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Abstract

This study aims at contributing to the ongoing debates on the bracket creep, whether Germany needs an integration of inflation indexation into its personal income tax system in order to reduce distortions of tax liabilities and additional tax burdens. On the other hand, 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 the previous reform efforts, made in this country since 1958, have led to the change of the real, inflation-adjusted average personal income tax burden of the 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 the, also some ‘unexpected’, real changes in average tax burden, when the ‘hidden’ distortion caused by inflation prevails. According to the long-term real view adopted in this study, the evolution of German personal income tax system made the middle-income single earners worse-off, while the lower as well as the higher income groups are significantly better off.

JEL-Codes: H210, H230, H240, H310.

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

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1. Introduction

Personal income tax generates a major share of tax revenues in Germany, whereas it has traditionally been adopted as a policy instrument aimed at rectifying inequality of disposable income and achieving better redistribution among rich and poor households worldwide (Atkinson, 1970; Mirrlees, 1971; Tuomala, 1990; Slemrod, 1992; Bach, Corneo and Steiner, 2013). On the other hand, personal income tax system affects economic growth as well as labour supply decision of households, since it distorts the relative price for leisure and consumption (Atkinson and Stiglitz, 1980; Triest, 1995; Aaberge and Colombino, 2008; Boeters, 2010).¹ Due to 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 for academic research and political discussion at the same time (see also Keen, Papapanagos and Shorrocks, 2000; Heady, 2004; Egger, Radulescu and Rees, 2013).

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-wings would like to see more stronger income tax discharges for the lower-income households and a significant increase of the income taxes for high incomes, emphasising the growing income divergence in this country (Bach, Haan and Ochmann, 2013). Although annual inflation rates have recently been quite modest in this country, the extra bracket-creep tax burden emerging in the time of continuously growing the country’s tax revenue has been assessed unfair (Broer, 2011; Heer and Süßmuth, 2013; Lemmer, 2014). In this context, the real – i.e. inflation-adjusted – personal income is also widely seen in Germany as the indicator which more appropriately considers the ‘ability to pay’ of individual taxpayers (see also Rietzler, Teichmann and Truger, 2014).

¹ “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 consequence, decreases the overall scope for redistribution” (Boeters, 2010, p. 1).

The bracket creep – the situation, repeatedly, where inflation pushes income into higher tax brackets, although the real income remains unchanged, and consequently this fictitious extra income causes the increases in real tax burden for taxpayers – is not a new tax policy issue (see also von Furstenberg, 1975; Sunley and Pechman, 1976; Bailey, 1976; Jarvis, 1977; Altig and Carlstrom, 1991; Immervoll, 2005). In particular taxpayers near the top-end of a tax bracket are more likely to creep to a higher bracket and thus experience a rapid rise in marginal rates (Saez, 2003). Since the 1970s there have always been intensive discussions about the possibilities of an indexation by adopting various measures, including such as (i) lowering statutory tax rates aimed at eliminating nominal income increase due to inflation; (ii) cost-of-living adjustments; (iii) introduction of price escalators into the income tax structure, to name a few. In a number of countries such efforts have remained less successful, due also to the problems of time lag between the 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 Tanzi, 1976; OECD, 1976; Gutierrez, Immervoll and Sutherland, 2005; Johnson, 2015²).

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, p. 215-216). Consequently, 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 the bracket creep (Lemmer, 2014). In countries like Germany without such an indexation a personal income tax reduction and other changes (including that of basic personal allowance) carried out in the context of tax reform (see Table 1), for example, tends to hardly improve the net income of taxpayers in a high inflation phase as originally designed, but only compensates their increased income tax liability.

² Highlighting the needs of tax reform in the UK, Johnson (2015) urges to reintroduce 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.

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	1,549	22	66,478	56	
1978	1,702	22	66,478	56	
1979–1980	1,887	22	66,468	56	
1981–1985	2,154	22	66,468	56	
1986–1987	2,319	22	66,484	56	
1988–1989	2,430	22	66,484	56	
1990	2,871	19	61,376	53	
1991–1992					3.75
1993–1994	2,871	19	61,376	53	0.00
1995					7.50
1996–1997	6,184	25.9	61,376	53	
1998	6,322	25.9	61,376	53	5.50
1999	6,681	23.9	61,376	53	
2000	6,902	22.9	58,643	51	
2001	7,206	19.9	54,998	48.5	
2002–2003	7,235	19.9	55,008	48.5	
2004	7,664	16	52,152	45	
2005–2006	7,664	15	52,152	42	
2007–2008	7,664	15	52,152 from 250,001	42 45	
2009	7,834	14	52,552 from 250,401	42 45	
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: German Federal Ministry of Finance.

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 (*Grundfreibe-*

trag) was continuously raised from 859 euros to 8,354 euros, the basic tax rate has gradually decreased from 20% to 14% (with the exception in the years from 1996 to 1998 the rate reached 25.9%). In 1958 the highest statutory income tax rate with 53% was due from a taxable income of 56,263 euros. In 2014 the highest tax rate of 42% is imposed from 52,882 euros, whereas the rate further increases to 45% 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 observe all the, also some unfavourable, real changes in average tax burden, when the serious tax distortion emerges due to inflation.

There are two main reasons for a growing interest in this topic in Germany. Firstly, although inflation rates have recently been quite low, the additional integration of inflation-adjustment mechanism into the personal income tax system still appears to be necessary in this country to reduce the distortions of tax liabilities which lead to the additional tax burdens. Secondly, various personal income tax reforms and aforementioned modifications implemented in the last sixty years have also changed the personal income tax system of this country to a certain extent (see also Immervoll, 2005; Boss, Müller and Schrinner, 2014). In this context this study investigates and highlights the extent to which all these previous reform efforts made in this country since 1958 have contributed to the change of the real, inflation-adjusted average personal income tax burden of the single earners in 2014.

2. Some Simple Models for Calculation and Comparison of Real Average Income Tax Burden

The paragraph 32a of German income tax law (§ 32a EStG - *Einkommensteuergesetz*) prescribes the way how the 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 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 1958-1964³

- a) Y to 1,680 DM: $T = 0$;
- b) Y ranges from 1,681 DM to 8,009 DM: $T = 0.20 \cdot (Y - 1,680)$;
- c) Y ranges from 8,010 DM to 23,999 DM: $T = 1,264 + 272 \cdot \{(Y - 8,000)/1,000\} + 2.9 \cdot \{(Y - 8,000)/1,000\}^2$;
- d) Y ranges from 24,000 DM to 110,039 DM: $T = 6,358 + 382 \cdot \{(Y - 24,000)/1,000\} + 1.572 \cdot \{(Y - 24,000)/1,000\}^2 - 0.006 \cdot \{(Y - 24,000)/1,000\}^3$; and
- e) Y from 110,040 DM: $T = 0.53 \cdot Y - 11,281$

For the fiscal year 2014 the calculation scheme has been changed:⁴

- a) Y to 8,354 euros: $T = 0$;
- b) Y ranges from 8,355 euros to 13,469 euros: $T = [(974.58 \cdot \{(Y - 8,354)/10,000\} + 1,400)] \cdot \{(Y - 8,354)/10,000\}$;
- c) Y ranges from 13,470 euros to 52,881 euros: $T = [(228.74 \cdot \{(Y - 13,469)/10,000\} + 2,397)] \cdot \{(Y - 13,469)/10,000\} + 971$;
- d) Y ranges from 52,882 euros to 250,730 euros: $T = 0.42 \cdot Y - 8,239$; and
- e) Y from 250,731 euros: $T = 0.45 \cdot Y - 15,761$

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, p. 161) in the aforementioned computation schedules.

³ In Germany the current income of family taxation with income splitting for spouses was introduced in 1958.

⁴ Since 1964 the calculation schedule has been changed altogether twenty-five times until 2014 (see also <https://www.bmf-steuerrechner.de/ekst/>).

It is generally acknowledged that a progressive tax system should be defined as one where the average rate of taxation increases with the income before tax and such a system is structured with marginal tax rates exceeding average rates and increasing with the tax base (Jakobsson, 1976; Kakwani, 1977; Boeters, 2010). 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).

The CRIP shows the elasticity of net (i.e. after-tax) income to taxable income, and is defined as

$$\begin{aligned} (1) \rho(Y) &= \{\Delta(Y-T) / (Y-T)\} / \{\Delta Y / Y\} \\ &= (1 - t_{mar}) / (1 - t_{ave}) \\ &= [d \ln \{(1 - T/Y) Y\}] / [d \ln Y] \end{aligned}$$

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

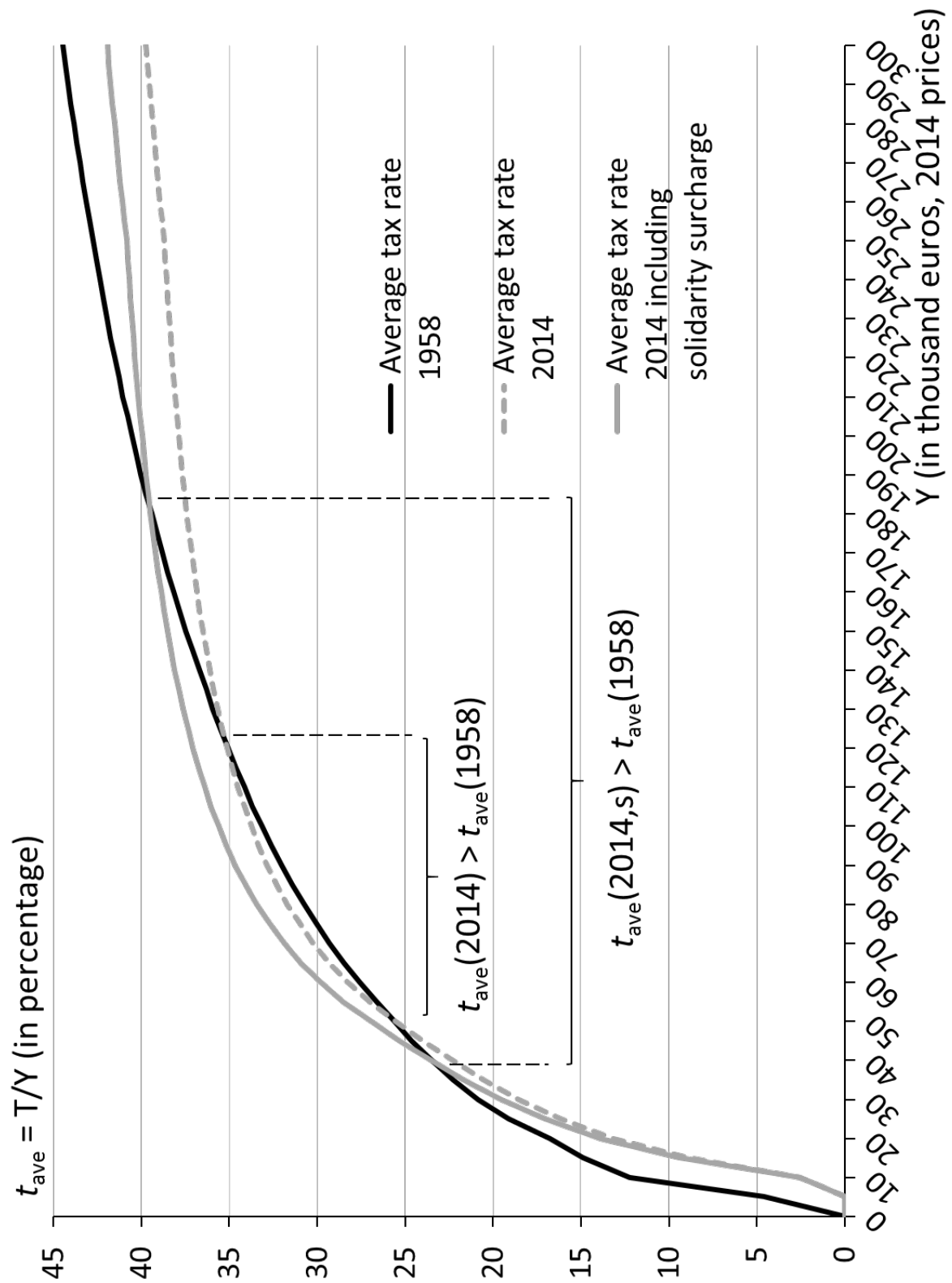
3. Real Effects of German Personal Income Tax Reforms between 1958 and 2014

In the following 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 term (see also Boss and Ente, 1988; Brügelmann, 2008). Such an inflation-indexation between the two selected years is carried out in this study by 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 Eco-

nomic Policy, 2011). Secondly, changes of the tax-deductible professional outlays and expenses, as well as other types of tax-free allowances in the course of time can lead to significant differences in taxable incomes, although the gross income remains unchanged. Due to this reason the following analysis is based on information on the taxable income, which Boss and Ente (1988) also apply.

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 already mentioned above, Germany has experienced a number of changes in personal income tax system of which major motives appear to generally reduce overall tax burden as well as to better guarantee the income redistribution. Against this political intention, the same chart demonstrates rather surprisingly that there exists a segment of taxable income group of German single earners with the increased real average tax burden, who are currently worse off by the series of tax reforms implemented between 1958 and 2014. This group's taxable income ranges from ca. 50,000 to 120,000 euros (and from 40,000 to 180,000 euros when the solidarity surcharge is additionally considered for the calculation of average tax rate). With an income of 70,000 euros, for example, the average tax rate amounts to 29% in 1958, which delivers an after-tax income of 49,491 euros (again in 2014 prices). In comparison, in 2014 the average tax rate reaches 30% (and 32% with the solidarity surcharge) and the net income decreases 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, for the taxable income of 15,000 euros the real average tax rate amounted to 15% in 1958, while that for the year 2014 lies at approximately 9% less with or without the consideration of solidarity surcharge for the calculation). Consequently, from this sum of taxable income, for example, a net income of 12,768 euros was obtained in 1958, and its amount grew to 13,657 euros (or 13,583 euros incl. the solidarity surcharge) in 2014. In this context the obvious real income tax discharges for the lower-income single earners⁵ can be observed, which appears to well correspond to the basic idea of German personal income tax reform (see also Boss, Müller and Schrinner, 2014). On the income level of about 40,000 euros and at the average tax rate of 24% an intersection of the real average tax curve of 1958 and that of 2014 (with the solidarity surcharge) takes place.⁶

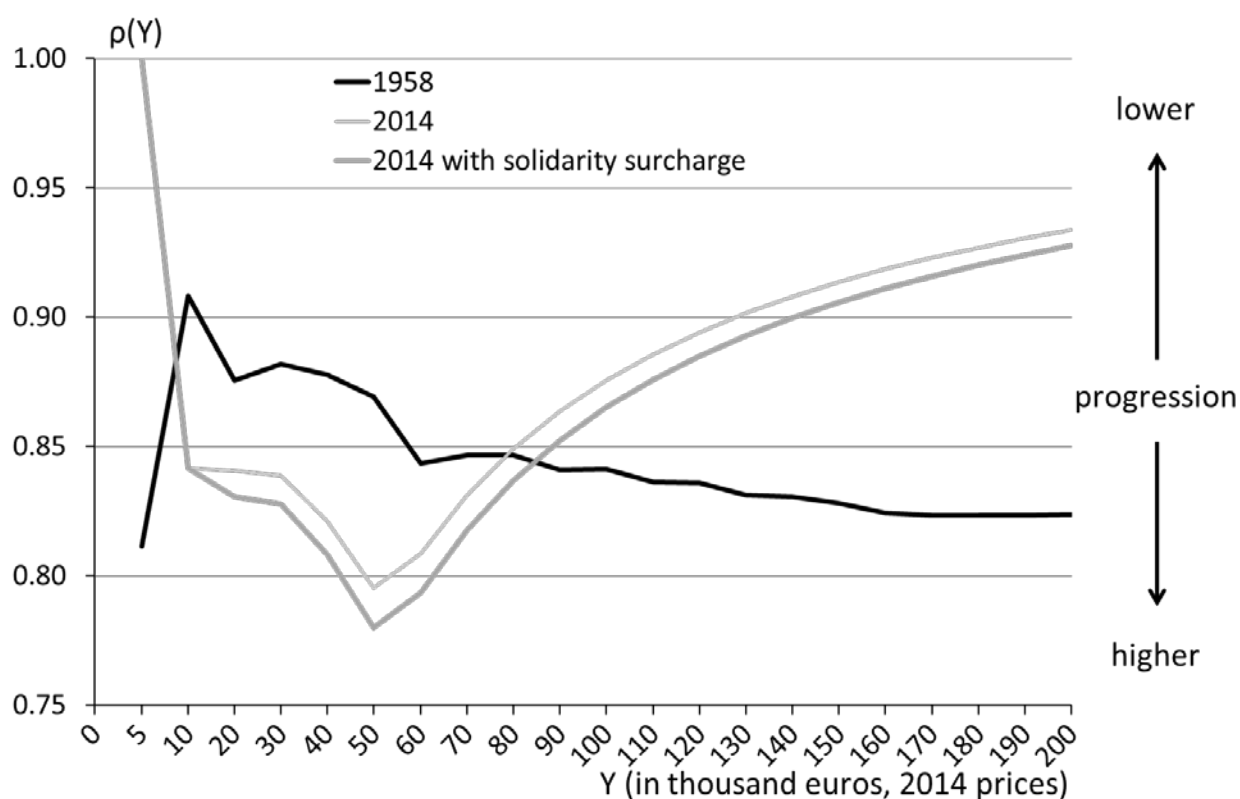
The series of German personal income tax reforms implemented since 1958 have also contributed to the reduction of real average tax burden for the upper-income class in Germany. And the average personal income tax gap between 1958 and 2014 continues to grow and becomes more significant when the taxable income further increases, starting from ca. 120,000 euros (and 180,000 euros if the solidarity surcharge is additionally 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% (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% in 1958 which lead to a reduction of net income to 98,949 euros. All these facts suggest that in real term the current German personal income tax system makes those upper-income single earners considerably better off, when compared to that of 1958.

⁵ According to the calculation made by the German Federal Statistical Office in cooperation with the *Frankfurter Allgemeine Zeitung*, around 75 percent 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 ranges around this level. In comparison, those who earn a gross income of more than ca. 148,000 euros (in 2014 prices) annually belong to the upper class in Germany (*Frankfurter Allgemeine Zeitung*, 2011).

⁶ It has always been an uneasy task to estimate the average personal-income-tax functions (see also Gourveia and 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).

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 ca. 50,000 to 120,000 euros (and from 40,000 to 180,000 euros with the solidarity surcharge) can also be explained by the changes in the 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).

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 and also in Table A2 in annex reveals that in 2014 there exists a significantly higher progression in the range of tax-

able income between 10,000 to 80,000 euros, compared to the case in 1958. A more ‘compressed’ personal income tax system in 2014, in particular 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 exists in 2014 for the range of taxable income mentioned above, which is in turn well reflected by the CRIP curve of 2014 running below that of 1958 and by the changes of the CRIP-gap. This also implies the fact that the lower and middle-income single earners currently pay relatively higher taxes than those upper-income earners when there is a marginal change of the taxable income. And when this process gets slower and less significant as the taxable income grows, the CRIP of 2014 starts to become larger, indicating the shrinking tax progressivity: this becomes increasingly apparent when the taxable income exceeds 80,000 euros.

4. Conclusion

This brief study aims at contributing to the ongoing political and scientific debates on the bracket creep, whether Germany needs an integration of 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 lacks in this country. On the other hand, in the context of a series of tax reforms, Germany has continuously flattened the personal income tax rates and modified its tax system. Major political motives for all these previous reform efforts appear 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. Under the consideration of the aforementioned goals of these reforms, this study compares the extent to which the previous reform efforts made in this country since 1958 have led to the change of the real, inflation-adjusted average personal income tax burden of the 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 the,

also some ‘unexpected’, real changes in average tax burden, when the ‘hidden’ distortion caused by inflation prevails.

The comparison of real average personal income tax rates between 1958 and 2014 demonstrates that the segment of annual taxable income group from ca. 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 by the previously implemented series of tax reforms: e.g. for a taxable income of 70,000 euros, $t_{ave} = 29\%$ in 1958, while the tax rate slightly grew to 30% (and 32% with the solidarity surcharge) in 2014. However, in the same period of time, the clear real income tax discharges have resulted for the lower-income single earners (i.e. $Y < 40,000$ euros), even though the solidarity surcharges also prevail. In addition, the previous tax reforms accompanied by the solidarity surcharge have also reduced the real average tax burden for the upper-income class (with $Y > 180,000$ euros) in this country (see Figure 1). Moreover, the comparison of coefficient of residual income progression (CRIP) between 1958 and 2014 indicates that the 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 the lower and middle-income single earners currently pay relatively higher taxes than those upper-income earners when there is marginal change of the taxable income (see Figure 2). From a real point of view, 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 just in the long run, in particular 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 its income tax as a policy instrument, aimed at rectifying inequality of disposable income and achieving better redistribution among rich and poor single earners.

The 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 extra bracket-creep tax burden in the short term, but also to avoid some adverse effects

caused by the individual tax reforms from a ‘real’ point of view, and eventually to better shape its progressive tax system in the long run.

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Annex

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: $x = Y/5,000 + 1$, where Y = taxable income.

Source: Authors' own calculation.

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
5,000	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.