

Long-term Participation Tax Rates

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Abstract. Generous income support programs as provided by European welfare states have often been blamed to reduce work incentives for lower income classes and to increase durations of unemployment. Standard studies measure work incentives based on annual income concepts. This paper analyzes how work incentives inherent in the German tax-benefit system evolve when extending the time horizon to three years (long-term). Participation tax rates are computed for 3-year periods 1995-1997 and 2005-2007 to reveal potential effects of the labor market reforms between 2003 and 2005. Results show that long-term work incentives increased even more than short-term work incentives. Particularly for middle-income individuals, this is largely explained by the abolition of earnings-related unemployment assistance.

Keywords: Welfare, Work incentives, Unemployment, Unemployment Insurance

JEL-Classification: H31, J65.

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1 Introduction

The shaping of income tax tariffs and income support programmes generates substantial controversy among policy-makers and economists (Brewer et al., 2008). Optimal tax theory argues that a tax-benefit system should be fair and minimize distortions (Mirrlees, 1971). A tax-benefit system can promote equality by transferring income from the rich to the poor. But this may come at the cost of efficiency. Transfers to the poor may induce low income individuals not to work at all and progressive taxes may cause middle and high income individuals to work less.

The efficiency cost of a tax-benefit system depends amongst others on the behavioral response of individuals to taxes and benefits and on the post-tax financial reward when changing individual labor supply (Immervoll et al., 2007). The behavioral response captures to what extent decisions at the extensive and intensive margin are influenced by the tax-benefit system.¹ The financial reward of an increase in individual labor supply is determined by the design of a tax-benefit system due to the tax levied on additional earnings and the withdrawal of benefits. Two measures characterize the work incentives inherent in a tax-benefit system: the participation tax rate (PTR) measures the post-tax financial gain from working compared to not working; the effective marginal tax rate (EMTR) captures the post-tax financial gain from working a bit more. The empirical literature has shown that behavioral responses at the extensive margin are more important, particularly for low-income individuals.²

The last two decades have seen a lively discussion regarding the readjustment of European welfare states. Under the general impression that efficiency costs of tax-benefit systems are high especially at the extensive margin, major labor market reforms in many European countries have been undertaken in the 1990s and early 2000s. Reforms were mostly aimed at the reduction of out-of-work benefits and characterized by a transition to more activating labor market schemes to increase incentives to take up work. In Germany, a coalition of social democrats and green party came into power in 1998 after 16 years of conservative government. The most radical changes, the so-called *Hartz-reforms*, were introduced between 2003 and 2005. Moreover, personal income tax reforms between 1998 and 2005 substantially reduced average tax rates especially relieving the rich (Corneo, 2005).

The aim of this paper is to compare work incentives measured by PTRs before and after the reforms of the red-green government in Germany. The study first extends the

¹Saez (2002) first incorporates intensive and extensive margins into optimal tax theory.

²See Meghir and Phillips (2010) for an overview over empirical studies on labor supply elasticities.

analysis of work incentives to more than a year.³ PTRs are computed for 1-year and 3-year periods encompassing the years 1995-1997 and 2005-2007. The previous literature measures work incentives based on annual income concepts. Thereby, important aspects are neglected which individuals maximizing utility over time might consider. A working individual can experience earnings growth over time driven by training on the job and tenure. In contrast, a non-working individual receives benefits from unemployment insurance and social assistance that are determined by institutional rules. Long-term unemployment⁴ leads to a depreciation of the individual's human capital which in turn decreases the probability of reintegration in the labor market and reduces future earnings potential. Most importantly, out-of-work benefits in Germany are decreasing with the duration of unemployment. Earnings-related unemployment benefits are only paid for about a year for most age groups. Thus, financial consequences of long-term unemployment as opposed to working are captured more comprehensively when extending the horizon to more than a year. Out-of-work income after the exhaustion of unemployment benefits is cut back even more since the reform in 2005 replaced earnings-related unemployment assistance, which was paid after the exhaustion of unemployment benefits, by means-tested social assistance. Thus, the reform potentially increased the post-tax financial reward for taking up a job for certain income groups.

PTRs are computed for the entire earnings distribution and demographic subgroups. Decomposing the results reveals if work incentives were enhanced for specially targeted subgroups like singles. Joint taxation of married couples, as is the case in Germany, can result in very low work incentives for the partner with the inferior earnings potential, which still applies more often to the female partner (Immervoll et al., 2007). Thus, PTRs are differentiated by gender and household type characteristics.

Basic concepts regarding the measurement of a long-term PTR are outlined in section 2 and the underlying data base is described in section 3. Section 4 explains the simulation for which section 5 explains the institutional rules effective in the respective period. Results are discussed in section 6 and section 7 concludes.

³For cross-country studies on PTRs in EU countries see Immervoll et al. (2007), Immervoll et al. (2009) and O'Donoghue (2011). These studies rely on the simulation model EUROMOD based on the tax-benefit rules prevailing in the year 1998. Country studies on PTRs are, e.g., Dockery et al. (2008) for Australia, Adam et al. (2006) and Brewer et al. (2008) for UK as well as Pirttilä and Selin (2011) for Sweden.

⁴According to German §18 Social Code III, individuals are classified as long-term unemployed if unemployed for more than a year.

2 Basic Concepts

2.1 Measuring participation tax rates

The PTR captures the implicit tax on working imposed by the tax-benefit system.⁵ It is assumed that the individual i can choose between the two labor market states E employed or U unemployed. The PTR measures the change in household net taxes from labor market state E to U as a fraction of individual earnings in labor market state E . Taxes and benefits are based on the household context for three reasons. First, the loss of earned income may not only trigger off eligibility rights for the unemployed individual but for other household members as well. Second, joint taxation in Germany requires to consider a married couple as a unit and to assess taxes on the basis of household income. Third, the impact of a change in overall household income on taxes and benefits takes the extent of income brought in by other household members and by other income sources into account. Net taxes T_h paid by the household h are income taxes t_h including social security contributions reduced by transfers b_h . Individuals in high-income households will pay positive net taxes to the government as taxes will exceed benefits. Individuals in low-income households will receive benefits from the government paying negative net taxes. According to Immervoll et al. (2007) an annual PTR can thus be denoted as

$$PTR_{h,t}^{short} = \frac{T(y_{h,t}^E) - T(y_{h,t}^U)}{y_{i,t}^{E,w}}, \quad (1)$$

where y_h^E is gross household income and $T(y_h^E)$ is household net taxes when the individual is employed and thus in labor market state E suppressing time indices. y_h^U is gross household income if setting individual earnings to zero and holding constant other household members' labor income and household income from other sources. $T(y_h^U)$ is household net taxes in case the individual is unemployed and in labor market state U . If household net taxes are equal for both labor market states, then the PTR is zero and incentives to take up work are not distorted. But a welfare state providing income support in state U usually leads to $t_h < b_h$ resulting in $T(y_h^U) < 0$ as unemployment benefits will be higher than taxes paid for the declined household income y_h^U . In sum,

⁵The replacement rate of household income gives the share of in-work income that is maintained when one household member stops working. Replacement rates may be high in case of generous income support by welfare states or because of household income from other sources. But including these other income sources clouds the effects of the tax-benefit system. The PTR concentrates on the change of net taxes when out of work as a fraction of earnings. Thereby, it provides a better measure for the resulting work incentives of the tax-benefit system *per se* because it isolates to what degree the tax-benefit system replaces lost earnings (O'Donoghue, 2011).

the change in net taxes will be positive in presence of a welfare state and the PTR will be higher than zero for most individuals. The higher the PTR, the more do generous income support programs reduce the financial gain from working. The PTR is one, if the change in net taxes $T(y_h^E) - T(y_h^U)$ (numerator) is equal to individual earnings $y_i^{E,w}$ (denominator). In this case, there is no financial gain from working. If out-of-work income support exceeds earnings, then the PTR can be even greater than 1.

2.2 Long-term participation tax rates

The standard approach assesses work incentives over the time horizon of one year. But economic theory on household economics predicts income pooling and budget smoothing over long periods. Individuals may thus condition their participation decision not only on the expected income of the next year, but rather on a longer time horizon. A working individual can achieve potential earnings increases over time carving out a career as opposed to a transfer dependent individual receiving a stable transfer income fixed by the legislator. But earnings-related unemployment benefits are only paid during a limited period of time, i.e., during one year for most individuals in Germany. Extending the time horizon of the PTR, the drop of benefits after exhaustion of earnings-related unemployment benefits can be accounted for. Hence, PTRs are calculated for one year and for a longer time period of three years to shed light on labor market participation incentives in the long-term. To calculate long-term PTRs a long-term income measure is needed.

Long-term income is computed as the Net Present Value (NPV) of income streams over the respective period. The NPV indicates what future income streams accumulated over time are worth today ($k = 1$). For the 3-year period it is defined as

$$NPV = \sum_{k=1}^{K=3} d_k \cdot y_k \quad (2)$$

with

$$d_k = \frac{1}{(1 + i_{k-1})^{k-1}}$$

Income y_k in year k of the 3-year period is discounted with discount factor d_k based on interest rate i_{k-1} of a zero-coupon bond with $k - 1$ years to maturity. Interest rates are taken from the yield curve which takes market participants' expectations today on

future interest rates and inflation into account.⁶ Yield curve interest rates for the base years 1995 and 2005 with one or two years to maturity are given in Table 1.

Table 1: **Yield curve interest rates for the base years 1995 and 2005**

	$t=1995$	$t=2005$
i_{1t}	3.609%	3.861%
i_{2t}	2.707%	2.857%

Source: Own calculations based on interest rates of listed German Federal Treasury bonds available at www.bundesbank.de.

Note: i_{1t} refers to interest rate of a zero-coupon bond in base year t with $k - 1 = 1$ year to maturity.

Since the NPV is sensitive to the discount rate, deflated long-term incomes using the Consumer Price Index (CPI) are computed alternatively. However, results do not differ much.⁷

Using (1) and (2) and suppressing time index t yields a measure for PTR in the long-term as

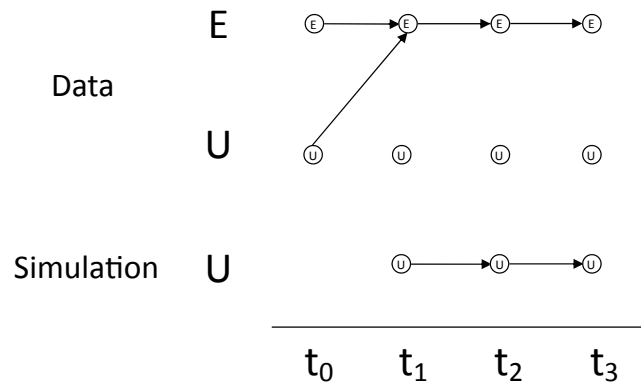
$$\begin{aligned}
 PTR_h^{long} &= \frac{NPV(T(y_h^E)) - NPV(T(y_h^U))}{NPV(y_i^{E,w})} \\
 &= \frac{\sum_{k=1}^{K=3} d_k \cdot [T(y_{h,k}^E) - (T(y_{h,k}^U))]}{\sum_{k=1}^{K=3} d_k \cdot y_{i,k}^{E,w}}
 \end{aligned} \tag{3}$$

PTRs are computed over two 3-year periods 1995-1997 and 2005-2007. Thereby, results can be produced for a time horizon before and after the major labor market reforms between 2003 and 2005. Additionally, the interim period from 1999 to 2003 when earnings from side job in marginal employment (*geringfügige Beschäftigung*) were subject to taxes and social security contributions changing work incentives for marginal employment temporarily is spared from the analysis. To explore PTRs of the entire work force rather than being restricted to look at those individuals whose change of employment status is observed in the data, the working population in state E is considered (Immervoll/O'Donoghue, 2004). For this population, household income, taxes and transfers are then simulated for state U . This is illustrated in Figure 1.

⁶Yield curve interest rates are computed on the basis of German Federal Treasury Bonds. See Bartels (2012) for a detailed description of the yield curve as an indicator for expected interest rates.

⁷Results based on CPI-adjusted long-term income measures are available from the author upon request.

Figure 1: **Data and Simulation**



3 Data

The analysis is based on a subsample from the SOEP survey years 1993 to 2008. The SOEP is a representative panel study containing individual and household data in Germany from 1984 onwards and was expanded to the New German Laender after German reunification in 1990. All household members are interviewed individually once they reach the age of 16. A critical variable in the calculation of taxable income, taxes and benefits is the year in which reported income is received. Yearly income in the SOEP is asked retrospectively, e.g., the income reported in 1996 belongs to 1995.⁸

For each 3-year period a balanced panel is constructed. The sample only includes individuals who were employed during all three years and are aged between 20 and 49 in the first year to avoid distortions due to early or partial retirement which is possible after the age of 55. Those individuals are dropped who exhibit a missing on labor income not replaced by an imputed value and who are self-employed or civil servants in the last two years before the 3-year period and, as a consequence, did not necessarily contribute to unemployment insurance. Disabled individuals and recipients of unemployment benefits, subsistence allowance⁹ or social assistance are excluded, too. Only individuals belonging to households classifiable as single, single parent, married couple without children and married couple with one or two children are included. Since PTRs presumably turn out quite different for certain demographic groups, the panel is divided into subgroups such as gender and household type differentiated by the number of household members and

⁸See Haisken-DeNew and Frick (2005), Frick (2006) and Wagner et al. (2007) for further details.

⁹Subsistence allowance is paid in place of unemployment benefits if the unemployed undertakes vocational training. It is merged to unemployment benefits in 2005.

the number of earners. Table 2 presents the number of observations for each subgroup. Case numbers are too small for single parents to produce reliable results, so they are dropped from the sample. If both adults are working and meet the requirements outlined above, then the household enters the sample twice.

Table 2: **Number of observations**

Period		1995	2005
All		1324	1557
Gender	Male	778	882
	Female	546	675
Household type	Single	177	332
	Married couple w/o children	260	317
	Married couple with 1 or 2 children	887	908

Source: SOEP

Employment decisions and earnings are largely correlated with gender. Women are more probable to work less and earn less than their husband. Moreover, women are more probable to live in a couple and to live in two-earner households. The distribution of one- and two-earner households over singles, couples and families with children is presented in Table 3. The share of single households increases between the two periods for both men and women whereas the share of two-earner families decreases.

Table 3: **Share of household types by gender**

Household type	1995		2005	
	Men	Women	Men	Women
Single, no children	13.1%	13.8%	23%	19.1%
Couple, no children				
Spouse not working	2.1%	2.9%	2.7%	5.3%
Spouse working	13%	23.3%	13.7%	20.2%
Couple with children				
Spouse not working	25.8%	8.4%	22.6%	8.4%
Spouse working	46%	51.6%	38%	47%
Total	100%	100%	100%	100%

Source: SOEP

4 Simulation

Informations on household income y_h^E and individual earnings $y_i^{E,w}$ in labor market state E are taken from the SOEP data which are outlined in detail in Table 4.

Table 4: **Informations in the data for labor market state E**

Gross household income (y_h^E)	labor earnings, asset income, private transfers, private pensions, social security pensions
Individual labor earnings ($y_i^{E,w}$)	earnings from dependent employment

Source: SOEP

Gross household income y_h^U if the individual is out of work is simulated. It is obtained as the gross household income y_h^E reduced by individual labor earnings $y_i^{E,w}$:

$$y_h^U = y_h^E - y_i^{E,w} \quad (4)$$

Taxes t_h^E are simulated using the same simulation procedure as for taxes t_h^U to assure consistent assumptions regarding deductions etc. Explanations focus on state U in the following, but the computation of household taxes in state E is equivalent to state U . Household taxes paid in state U are the sum of income tax $T_h^{U,inc}$ assessed on the basis of y_h^U , solidarity surcharge $T_h^{U,S}$ and social security contributions S_j^U on spouse's earnings $y_j^{E,w}$ if the spouse j is working in E . Household taxes t_h^U are thus given as

$$t_h^U = T_h^{U,inc}(y_h^U) + T_h^{U,S}(y_h^U) + S_j^U(y_j^{E,w}) \quad (5)$$

Household public transfers b_h^E in state E are taken from the data and household public transfers received in state U are partly simulated as displayed in Table 5. Income-related transfers such as unemployment benefits, unemployment assistance and housing allowances need to be recomputed. In contrast, direct housing subsidy, maternity benefits and child benefits do not depend on household income and can be taken from state E in the data. Government student assistance and special circumstances support are assumed to remain constant when changing to state U .

Table 5: **Public transfers in labor market state E and U**

Public transfers (b_h^E)	unemployment benefits, unemployment assistance, maternity benefits, government student assistance, social assistance, special circumstances support, housing allowances, direct housing subsidy, child benefits
Public transfers (b_h^U)	<i>unemployment benefits, unemployment assistance, maternity benefits, government student assistance, social assistance, special circumstances support, housing allowances, direct housing subsidy, child benefits</i>

Source: SOEP

Note: Transfers in italics are simulated.

Formally, household public transfers in U are given as

$$b_h^U = b_h^E - (b_h^{E,sa} + b_h^{E,ha}) + (b_i^{U,ub} + b_i^{U,ua} + b_h^{U,sa} + b_h^{U,ha}), \quad (6)$$

where b_h^{ub} is unemployment benefits and b_h^{ua} is unemployment assistance both depending on the presence of children c . b_h^{sa} is social assistance and b_h^{ha} is housing allowance.

5 Tax-Benefit System

5.1 Benefits

Statutory provisions for each of the potential transfer payments are described in the following. In calculating transfer payments if the individual is in state U , insurance payments, means-tested payments and not means-tested payments have to be distinguished.

5.1.1 Unemployment Benefits

As an insurance program, a potential receipt of unemployment benefits depends on insurance contributions carried out during employment. Contributions to unemployment insurance and thus unemployment benefits are top-coded. Unemployment benefits $b_{i,t}^{ub}(c)$ in year t are obtained as a specific percentage of net earnings of the previous year $t - 1$. Thus, the simulation of unemployment benefits $b_{i,t}^{ub}(c)$ hypothetically received if out of work in 1995 and 2005 refers to earnings of 1994 and 2004, respectively. Formally unemployment benefits are given by

$$b_{i,t}^{ub}(c) = s^{ub}(c) \cdot (y_{i,t-1}^w - t_{i,t-1}^w - S_{i,t-1}), \quad (7)$$

where $s^{ub}(c)$ is the percentage of previous net earnings depending on the existence of children $c \in \{0, 1\}$. $s^{ub}(c)$ lies at 60 % for childless individuals ($c = 0$) and at 67 % for parents ($c = 1$). Net earnings of the previous year are given by gross earnings $y_{i,t-1}^w$ reduced by wage taxes $t_{i,t-1}^w$ and social security contributions $S_{i,t-1}$.

The length of the entitlement is increasing with age and has been subject to several reforms under the period of investigation.¹⁰ Table 6 provides details to changes in the length of entitlement.

Table 6: **Unemployment benefits - Length of entitlement in months**

		1995	1996	1997	2005	2006	2007
Age	<43	12	12	12	12	12	12
	43-45	18	18	12	12	12	12
	46-49	22	22	18	18	12	12
	50-54	26	26	22	22	12	12

Source: §127 Social Code III; Steffen (2008); BMAS (2012)

In 2006, the duration for which one can receive benefits declines remarkably for almost all age groups. The sample includes individuals up to the age of 49 in the first year of the 3-year period, for what reason entitlement lengths for older age groups are not listed in Table 6. But generosity of a transfer system also entails the level of a benefit and the conditions necessary to qualify for the benefit and those for continuing to receive a benefit (Scruggs, 2006). The time period a person had to be employed subject to social security contributions to be able to apply for unemployment benefits is a minimum of 12 months. But during 1995 to 1997 these 12 months of employment has to take place during the last three years, whereas the time horizon is shortened in 2006 to two years according to §123 and §124 Social Code III. However, the level of the benefit as percentage of previous net earnings remains untouched.

¹⁰The entitlement length depends also on the number of months employed subject to social security contributions during the last seven years according to §127 social code III. For the simulation it is assumed, that individuals were employed in total for at least 24 months during the last seven years thus being eligible for 12 months unemployment benefits.

5.1.2 Unemployment Assistance

For the years 1995 to 1997 individuals may receive earnings-related unemployment assistance after the exhaustion of unemployment benefits. Unemployment assistance is an insurance payment hinging on social security contributions, but means-tested at the same time. Possible claims for unemployment assistance are reduced by net household income. Net household income is reduced again by an allowance on spouse's earnings equal to his hypothetical unemployment assistance claim (§194 Social Code III). The remaining amount decreases the claim of the individual for unemployment assistance which can be expressed as

$$b_{i,t}^{ua}(c) = s^{ua}(c) \cdot (y_{i,t-1}^w - t_{i,t-1}^w - S_{i,t-1}) - ((y_{h,t-1}^U - t_{h,t-1}^U - S_{j,t-1}) - s^{ua}(c) \cdot (y_{j,t-1}^w - t_{j,t-1}^w - S_{j,t-1})), \quad (8)$$

where $s^{ua}(c)$ is the percentage of previous net earnings depending on the existence of children $c \in \{0, 1\}$. $s^{ua}(c)$ is at 53 % for childless individuals ($c = 0$) and at 57 % for parents ($c = 1$). $y_{j,t}^w$, $t_{j,t}^w$ and $S_{j,t}$ are spouse's earnings, wage taxes and social security contributions. In sum, only single or individuals with a partner who is a transfer recipient and/or not working receive the full amount of unemployment assistance. Families with children receive a more generous income support. This is the case for both unemployment benefits and unemployment assistance. Unemployment assistance is allowed for one year after which the individual has to renew his claim and prove his neediness again (§190 Social Code III). Under the condition that the claim is admitted unemployment assistance can be granted until the individual's retirement.

5.1.3 Social Assistance

Means-tested social assistance is based on the needs of the household as a whole with household members being treated as a community (*Bedarfsgemeinschaft*). Households can be entitled to social assistance if the individual in state U has not contributed (sufficiently) to unemployment insurance in state E (1) or if the claim for unemployment benefits/assistance of the individual in state U is very low (2). In 2005, the so-called *Hartz IV-reform* merges social assistance for those able to work and unemployment assistance to a single system so called unemployment benefit II (*Arbeitslosengeld II*). Since payments of unemployment benefit II are equivalent to social assistance it is referred to social assistance in the following. Starting in 2005, households additionally can be

entitled to social assistance if unemployment benefits of the individual in state U are exhausted (3) with the overall household income not covering household needs.

The household head receives the standard rate of social assistance according to §20 of Social Code II, whereas other household members only receive a share of the standard rate depending on age. Hence, social assistance increases with the number of persons in the household. Standard rates differ between Old and New German Laender for most of the time under investigation and are presented in Table 7.

Table 7: **Social assistance - monthly standard rates**

	1995	1996	1997	2005	2006	2007
West	267	270	273	345	345	347
East	258	261	264	331	331	347

Source: BMAS (2012)

Note: Standard rates are in current Euros.

Table 8 shows household member shares for the two 3-year periods. In 2005, shares are raised for partners and children. Only for children between 14 and 17 years shares are reduced.¹¹

Table 8: **Social assistance - household member shares of standard rates**

	1995-97		2005-07	
Head	100%		100%	
Partner			90%	
0-6 years	50%		0-5 years	60%
7-13 years	65%		6-13 years	70%
14-17 years	90%		14-17 years	80%
18+ years	80%		18+ years	80%

Source: §22 Federal Social Security Act, §20 Social Code II, governing law of the respective year.

Note: Standard rates are displayed in Table 6.

The sum of household member shares gives the households-size-specific factor $f_{h,t}$ which is multiplied by the annual standard rate $sr_{h,t}(r)$. The standard rate $sr_{h,t}(r)$ differs by region r the household is located (West or East Germany) and year t as shown in Table 7. Additionally, housing assistance $hh_{h,t}(r)$ is provided to compensate for rent and heating payments. Possible claims on social assistance $b_{h,t}^{sa}(c)$ are computed as

¹¹In the simulation fixed shares are used: 0.6 for children between 0 and 14 years and 0.8 for household members older than 14 years.

$$b_{h,t}^{sa}(c) = f_{h,t} \cdot sr_{h,t}(r) + hh_{h,t}(r) \quad (9)$$

Household size-specific housing and heating transfers are taken from the statistical data of the German labor administration (*Bundesagentur für Arbeit*) available for the years 2005 to 2007 and are provided in Table 9.¹²

Table 9: **Housing assistance - monthly household size-specific average payments**

		2005	2006	2007
1	West	228.23	251.47	256.71
	East	199.07	223.09	226.02
2	West	315.39	325.22	327.43
	East	271.52	284.39	283.01
3	West	366.93	379.45	380.26
	East	320.74	334.87	334.60
4	West	433.76	447.80	448.51
	East	378.90	394.53	396.91
5+	West	521.40	541.33	545.66
	East	471.18	496.74	499.54

Source: Statistik der Bundesagentur für Arbeit (2005, 2006, 2007)
Note: Payments are in current Euro.

Potential claims for social assistance are reduced by household income and property as well as unemployment benefits and unemployment assistance. For the simulation it is assumed that household's property does not exceed the exemption limits. Following Bönke and Eichfelder (2010), claims for social assistance after deductions can be expressed as

$$b_{h,t}^{sa}(c) = \text{Max}(f_{h,t} \cdot sr_{h,t}(r) + hh_{h,t}(r) - ch_{h,t}(c) - \text{Max}(y_h^U - t_h^U + b_{i,t}^{ub}(c) + b_{i,t}^{ua}(c) - \text{Min}(LE, y_h^U) - A_j, 0), 0), \quad (10)$$

where $ch_{h,t}(c)$ are child benefits and A_j denotes the earnings allowance for spouse j 's earnings $y_{j,t}^w$ according to §11b of Social Code II. LE is lump-sum income-related expenses of 100 Euro per month or 1,200 per year in §11 Social Code II, which is granted

¹²Before 2005, average housing transfers are documented by the Federal Bureau of Statistics (*Statistisches Bundesamt*), but heating transfers are neither included nor provided separately. To compute housing and heating transfers of the years 1995 to 1997 transfers for 2005 as given in Table 9 are deflated to price levels of the respective years.

since 2005. Statutory earnings allowance are subject to reform between the two 3-year periods. Allowances 1995-1997 are given as

$$A_{j,t} = \begin{cases} y_{j,t}^w & \text{if } y_{j,t}^w \leq 0.25 \cdot sr_{h,t}(r) \\ 0.15 \cdot y_{j,t}^w & \text{if } 0.25 \cdot sr_{h,t}(r) < y_{j,t}^w \leq 0.5 \cdot sr_{h,t}(r) \end{cases} \quad (11a)$$

$$(11b)$$

Allowances since 2005 are defined as

$$A_{j,t} = \begin{cases} 0.2 \cdot (y_{j,t}^w - 1200) & \text{if } 1200 < y_{j,t}^w \leq 9,600 \\ 0.2 \cdot 8,400 + 0.1 \cdot (y_{j,t}^w - 9,600) & \text{if } 9,600 < y_{j,t}^w \leq 14,400 \\ 0.2 \cdot 8,400 + 0.1 \cdot 8400 & \text{if } y_{j,t}^w > 14,400 \end{cases} \quad (12a)$$

$$(12b)$$

$$(12c)$$

The upper limit of 14,400 Euro increases to 18,000 Euro if children live in the household.

5.1.4 Housing allowance

Households with an income below a specific threshold can apply for housing allowance in place of social assistance. The payment depends on the number of household members and on household income reduced by lump sum deductions. Housing allowances are computed in accordance to the German Housing Benefit Act (*Wohngeldgesetz*) following Bönke and Eichfelder (2010) as

$$b_{h,t}^{ha} = \text{Max}(H_{h,t}^{ha} - (a_i + b_i \cdot H_{h,t}^{ha} + c_i \cdot H_{h,t}^{ha}) \cdot y_{h,t}^{ha}, 0), \quad (13)$$

where H_h^{ha} denotes the relevant housing costs, y_h^{ha} the relevant net household income and a_i , b_i , c_i the factors in appendix 1 of the Housing Benefit Act. The relevant income for housing benefits y_h^{ha} is gross household income y_h^U reduced by the lump sum for income-related expenses LE , which is described in detail in 5.2.2. The relevant housing costs $H_{h,t}^{ha}$ are calculated equivalently to housing assistance as included in social assistance.

5.1.5 Child benefits

Households with children receive child benefits depending on the number of children. Child benefits are paid at least until the 18th birthday regardless of the labor market state of the parents. A tax exemption instead of child benefits is granted to households with higher income. Table 10 presents monthly child benefits and child allowances over time.

Table 10: **Monthly child benefits and child allowances**

	1995	1996	1997	2005	2006	2007
1st child	36	102	112	154	154	154
2nd	66	102	112	154	154	154
3rd	112	153	153	154	154	154
4th +	123	179	179	179	179	179
Child allowance	2,098	3,203	3,534	3,648	3,648	3,648

Source: §6 Federal Child Benefit Act, §32 and §66 Income Tax Code, governing law of the respective year
Note: Benefits and allowances are in current Euros.

In 2005 an additional child benefit (*Kinderzuschlag*) is introduced to raise the household income of working families above the threshold of social assistance (§6a Federal Child Benefit Act). The additional child benefit is conditional on being employed and is so far the only in-work benefit in Germany. Households are eligible for this benefit if household income meets the needs of the parents but not the needs of their children. The maximum benefit lies at 140 Euro per month for children under 18 years living in the same household as their parents and is granted to households where household income is equal to the hypothetical claim on social assistance of the parents only. If income lies above that level, additional child benefit is withdrawn at a rate of 70 %. The upper income level for eligibility lies at the social assistance level for the household as a whole including the children.

5.2 Taxes

Statutory provisions for the calculation of household income taxes and social security contributions are described below.

5.2.1 Social security contributions

Individual gross earnings is the assessment basis for social security contributions of the employee. Earnings below a threshold are denoted as marginal employment and exempted from social security contributions. The reform in 2005 increases the threshold remarkably to 400 Euro per month (or 4,800 Euro annually). Year-specific earnings thresholds are shown in Table 11.¹³

¹³Up to the earnings threshold the employer pays a flat-rate contribution which does not establish an entitlement to social security payments such as unemployment benefits for the employee.

Table 11: **Annual earnings thresholds for marginal employment**

	1995	1996	1997	2005-07
West	3559	3620	3743	4800
East	2884	3068	3190	4800

Source: §8 Social Code IV; IAB (2012)
Note: Earnings thresholds are in current Euros.

From 1995 to 1997, earnings exceeding these thresholds are due to social security contributions resulting in high marginal tax rates. With the introduction of a zone with increasing social security contributions for modest incomes in 2005 marginal tax rates for low income earners are cut down. Since then, social security contributions increase for annual earnings between $e_t^1=4,800$ and $e_t^2=9,600$ Euro (so-called *Midi-Jobs*) from about 4% to about 21% according to §20 Social Code IV. The overall social security contribution rate does not change significantly over time. Hence, a contribution rate $s = 21\%$ is applied to calculate social security contributions $S_{j,t}$ for earnings above earnings threshold $e_t^1 = e_t^2$ between 1995 and 1997 and above e_t^2 between 2005 and 2007, respectively. Above the contribution ceiling RVB_t^{max} of the respective year t contributions are fixed in absolute value.¹⁴ Social security contributions are simulated for a working spouse j when individual i is out of work and in state U . $S_{j,t}$ are given as

$$S_{j,t} = \begin{cases} 0 & \text{if } e_t^1 > y_{j,t}^w & (14a) \\ s \cdot (F \cdot e_t^1 + (2 - F)(y_{j,t}^w - e_t^1)) & \text{if } e_t^1 < y_{j,t}^w < e_t^2 & (14b) \\ s \cdot y_{j,t}^w & \text{if } y_{j,t}^w > e_t^2 & (14c) \\ s \cdot RVB_t^{max} & \text{if } y_{j,t}^w > RVB_t^{max} & (14d) \end{cases}$$

F is a fixed factor equal to 0.7673.

5.2.2 Income tax

Gross household income is subject to taxes on income if exceeding the exemption limits. Table 12 shows exemption limits and other central features of the German income tax schedule over time. Income tax reforms undertaken by the red-green government between 1998 and 2005 reduces average tax rates substantially. The tax burden for low income

¹⁴For the simulation the contribution assessment ceiling of social security pensions and unemployment insurance is applied.

groups is reduced by decreasing the basic allowance and the minimal marginal tax rate. In the German tax schedule, marginal tax rates increase linearly with income up to a threshold indicated as the end of progression zone in Table 12. The top marginal tax rates stays constant for income exceeding that threshold. Both threshold and top marginal tax rate are decreased throughout the reforms reducing the tax burden of high income groups, too. In 2007, an additional threshold for the rich is introduced above which the marginal tax rate is 45%.

Table 12: **Changes in the German income tax schedule**

year	Allowance	Min. marginal tax rate	End of pro- gression zone	Top marginal tax rate
1995	2,871	19.0%	61,376	53%
1996/1997	6,184	25.9%	61,376	53%
2005/2006	7,664	15.0%	52,152	42%
2007	7,664	15.0%	250,001	45%

Source: German Federal Ministry of Finance

Note: Values are in current Euros.

Calculating the taxable income, a lump sum for income-related expenses LE and a lump sum for special private expenses (*Sonderausgaben*) LS is deducted. It is assumed that expenses do not exceed these lump-sum deductions. Furthermore, the saver's allowance SA is deducted from asset income which is twice as high for married couples. Lump sum deductions over time are presented in Table 13.

Table 13: **Lump sum deductions**

	1995-97	2005-06	2007
LE	1023	920	920
LS	55	36	36
SA	3,068	1,370	750

Source: §9a, §10c and §20 Income Tax Code of the respective years.

Note: Deductions are in current Euros.

Moreover, social security contributions can be partially deducted from taxable income. A time-varying amount $SE_{j,t}^{m2}$ reflecting social security contributions is deducted from taxable income. Since 2005 tax authorities apply the more favorable of two different calculations of deductions $SE_{j,t}^{m1}$ and $SE_{j,t}^{m2}$ (§10 Income Tax Code).¹⁵ Furthermore,

¹⁵For details regarding the assessment of $SE_{j,t}^{m1}$ and $SE_{j,t}^{m2}$ see Bönke and Eichfelder (2008).

the profit share (*Ertragsanteil*) of social security pensions is added to taxable income.¹⁶ According to the progression clause (*Progressionsvorbehalt*) of §32b Income Tax Code unemployment benefits, unemployment assistance and maternity benefits have to be included when computing the income tax rate, but are not considered when assessing the resulting income tax. Following Bönke and Eichfelder (2010) the taxable base can be described as

$$y_{h,t}^{TP} = y_{h,t}^U + b_{i,t}^{ub}(c) + b_{i,t}^{ua}(c) + mat_{i,t}(c) - LE - LS - Min(Max(SE_{j,t}^{m1}, SE_{j,t}^{m2}), S_{j,t}), \quad (15)$$

The income tax T^{inc} is then computed according to §32a Income Tax Code. The income tax rate $t_{h,t}^{inc}$ is calculated by $t_{h,t}^{inc} = \frac{T_{h,t}^{inc}}{y_{h,t}^{TP}}$ and is applied to the taxable income given as

$$y_{h,t}^T = y_{h,t}^U - LE - LS - Min(Max(SE_{j,t}^{m1}, SE_{j,t}^{m2}), S_{j,t}), \quad (16)$$

The resulting income tax $T_{h,t}^{inc}$ is given by $T_{h,t}^{inc} = t_{h,t}^{inc} \cdot y_{h,t}^T$. Married couples are taxed jointly. Couple's joint taxable income is halved to assess the income tax rate. Then, the resulting income tax is doubled.

5.2.3 Solidarity surcharge

A solidarity surcharge T^S is levied if the income tax surpasses the exemption limit EL^S . Table 14 shows rates of the solidarity surcharge t^s and exemption limits EL^S over time.

Table 14: Solidarity surcharge rate and exemption limits

	1995-97	2005-07
t^S	7.5%	5.5%
EL^S	681	972

Source: §3 and §4 Solidarity Surcharge Code
Note: Exemptions limits are in current Euros.

On the first pay level the surcharge is imposed at a higher marginal rate $t^{s*} = 20\%$. Hence, $T_{h,t}^S$ is given by

$$T_{h,t}^S = \begin{cases} 0 & \text{if } T_{h,t}^{inc} \leq EL_t^S \quad (17a) \\ Min(T_{h,t}^{inc} \cdot (1 + t^s), T_{h,t}^{inc} + (T_{h,t}^{inc} - EL_t^S) \cdot t^{s*}) & \text{if } T_{h,t}^{inc} > EL_t^S \quad (17b) \end{cases}$$

¹⁶Only the profit share of social security pensions is taxed, which varies over time. For the simulation, the profit share is assumed to be stable at 30 %.

6 Results

There are several factors that lead to variation of PTRs among the population. High out-of-work income provided by the welfare state and large reductions in household net taxes when changing to state U generate high PTRs. It strongly depends on the household context to which extent household net taxes are reduced in state U and to which extent hypothetical claims on means-tested benefits are withdrawn because of other household income sources. Another major determinant is individual earnings in the denominator of the PTR-formula. The lower wage and/or weekly working hours, the higher is the PTR. So real wage growth may also lead to lower PTRs and higher work incentives.

6.1 Participation tax rates by individual earnings

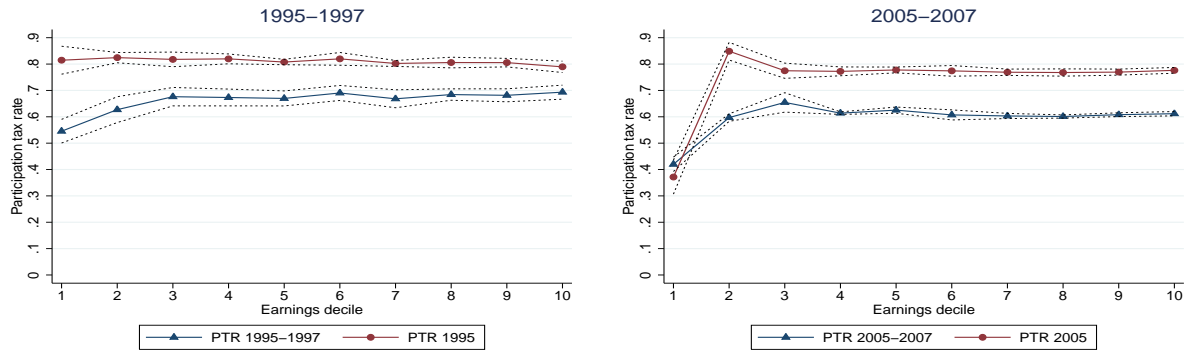
PTRs of working individuals sorted by earnings deciles are displayed in Figure 2. The line denoted by triangles gives the median PTR over a 3-year period (long-term), whereas the line denoted by dots presents the median PTR over a 1-year period (short-term). For PTRs over three years, earnings deciles are based on NPV of earnings over three years and for annual PTRs on annual earnings. The graph on the left hand depicts PTRs for the pre-reform period 1995-1997 and the graph on the right for the post-reform period 2005-2007.

The short-term PTR of the median earner (5th decile) earning about 24,000 Euro in 1995 is at about 80%. This implies that the difference between in- and out-of-work net taxes is 19,200 Euro which equals 80% of individual gross earnings. For a single with income from earnings only, this results from taxes on earnings of 11,000 Euros and zero transfers when in state E and zero taxes and unemployment benefits of 8,200 Euro when in state U . The PTR is attributable to the sum of the in-work tax rate $\frac{11,000}{24,000} = 46\%$ and the out-of-work gross benefit ratio $\frac{8,200}{24,000} = 34\%$.

In both periods, PTRs decrease when extending the measurement period to three years. In the long-term, out-of-work income falls when unemployment benefits are exhausted. In 1995-1997, short-term PTRs are about 10 percentage points higher than long-term PTRs. Because of the abolition of unemployment assistance in 2005 income may drop even further to levels of social assistance when unemployment benefits are exhausted. Before the reform higher income earners receive 53% of net earnings when unemployed for more than a year, whereas they fall back to social assistance if being the household's principal earner thereafter. Accordingly, the post-reform spread between short-term and

long-term PTRs increases to almost 20 percentage points for most deciles. Long-term PTRs of low income earners exceed short-term PTRs slightly. Explanations for this occurrence are provided in the descriptions of Figure 3 and 4.

Figure 2: **PTR - Short-term vs. Long-term**



Source: Own calculations

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over one year and three years, respectively. Dotted lines denote Hall's (1994) bootstrap confidence intervals at 95%-level.

A direct comparison of short-term PTRs for the years 1995 and 2005 is displayed in Figure 3. Short-term PTRs before the reform are remarkably stable over earnings deciles. Income tax reductions when changing to state U and earnings-related unemployment benefits increase almost with the same rate as earnings over the deciles such that the PTR remains rather constant. Earnings of individuals in the 6th decile are about 27,000 Euro in 1995. For a single in the 6th decile, taxes on earnings are about 12,000 Euros in state E and unemployment benefits about 9,600 Euro when in state U . Compared to the median earner (5th decile) outlined above, the difference between net taxes in- and out-of-work is 2,400 Euro higher whereas earnings increase by 3,000 Euro. This means that each additional Euro earned increases the differences between net taxes in- and out-of-work by 0.8 Euro.

For most earnings deciles, post-reform PTRs decrease slightly. But PTRs decrease sharply for individuals in the lowest earnings. In 1995, individuals in the lowest decile earned a maximum of 12135 Euro (in prices of 2005), whereas in 2005 the decile threshold lies at 7300 Euro. This earnings drop in the lowest decile reflects the growth of the low-income sector which in turn implies a higher number of working individuals who are not subject to social security contributions. Consequently, less individuals accumulate claims for unemployment benefits. Indeed, the portion of individuals in the lowest earnings decile eligible for unemployment benefits falls from 76% in 1995 to 28% in 2005. In both periods, more than 80% of the two lowest deciles are women. Particularly

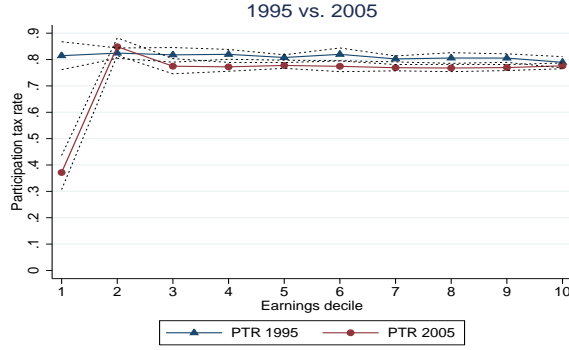
in the lowest decile, they are mainly side earners married to a spouse earning their livelihood. Most of these individuals are not eligible for social assistance because of spouse's high earnings. Accordingly, the share of individuals in the lowest decile receiving social assistance in U stays rather constant at 10% in 1995 and 9% in 2005. Reduced eligibility for unemployment benefits combined with limited claims for social assistance in the lowest decile is responsible for low levels of post-reform PTRs. Furthermore, lower earnings in the lowest decile imply that household income falls less when individual is in state U which in turn amounts to smaller tax reductions when changing from E to U . On average, individuals in the lowest decile exhibit a tax reduction of $T_{h,1995}^{inc,E} - T_{h,1995}^{inc,U} = 11,800 - 9,300 = 2,500$ and $T_{h,2005}^{inc,E} - T_{h,2005}^{inc,U} = 9,000 - 8,300 = 700$. As a result, lower earnings leading to smaller tax reductions also contribute to lower PTRs in the bottom decile.

Post-reform PTRs of the second lowest decile are both higher than in 1995 and higher than PTRs of other 2005 earnings deciles. Individuals in the second lowest decile earned a maximum of about 17,900 Euro (in prices of 2005) in 1995 and of about 15,300 Euro in 2005. Elevated PTRs in that decile arise for technical reasons. The share of families in the second lowest decile is higher compared to both 1995 and higher earnings deciles in 2005. The share of families is 73% in 1995 and 78% in 2005. A larger share of families in the decile increases both earnings-related unemployment benefits which is higher for families with children and claims on social assistance. Additional child benefits introduced in 2005 also contribute to raise families out-of-work benefits in comparison to 1995. In 2005, the share of families peaks at the second lowest decile and then drops to levels of 50% for higher earnings deciles. As a consequence, average out-of-work benefits are higher in the second lowest decile inducing higher PTRs for a given level of earnings. The slight decrease of post-reform PTRs of the following earnings deciles may be explained by changed household structure, too. Neither unemployment benefits paid in the first 12 months nor social assistance payments were changed by the reform 2005. But in comparison to 1995, the share of families declines for all earnings deciles except for the two lowest. Comparing earnings deciles suggests that out-of-work benefits are lower in 2005 and PTRs accordingly because of the higher number of 1- and 2-person households without children.

Empirical results on behavioral responses at the extensive margin can give an idea of the optimal size of the PTR. The extensive elasticity measures the percentage number of employed workers who decide to leave the labor force when the difference between net income in-work and out-of-work decreases by 1 percent (Saez, 2002). The higher

the extensive elasticities for a certain group, the lower is the optimal PTR for the group (Brewer et al., 2008).¹⁷ The empirical literature finds that extensive elasticities are higher for low-income, low-skilled individuals as they are eligible to substantial benefits (Meghir/Phillipps, 2010). If PTRs exceeded the optimal value, the PTR decrease for low-income individuals can be judged as a move in the right direction.

Figure 3: PTR - Short-term



Source: Own calculations

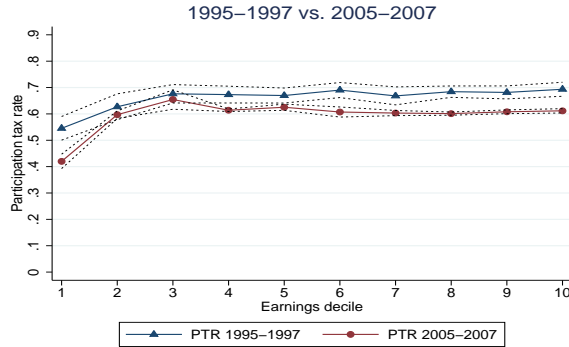
Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over one year and three years, respectively. Dotted lines denote Hall's (1994) bootstrap confidence intervals at 95%-level.

Over a 3-year period differences between the two periods appear more prominent as can be taken from Figure 4. The distance to pre-reform PTRs tends to first diminish and then grow with earnings. Section 6.3 analyzes if the abolition of earnings-related unemployment assistance in 2005 can serve as the major explanation for the spread between the periods. However, benefits are not equally important over earnings deciles. As earnings increase benefits in U become less important and the size of tax reductions when changing from E to U grows. Income tax reforms by the red-green government particularly reduce the tax burden of the rich (Corneo, 2005). A single with income from earnings only, who is in the highest decile in both periods with earnings of 63,000 Euro in 1995 (72,000 in prices of 2005) and 72,000 Euro in 2005, has a stable out-of-work gross benefit ratio resulting from $\frac{18,300}{63,000} = 29\%$ in 1995 and $\frac{21,000}{72,000} = 29\%$ in 2005. But the in-work tax rate declines from $\frac{33,400}{63,000} = 53\%$ in 1995 to $\frac{35,300}{72,000} = 49\%$ in 2005 such that the fraction of the PTR attributable to in-work taxes falls. The decrease in the progressivity of the tax system induces the difference $T_{h,2005}^{inc,E} - T_{h,2005}^{inc,U}$ to decline. This effect becomes even more prominent if accumulated over a 3-year period such that the

¹⁷Brewer et al. (2008) refer to the Ramsey principle of optimal taxation that commodities with relatively more elastic demands should have relatively lower tax rates.

decline of post-reform PTRs is more pronounced for the top of the earnings distribution.

Figure 4: PTR - Long-term



Source: Own calculations

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over one year and three years, respectively. Dotted lines denote Hall's (1994) bootstrap confidence intervals at 95%-level.

6.2 Distribution of participation tax rates over household types

The next two tables illustrate how long-term PTRs vary by gender and household type. Table 15 and 16 display distributions of long-term PTRs sorted by size of PTRs. The median (50th centile) is the middle number, such that half of individuals of the respective group face higher PTRs and half face lower.

Table 15 presents the distribution of PTRs for the pre-reform period. 25% of the male singles face a PTR lower than 69% and 75% of the male singles face a PTR lower than 74%. This implies that half of the male singles have a PTR between 69% and 74%. For half of the female singles PTRs between 67% and 73% arise. Hence, female singles face lower PTRs than male singles which implicates higher work incentives for female singles. Individuals living in couples are subject to the withdrawal of means-tested benefits when household income exceeds the hypothetical claims. According to the lower level of state support their PTRs should be lower than for singles. As Table 15 shows, individuals living in couples without children have lower PTRs than singles. The median PTR lies at 66% for men in childless couples and between 60% and 64% for women in childless couples. The average PTR for a man in a one-earner couple is 64%. Immervoll et al. (2009) find an average PTR for primary earners (mostly men) in one-earner couples of 63% in 1998.¹⁸ Comparing PTR distributions for one-earner and two-earner house-

¹⁸The PTR of 63% would be presumably lower if computed over a 3-year period as we do, but Immervoll et al. (2009) restrict their sample to primary earners working the entire year. On average, more individuals may be eligible for unemployment benefits in their sample and may, as a consequence,

holds reveals that individuals in two-earner households surprisingly face higher PTRs. Benefit-withdrawal for individuals in two-earner households should lead to lower PTRs than for one-earner households where benefit-withdrawal occurs only if other household income sources than earnings are present. But one has to note that only 2% of men in the sample and only 3% of women live in one-earner couples without children as shown in Table 3. Due to the small number of observations, results for one-earner households must be interpreted with caution. In contrast, 13% of men and 23% of women live in two-earner couples without children.

PTRs for adults living in families with children lie between those of singles and childless couples. Median PTRs are between 58% and 71%. On the one hand, unemployment benefits and unemployment assistance are higher if children live in the household so PTRs are higher for individuals with children. Furthermore, social assistance increases with the number of household members. Apart from that, means-tested benefits will be withdrawn largely if not completely when the spouse adds earnings to household income. This will not occur for singles, which is why singles exhibit higher PTRs. Individuals living in two-earner households with children face lower PTRs than those in one-earner households. This is line with the expectations as outlined above. Means-tested benefits will be withdrawn largely if not completely when the spouse adds earnings to household income which in turn leads to lower PTRs and stronger working incentives. Again, women generally have lower levels of PTRs than men.

There is a consensus that extensive elasticities are higher for women than for men such that optimal PTRs should be lower for women to increase working incentives.¹⁹ Indeed, women in Germany face lower PTRs which is mainly due to their circumstances of living.

The distribution of PTRs by household type for the post-reform period is given in Table 16. Again, singles have the highest PTRs with a median of 62%. Compared to 1995-1997 PTRs are lower for singles at all centile of the PTR distribution. Hence, work incentives are strengthened across the entire group of singles.

Overall, the pre-reform order is preserved: Individuals living in couples with children generally face the second highest PTR and most individuals in couples without children have the lowest PTR. Additionally, PTRs are lower than in 1995-1997 for the majority and, consequently, work incentives higher. Married men face lower PTRs in 2005-2007 which does not vary with household characteristics like presence of children or a working

exhibit higher PTRs.

¹⁹See Meghir/Philipps (2010) for a literature overview.

Table 15: Centile of distribution of PTRs, 1995-1997

Household type	10th	25th	50th	75th	90th	mean
Single, no children						
Men	0.66	0.69	0.72	0.74	0.76	0.72
Women	0.63	0.67	0.70	0.73	0.77	0.70
Couple, no children						
Men						
Spouse not working	0.56	0.58	0.66	0.67	0.69	0.64
Spouse working	0.56	0.61	0.66	0.70	0.76	0.65
Women						
Spouse not working	0.47	0.56	0.60	0.68	0.69	0.57
Spouse working	0.56	0.60	0.64	0.69	0.73	0.64
Couple with children						
Men						
Spouse not working	0.62	0.66	0.71	0.77	0.81	0.72
Spouse working	0.59	0.63	0.66	0.72	0.77	0.67
Women						
Spouse not working	0.48	0.56	0.62	0.71	0.74	0.64
Spouse working	0.41	0.52	0.58	0.62	0.69	0.58
All	0.56	0.61	0.67	0.73	0.77	0.67

Source: Own calculations

Note: Each line displays the distribution of PTR for the respective subgroup.

spouse. Typically, two-earner households are shaped by a high-income husband and a side-earning wife such that the incentives of the husband whether or not to take up a job is influenced sparsely by the presence of a second earner.

However, some exceptions remain. The distribution of PTRs for women living in families with children substantially widens between 1995-1997 and 2005-2007. Low PTRs (10th decile) are by about 10 percentage points smaller after the reforms for both women being the single earner and living in two-earner households. At the other extreme, PTRs at the 90th decile for women in two-earner families also grow by 15 percentage points. Compared to the pre-reform period, more women live in single households or in couples without children. The share of women living in families with children decreased which causes the distribution of PTRs to be more dispersed. On the one hand, many women in families are side earner. Claims for unemployment benefits are small if accumulated at all and a change to unemployment reduces household income taxes negligibly. This group faces small PTRs as described above. On the other hand, in 2005 more women take up high-income jobs where they accumulate entitlements to unemployment benefits. Their decision to change to state U reduces household income taxes significantly. In sum, this may lead to higher PTR at the other end of the distribution.

Table 16: Centile of distribution of PTRs, 2005-2007

Household type	10th	25th	50th	75th	90th	mean
Single, no children						
Men	0.59	0.60	0.62	0.65	0.68	0.64
Women	0.57	0.59	0.62	0.65	0.71	0.64
Couple, no children						
Men						
Spouse not working	0.50	0.50	0.56	0.60	0.67	0.57
Spouse working	0.54	0.56	0.58	0.61	0.65	0.59
Women						
Spouse not working	0.51	0.56	0.61	0.61	0.65	0.57
Spouse working	0.52	0.56	0.58	0.61	0.65	0.57
Couple with children						
Men						
Spouse not working	0.57	0.59	0.62	0.69	0.77	0.66
Spouse working	0.57	0.58	0.61	0.66	0.69	0.62
Women						
Spouse not working	0.39	0.50	0.60	0.65	0.89	0.60
Spouse working	0.30	0.43	0.58	0.63	0.67	0.54
All	0.53	0.58	0.61	0.65	0.69	0.61

Source: Own calculations

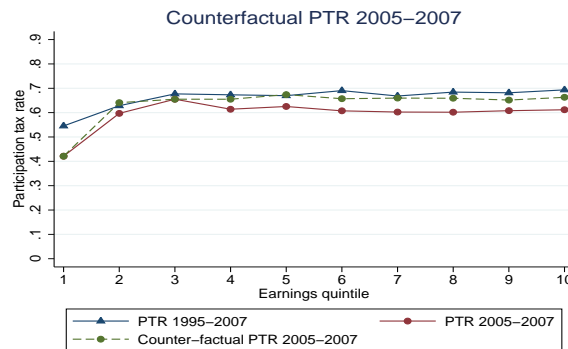
Note: Each line displays the distribution of PTR for the respective subgroup.

6.3 Counterfactual participation tax rates

To analyze to what extent recent reforms contributed to improve work incentives, PTRs are simulated for the counterfactual case that *Hartz IV-reforms* had not taken place. The *Hartz IV-reforms*, i.e., the replacement of earnings-related unemployment assistance with means-tested social assistance and enlarged earnings allowances for social assistance recipients, is the part of the reforms most controversially discussed. Benefits are more important for low- and middle income groups, whereas high-income groups are more affected by taxes. Furthermore, work incentives at the extensive margin as captured by PTRs are of greater importance for low-income individuals who face the decision whether or not to work at all in the presence of a welfare state. As outlined above, empirical literature finds evidence, that high-income individuals are more concerned about their labor supply along the intensive margin. Therefore, the counterfactual analysis concentrates on the *Hartz IV-reforms* and leaves tax reforms aside.

In the counterfactual situation, unemployment assistance applies instead of social assistance after the exhaustion of unemployment benefits as described in equation (8) and spouse's earnings are deducted from hypothetical claims on social assistance according to the statutory rules of 1995 described in equation (11). PTRs are simulated for incomes and household characteristics of individuals in the sample in 2005. Most of the post-reform PTR decrease can be traced to the abolition of unemployment assistance, particularly for middle-income individuals as can be taken from Figure 5. The pattern diverges for the margins of the earnings distribution. In the lowest decile, the majority is not eligible for unemployment benefits and consequently not for unemployment assistance. Small post-reform PTRs are predominantly explained by small changes in household taxes from E to U stemming from low earnings in that decile. As a result, the abolition of unemployment assistance is of no consequence for this group. For individuals in the 8th decile and above, abolition of unemployment assistance is less of an explanation, because reductions of household income tax when out of work play a greater role.

Figure 5: PTR - Long-term



Source: Own calculations

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over one year and three years, respectively. Dotted lines denote Hall's (1994) bootstrap confidence intervals at 95%-level.

In the UK, growth in real earnings was the driving force behind the gradual strengthening of work incentives from the early 1980s to the late 1990s according to Adam et al. (2006). But thereafter tax and benefit changes weakened work incentives in the UK. The trend seems to be the opposite for Germany. Real gross wages have hardly risen between the two periods considered here. Whereas changes in the benefit system have contributed importantly to strengthen work incentives.

7 Conclusion

This article has examined if work incentives have changed after the labor market reforms taking place in Germany between 1999 and 2005. Participation tax rates (PTR) were computed for a pre-reform period 1995-1997 and a post-reform period 2005-2007. Thereby, the time horizon of one year typically surveyed by studies on work incentives is extended to three years. Standard economic theory suggests that individuals condition their participation decision rather on a longer time horizon than on a year only. Moreover, the extension of the time horizon incorporates important changes in benefits for long-term unemployed. The *Hartz IV-reforms* in 2005 replaced earnings-related unemployment assistance being paid effectively until retirement with means-tested social assistance. This leads to potentially harsh income drops for single earners if unemployed for longer than a year.

Comparing the pre- and post-reform periods reveals that work incentives were strengthened through the changes in the tax-benefit system because PTRs have generally decreased. Both the traditional measure over a 1-year period (short-term) and the 3-year (long-term) PTR show the improvement in work incentives. This study first provides evidence that long-term work incentives actually improved more than short-term work incentives. Particularly for singles, it is financially far less attractive to decide to be unemployed than to work since the reforms. PTRs fell particularly for the bottom of the distribution. This happens for two reasons: the growth of the low-income sector increased the number of individuals in marginal employment who are not eligible for unemployment benefits when out-of-work; the lowest decile is dominated by women married to a husband earning their livelihood such that they are not eligible for benefits from social assistance either and the reduction in household income taxes when the wife is out-of-work is small. For the top of the earnings distribution, the reduction of household income taxes when out of work outweighs out-of-work benefits in size.

As real wage growth in Germany was moderate between the two periods it contributes only negligibly to improve work incentives if at all. A counterfactual analysis reveals that the abolition of unemployment assistance in sequel of the *Hartz IV-reforms* predominantly explains increased work incentives of middle earnings classes. But this does not hold for the margins of the earnings distribution. Individuals in the lowest decile lack of eligibility for unemployment benefits and unemployment assistance. For high-income earners, the downsized tax reduction when out of work plays a bigger role in explaining higher work incentives.

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