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Distributional Effects of the German Tax Reform 2000 – A Behavioral Microsimulation Analysis

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Abstract

In the year 2000, the German government passed the most ambitious tax reform in postwar German history aiming at significant tax relief for households. We analyze the effects of this reform an the distribution of household incomes using a behavioral microsimulation model based an representative micro-data from the German Socio-Economic Panel (SOEP). Our empirical analysis accounts for the effects of bracket creeping and labor supply adjustment an the distribution of household incomes. We find that the tax reform leads to a significant increase in net household income. The relative gains increase with taxable income, thus income inequality is rising. This is slightly mitigated by the impact of the labor supply responses induced by the reform, especially at the lower end of the income distribution.

JEL Classification: H24, H31, J22.

1. Introduction

In the year 2000, the German government passed the most ambitious tax reform in postwar German history. The reform aims at reducing the burden and distortions of taxation for both companies and private households. This paper focuses on the part of the reform related to the personal income tax, which has been implemented in several steps starting in 2001 (see Figure 1)[1]. By 2005, the top marginal rate of the personal income tax is to be reduced to 42 percent, compared to 51 percent in 2000. In the same period, the lowest

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[1] In this analysis, our focus is on changes in the tax function. Reforms such as increasing child benefits or the reduction of the savings tax allowance are not included as they were announced and implemented before the tax reform of 2000. For a more general discussion of the tax reform and its implementation, see Bundesfinanzministerium (2003) and Haan and Steiner (2004).

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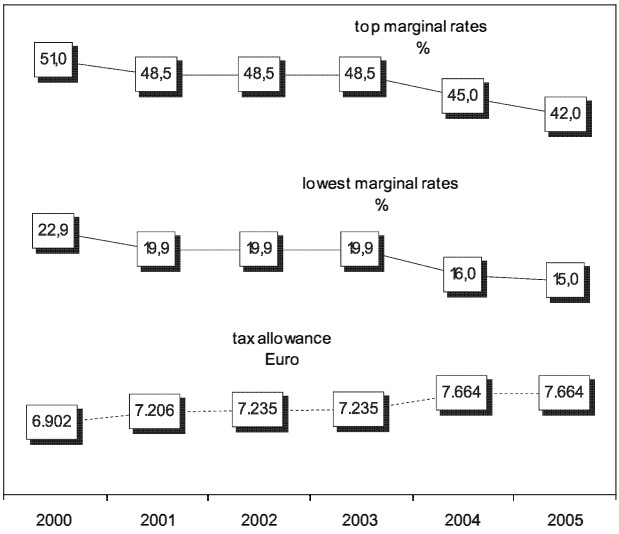
marginal tax rate is reduced from 22.9 percent to 15 percent, and the basic tax allowance is increased from 6,902 euros to 7,664 euros. It is expected that this reform will have a significant impact on the distribution of incomes of private households in Germany (see, e.g., Wagenhals 2000, Merz and Zwick 2002, Bach and Buslei 2003, and Corneo 2003).



Source: Bundesfinanzministerium (2003).

Figure 1: Changes in the Personal Income Tax 2000 – 2005

In this paper, we provide a detailed analysis of the distributional effects of the tax reform on the basis of a behavioral microsimulation model. This allows us to simulate the effects of the tax reform 2000, which will only be fully implemented by the year 2005. The microsimulation model is based on the 2002 wave of the German Socio-Economic Panel (SOEP), which for the first time includes a disproportionately large subsample of high-income households. Given that a very large share of the income tax is borne by the top income decile, the representation of this group is of great importance for the analysis of the distributional effects of the tax reform. To account for behavioral adjustment at the household level, we estimate the impact of labor supply induced by the reform on the distribution of household incomes. In our empirical analysis we also control for bracket creeping, which measures the real increase of households' tax payments due to a purely inflation-related increase in taxable income. As we will demonstrate, this effect reduces the cash gain of the tax reform significantly.

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2. Simulation Methodology

According to the principle of comprehensive income taxation, the idea behind the German tax system, the sum of incomes from all sources is taxed at a single rate after several deductions have been made. In this study, we derive tax payments and net household incomes on the basis of our empirical tax-benefit simulation model (STMS), which includes all relevant components of the German tax and transfer system defining a private household's tax base (see Haan and Steiner 2004). This is done for a *pre-reform simulation* based on the tax system as it was in 2000, and for a *post-reform simulation* (counterfactual) based on the tax system of 2005. The difference between these two simulations measures the tax relief induced by the tax reform on the household level.

The STSM used for the present analysis is based on micro data from the 2002 wave of the SOEP. The dataset includes detailed information on about 11,000 households representing about 38.7 million private households in Germany. For the first time in 2002, the SOEP also included a disproportionately large sample of high-income households. This so-called *high-income sample* consists of over 1,200 households with monthly net incomes of at least 3,834 euros[2]. Given that the highest decile of taxable income contributes a very large share (roughly 40 percent) of the overall amount of personal income tax collected, the inclusion of this group is crucial for a comprehensive analysis of the distribution effects of the tax reform.

We perform two types of simulation on the basis of the STSM: *first-round effects* of the tax reform are calculated on the simplifying assumption that no behavioral adjustments are induced by the reform. *Second-round effects* also account for behavioral effects of the tax reform (see, e.g., Creedy and Duncan 2002). In the empirical public finance literature, it is common to measure behavioral adjustment of households by estimating labor supply elasticities (Eissa 1996, Moffitt and Wilhelm 2000)[3]. We follow this literature and estimate the labor supply effects induced by the tax reform on the basis of the behavioral household labor supply model embedded in STSM, as described in Haan and Steiner (2004).

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2 A description of the SOEP can be downloaded from www.diw.de/soep; see also Haisken-DeNew and Frick (2003) and Schupp and Wagner (2002). The high-income sample is described in Schupp et al. (2003).

3 Following Feldstein (1995), the "new tax-responsiveness" literature stresses the elasticity of taxable income instead of traditional labor supply elasticities, since the former also measures other individual responses to tax changes, which affect the tax base. There is not sufficient information on the various exemptions in the German tax code affecting the level of taxable income in our database to estimate the elasticity of taxable income, especially for households with a large share of income from capital, rents, and self-employment. Hence, our estimates only partially account for the behavioral responses induced by the tax reform.

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3. Simulation Results

3.1 "First-Round" Distributional Effects

Simulation results of *first-round* distributional effects of the tax reform are summarized in Table 1. We report net household incomes by decile, based on the *pre-reform* tax schedule (2000) and based on the tax regime of 2005, when the reform will be completely phased in. In addition, absolute and relative cash gains are presented. Simulations are based on prices in the year 2000. The population in our analysis consists of all private households living in Germany in the year 2002, amounting to about 38.7 million households[4]. In the left-hand part of the table, simulation results are reported without accounting for the effects of *bracket creeping;* the right-hand part of the table contains the respective results considering these effects. Bracket creeping occurs because the German tax system is defined in nominal rather than in real terms, i.e., is not indexed to the rate of inflation. This implies that a nominal increase in taxable income leads to higher marginal tax rates, although in real terms, the income of the household remains unchanged. The amount of nominal cash gains does not, therefore, represent the reduction of the real burden of taxation on private households. In order to prevent the situation of households from worsening solely due to inflation, the government has to adjust the tax function over the years, either by reducing the marginal tax rates or by increasing the amount of the basic tax allowance. Since the cumulative inflation rate between 2000 and 2005 amounts to approximately 8.6 percent, this effect is certainly not negligible[5].

To calculate the real gains from the tax reform, we subtract the tax relief necessary to reimburse the households for the additional tax payments due to bracket creeping from the nominal gains attributable to the tax reform. Technically, we calculate the effect of bracket creeping by simulating the tax payments of households with inflated prices, implicitly assuming no increase in real wages, i.e. productivity. The real increase in tax payments due to the inflated taxable income thus measures the effect of bracket creeping. Our simulation results show that the relative additional tax payments over the period 2001 – 2005 due to bracket creeping amount to 6.8 percent (Haan and Steiner 2004). To offset the cumulative negative effect of bracket creeping, the government would have to reimburse each household an average of 242 euros. In other words, the real gain from the tax reform for the average household is reduced by this amount[6].

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[4] In the year 2000, we observe about 25 million tax units, about 40 percent of the units are single filers and 60 percent are joint filers.

[5] Relative to the year 2000, the (cumulative) effect of inflation measured by the consumer price deflator (*Verbraucherpreisindex*) amounts to 8.6 percent for 2005 (see DIW 2004).

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Not accounting for bracket creeping, the yearly increase in net household income amounts on average to approximately 966 euros (3.74 percent). Estimated cash gains are monotonically increasing in taxable income, both in absolute and in relative terms, and vary substantially by taxable income decile. Households in the three lowest deciles do not gain from the tax reform at all, since these households were already exempted from taxes before the regime change. For most of them, the main sources of income consist of pensions or social transfers such as unemployment compensation and social assistance. In contrast, cash gains for the top income decile amount to more than 6,300 euros per year, or to a real increase of 8.61 percent. This is mainly due to the reduction of the top marginal tax rate from 51 percent to 42 percent. Thus, income inequality as measured by the *Gini coefficient* is increasing form 0.343 to 0.353[7].

Table 1

Cumulative Impact on Household Income (by Income Deciles)

Income Decile	Net Income (2000)	No Adjustment for Bracket Creeping			With Adjustment for Bracket Creeping		
		Net Income (2005)	Δ (in Euros)	Δ (Percent)	Net Income (2005)	Δ (in Euros)	Δ (Percent)
1	10,090	10,090	0	0.00	10,090	0	0.00
2	13,526	13,526	0	0.00	13,526	0	0.00
3	19,479	19,479	0	0.00	19,479	0	0.00
4	22,751	22,899	148	0.65	22,824	73	0.32
5	22,155	22,830	675	3.05	22,601	446	2.01
6	26,630	27,639	1,009	3.79	27,353	724	2.72
7	28,712	29,940	1,228	4.28	29,600	888	3.09
8	34,298	35,888	1,590	4.64	35,445	1,147	3.34
9	43,124	45,360	2,237	5.19	44,739	1,615	3.75
10	73,779	80,128	6,349	8.61	79,023	5,244	7.11
Mean	25,823	26,790	966	3.74	26,548	725	2.8
Gini	0.343	0.353			0.351		

Notes: Yearly net household income in euros (in prices of 2000), income deciles refer to taxable income; year of analysis: 2000; $N = 38.7$ million households (11,064 obs.).

Source: SOEP, wave S (2002), own calculations.

6 For a more comprehensive discussion of these bracket creeping effects, see Haan and Steiner (2004).

7 The Gini coefficient ranges between 0 (equality of all incomes) to 1 (highest-ranked person receives all income); it is particularly sensitive to income changes in the middle part of the distribution.

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Accounting for bracket creeping, the real effects of the tax reform on household incomes are summarized in the right-hand part of Table 1. The average increase of yearly net household income amounts to 725 euros (2.8 percent). Overall, the distribution of relative cash gains by income decile is similar to the one derived without accounting for bracket creeping effects. In particular, relative cash gains are still increasing in the level of taxable incomes, although for all households with taxable incomes above the basic tax allowance, both absolute and relative gains are reduced by bracket creeping. As indicated by the Gini coefficient, controlling for bracket creeping slightly reduces income inequality. This can be explained by the fact that the bottom of the income distribution is not affected by the effects of bracket creeping.

3.2 "Second-Round" Effects – Accounting for Labor Supply Responses

One important aim of the tax reform is to increase work incentives by reducing tax distortions embedded in the German tax system. Since changes in employment may have important effects on the income distribution, it is crucial for our distributional analysis to know whether the tax reform does in fact increase the labor supply, and if so, for which groups of households. Employing a discrete choice estimation, Haan and Steiner (2004) estimate the total labor supply effect of the German tax reform in 2000 to amount to approximately 170,000 additional persons, or to about 150,000 full-time equivalents. Here, we use these estimates to account for "second-round" labor supply effects of the tax reform on the distribution of incomes. Simulation results taking into account both bracket creeping and *second-round* effects are summarized in Table 2 below.

Average Effects

As household labor supply increases, the new simulated net household income based on the tax function of 2005 exceeds the net household income, assuming an inelastic labor supply. On average, the adjusted labor supply leads to a 126-euro increase in net household income. In general, the analysis of the distributional effects, including second-round effects, supports the conclusions derived above. Absolute and relative gains due to the tax reform are increasing in taxable income: for the 10th decile, the *post-reform* net income exceeds *pre-reform* income by about 5,300 euros per year (7.2 percent), compared to a relative increase of about 1 percent at the bottom of the income distribution. Taking into account labor supply adjustment thus increases net household income in the highest decile by about 70 euros, in comparison to the analysis without any behavioral adjustment. More important, however, is the impact of the adjusted labor supply on household incomes at the bottom of

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the distribution. In contrast to the analysis in the previous section, net incomes for these households markedly increase due to labor supply responses to the tax reform. This effect is particularly strong for the households in the lowest income decile, as additional earnings will not shift them above the basic tax allowance, thus leaving them untaxed.

Table 2

Real Cumulative Impact on Net Household Incomes – Second-Round Effects

Taxable Income	*Net Income* (2000)	*Net Income* (2005)	Δ (in Euros)	Δ (Percent)
1	10,090	10,231	140	1.39
2	13,526	13,647	122	0.90
3	19,479	19,610	131	0.67
4	22,751	22,950	199	0.87
5	22,155	22,724	569	2.57
6	26,630	27,486	857	3.22
7	28,712	29,734	1,021	3.56
8	34,298	35,578	1,280	3.73
9	43,124	44,853	1,730	4.01
10	73,779	79,091	5,312	7.20
Mean	25,823	26,674	851	3.29
Gini	0.343	0.350		

Notes: Yearly net household income in euros (in prices of 2000), income deciles refer to taxable income; year of analysis: 2000; $N = 38.7$ million households (11064 obs.).

Source: SOEP, wave S (2002), own calculations.

The behavioral change of the households in the lower deciles affects overall income inequality, although only modestly. In comparison to the *pre-tax reform* distribution, the Gini coefficient increases by 0.07 points. Taking into account labor supply responses, the Gini coefficient slightly declines from 0.351 to 0.350. Hence, the increase in net household income in the lower deciles implies a marginally more equal income distribution.

Differences between Groups

Table 3 summarizes estimated cash gains from the tax reform for various groups, accounting for bracket creeping and labor supply effects. We distinguish between region (East and West Germany), marital status, and the number of children living in a household, since social policy discussions in Germany typically focus on these groups. Simulation results show:

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- Singles gain less than couples. This can be explained by differences in taxable income, as people with higher incomes are more likely to be non-singles. Cash gains for non-married couples are higher than for married couples. This difference is related to the principle of joint taxation (income splitting) in the German tax system. Since non-married couples do not benefit from income splitting, for a given income level, the reduction of marginal taxes has a stronger effect on their net incomes than on the incomes of married couples (Steiner and Wrohlich 2004). This has both a direct income effect and a differential positive labor supply effect.
- Average cash gains for households living in West Germany (3.47 percent) are higher than for those living in East Germany (2.29 percent) because of the still-large average income differential between the two regions.
- There is no clear relationship between the number of children and average cash gains induced by the tax reform. Both in East and West Germany, households with two children gain most, whereas cash gains are relatively small for households with three or more children. This is related to differences in income levels between households and the fact that the tax reform does not contain special provisions for large families. For these families, the government has increased child benefits, which is not explicitly taken into account in our calculations because this change is not directly linked to the tax reform.

Although the impact of the tax reform varies substantially according to region, marital status, and number of children, only a negligible share of the increase in inequality is attributable to changes in inequality *between* these groups. As a decomposition analysis shows, the increase in income inequality induced by the tax reform is mainly due to an increase in inequality *within* groups, irrespective of whether the decomposition is based on region, marital status, or the number of children[8].

4. Summary and Conclusion

It was the purpose of our study to provide empirical evidence about the distributional effects of the German personal income tax reform of 2000. As this reform will not be fully implemented until the year 2005, we have undertaken an *ex ante* analysis based on a behavioral microsimulation model estimated on the SOEP. The major advantage of our database is that for the first time in the year 2002, the SOEP included a disproportionately large high-income sample of German households who contribute a very large share of the total income tax.

[8] This decomposition analysis is based on the Theil index, which is a decomposable measure of inequality (see, e.g., Cowell 1995). Detailed results of this decomposition analysis may be obtained from the authors upon request.

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Table 3

Real Cumulative Impact on Net Household Incomes – Second-Round Effects by Region, Marital Status, and Number of Children

	Net Income (2000)	*Net Income* (2005)	Δ (in Euros)	Δ (Percent)
Germany	25,823	26,674	851	3.29
single	16,804	17,384	581	3.46
non-married couple	31,534	32,678	1,144	3.63
married couple	34,000	35,079	1,080	3.18
no children	22,703	23,449	746	3.29
1 child	28,904	29,830	926	3.21
2 children	37,425	38,766	1,341	3.58
3 or more children	37,002	38,042	1,040	2.81
West Germany	26,868	27,802	934	3.47
single	17,546	18,200	653	3.72
non-married couple	33,824	35,143	1,319	3.90
married couple	35,176	36,340	1,164	3.31
no children	23,750	24,585	835	3.52
1 child	29,951	30,955	1,004	3.35
2 children	38,291	39,689	1,398	3.65
3 or more children	37,824	38,928	1,104	2.92
East Germany	21,264	21,751	487	2.29
single	13,555	13,818	263	1.94
non-married couple	24,799	25,429	630	2.54
married couple	28,572	29,264	693	2.42
no children	18,066	18,418	352	1.95
1 child	25,223	25,877	653	2.59
2 children	33,403	34,478	1,075	3.22
3 or more children	30,608	31,151	543	1.77

Notes: Yearly net household income in euros (in prices of 2000), income deciles refer to taxable income; year of analysis: 2000; $N = 38.7$ million households (11,064 obs.).

Source: SOEP, wave S (2002), own calculations.

Accounting for bracket creeping and labor supply effects, our simulation results show that the total effect of the tax reform on net household incomes amounts on average to 850 euros, which represents a relative increase of 3.29 percent. Estimated cash gains induced by the tax reform are increasing, both in absolute and in relative terms, in the level of taxable income, implying an increase in income inequality as a consequence of the tax reform. Controlling for bracket creeping reduces the real value of cash gains markedly, and also

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slightly reduces inequality, since households at the bottom of the income distribution are not affected by this effect. Accounting for positive labor supply effects induced by the tax reform increases cash gains and reduces income inequality since behavioral effects are relatively strong for households at the bottom of the income distribution. Disaggregated by region, family status and number of children, we find that households in West Germany, couples, and households with two children benefit most from the tax reform. However, most of the increase in inequality is related to changes in inequality *within* rather than *between* these groups.

In the present paper, we have not taken into account indirect effects resulting from the financing of the tax reform. Estimations show that the budgetary costs of the personal income tax reform amount to about 33 billion euros per year (see Haan and Steiner 2004). Depending on how this substantial budgetary burden is financed, e.g., by a higher budget deficit, higher consumption taxes, or cuts in (social) expenditures, the net distribution effects of the reform may be very different from those derived in this paper. Furthermore, the positive labor supply response induced by the tax reform might lead to a reduction of market wages to balance demand and supply on the labor market. These so-called "third-round" effects will also have an impact on the distribution of household incomes. Considering these indirect effects is an important topic for future research.

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