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Effects of tax reform on average personal income tax burden and tax progressivity in Germany under the particular consideration of bracket creep

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Abstract
This study primarily aims to contribute to the ongoing debates on bracket creep and examine whether Germany needs to integrate inflation indexation into its personal income tax system in order to reduce distortions of tax liabilities and additional tax burdens. Germany has continuously flattened the personal income tax rates in the context of a series of tax reforms and modified its tax system. Under the consideration of the major goals of these reforms, this study compares the extent to which previous reform efforts, made in this country since 1958, led to changes in the real, inflation-adjusted average personal income tax burden of single earners in 2014. Furthermore this study examines the changes in progressivity of tax rates over the same period of time, which is measured by the coefficient of residual income progression (CRIP). According to the long-term real view adopted in this study, the evolution of the German personal income tax system made middle-income single earners worse off, while both the lower and higher income groups are significantly better off.

Keywords: personal income taxation; bracket creep; real average tax burden; single earners; tax progressivity; coefficient of residual income progression; Germany

JEL-Classification: H21, H23, H24, H31

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1. INTRODUCTION

Personal income tax generates a major share of tax revenue in Germany, whereas it has traditionally been adopted as a policy instrument aimed at rectifying inequality in disposable income and achieving better redistribution among rich and poor households worldwide (Atkinson, 1970; Bach, Corneo & Steiner, 2013; Mirrlees, 1971; Slemrod, 1992; Tuomala, 1990). On the other hand, personal income tax system affects economic growth as well as the labour supply decision of households, since it distorts the relative price for leisure and consumption (Aaberge & Colombino, 2008; Atkinson & Stiglitz, 1980; Boeters, 2010; Triest, 1990).[3] For this reason, progressivity and efficiency of the income tax system and their changes in the context of income tax reform have always been a popular topic of academic research and political discussion (see also Egger et al., 2013; Heady, 2004; Keen et al., 2000).

While the conservative and liberal parties in Germany have recently suggested the compensation of extra income tax burden in the middle and higher income groups caused by the so-called 'bracket creep', the left-wing parties would like to see stronger income tax reductions for the lower-income households and a significant increase in income tax for high incomes, emphasising the growing income divergence in this country (Bach, Haan & Ochmann., 2013). Although annual inflation rates have recently been quite modest in this country, the extra bracket-creep tax burden emerging over the period of continuous growth in the country's tax revenue has been assessed as unfair (Broer, 2011; Heer & Süssmuth, 2013; Lemmer, 2014). In this context, the real, that is, inflation-adjusted, personal income is also widely seen in Germany as the indicator that more appropriately reflects the individual taxpayer's 'ability to pay' (see also Rietzler et al., 2014).

Bracket creep is not a new tax policy issue. The term refers to the situation where inflation pushes income into higher tax brackets, although real income remains unchanged, and consequently this fictitious extra income causes increases in the real tax burden for taxpayers (see also, Altig & Carlstrom, 1991; Bailey, 1976; Immervoll, 2005; Jarvis, 1977; Sunley & Pechman, 1976; von Furstenberg, 1975). Taxpayers near the top-end of a tax bracket in particular are more likely to creep into a higher bracket and thus experience a rapid rise in marginal rates (Saez, 2003). Since the 1970s there have been intensive discussions over the possibilities of an indexation by adopting various measures, including (i) lowering statutory tax rates aimed at eliminating nominal income increase due to inflation; (ii) cost-of-living adjustments; (iii) the introduction of price escalators into the income tax structure, to name a few. In a number of countries such efforts have remained less successful, partly due to the problems of time lag between current inflation and the rate reflected in the adjustment index, as well as the time lag between the earning of income and the collection of taxes (see also Gutierrez et al., 2005; Johnson, 2015[4]; OECD, 1976; Tanzi, 1976).

[3] 'A high degree of tax progressivity means high marginal tax rates at the upper end of the income distribution. This leads to large labour supply distortions in the high-income group and, as a result, decreases the overall scope for redistribution' (Boeters, 2010, p. 1).

[4] Highlighting the needs of tax reform in the UK, Johnson (2015) urges an introduction of a coherent system of inflation indexation into the tax system. He argues that increasing indirect taxes in line with the retail price index and most direct tax thresholds in line with the consumer price index erodes confidence in the honesty of policymaking in this country.

Furthermore, international experiences demonstrate that 'lower income taxpayers and those with more dependents have generally experienced larger *percentage* increases in average tax than have high-income families or those with few dependents, both because inflation erodes the real value of exemptions and because the rate structure are progressive' (Tanzi, 1976: 215–216). As a result, the annual adjustment of the statutory tax rate in combination with tax deduction according to the price trend has recently been the most popular means adopted in many OECD countries to rectify the negative effects caused by bracket creep (Lemmer, 2014). In countries like Germany a personal income tax reduction and other changes (including those to the basic personal allowance) carried out in the context of tax reform (see Table 1), for example, barely improve the net income of taxpayers in a high inflation phase as originally intended without such an indexation, but merely compensate for their increased income tax liability.

Table 1: Evolution of German Personal Income Tax System

Period	Basic personal allowance (nominal in €)	Basic tax rate (%)	Top income threshold (nominal in €)	Highest tax rate (%)	Solidarity surcharges (% of nominal income tax liability in €)
1958–1964	859	20	56 263	53	
1965–1974	859	19	56 263	53	
1975–1977	1549	22	66 478	56	
1978	1702	22	66 478	56	
1979–1980	1887	22	66 468	56	
1981–1985	2154	22	66 468	56	
1986–1987	2319	22	66 484	56	
1988–1989	2430	22	66 484	56	
1990	2871	19	61 376	53	
1991–1992					3.75
1993–1994	2871	19	61 376	53	0.00
1995					7.50
1996–1997	6184	25.9	61 376	53	
1998	6322	25.9	61 376	53	5.50
1999	6681	23.9	61 376	53	
2000	6902	22.9	58 643	51	
2001	7206	19.9	54 998	48.5	
2002–2003	7235	19.9	55 008	48.5	
2004	7664	16	52 152	45	
2005–2006	7664	15	52 152	42	
2007–2008	7664	15	52 152 from 250 001	42 45	
2009	7834	14	52 552 from 250 401	42 45	

Period	Basic personal allowance (nominal in €)	Basic tax rate (%)	Top income threshold (nominal in €)	Highest tax rate (%)	Solidarity surcharges (% of nominal income tax liability in €)
2010–2012	8 004	14	52 882 from 250 731	42 45	
2013	8 130	14	52 882 from 250 731	42 45	
2014	8 354	14	52 882 from 250 731	42 45	

Source: Authors' compilation based on information from German Federal Ministry of Finance (https://www.bmf-steuerrechner.de/ekst/?) .

At first glance, when a 'nominal view' is applied (Immervoll, 2005), the performance of a number of German personal income tax reforms made between 1958 and 2014 appears to be quite promising. The tax-free basic personal allowance (*Grundfreibetrag*) increased steadily from 859 euros to 8354 euros, the basic tax rate has gradually decreased from 20 per cent to 14 per cent (with the exception of the 1996–1998 period where the rate reached 25.9 per cent). In 1958 the highest statutory income tax rate of 53 per cent was due on a taxable income of 56 263 euros. In 2014 the highest tax rate of 42 per cent was imposed on amounts from 52 882 euros, whereas the rate further increases to 45 per cent of a taxable income of 250 731 euros (see Table 1). However, this is not the end of the story, but only the beginning—such a nominal view alone does not adequately take account of all the partly unfavourable, real changes in the average tax burden, when the serious tax distortion emerges due to inflation.

There are two major motivations for this study. Firstly, although inflation rates have recently been quite low, the additional integration of inflation-adjustment mechanisms into the personal income tax system still appears to be necessary in this country to reduce the distortions in tax liabilities that lead to additional tax burdens. Secondly, Germany's personal income tax system has never been equipped with any kind of inflation-indexation mechanism, which, in turn, suggests that various tax reforms and modifications in the last sixty years have been carried out without adequately considering the effect of bracket creep (see also Boss et al., 2014; Immervoll, 2005). Adopting CPI deflation, this study attempts to investigate the extent to which all of these previous reform efforts made in this country since 1958, have contributed to changes in the real, inflation-adjusted average personal income tax burden, as well as to changes in progressivity of the tax rate on single earners in 2014.[5]

[5] Repeatedly this study primarily aims to highlight the long-term income tax distortions caused by the lack of an inflation-indexation mechanism in the German personal income tax system. To this end, the application of CPI deflation appears to be suitable. In the case of additional consideration of the increases in real personal incomes, it would certainly be more appropriate to compare average tax rates and CRIP measures for average income or tax rates/CRIP on different quintiles or deciles of income. However, the consideration of historical real income development (and standards of living) is beyond the scope of this study.

2. SOME SIMPLE MODELS FOR CALCULATING AND COMPARING THE REAL AVERAGE INCOME TAX BURDEN

Paragraph 32a of German income tax law (§ 32a EStG - *Einkommensteuergesetz*) prescribes how income tax will be calculated each year according to the different tax-base brackets with a top taxable income threshold. This tax schedule also contains a basic personal allowance. When T denotes income tax and Y shows annual taxable income (measured in nominal term), the computation of the income tax liability of single taxpayers in a given year is carried out on the basis of the following simple formulas:

For the period of 1958–1964[6]

a) Y to 1680 DM: T = 0;

b) Y ranges from 1681 DM to 8009 DM: T = 0.20*(Y – 1680);

c) Y ranges from 8010 DM to 23 999 DM: T = 1264 + 272*{(Y – 8000)/1000} + 2.9*{(Y – 8000)/1000}²;

d) Y ranges from 24 000 DM to 110 039 DM: T = 6358 + 382*{(Y – 24 000)/1000} + 1.572*{(Y – 24 000)/1000}² – 0.006*{(Y – 24 000)/1000}³; and

e) Y from 110 040 DM: T = 0.53*Y – 11 281

For the fiscal year 2014 the calculation scheme has been changed:[7]

a) Y to 8354 euros: T = 0;

b) Y ranges from 8355 euros to 13 469 euros: T = [(974.58*{(Y – 8354)/10 000} + 1400)]*{(Y – 8354)/10 000};

c) Y ranges from 13 470 euros to 52 881 euros: T = [(228.74*{(Y – 13 469)/10 000} + 2397]*{(Y – 13 469)/10 000} + 971;

d) Y ranges from 52 882 euros to 250 730 euros: T = 0.42*Y – 8239; and

e) Y from 250 731 euros: T = 0.45*Y – 15 761

The splitting rule is applied when married couples are taxed, 'a tax rate for a single taxpayer with taxable income Y equals the tax rate of couple with a taxable income of 2Y' (Corneo, 2005: 161) in the aforementioned computation schedules.

It is generally acknowledged that a progressive tax system should be defined as one whereby the average rate of taxation increases with income before tax. Such a system is structured with marginal tax rates exceeding average rates and increasing with the tax base (Boeters, 2010; Jakobsson, 1976; Kakwani, 1977). This paper adopts a widely-used method for the purpose of measuring and comparing the degree of progression between the investigated years 1958 and 2014: the coefficient of residual income progression (CRIP).

[6] In Germany the current income of family taxation with income splitting for spouses was introduced in 1958.

[7] The calculation schedule was changed a total of twenty-five times between 1964 and 2014 (see <https://www.bmf-steuerrechner.de/ekst/?>).

The CRIP shows the elasticity of net, that is, after-tax, income to taxable income, and is defined as:

$$\rho(Y) = \{\Delta(Y\text{-}T) / (Y\text{-}T)\} / \{\Delta Y / Y\}$$

$$= (1 - t_{mar}) / (1\text{-}t_{ave})$$

$$= [d \ln \{(1 - T/Y) Y\}] / [d \ln Y]$$

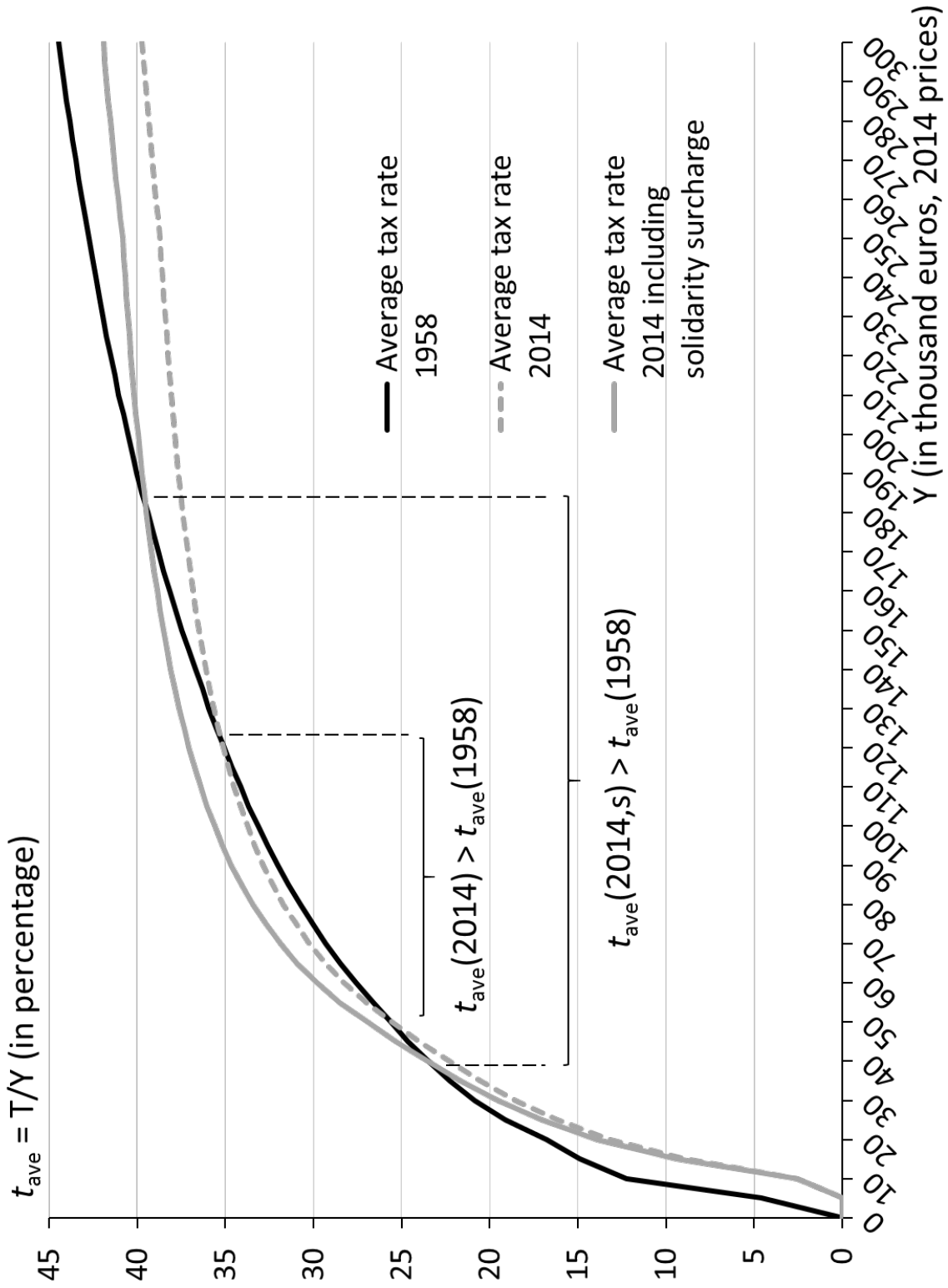
where Y = taxable income; t_{mar} = marginal tax rate; and t_{ave} = average tax rate. Hence, in a proportional tax regime the CRIP is 1. The tax progressivity exists at a certain level of taxable income Y, when $\rho(Y) < 1$. The smaller this coefficient, the higher the degree of progressivity (see Boeters, 2010; Bovenberg, 2006; Corneo, 2005; Jakobsson, 1976).

3. REAL EFFECTS OF GERMAN PERSONAL INCOME TAX REFORMS BETWEEN 1958 AND 2014

In the following section the real average income tax rates of German single earners are measured and compared for the years 1958 and 2014. In this context the nominal tax base has to be firstly adjusted and expressed in real terms (see also Boss & Ente, 1988; Brügelmann, 2008). Such an inflation-indexation comparison between the two selected years is carried out in this study via the cumulative inflation rate which is calculated based on the 'official' annual average CPI in the same period of time (see also Institute on Taxation and Economic Policy, 2011). Secondly, changes in tax-deductible professional outlays and expenses, as well as other types of tax-free allowances over the course of time can lead to significant differences in taxable incomes, although the gross income remains unchanged. For this reason the following analysis is based on information on taxable income, which is also applied by Boss and Ente (1988).

Figure 1 compares the real average personal income tax burden of the year 1958 with that of 2014; both are computed using the tax-bases expressed in terms of 2014 prices. As mentioned above, Germany has experienced a number of changes to the personal income tax system, mainly motivated by a desire to generally reduce the overall tax burden, as well as to better guarantee income redistribution. In contrast to this political intention, the same chart demonstrates rather surprisingly that a segment within the taxable income group of German single earners with the increased real average tax burden is currently worse off due to a series of tax reforms implemented between 1958 and 2014. This group's taxable income ranges from approximately 50 000 to 120 000 euros (and from 40 000 to 180 000 euros when the solidarity surcharge is additionally considered in the calculation of average tax rate). With an income of 70 000 euros, for example, the average tax rate amounts to 29 per cent in 1958, which delivers an after-tax income of 49 491 euros (again in 2014 prices). By comparison, the average tax rate was 30 per cent in 2014 (and 32 per cent with the solidarity surcharge) while net income decreased to 48 839 euros (and to 47 675 euros with the solidarity surcharge).

Figure 1: Real Average Personal Income Tax Burden for Single Earner: Comparison between 1958 and 2014



Source: German Federal Ministry of Finance; German Federal Statistical Office; own calculations by authors.

By contrast, the real average tax rate on a taxable income of 15 000 euros amounted to 15 per cent in 1958, while the figure for 2014 was approximately 9 per cent (regardless of whether the solidarity surcharge is taken into consideration in the calculation). As a result, from this sum of taxable income, for example, a net income of 12 768 euros was obtained in 1958. This figure grew to 13 657 euros (or 13 583 euros including the solidarity surcharge) in 2014. In this context the obvious real income tax reductions for the lower-income single earners[8] can be observed, which appears to correspond closely to the basic idea of the German personal income tax reform (see also Boss et al., 2014). At an income level of around 40 000 euros and at an average tax rate of 24 per cent, the real average tax curves of 1958 and 2014 (with the solidarity surcharge) intersect.[9]

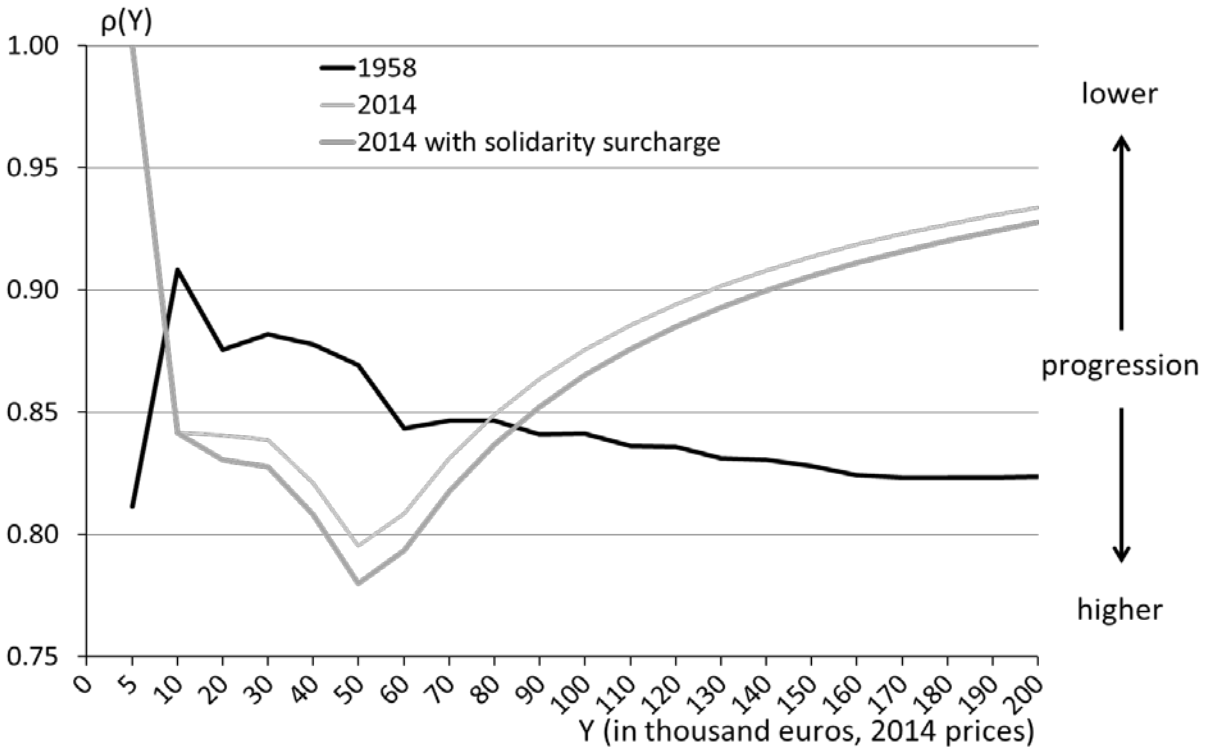
The series of German personal income tax reforms implemented since 1958 have also helped to reduce the real average tax burden for the upper-income class in Germany. The average personal income tax gap continued to grow between 1958 and 2014 and becomes more significant as taxable income rises, starting from approximately 120 000 euros (and 180 000 euros if the solidarity surcharge is taken into account), as shown by Figure 1. For example, a taxable income of 160 000 euros (in 2014 prices) is subject to an average tax rate of 37 per cent (without the solidarity surcharge) in 2014, resulting in an after-tax income of 101 039 euros; the valid tax rate for the same taxable income amounted to 38 per cent in 1958, which led to a reduction in net income to 98 949 euros. All these facts suggest that, in real terms, the current German personal income tax system makes those upper-income single earners considerably better off compared to the system in 1958.

Apart from the increased basic personal allowance and the lowered top taxable income threshold, from which the highest statutory personal income tax rate applies in 2014 (see Table 1), the increased real average tax burden in this year (compared to that of 1958) for those single earners whose taxable income ranges from approximately 50 000 to 120 000 euros (and from 40 000 to 180 000 euros with the solidarity surcharge) can also be explained by changes in tax progressivity. For this purpose, the coefficients of residual income progression (CRIP) at the given level of taxable income are compared between 1958 and 2014 (Figure 2).

[8] According to the calculation made by the German Federal Statistical Office in cooperation with the Frankfurter Allgemeine Zeitung, around 75 per cent of the tax payers in Germany earn an annual income of less than approximately 38 200 euros (expressed at 2014 prices). Moreover, the average gross salary of German employees is around this level. In comparison, those who earn a gross income of more than approximately 148 000 euros (in 2014 prices) annually belong to the upper class in Germany (Frankfurter Allgemeine Zeitung, 2011).

[9] It has always been an uneasy task to estimate the average personal-income-tax functions (Gourveia & Strauss, 1994). Despite that we attempted to statistically identify this function for the taxable personal income of German single earners, ranging from 10 000 to 300 000 euros (see Table A1 in annex).

Figure 2: Comparison of the Coefficient of Residual Income Progression (CRIP) between 1958 and 2014



Source: Authors' own calculation and Table A2 in Annex.

The development of CRIP, shown in Figure 2 as well as in Table A2 in the annex, clearly reveals that there was a significantly higher progression in 2014 in the range of taxable income between 10 000 to 80 000 euros, compared to the situation in 1958. A more 'compressed' personal income tax system in 2014, equipped with the increased basic personal allowance, calls for a greater progression in the lower taxable income group to reach a higher real average tax rate at the given higher level of taxable income. More precisely, a faster and more excessive increase in marginal tax rate in relation to the prevailing average tax rate existed in 2014 for the range of taxable income mentioned above, which is reflected by the CRIP curve of 2014 running below that of 1958, and by changes in the CRIP-gap. This also implies that the lower and middle-income single earners currently pay relatively higher taxes than those upper-income earners when there is a marginal change in the taxable income. Moreover, when this process slows down and becomes less significant as taxable income grows, the CRIP of 2014 starts to grow, indicating shrinking tax progressivity. This phenomenon becomes increasingly apparent when the taxable income exceeds 80 000 euros.

4. CONCLUSION

This brief study aims at to contribute to the ongoing political and scientific debates on bracket creep and examines whether Germany needs to integrate inflation indexation into its personal income tax system to reduce distortions of tax liabilities and

additional tax burdens. At present, such an inflation accounting system is lacking in Germany. On the other hand, in the context of a series of tax reforms, Germany has continuously flattened its personal income tax rates and modified its tax system. The major political motives for all of these previous reform efforts appear to have been to generally reduce the overall tax burden, as well as to better reflect the ability-to-pay principle in the personal income tax system and to better guarantee the income redistribution among the different income groups in this country. In view of the aforementioned goals of these reforms, this study compares the extent to which previous reform efforts made in this country since 1958 have led to changes in the real, inflation-adjusted average personal income tax burden of single earners in 2014. By doing so, it highlights that understanding the tax reform from a 'nominal' point of view alone can fail to capture all of the real changes in the average tax burden, when the 'hidden' distortion caused by inflation prevails.

The comparison of real average personal income tax rates in 1958 and 2014 demonstrates that the annual taxable income group earning around 50 000 to 120 000 euros (and from 40 000 to 180 000 euros with the solidarity surcharge both expressed in terms of 2014 prices) are worse off under the previously implemented series of tax reforms, for example, for a taxable income of 70 000 euros, t_{ave} = 29 per cent in 1958, while the tax rate slightly grew to 30 per cent (and 32 per cent with the solidarity surcharge) in 2014. Over the same period, by contrast, there were clear real income tax reductions for lower-income single earners (that is, Y < 40 000 euros), even although solidarity surcharges also prevail. In addition, the previous tax reforms accompanied by the solidarity surcharge also reduced the real average tax burden for the upper-income class (with Y > 180 000 euros) in Germany (see Figure 1). Moreover, a comparison of the coefficient of residual income progression (CRIP) between 1958 and 2014 indicates that a higher degree of progressivity applies for the taxable income from 10 000 to 80 000 euros in 2014, compared to that of 1958, which, in turn, implies that lower and middle-income single earners currently pay relatively higher taxes than upper-income earners when there is a marginal change in taxable income (see Figure 2). Such rather surprising effects on different income groups not only violate the basic ability-to-pay principle and disturb the smooth progressivity development, but also make the entire German personal income tax system less equitable in the long run, particularly for the middle-income group. More precisely, this study demonstrates the mismatch between the policy intention and the long-term real effects of personal income tax reforms in Germany and, at the same time, questions the effectiveness of income tax as a policy instrument aimed at rectifying inequality of disposable income and achieving greater redistribution among rich and poor single earners.

Timely inflation-indexation and its integration into the personal income tax system appears to be necessary in Germany, not only to effectively prevent the emergence of an extra bracket-creep tax burden in the short term, but also to avoid some of the adverse effects caused by individual tax reforms from a 'real' point of view, and ultimately to better shape its progressive tax system in the long run.

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6. APPENDICES

6.1 Appendix 1

Table A1: Estimated Real Average Personal Income Tax Function for Taxable Personal Income Range between 10 000 and 300 000 euros: 1958 and 2014

	Real average tax function	R^2
1958	$t_{ave} = -0.00000902725594x^4 + 0.00151268116206x^3 - 0.09349617017108x^2 + 2.79155224693159x + 4.06269344903740$	0.9931
2014	$t_{ave} = -0.00001506601961x^4 + 0.00257502270136x^3 - 0.15836489559227x^2 + 4.25412262468126x - 5.87076390678340$	0.9928
2014 (with solidarity surcharge)	$t_{ave} = -0.00001593188675x^4 + 0.00272259717316x^3 - 0.16740281526725x^2 + 4.49525620537543x - 6.24337980875862$	0.9926

Note: x = Y/5000 + 1, where Y = taxable income.

Source: Authors' own calculation.

6.2 Appendix 2

Table A2: Coefficients of Residual Income Progression (CRIP): A Comparison between 1958 and 2014

Taxable income (€ in 2014 prices)	CRIP 1958	CRIP 2014	CRIP 2014 with solidarity surcharge
5000	0.8115	1.0000	1.0000
10 000	0.9081	0.8415	0.8415
20 000	0.8756	0.8407	0.8305
30 000	0.8819	0.8387	0.8277
40 000	0.8778	0.8210	0.8081
50 000	0.8691	0.7953	0.7799
60 000	0.8435	0.8086	0.7936
70 000	0.8465	0.8313	0.8177
80 000	0.8466	0.8492	0.8367
90 000	0.8409	0.8637	0.8522
100 000	0.8411	0.8756	0.8650
110 000	0.8362	0.8856	0.8757
120 000	0.8360	0.8942	0.8849
130 000	0.8313	0.9015	0.8928
140 000	0.8305	0.9079	0.8997
150 000	0.8281	0.9135	0.9058
160 000	0.8242	0.9185	0.9111
170 000	0.8235	0.9229	0.9159
180 000	0.8232	0.9269	0.9202
190 000	0.8233	0.9304	0.9241
200 000	0.8237	0.9337	0.9276

Source: Authors' own calculation.