



Tax Reforms And Their Varying Impacts on Private Households in Germany; Socio-Economic Modelling Opportunities in a Macro-Econometric Input-Output Model

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Tax reforms and their varying impacts on private households in Germany

Socio-economic modelling opportunities in
a macro-econometric input-output model.

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Impressum

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1 INTRODUCTION

In 2015, private households generated 386 bn Euro property income and 1,545 bn Euro gross income from wages and salaries (StBA 2016). In total they paid 282 bn Euro income taxes (ibid.). From 1991 to 2005 private household income from wealth and wages in average grew faster than income taxes: while property income and gross income from wages and salaries increased by 3.4 % and 2.1 % p. a., income taxes increased by only 1.5 % p. a. (ibid.). In the period thereafter (2005-2015) the situation changed leading to higher average annual growth rates in taxes (4.2 % p. a.) than in income (0.2 % p. a. for property income and 3.1 % p. a. for wage income) (ibid.). Simultaneously with this development the dispute about the bracket creep and the demand for tax cuts flared up again (Hechter et al. 2012, Breidenbach 2014). Especially households with small and medium incomes were affected by high raises in the income tax burden caused by the bracket creep (Lühn 2013). Changes in the income tariffs between 2005 and 2014 did not suffice to compensate the bracket creep (ibid.).

The aim of this paper is to analyse the effects of an income tax reduction on the total economy as well as on the income situation of different household types. By combining the macro-econometric input-output model INFORGE with the socio-economic system DEMOS (with household specific income and consumption information) we can show which household types would profit most and how their income would change. Issues concerning measures of inequality can be addressed as well.

It can be shown that a tax reduction has a positive effect throughout the economy in the initial year of the tax reform. In the years that follows the positive impact changes into small persistently negative ones. Furthermore, the first positive impulse is not high enough to outweigh the accumulated negative effects. Working households with high incomes profit most from simple tax cuts. Non-working households are faced with comparably smaller positive deviations in income but succeed to have positive effects in the long run. The inequality is higher in the year of the tax reform and falls back to the original level thereafter.

The remainder of the paper is structured as follows. Section 2 gives a short overview of the modelling context and the scenario settings. Section 3 encompasses the results on economic and household-specific level. The conclusion is in Section 4.

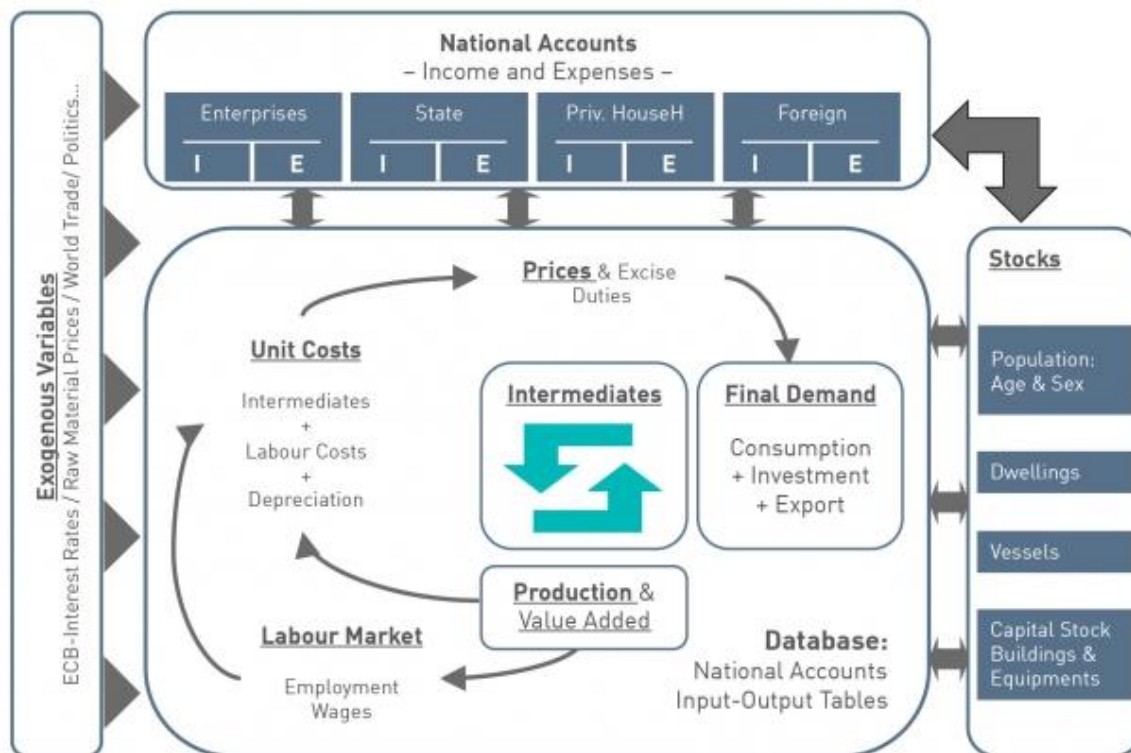
2 MODEL AND SCENARIO SETTING

The effects of an income tax reform on the income situation of different household types and the consequences for their consumption behaviour is shown using the macro-econometric input-output model INFORGE in combination with the socio-economic module DEMOS. The modelling background and the scenario setting is described in the next subsections.

2.1 MODELLING BACKGROUND

The economic framework is represented by the macro-econometric input-output model INFORGE (INterindustryFORecastingGermany) (see Figure 1). The model has been used for economic forecasts, projections and scenario analyses for Germany in many projects and studies (e. g. Drosdowski et al. 2016, Bünemann & Stöver 2015, Meyer et al. 2015). It is established among European input-output models (**Fehler! Verweisquelle konnte nicht gefunden werden.**) and well documented (**Fehler! Verweisquelle konnte nicht gefunden werden.**, **Fehler! Verweisquelle konnte nicht gefunden werden.**).

Figure 1: THE MACRO-ECONOMETRIC MODEL INFORGE



Source: own figure.

INFORGE follows the INFORUM modelling principles (**Fehler! Verweisquelle konnte nicht gefunden werden.**) such as bottom-up modelling and full integration. Hence, each industrial sector is modelled individually and macro-economic variables are calculated through explicit aggregation. This way, each individual sector is embedded within the broad economic context and industrial interdependencies are explicitly incorporated and used to explain economic interactions. The model is based on the System of National Accounts and Balancing items (SNAB) including input-output tables as its economic core. Thus, inter-industry relations are incorporated on a high level of detail. Both the demand and the supply side are equally well considered by taking into account the interacting relationship between production sectors, private household demand and price effects. In addition, bounded rationality and the existence of imperfect markets are allowed. The model is annually updated and often combined with modules to deal with specific questions and objectives concerning energy and environment, labour market disaggregated by occupation and qualification, world trade or regional aspects, to name a few. Currently, the model calculates projections

until the year 2035.

Some of its variables have to be set exogenously reflecting adequate assumptions. This is the case for fiscal policy instruments such as taxes, interest rates of the European Central Bank, exchange rates and commodity prices. The global economic development is given by the GDP forecasts of the International Monetary Fund (World Economic Outlook), the European Commission (AMECO) and the International Energy Agency (World Energy Outlook). The international economic performance determines the worldwide trade volume (imports), which, in turn, is used to derive the German exports with the help of bilateral trade matrices. The projection of the German population bases on Variant 2 ("Continued trend based on higher immigration") of the 13th coordinated population projection (StBA 2015) and includes an adjustment for the high net migration of the recent years.¹ The development of the population influences the evolution of households and has a major impact on the labour market, the real estate market, private consumption (esp. durables such as passenger cars) and the supply of public goods (government consumption expenditures).

INFORGE is a powerful tool to analyse a wide variety of socio-economic issues on the aggregate level and to generate numerous socio-economic indicators related to income generation, distribution and use. Although its basic version is not designed to trace developments on the household level, one of its extensions, DEMOS, focuses on income and private consumption differentiated by household groups, using more disaggregated data. The household module DEMOS was already successfully used within the project *soeb 2* (**Fehler! Verweisquelle konnte nicht gefunden werden.**), as well as in studies related to distributional effects of environmental policies (**Fehler! Verweisquelle konnte nicht gefunden werden., Fehler! Verweisquelle konnte nicht gefunden werden.**).

Figure 2 provides a simplified overview of the functional relationship between INFORGE and the socio-economic module DEMOS.

The modelling consists of four main steps:

1. The growth rates for income and receipts (by sources) per household from the economic model INFORGE are applied to the respective income components of DEMOS. The income components of DEMOS are the same as in INFORGE, but they are differentiated by household size and social status.² The composition and level of income varies considerably between household groups. Different growth rates for different sources of income hence result in different household income developments depending on socio-economic characteristics. If, for example, pension payments within the economic model INFORGE increase because of a legislative reform, this should have the same positive effect on the respective payments received by the households in DEMOS. As a result, the socio-economic group

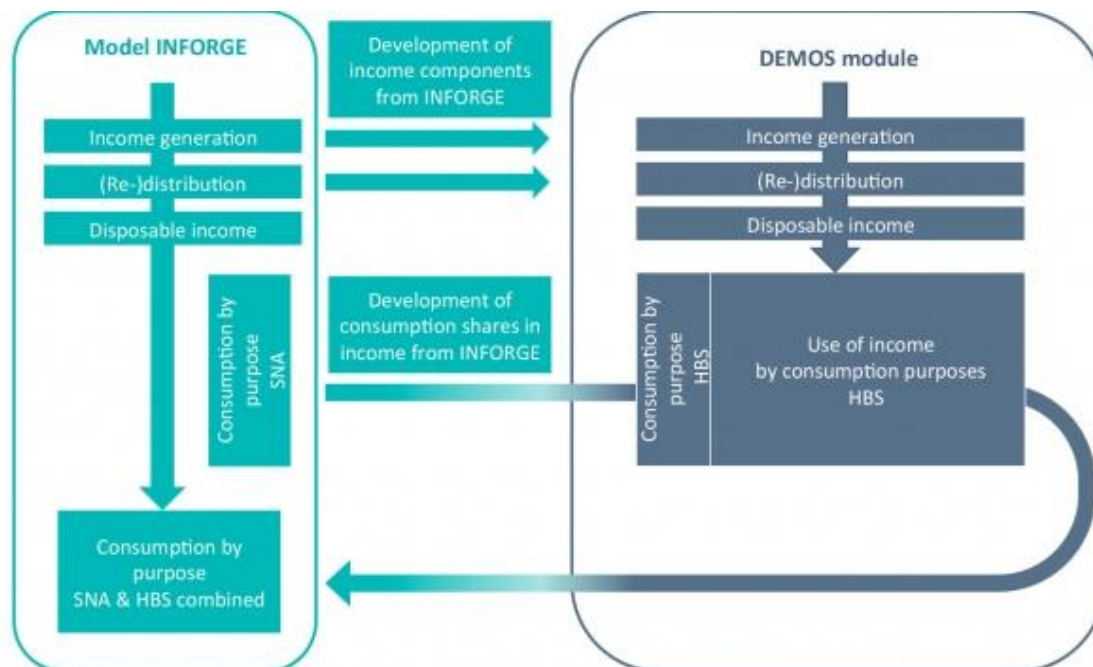
¹ In Variant 2 it is assumed that the average annual birth rate will be 1.4 children per woman, that life expectancy will increase by seven years (men) and six years (women) as well as that net annual migration will fall from the initial level of 500,000 to 200,000 by 2021 and afterwards remain at that level.

² The social characteristics household size and social status are linked with each other resulting in a 5x10 matrix. Household size has a dimension of 5 (1, ..., 4 and 5+ person households), social status of 10 being self-employed farmer, self-employed (except farmer), "Beamter", employee, worker, unemployed, pensioner, pensioner (former "Beamter"), student (university), other non-working population.

“pensioner household” increases its (average) disposable income, other things being equal.

2. The same procedure as in (1) applies to the shares of consumption expenditures (by purposes) in disposable income.
3. The changing shares of consumption purposes are multiplied by the disposable income of each household group resulting in household-specific consumption expenditures.
4. The expenditures are then summed up over all household groups and reintegrated into the economic model INFORGE, which adjusts its solutions iteratively leading to changing variable values.

Figure 2: Socio-economic modelling combining THE MACRO-ECONOMETRIC MODEL INFORGE with Module demos



Source: own figure.

Thus, the development of incomes and consumption expenditures for different household groups can be projected until 2035, including household composition changes due to demography (e.g. increasing number of pensioner households).

The relevant data set containing disaggregated socio-economic information on private households with regard to income and consumption in Germany is the Household Budget Survey (HBS) published by the German Federal Statistical Office (Statistisches Bundesamt). It provides data in Euros on income and expenditures per household and month, differentiated by household size, age group, social status, household type, income group and cross combinations of these characteristics.³ The level of detail in the data is very high and offers the opportunity for extensive research on structure, behaviour and participation

³ The data are classified by the characteristics of the main income earner.

opportunities of households. Nevertheless, there are some deficiencies: the survey is only conducted every fifth year and the research procedure and classification structure have been subject to frequent revisions, making an inter-temporal comparison of the rare data points difficult. The currently available data stem from the latest HSB wave for the year 2008. New data for 2013 is not expected to become available before 2016.

Within the five year cycle of data provision, smaller annual surveys – called “Laufende Wirtschaftsrechnungen” – supplement the data. However, they are less reliable and cannot be compared directly with the HBS results. Thus, the data basis may not be sufficient for econometric analysis relying on time series. A direct integration into the economic model INFORGE, which uses time series to estimate behavioural relationships between income, prices and consumption, is hence difficult. Nevertheless, an indirect link is still a valid option: the economic model can create an adequate stimulus for the socio-economic data set and the changes can be fed back to the economic model.

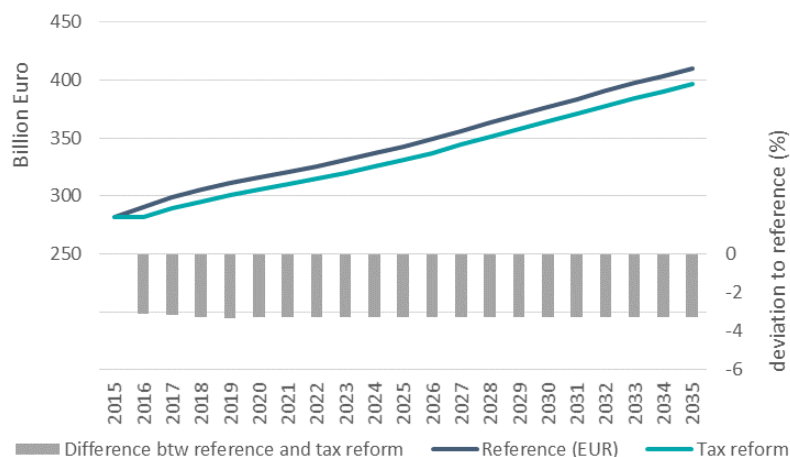
An additional important data source is the Microcensus – an official representative statistic of the population and labour market in Germany (the largest annual household survey in Europe) with a general sampling fraction of 1 % of the population for all variables.⁴ Using the Microcensus information, it is possible to analyse the evolution of household structures in DEMOS as well as to support the households’ projection in INFORGE.

2.2 SCENARIO SETTING

In order to examine the impact of an income tax reform, a scenario analysis is undertaken using the modelling system INFORGE and DEMOS. It is assumed that the tax payments of private households on income and wealth are reduced by a tax reform by 3.1 % in 2016 (see grey bars in Figure 3). As a result the tax payments in 2016 are as high as in 2015 (see turquoise line in Figure 3). In the years thereafter the tax payments in the scenario develop as formerly assumed in the reference, i. e. the difference between reference and scenario remains.

⁴ For basic information on the Microcensus see https://www.destatis.de/EN/Meta/abisz/Mikrozensus_e.html.

Figure 3: Tax payments of private households on income and wealth in the reference and the scenario (in bn Euro, left axis) and the percentage deviation between reference and scenario (right axis)



Source: INFORGE

3 RESULTS

The impact of the tax reform is analysed comparing the scenario results to the reference. Absolute and percentage deviations between the two calculations are given. First the effects for the total economy and its components are quantified, then the consequences for different household types are analysed.

3.1 ECONOMIC CONSEQUENCES OF AN INCOME TAX REFORM

Table 1: Difference between reference and scenario for GDP and its main components

	deviation in bn Euro			deviation in %		
	2016	2023	2030	2016	2023	2030
GDP	6,1	-1,7	-1,5	0,2	-0,1	0,0
Private consumption	7,1	-0,9	-0,6	0,5	-0,1	0,0
Government consumption	-0,2	-0,4	-0,5	0,0	-0,1	-0,1
GFCF in machinery and equipment	0,8	-0,1	-0,1	0,3	0,0	0,0
GFCF in construction	0,6	0,3	0,3	0,2	0,1	0,1
Export	0,5	-0,1	0,0	0,0	0,0	0,0
Import	2,8	0,5	0,7	0,2	0,0	0,0

Source: INFORGE

In the year of the tax reform the impact on the economy is positive: the GDP is 0.2 % or 6.1 bn Euro higher than in the reference. Private households have to pay 9.1 bn Euro less taxes. Most part of the extra money is spent on consumption that lies 6.1 bn Euro or 0.5 % higher. The rest is saved resulting in an increase in the saving rate of 0.1 %-points. Due to a high share of imported intermediate and final goods in consumer goods imports show the

second highest positive deviation of the GDP components. Through the intersectoral interdependence of the producing economic activities the other GDP components can profit as well. Only government consumption is slightly lower than in the reference. The income tax revenues are reduced by 8.8 bn Euros or 2.3 % and diminish the options for government consumption. Parts of the losses in income tax revenues are compensated by additional receipts from higher wages and employment as well as increases from VAT revenues. The gross annual payroll per employee is by 6 Euro higher and 34.3 thousand people are additionally employed. Due to the increase in consumption VAT revenues are 1.3 bn Euro or 0.4 % higher.

The positive impact of the tax reform is not long lasting. One year after the reform most of the effects turn negative and stay negative throughout the observation period until 2030. However, the deviations from the reference become very low. Nevertheless, the first positive impulse is not high enough to outweigh the negative effects, i.e. summing up the differences in GDP between reference and scenario leads to a total lower output of 17.4 bn Euro for the whole period 2016-2030.

3.2 IMPACT ON INCOME AND CONSUMPTION OF DIFFERENT HOUSEHOLD TYPES

Table 2: Difference between reference and scenario for the monthly household income of different household types

	deviation in Euro (per month and household)			deviation in % (per month and household)		
	2016	2023	2030	2016	2023	2030
farmer	25,7	-3,0	-1,3	0,6	-0,1	0,0
other self-employed	39,7	-0,9	0,2	0,9	0,0	0,0
public servant (Beamter)	31,5	-2,1	-1,2	0,6	0,0	0,0
white-collar worker	28,1	-1,5	-0,9	0,7	0,0	0,0
blue-collar worker	16,4	-0,9	-0,2	0,5	0,0	0,0
unemployed	1,9	-0,1	0,1	0,1	0,0	0,0
pensioner	3,2	-1,0	0,2	0,1	0,0	0,0
non-working population	3,2	-0,8	0,4	0,1	0,0	0,0
average	19,0	-1,0	0,1	0,6	0,0	0,0

Source: DEMOS

In 2016 working households profit most from an income tax reform. The higher the income (other self-employed and public servants) the higher is the gain by the lower income tax. Blue-collar workers representing lower working incomes show the lowest deviations of the working households. The disposable income of the other household types show positive deviations from the reference as well. Unemployed can only generate the lowest increases in income.

Again the positive effect appears mainly in the initial year of the tax reform and turn negative thereafter. However, non-working households (unemployed, pensioners, non-working population) can generate positive differences in income between reference and scenario in the long run.

Table 3: Difference between reference and scenario for inequality measured as distance to average income for different household types

	distance to average income in % (reference)			deviation from average in %-points		
	2016	2023	2030	2016	2023	2030
farmer	22,7	36,4	59,2	0,1	0,0	0,0
other self-employed	38,1	35,2	34,1	0,4	0,0	0,0
public servant (Beamter)	56,2	60,4	66,7	0,1	0,0	0,0
white-collar worker	18,0	19,9	22,2	0,2	0,0	0,0
blue-collar worker	5,6	7,2	9,0	-0,1	0,0	0,0
unemployed	-58,1	-58,9	-59,6	-0,2	0,0	0,0
pensioner	-21,6	-20,7	-22,4	-0,3	0,0	0,0
non-working population	-24,8	-23,8	-25,0	-0,3	0,0	0,0
average	0,0	0,0	0,0	0,0	0,0	0,0

Source: DEMOS

Working households are above average, the non-working households below. The highest negative distance to average is represented by the unemployed with an income in the reference that lies 58 % under the average income. The highest positive distance constitutes the income of the public servants being 56 % higher than average.

Inequality is slightly higher in the scenario compared to the reference. All incomes above average are increasing the positive distance to the average. The incomes below average also broaden the distance by developing more in the negative direction.

4 CONCLUSION

The total economy will profit from an income tax reform in the initial year of the reform. The positive effects do not persist in the years after the reform but change into small negative effects. The accumulated total impact of the tax reform for the whole period is negative as well.

All household types have a higher disposable income in the scenario than in the reference. Working household profit most in the year of the tax reform and show negative effects thereafter. In the contrary, pensioner and other household types generate also positive effects in the long run.

Due to the high positive impact for working households in the initial year of the tax reform inequality is slightly higher in that year. Thereafter the inequality falls back to the level of the reference.

As a consequence a tax reform that only reduces tax payments is not favourable as it is likely to increase inequality and difficult to generate long-term positive effects. A more complex change in the tariff system or income related tax reductions could possibly generate fairer and more sustainable impacts.

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