A UBI for Germany funded by indirect tax reforms

IPR-FRIBIS Working Paper

Eric Qiao

March 2024

Abstract

Microsimulation studies of the funding options for Universal Basic Income (UBI) programmes are predominantly conducted using existing income tax and benefit systems, often with an assumption of budget neutrality. In this paper, we explore the possibility of funding UBI programmes through indirect tax reforms, principally increases in VAT rates, coupled with reforms to social security benefits. We use EUROMOD software and Household Budget Survey data (HBS) to model UBI schemes with different rates and target populations in the context of the 2019 tax and benefit system in Germany. We find that, unsurprisingly, small increments to VAT rates can fund low levels of UBI, but that higher level programmes cannot be realised without significant VAT increases. Distributional progressivity is higher for UBI schemes that are funded by a combination of indirect and direct taxes, and which have higher levels of UBI. We also examine additional UBI programmes targeted at sub-populations of children and young adults, which require smaller increases in VAT and/or direct taxes.

Keywords: UBI, financing, distributional effects, budgetary effects.

Acknowledgements

This working paper was made possible by a grant from the Freiburg Institute for Basic Income Studies.

Contents

List of figures

List of tables

1. Introduction

Proposals for Universal Basic Income (UBI) have risen in salience in public debates across the world in recent years. The reasons for this are many. Advocates of UBI argue that it can address worsening inequality, alleviate poverty and tackle economic insecurity, while others consider it a necessary response to increased automation of labour and unsustainable environmental resource extraction (Reed et al. 2022; Chrisp and Martinelli 2022; Langridge et al. 2023).

In recent years there have been a number of microsimulation studies of UBI schemes, most of which analyse reforms to direct taxes and social security benefits to fund particular schemes, often on the assumption of budget neutrality (Martinelli 2020; Torry 2021; Richiardi 2022). Most of these UBI schemes struggle to achieve the same level of redistribution and progressivity as targeted or means-tested benefits, due to the innate non-targeting feature of UBI. Similar concerns with the regressivity of indirect taxes mean that the use of indirect taxes to fund UBI schemes is rarely explored in the literature. Yet given the long-term shift in the tax burden from labour to consumption over the last 30 years or so in OECD countries, and the use of consumption taxes gaining more momentum in political debate over environmental taxation, it is opportune to examine the budgetary and distributional effects of indirect taxes for funding UBI schemes.

There are at least two reasons why microsimulation models of indirect taxes are useful in UBI microsimulations. The first is their direct practical relevance for analysing and evaluating reforms to taxes that generate a substantial proportion of government revenue and have a similarly significant impact on household spending power and welfare (Capeau et al. 2014). The second is that these taxes are commonly characterised by some level of regressivity, so seeking to combine revenue raising with a UBI might induce more progressive tax-benefit distributions overall, depending on the configuration of the reforms in specific national settings.

In this paper, we set out to explore the distributional effects of several selected options for a UBI in Germany. All the programmes we model use different rates of UBI for adults of working age, children and pensioners. More specifically, we model a standard rate UBI for all working age adults and allocate 50% of this rate to children (0-18 years of age), while pensioners get a top-up to the standard UBI of their existing state pension. We also model discrete programmes for children (a Universal Child Benefit) and for young adults (a UBI for 20-24-year-olds). The selected programmes are funded by different revenue raising schemes. We model funding these UBI programmes by increasing VAT rates by 1 percentage point, 5 percentage points, and 10 percentage points, respectively, combined with a withdrawal of existing social security benefits. In addition, we model the funding of UBI schemes by a combination of increases in direct and indirect taxes, which serve as a comparison of the effects of increasing direct and indirect taxes.

The rest of the paper is organised as follows. Section 2 reviews the literature. In order to understand the impact of the reform, Section 3 describes the datasets; and Section 4 explains the German tax system and the current micro-economic impact of indirect taxation on German households. Section 5 discusses the expenditure imputation and indirect tax calculation; Section 6 discusses UBI options in detail; Section 7 presents the results, and Section 8 summarises and concludes.

2. Literature review

Seven published microsimulation studies were found which either explore funding UBI funding through indirect tax reforms (Wakolbingeret al. 2023) or explore the fiscal and distributional impact of indirect tax reforms which resemble that of a UBI. Table 1 shows the main set of characteristics and results of the studies, identifying the data source, modelling framework and main findings reported.

The type of models used amongst these studies can be divided into two broad categories based primarily on the distinction between theoretically consistent and data-driven models. The majority of the studies follow the theoretically consistent approach by calibrating parameters, such as demand elasticities. Despite this commonality, the studies have different emphases in their analyses. Xavier and Varelas (2019) focus on the comparison of the effects between the real data (ENIGHUR) and the microsimulation (ECUAMOD). Abramovsky and Phillips (2015) incorporate behavioural estimation by imputing arbitrary labour supply elasticities found in the literature. Savage (2017) focuses on the sensitivity of the data imputation. There are also other smaller differences in the definition of the parameters and reforms modelled.

The second type of model is data driven in that the studies only consider the calculations of replacing current tax and benefit system with a proposed one, and look at the numerical implications. Wakolbinger et al (2023) is one such study which replaces the current German tax and benefit system with a system containing only a consumption tax and an import duty, plus a UBI programme where a fixed value is allocated to two groups of people in the population (Adult and under 18).

Despite the sophistication of the microsimulation models, the mechanisms through which the distributional effects work are relatively straightforward. If you offer more income to some households through the form of a UBI, then you need to increase the taxes of some other households to balance the account, if revenue neutrality is to be maintained.

Another feature that distinguishes these models is the approach they adopt in imputing the expenditure data to the income data. There are four different techniques recorded in the literature hitherto, comprising two groups of methods. The first group is of explicit techniques: parametric regression and semi-parametric regression. The second group is of implicit techniques: distance function and grade correspondence technique. Most of the studies in Table 1 below adopt the parametric regression method (Xavier and Varelas, 2019; Abramovsky and Phillips 2015 etc) for the benefit of ease. However, in practice, we need to base our choice on the characteristics of the data. For example, in the case where many zero expenditures exist, the estimation of Engel curve, a distance function or grade correspondence may be a better choice, as seen in Maitino et al. (2017).

Table 1: Literature review

Study	Data source	Modelling framework	Main findings reported
Xavier, J.H., and Varelas, M. (2019)	Ecuador National Survey of Income and Expenditures of Urban and Rural Households (ENIGHUR) 2-11-2012. And ECUAMOD simulated data.	ECUAMOD *Tax and social Insurance (SICs)* Personal income tax Employee SICs Self-employed SICs VAT *Social Benefits* Human Development Transfer Joaquin Gallegos Lara	1. Minor differences ENIGHUR *Poor* ECUAMOD *Better* 2. Direct taxes and cash transfers reduce income inequality by 3.2 to 4.1 points. 3. Indirect taxes slightly increase inequality only by 0.1 point (ECUAMOD), decrease by 0.8 point (ENIGHUR) 4. Social benefit reduces the inequality the most amongst the income components measured. 5. Public pension's effect is minor.
Abramovsky, L. and Phillips, D. (2015)	Mexico ENIGH data	MEXTAX *Tax and social insurance (SICs)* Income tax Employee's SICs VAT & Excise duties *Social Benefits* Earned-income ISR subsidy	1.The reform to VAT and duties yielded neutral distributional effects. 2. Using income as the measure of living standards, the reform is found to be progressive. (-1.4% and -0.6%) 3. Using expenditure as the measure of living standards, the reform is more successful. (0.26%, 0.94%) 4. Labour supply responsiveness have modest quantitative effects on the results.
Savage, M. (2017)	Irish Household Budget Survey (HBS) and Irish Survey on Income and Living Conditions (SILC)	SWITCH Direct tax Indirect tax Social welfare systems	The imputation of expenditure data hardly changes the distributional effects of the analysis. *Reform 1* 1. VAT increase decrease income in each decile. 2. Increase in Child Benefit performs well in compensating the effect in VAT increase. *Reform 2* 1. The increase in the fuel allowance is largely progressive, largest increases in income occurring at the bottom of the distribution. 2. The increase at the top of the income distribution see almost zero changes due to means-testing.
Decoster, A., Verweft, D., Loughrey, J. and O'Donoghue, C. (2010)	Household Budget Survey and EU-SILC in Belgium, Hungary, Ireland and the UK	EUROMOD Indirect tax	1. Proposed the method of imputing expenditure information by means of Engel curve estimated on expenditure surveys. 2.Indirect taxation is regressive with respect to income, but proportional, or even progressive with respect to expenditure. 3. The redistributive effect of a tax, the extent to which it decreases inequality, is a function both of its progressivity and its average rate.

O'Donoghue, C. (2021)	Irish Household Budget Survey (HBS)	EUROMOD Indirect tax	1. Home fuels are consumed most intensively by poorer households relative to richer households. 2. Tobacco, food, rent and communications are among the other commodities consumed most intensively by poor households. 3. Education expenses and other goods are consumed most intensively by richer households. 4. Goods with a higher marginal revenue cost would have their tax rate increased under optimal taxation.
Maitino, M. L. et al. (2017)	EU-SILC and Italian HBS	EUROMOD Indirect tax In-kind transfers	1. The food share is higher in the South of Italy than in the North. 2. The propensity to consume decreases by income deciles. 3. The reduced rate of VAT has the most regressivity in expenditure. 4. The expenditure on education follows a monotonic increase in income quintiles across all levels. 5. The matching results are largely similar from different methods, parametric and non-parametric.
Wakolbinger, F. et al. (2023)	Eurostat, 2022. Germany data	UBI Scheme Adult: €1,000/month; Under 18: €500/month. Purely funded by consumption tax and import duties, all other taxes and SICs are eliminated.	1. Require €560 bn to 700 bn additional tax revenue. 2. Consumer prices are likely to increase drastically. 3. Real income changes are modest. 4. Price increases are lower for consumer goods with lower import content. 5. Consumption is likely to shift towards domestically produced goods.

As changes in indirect taxes affect the relative prices of goods, there will either be a change in consumption patterns or a change in savings. Accounting for behavioural changes would seem a particularly fruitful avenue for exploring the true distributional impact of a UBI programme. The findings in the Abramovsky and Phillips (2015) paper are particularly useful, as they show that the labour supply also responds to indirect tax changes, though moderately.

While most of the papers here have focused on single-country analyses, there is an increasing literature looking at indirect taxes in a comparative context (O'Donoghue et al. 2004; Decoster et al. 2010). Many of the papers in the literature focus on indirect taxes only, given the fact that income data in a household budget survey is not always of sufficient quality to model direct taxes. But more often, there is a need to statistically match data from a budget survey into an income survey in order to model both direct and indirect taxes (Maitino et al. 2017).

Differing approaches to each of the issues may lead to differences in findings from the same data sources. While these differences must be appreciated, we also need to track the impact of each approach, so that the results of the analysis can be meaningfully compared across studies.

3. Data and indirect tax calculation

The expenditure survey used in this analysis is the 2010 wave of the German Household Budget Survey (HBS). A nationally representative sample of 3,565 households is asked to maintain a detailed diary of household expenditure over a two-week period. Some expenditure items, such as expenditure on durable items, are collected over a longer period. There are also demographic and socio-economic variables such as age, education, economic status, disposable income etc.

The indirect taxes included in the analysis are value added tax (VAT), excise duties and ad valorem excise. The calculation followed Akoguz et al. (2018) closely in order to keep the consistency. We do the calculations at the most detailed level of aggregation available (COICOP). A good at this level of aggregation is indexed by k. in the sequel of this subsection, we act as if the statutory rates are uniquely defined at this level of aggregation. The total tax liability payable on a good k by a household h, denoted by T_k^h is the difference between expenditure on good k by the household, e_k^h, and seller's revenues obtained from this expenditure. Defining household expenditure on commodity k as quantity bought, x_k^h, times consumer price,

$$e_k^h = q_k x_k^h$$

and seller's revenues by producer price times that quantity, $p_k x_k^h$, we thus have

$$T_k^h = (q_k - p_k) x_k^h$$

The wedge between consumer price and producer price originates from different indirect tax instruments, giving us the following relation between consumer price q_k and producer price p_k

$$q_k = (1 + t_k)(p_k + a_k + v_k q_k)$$

To summarise the different indirect taxes, we define one implicit tax rate on good k as

$$q_k \equiv (1 + \tau_k) p_k$$

We thus have

$$T_{t_k}^h + T_{v_k}^h + T_{a_k} = \left(\frac{t_k}{1 + t_k} + v_k + \frac{a_k}{q_k} \right) e_k^h = T_k^h$$

The above equations show that we can calculate indirect tax liabilities for commodities on which no specific excises are levied solely on the basis of information on expenditures and statutory rates. For goods on which specific excises are levied we also need to calculate quantities measured. Let quantities measured at producer prices be denoted by $\tilde{x}_k^h$, then

$$\tilde{x}_k^h \equiv p_k x_k^h = \frac{q_k}{1 + \tau_k} x_k^h = \frac{e_k^h}{1 + \tau_k}$$

We thus can summarise the variables explained as below:

Expenditure $e_k^h = q_k x_k^h$

Quantity at producer prices $\tilde{x}_k^h = \frac{e_k^h}{1+\tau_k}$

Quantity (for goods with specific excises) $x_k^h = \frac{e_k^h}{q_k^h}$

Income shares of expenditures on k $w_k^h = \frac{e_k^h}{y^h}$

VAT tax liability $T_{t_k}^h = \frac{t_k}{1+t_k} e_k^h$

Ad valorem excise $T_{t_k}^h = v_k e_k^h$

Specific excise liabilities $T_{a_k}^h = \frac{a_k}{q_k} e_k^h$

The income survey used in this paper is the 2019 wave of the Survey of Income and Living Conditions (SILC). German SILC is an annual survey designed to obtain information regarding the income and living conditions of German households. German SILC 2019 is a survey of 16,751 households, consisting of 23,603 individuals, between January 2019 and January 2020, with an income reference period being the 12 months prior to the interview. It is incorporated into the tax-benefit microsimulation model of EUROMOD.

4. The German indirect tax system and the regressivity of indirect taxes

4.1 The German indirect tax system

The German indirect taxation generally includes VAT, other transactional taxes and excise duties. VAT is taxed on almost all consumption expenses. Technically, it is collected from the enterprises selling goods and services who can claim back the VAT paid for their inputs. The standard tax rate is 19% in the year 2019, and a reduced rate of 7% applies for most foodstuffs and certain other basic necessities.

Other transactional taxes include taxes such as the real property acquisition tax, which happens when property is transferred. The rate is 3.5% but individual German states may choose different rates. Another transactional tax is insurance tax, which taxes the insurance contributions or premiums except for statutory and private life and health insurance and statutory unemployment insurance. The rate here is generally 19%; different rates may apply to specific insurances. Other transactional taxes only have minor revenues.

The excise duties are specific taxes on the consumption or usage of certain goods. Most revenue is collected from energy tax, which is a tax on all fossil and biological energy carriers, and tobacco tax. Further excise taxes, like the beer tax are of comparatively minor importance.

4.2 The regressivity of indirect tax

In 2019, German households paid an average of €3,120 annually in indirect taxes. VAT accounts for almost three-quarters of that amount, followed by the excise duty, and ad valorem duty.

Table 2: Average annual amounts by income deciles (EUR)

Decile	Total indirect taxation	VAT	Excise	ad. val duty
1	1,908	1,321	427	160
2	2,221	1,538	517	165
3	2,527	1,761	588	177
4	2,763	1,931	661	171
5	2,961	2,090	683	189
6	3,170	2,267	718	185
7	3,287	2,358	745	184
8	3,784	2,799	805	181
9	3,929	2,927	821	181
10	4,654	3,624	850	180
Total	**3,120**	**2,262**	**682**	**177**

The average amount of indirect tax rises in close correlation to the standard of living as it does for all the taxes taken separately. Overall, the average amount of indirect taxes paid by the highest decile is 2.5 times higher than that of the first decile.

The fiscal pressure from indirect taxation appears regressive when it is measured against income, as saving is a rising function of standard of living and income in the lower deciles is allocated exclusively to consumption. If we measure such impact against expenditure, the apparent indirect tax rate could be calculated as:

Table 3: Apparent indirect tax rate

Expenditure deciles	Indirect tax rate
1	17.5%
2	17.6%
3	17.8%
4	18.0%
5	18.2%
6	18.3%
7	18.6%
8	18.8%
9	18.7%
10	19.1%

However, taking income as a measure for the impact of indirect taxation instead of expenditure is essential because the distributional impact of indirect taxes must take account of household resources. The total expenditure is only an incomplete view. Moreover, as saving is intended to be consumed later, it is also ultimately subject to indirect taxes.

5. Expenditure imputation

In terms of the expenditure imputation and indirect tax calculation, we closely follow Akoguz et al. (2018), so that our results can be tractable and gaugeable on a comparative basis. In the following sections, the theoretical and practical procedure we follow is explained in detail.

5.1 The imputation process

We adopted the predictive mean matching approach (PMM), which combines regression-based imputation and hot deck matching approaches. Its most basic application pertains to imputing a single or multiple variable(s) with missing values.

First, a regression model is estimated on the source data where the variable to be imputed is the dependent variable and the common variables are the covariates, as in regression-based imputation.

Then, the variable to be imputed is fitted for both recipient and source data. Note that in contrast to regression-based methods, fitted values from the estimated model are also produced for observations in the source data.

The distances between households in source and recipient datasets are constructed on the basis of these fitted values. As there is only one variable to impute, the absolute value of the difference between fitted values of an observation in the source and an observation in the recipient constitute this distance. The pair with the closest distance form a match.

Essentially, the PMM approach can be defined as a specific type of hot deck matching which uses a distance metric that assigns corresponding regression coefficients as weights to the differences between the values of the variables entering the distance function. By doing so, it benefits from the information regarding the relation between household characteristics and the variable to be imputed in the source data. Since it is based on regressions, the method does not perform well when it comes to imputing values for expenditures on a detailed level of aggregation.

In practice, we first categorised the expenditure into 20 broad categories[1] to which our regression model was applied. Our basic regression model correlates income shares of expenditure on the 20 broad categories with household characteristics. Though we stress that we do not give any structural interpretation to the regression model, the selection of covariates is very much inspired by the specification of Engel curves. More specifically, a third-degree

[1] 20 categories: Food and non-alcoholic beverages, Alcoholic beverages, Clothing and footwear, Communications, Culture and recreation, Education, Health and care, House durables, House goods and services, Housing and rental, Insurance, Other, Personal care, Private transportation, public transportation, Restaurants and hotels, Tobacco, Traveling, Utilities and Vehicles.

polynomial in the log of incomes and a rich set of household composition characteristics were included, containing detailed information on the number of household members in different socio-demographic groups, such as gender, economic status, education and age.

5.2 Imputation results

In this section, we present the evaluation of the imputation quality by discussing the graphs of mean income shares of expenditures per income ventile. We examine the imputation results for all 20 broad categories, discussing the categories that perform well, and others that do not do so well. Figure 1 shows the total expenditure from both EU-SILC and HBS. The pattern matches quite well from both datasets, which is likely to indicate that the imputation quality is high. To be more specific, the quality of imputation is better during the mid-ventiles, and less so at the tails of the locus, largely due to infrequent expenditures.

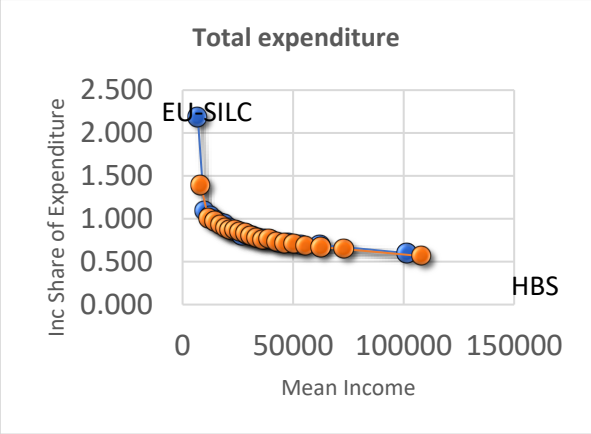

Figure 1: Ventile graph of total expenditure

Similar patterns can be seen in Figure 2 in expenditure categories such as food and non-alcoholic beverages, housing and rental, utilities, communications, culture and recreation, and tobacco etc.

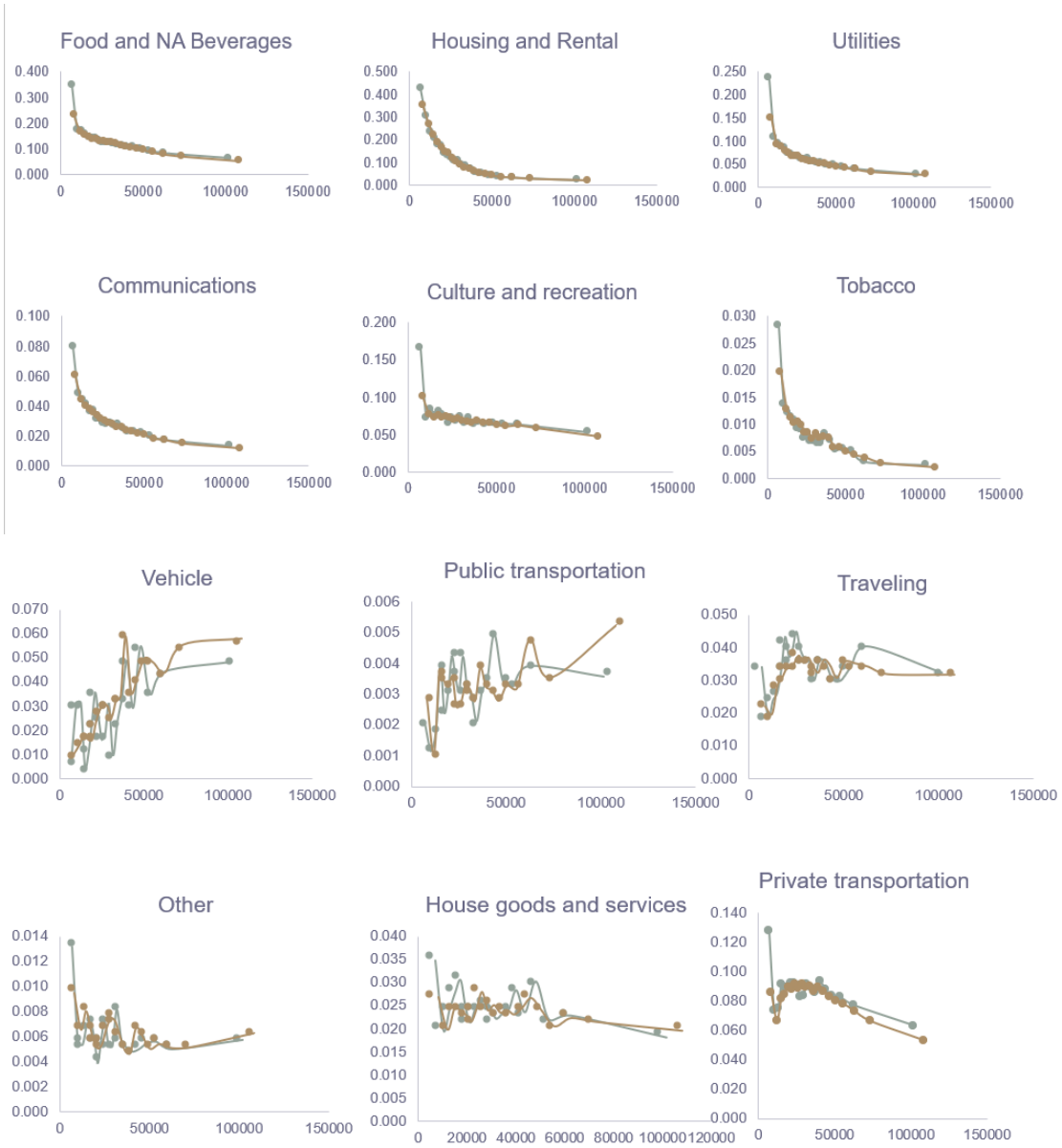

Figure 2: Ventile graphs on imputation quality evaluation

The fit is not as good for expenditures on vehicles, public transportation, travelling, house goods and services, and other expenditure.

6. Assumptions and UBI options

We model UBI programmes using 2019 policies for taxes and benefits in Germany, rather than 2020 or 2021, in order to prevent distortions from Covid-19 pandemic policy interventions in the analysis (as do Richiardi 2022 and Maier and Ricci 2024). In addition, due to the fact that our expenditure data is recorded for 2010, we assume a constant income share of expenditure, i.e. no change in household consumption behaviour, owing to the inability to calculate elasticities with just one year's expenditure data. We believe that the unaccounted-for behavioural changes are likely to lead to an increase in labour supply (income and substitution effects) or decrease in consumption. This means that we are likely to underestimate the size and hence the effects of the UBI schemes.

Second, most of the UBI microsimulation literature restricts the modelled options by imposing a budget neutrality condition, which means that the budget balance through taxes plus social contributions minus pensions and benefits remain unchanged. As a result, most of the UBI microsimulation studies find limited effects, budgetary and distributional. In this study, we unchain ourselves from the budget neutrality condition, to explore more generous UBI options, as what Gotz Werner defined as the "cultural minimum" (Wakolbinger et al. 2023), i.e. a level of UBI that can secure a social minimum of living standards.

We consider three different sets of UBI options. The first is a UBI for all, in which everyone receives a basic income; the second is a UBI for young adults (20-24 years old); and the third is a UBI for children (up to 18 years old), or what we can refer to as a Universal Child Benefit. The reason behind such choices is that children and young adults have not yet entered or have just entered the labour market, so additional investment can improve their transition or preparation for adulthood.

6.1 Basic income for all

We assume that adults receive standard UBI payments and children receive 50% of the standard basic income payment available for adults, while pensioners receive a top-up to their state pension to the level of the standard UBI, so that they are at least not worse off. The level of the basic income is determined by the budget condition and how the schemes are funded.

In our analysis, we first model four reforms:

- Reform 1: A UBI funded by increasing the VAT rate respectively by 1 unit point i.e. to 20% in the standard rate and 8% in the reduced rate
- Reform 2: A UBI funded by a 5-unit point increase in VAT, i.e. to 24% in the standard rate and 12% in the reduced rate
- Reform 3: A UBI funded by a 10-unit point increase in VAT, i.e. to 29% in the standard rate and 17% in the reduced rate

- Reform 4: A UBI of €1,000/adult per month, and €500/child per month, with the UBI funded by VAT and income tax. UBI at this level is found in literature to be incapable of funding by indirect tax reforms alone (Wakolbinger et al. 2023); we therefore examine the feasibility of sharing the tax burden between indirect taxes and direct taxes.

6.2 Basic income for young adults

In this UBI scenario, we restrict the payment of a basic income to young adults (20-24 years old). The motivation is that young adults are new entrants to the labour market, experience greater income precarity and have limited savings or assets. They could benefit from a UBI that gives them greater stability and support in their transitions to early adulthood, which could impact on their choices in the short term, as well as in the long term. In this scenario, the basic income is entirely additional, not taxable, not means-tested, and with no changes to the benefits. Two reforms are modelled, Reform 5 (€1,000/adult per month) funded only by VAT reform; and Reform 6, (€1,000/adult per month) funded by VAT and income tax jointly.

6.3 Universal Child Benefit

In this scenario, we restrict the payment of €500 to each child (up to 18 years old). Like other child benefits, this policy aims to reduce the financial burden on parents of childrearing, and to alleviate child poverty, but through a universal, rather than means-tested payment for each child. This basic income is also additional, not taxable, not means-tested, and no changes to the benefits. Again, two reforms are modelled, Reform 7 by VAT only, and Reform 8 by VAT and income tax jointly.

7. Results

7.1 Budgetary effects

The level of the monthly standard UBI ranges from €168 (Reform 1) to €1,000 (Reform 4). The amount of the child UBI is 50% of the standard UBI for adults. The patterns show that big increases in indirect taxes enable more generous UBI payments. Reform 4 has a fixed payment; it requires an increase in the indirect tax rate by 12.4 unit points and direct tax by 9.7 unit points. These are still big increases, which are very likely to be politically unfeasible.

Table 4: Basic Income payments (€/month)

	Reform 1	Reform 2	Reform 3	Reform 4
Adult UBI	168	307	458	1,000
Child UBI	84	154	229	500

Table 5 describes how the different UBI options are funded, with reference to the baseline (2019 policies). Taxes are increased in all scenarios and these range from €15.9 billion (Reform 1) to €79.3 billion (Reform 2), to €158.6 billion (Reform 3), and €335.1 billion (Reform 4). Social insurance contributions and pensions remain unchanged. The main difference in funding comes from indirect taxes. The cost of the UBI options therefore ranges between €1.71 trillion (Reform 1), €1.77 trillion (Reform 2), €1.85 trillion (Reform 3), and €2.02 trillion (Reform 4).

Table 5: Budgetary effects for UBI

Difference to baseline (2019 Policies) (EUR in millions)					
	Basic Income for All				
	Baseline	Reform 1	Reform 2	Reform 3	Reform 4
Government revenue through taxes and SICs	**1,182,793.51**	**1,198,649.30**	**1,262,072.47**	**1,341,351.43**	**1,517,853.32**
...direct taxes	351,839.97	351,839.97	351,839.97	351,839.97	503,131.16
...indirect taxes	301,260.04	317,115.83	380,539.00	459,817.96	485,028.66
...employee SICs	242,568.48	242,568.48	242,568.48	242,568.48	242,568.48
...self-employed SICs	15,815.35	15,815.35	15,815.35	15,815.35	15,815.35
...other SICs	38,704.78	38,704.78	38,704.78	38,704.78	38,704.78
...employer SICs	232,604.89	232,604.89	232,604.89	232,604.89	232,604.89
Government expenditure on social transfers	**507,128.60**	**507,128.60**	**507,128.60**	**507,128.60**	**507,128.60**
By target group					
...unemployment benefit	32,271.57	32,271.57	32,271.57	32,271.57	32,271.57
...family and education benefits	47,731.06	47,731.06	47,731.06	47,731.06	47,731.06
...social assistance and housing benefits	5,658.76	5,658.76	5,658.76	5,658.76	5,658.76
...pensions, health and disability benefits	421,467.23	421,467.23	421,467.23	421,467.23	421,467.23
...firms	0	0	0	0	0
By benefit design					
...means-tested non-pension benefits	28,584.42	28,584.42	28,584.42	28,584.42	28,584.42
...non-means-tested non-pension benefits	72,004.15	72,004.15	72,004.15	72,004.15	72,004.15
...pensions	406,540.05	406,540.05	406,540.05	406,540.05	406,540.05
...firms' subsidies	0	0	0	0	0
Basic Income	**1,689,912.11**	**1,705,777.90**	**1,769,201.07**	**1,848,480.03**	**2,024,981.92**

As far as the sub-population options are concerned, basic income for young adults requires expenditure of €172 billion, while €90.4 billion is required for the universal child benefit. Since these UBI programmes are targeted at only a part of the population, it is unreasonable to consider redistribution the social security benefits of the rest of the population to raise the revenues for the reform. Therefore, the programmes are purely funded by tax increases.

Table 6: Budgetary effects for sub-population UBIs

Budgetary effects of sub-population UBI options	Difference to baseline (2019 Policies) (EUR in millions)			
	Basic Income for Young Adults		Universal Child Benefit	
	Reform 5	Reform 6	Reform 7	Reform 8
Government revenue through taxes and SICs	171,718.22	171,718.22	90,378.01	90,378.01
...direct taxes		86,200.79		45,387.36
...indirect taxes	171,718.22	85,517.43	90,378.01	44,990.66
...employee SICs	0	0	0	0
...self-employed SICs	0	0	0	0
...other SICs	0	0	0	0
...employer SICs	0	0	0	0
Government expenditure on social transfers	0	0	0	0
By target group				
...unemployment benefit	0	0	0	0
...family and education benefits	0	0	0	0
...social assistance and housing benefits	0	0	0	0
...pensions, health and disability benefits	0	0	0	0
...firms	0	0	0	0
By benefit design				
...means-tested non-pension benefits	0	0	0	0
...non-means-tested non-pension benefits	0	0	0	0
...pensions	0	0	0	0
...firms' subsidies	0	0	0	0
Basic Income	171,718.22	171,718.22	90,378.01	90,378.01

7.2 Distributional effects

In this section, we look at the winners and losers in the distributional effects of the different UBI programmes through the lens of demographic characteristics such as gender and age, as well as comparing the reforms we simulated.

The distribution by gender is largely balanced, because our UBI programmes are not designed to select on gender.

The UBI for all programmes suggest that the more generous the programme is, the more people benefit from it as a whole, and the greater the progressivity.

The sub-population programmes show strong effects by age because of the nature of age targeting. However, there are some spill-over effects onto other age groups. This is perhaps caused by multi-generational households.

We do not model the distributional effects of the reforms on households where someone has a disability, which is a limitation of the study.

Table 7: Share of winners and losers by sex and age

	Winners							
	Reform 1	Reform 2	Reform 3	Reform 4	Reform 5	Reform 6	Reform 7	Reform 8
Sex								
Female	51.20%	51.80%	53.60%	46.80%	12.50%	12.50%	10.40%	10.40%
Male	56.00%	53.30%	57.30%	49.00%	12.80%	12.80%	11.60%	11.60%
Age								
1-19	53.20%	61.40%	71.00%	78.20%	6.80%	6.80%	99.20%	99.20%
20-24	63.84%	73.68%	78.10%	87.58%	98.52%	98.44%	3.77%	3.77%
25-60	60.01%	70.73%	70.91%	81.45%	9.90%	9.40%	6.80%	6.80%
61 +	15.96%	18.42%	18.30%	15.20%	1.50%	1.53%	0.54%	0.54%
	Losers							
	Reform 1	**Reform 2**	**Reform 3**	**Reform 4**	**Reform 5**	**Reform 6**	**Reform 7**	**Reform 8**
Sex								
Female	48.80%	48.20%	46.40%	53.20%	87.50%	87.50%	89.60%	89.60%
Male	44.00%	46.70%	42.70%	51.00%	87.20%	87.20%	88.40%	88.40%
Age								
1-19	41.92%	38.60%	29.00%	46.92%	40.10%	18.30%	0.80%	0.80%
20-24	36.16%	26.32%	21.90%	52.55%	0.60%	29.28%	52.20%	52.20%
25-60	39.99%	29.27%	29.09%	48.87%	52.18%	19.03%	63.40%	63.40%
61 +	84.04%	81.58%	81.70%	31.20%	58.00%	12.17%	66.90%	66.80%

Figures 3 and 4 shows the percentage changes for winners and losers in each income decile. Reform 1 shows a large fraction of the population losing out in the lower deciles. This may appear strange, and is likely caused by the fact that the lower decile people tend to have higher income share of expenditure, meaning that indirect tax hit them harder than the compensation effect of a small UBI payment. It also shows the benefit withdrawing effect from the lower income deciles. A similar pattern is observed in the higher income deciles; they are worse off in our redistribution program.

As the UBI payment increases, we see decreasing proportions of losers in the lower income deciles, which confirms our expectation of distributional effects. Sub-population programmes entail almost no losers in the poorest decile; this implies that many of the poorest income deciles have either a young person or a child, which causes the benefit to outweigh their paying into the VAT. However, the proportion of losers quickly increases afterwards, because the UBI is funded by taxing the whole population.

(x-axis: income deciles, y-axis: share of population)

Figure 3: Winners and losers (UBI for all)

Figure 4: Winners and losers (UBI for sub-populations)

7.3 Inequality effects

Table 8 shows the contribution of taxes, pensions and benefits in the overall GINI index, which measures inequality in household income. As the generosity of the programmes increases, the progressive effects are more obvious, especially when measured by disposable income (calculated as original income + pensions – taxes + other benefits). The sub-population programmes are largely fit for the purpose. This is likely caused by the fact that the programmes are targeted, while the funding are widespread.

Table 8: GINI index

Basic inequality Indices	Baseline	Reform 1	Reform 2	Reform 3	Reform 4	Reform 5	Reform 6	Reform 7	Reform 8
GINI index					Difference to baseline				
Original income	0.4908	0	0	0	0	0	0	0	0
Original income after taxes/SICs	0.473	0.0068	0.0045	0.012	0.02	-0.0012	-0.0012	-0.0009	-0.0009
Original income incl. public pensions after taxes/SICs	0.3067	-0.007	-0.002	-0.018	-0.021	-0.0023	-0.0023	-0.0014	-0.0014
Disposable income	0.2681	0.0085	-0.01	-0.0312	-0.043	-0.0067	-0.0067	-0.0039	-0.0039

Poverty line is defined as 60% of the average equalised income in the baseline (€13512/year)

Table 9: At risk of poverty rates for different population sub-groups

Sub-population	Baseline	UBI for All				UBI for YA		UBI for Children	
		Reform 1	Reform 2	Reform 3	Reform 4	Reform 5	Reform 6	Reform 7	Reform 8
		Difference to baseline (Percentage point)							
One adult<65, no children	29.69%	5.1	4.2	2.5	-0.6	-1.8	-1.8	0.3	0.3
One adult≥65, no children	29.48%	-1.1	-0.2	1.9	2.7	0	0	0	0
One adult with children	31.83%	6.3	2.7	-3.9	-4.1	-1.2	-1.2	-2.6	-2.6
Two adults<65, no children	9.87%	-0.7	-2.9	-3.2	-3.8	1.7	1.7	3	3
Two adults with one child	7.99%	2.4	-1.8	-1.7	-2.5	-0.3	-0.3	-1.8	-1.8
Two adults with two children	7.07%	1.5	-1.3	-1.6	-3.7	-0.8	-0.8	-2.1	-2.1
Two adults with three or more children	12.39%	3.8	-0.9	-3.2	-5.5	-0.2	-0.2	-7.4	-7.4
Three or more adults, no children	4.11%	-0.2	-3.2	-7.4	-1.1	-2.9	-2.9	2.5	2.5
Three or more adults with children	11.19%	-0.7	-5.1	-4.5	-2.4	-5.6	-5.6	-5.1	-5.1
All	14.30%	1.8	-0.9	-2.3	-2	-1.2	-1.2	-1.5	-1.5

Poverty line is defined as 60% of the average equalised income in the baseline (€13,512/year)

Table 9 shows the baseline rates and the effects of the eight reforms for different population sub-groups. The big losers in Reforms 1 and 2 are families with children, as child benefits are eliminated. Families with children show big improvements in poverty rates in Reforms 3 and 4. Single individuals are the group that suffers in most of the scenarios (Reforms 1-3) among the UBIs for all, because they are the major bearers of the tax rise burden, while losing benefits. Households with more people or children tend to benefit in more of the scenarios; this is likely the result of resource pooling and consumption sharing.

8. Discussion and conclusion

In this study, we have investigated several UBI options financed by indirect tax reforms (with some interacting with direct tax reforms) in Germany through the EURMOD static tax-benefit microsimulation model. The UBI options were chosen based on the idea of an incremental increase in the size of the reform, and we explore budgetary as well as distributional effects, so that we can see the changes in these effects under each modelled option. We also modelled the UBI options for targeted populations, young adults and children.

The policy implications are that indirect taxes are mostly regressive in nature, but when combined with a UBI, they can actually bring about progressive effects in redistribution and poverty alleviation. The magnitude of these effects depends on the size of the change in the reform, largely that the bigger the reform and the higher the UBI, the more impactful the programme will be. Nonetheless, higher levels of UBI also imply significant increases in taxation, both indirect and direct, a feature which has led pure UBI schemes to be considered unaffordable or politically unfeasible in previous studies (Martinelli 2020).

Consequently, we modelled UBI schemes targeted at sub-populations, in what may be considered incremental steps to a UBI for all. These programmes are effective in that they are targeted at populations where poverty levels are high, such as young adults and children, and the cost can be sustainable as it is spread out across the whole population. They are likely to be constructive steps between small-scale UBI pilot programmes and national-level programmes for a whole population, and help us to have more insights into, for example, the behavioural impacts of UBI programmes, where data is currently limited.

Lastly, in our models, a combination of direct and indirect taxes seems to be a better option when it comes to raising taxes, as it reduces the impact of single taxes when it comes to UBI funding and is progressive.

References

Abramovsky, L. and Phillips, D. (2015). "A Tax Micro-simulator for Mexico (MEXTAX) and its application to the 2010 tax reforms." *IFS Working Papers,* No. W15/23.

Akoguz, E. C., Capeau, B., Decoster, A., De Sadeleer, L., Guner, D., Manios, K., Paulus, A. and Vanheukelom, T. (2020). *A New Indirect Tax Tool for EUROMOD Final Report*. Technical Report.

Capeau, B., Decoster, A., and Phillips, D. (2014). "Consumption and Indirect Tax Models." In C. O'Donoghue (ed.) *Handbook of Microsimulation Modelling*. Bingley: Emerald Group Publishing, 223-73.

Chrisp, J. and Martinelli, L. (2022). "The Case for a Basic Income in the Emergent Digitalized Economy." In M. Busemeyer, A. Kemmerling, P. Marx and K. van Kersbergen (eds.) *Digitalization and the Welfare State*. Oxford: Oxford University Press, 174-191.

Creedy, J. (2002). "The GST and vertical, horizontal and re-ranking effects of indirect taxation in Australia." *Australian Economic Review*, 35(4): 380-390.

Decoster, A., Loughrey, J. O'Donoghue, C. and Verwerft, D. (2010). "How regressive are indirect taxes? A Microsimulation analysis for Five European Countries." *Journal of Policy Analysis and Management*, 29: 326-350.

Decoster, A., Loughrey, J., O'Donoghue, C., and Verwerft, D. (2011). "Microsimulation of indirect taxes." *International Journal of Microsimulation*, 4(2): 41-56.

Decoster, A., Ochmann, R., and Spiritus, K. (2013). "Integrating indirect taxation into EUROMOD. Documentation and results for Germany." *EUROMOD Working Paper,* EM 20/13, ISER-University of Essex.

Institute for Fiscal Studies, et al. (2011). "A retrospective evaluation of the element of the EU VAT system." *Evaluation Report for the EU Commission.*

Kela (2016). "From Idea to Experiment: Report on universal basic income experiment in Finland." *Kela Working Paper 106/2016*. Helsinki: Kela.

Langridge, N., Buchs, M. and Howard, N. (2023). "An Ecological Basic Income? Examining the Ecological Credentials of Basic Income Through a Review of Selected Pilot Interventions." *Basic Income Studies,* 18(1): 47-87.

Maier, S. and Ricci, M. (2024). "The redistributive impact of consumption taxation in the EU: Lessons from the post-financial crisis decade." *Economic Analysis and Policy,* 81: 738-755.

Maitino, M., Ravagli, L., and Sciclone, N. (2017). "Microreg: a Traditional Tax-Benefit Microsimulation Model Extended to Indirect Taxes and In-Kind Transfers." *International Journal of Microsimulation,* 10(1): 5-38.

Martinelli, L. (2020). 'A basic income trilemma: Affordability, adequacy, and the advantages of radically simplified welfare.' *Journal of Social Policy*, 49(3): 461-482.

Martinelli, L. and O'Neill, K. (2019). "A comparison of the fiscal and distributional effects of alternative basic income implementation modes across the EU28", *EUROMOD Working Paper,* EM14/19, ISER-University of Essex.

O'Donoghue, C., Baldini, M., and Montovani, D. (2004). "Modelling the redistributive impact of indirect taxes in Europe: An application of EUROMOD." *EUROMOD Working Paper,* No. EM7/01, ISER-University of Essex.

O'Donoghue, C. (2021). *Practical Microsimulation Modelling.* Oxford University Press, Oxford.

Reed, H., Lansley, S., Johnson, M., Johnson, E. and Pickett, K.E. (2022). *Tackling Poverty: The Power of a Universal Basic Income*. London: Compass.

Richiardi, M. (2022) "A Basic Income for France: Ideas for a Debate", *CeMPA Working Paper Series,* CEMPA6/22.

Savage, M. (2017), "Integrated Modelling of the Impact of Direct and Indirect Taxes Using Complementary Datasets." *The Economic and Social Review*, 48(2), 171-205.

Torry, M. (2018). *Why we need a citizen's basic income.* Bristol: Policy Press.

Torry, M. (2021). "Three income maintenance options for 2021." *EUROMOD WP1/21,* ISER-University of Essex.

Wakolbinger, F., Dreer, E. and Schneider, F. (2023). "Consumption-Financed UBI in Germany." *Research Institute of Banking discussion paper*, JKU Linz.

Xavier, H. J. and Varelas, M. (2019). "Tax-Benefit Microsimulation and Income Redistribution in Ecuador." *International Journal of Microsimulation*, 12(1), 52-82.

Connect with us

Email us
ipr@bath.ac.uk

Find us online
www.bath.ac.uk/ipr

Read our blog
blogs.bath.ac.uk/iprblog

Join our mailing list
bit.ly/IPRnewsletter

Follow us on X
@UniofBathIPR

Follow us on LinkedIn
linkedin.com/school/bath-ac-uk-ipr

Subscribe to us on YouTube
bit.ly/IPRyoutube

Follow us on SoundCloud
bit.ly/IPRsoundcloud

UNIVERSITY OF BATH

IPR Institute for Policy Research