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Long-term participation tax rates

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SOEPpapers
on Multidisciplinary Panel Data Research

Long-term Participation Tax Rates

Charlotte Bartels

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Long-term Participation Tax Rates

Charlotte Bartels*

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Abstract. Generous income support programs as provided by European welfare states have often been blamed to reduce work incentives for the low-skilled and to increase durations of unemployment. Standard studies measure work incentives based on annual income concepts. This paper analyzes work incentives inherent in the German tax-benefit system when extending the time horizon to three years (long-term). Participation tax rates are computed for 1-year and 3-year periods 1995-1997 and 2005-2007 to reveal potential effects of the labor market and tax reforms between 1999 and 2005. The results show that participation tax rates are significantly lower over a 3-year period pointing at an overestimation of the disincentives by standard measures. Reforms reduced participation tax rates, particularly for singles and low-income individuals.

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). 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 (extensive margin) and progressive taxes may cause middle and high income individuals to work less (intensive margin). According to optimal tax theory, the efficiency cost of a tax-benefit system depends on the extent of the behavioral response of individuals and on the incentives inherent in the tax-benefit system (Immervoll et al., 2007).¹

The empirical literature has shown that the behavioral response at the extensive margin exceeds the response at the intensive margin, particularly for low-income individuals.² This hints at higher efficiency costs of a misshapen tax-benefit design at the extensive margin. Hence, this paper focuses on work incentives at the extensive margin and computes participation tax rates for Germany. The participation tax rate (PTR) is a measure for work incentives at the extensive margin derived from optimal tax theory. The effective marginal tax rate (EMTR) is its counterpart at the intensive margin.

The last two decades have seen a lively discussion regarding the readjustment of European welfare states. Under the general impression that work incentives are greatly distorted, major labor market reforms have been undertaken in many European countries in the 1990s and early 2000s. These reforms were mostly aimed at the reduction of out-of-work benefits and characterized by a transition to more activating labor market schemes. In Germany, a coalition of social democrats and green party came into power in 1998 after 16 years of conservative government. Personal income tax reforms between 1998 and 2005 substantially reduced average tax rates particularly relieving the rich (Corneo, 2005). The most radical changes, the so-called *Hartz reforms*, were introduced between 2003 and 2005 slashing out-of-work benefits for long-term unemployed.³

Several studies have analyzed PTRs across European countries applying tax-benefit rules of 1998 and for the UK over time.⁴ But all contributions deploy a time horizon of

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

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

³According to German §18 Social Code III, individuals are classified as long-term unemployed if unemployed for more than a year.

⁴For 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

only one year. The aim of this paper is to first extend the analysis of work incentives to more than a year. PTRs are computed for 1-year and 3-year periods encompassing the years 1995-1997 and 2005-2007. Thereby, important aspects can be included in the analysis 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 or social assistance which are determined by institutional rules. In Germany, benefits from unemployment insurance even decrease with the duration of unemployment. Moreover, human capital depreciation during unemployment reduces future earnings potential. Hence, income differences between working and non-working individuals tend to increase when extending the measurement period. Since the reform in 2005 out-of-work income after the exhaustion of unemployment benefits drops even more: Means-tested social assistance replaced earnings-related unemployment assistance, which was paid after the exhaustion of unemployment benefits. Thus, the reform potentially increased the post-tax financial reward for taking up a job for certain income groups. Again, this effect becomes only evident, when analysing work incentives over several years.

PTRs are computed for the entire earnings distribution and demographic subgroups such as gender, employment level and household type. Joint taxation of married couples, as is the case in Germany, can result in very low work incentives for wives having the inferior earnings potential in most cases, because the wife's earnings would be subject to the high tax rate of the husband. In contrast, a single woman would pay a low tax on low earnings. But taking transfers into account can change the picture: Benefits paid to the single woman would be withdrawn when she takes up a job, whereas the married woman potentially has no claims on benefits, such that no benefits can be withdrawn when taking up work. A priori it is thus unclear, which household context is exposed to higher tax-benefit system work incentives. Two scenarios are developed in order to include human capital depreciation into the PTR measure.

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.

Selin (2011) for Sweden.

2 Basic Concepts

2.1 Measuring participation tax rates

The PTR captures the implicit tax on working imposed by the tax-benefit system. 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 paid by the household h are income taxes t_h including social security contributions reduced by benefits b_h . Individuals in high-income households will pay positive T to the government as taxes will exceed benefits. Individuals in low-income households will predominantly receive benefits from the government which results in negative T . According to Immervoll et al. (2007) an annual PTR can thus be denoted as

$$PTR_h^s = \frac{T(y_h^E) - T(y_h^U)}{y_i^{E,w}}, \quad (1)$$

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 . S stands for short-term. 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 .⁵

⁵The net replacement rate (NRR) is an alternative measure for work incentives. It gives the share of in-work household income that is maintained when one household member stops working and is defined as $NRR = \frac{y_h^E - T(y_h^E)}{y_h^U - T(y_h^U)}$. High NRR may be the result of generous income support by welfare states but also of high household income from other sources. Thus, other income sources cloud the effect of the tax-benefit system. Particularly for two-earner households, the NRR is largely driven by the partner's earnings. In contrast, the PTR concentrates on the change of net taxes when out of work as a fraction of individual earnings and thereby provides a better indicator for financial work incentives created by the tax-benefit system *per se*. Using (1) the net replacement rate can also be expressed as $NRR = 1 - \frac{y_i^{E,w}(1 - PTR)}{y_h^E - T(y_h^E)}$. For a single or a single earner household with no other income than earnings a high NRR implies a high PTR. But in general there is no straightforward link between the two measures.

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 surpass taxes paid for the declined household income y_h^U . In sum, 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, which only changes due to reforms. 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. A 3-year period is chosen to raise the time horizon over a minimum of two years but to maximize the sample size of the balanced panel at the same time. 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

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

with

$$d_{t,k} = \frac{1}{(1 + i_{t,k-1})^{k-1}}$$

Income y_k in year k of the 3-year period with base year t is discounted with discount factor $d_{t,k}$ based on interest rate $i_{t,k-1}$ of a zero-coupon bond with $k-1$ years to maturity and base year t . 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 $t = 1995$ and $t = 2005$ 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**

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

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

Note: $i_{t,1}$ 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 l as

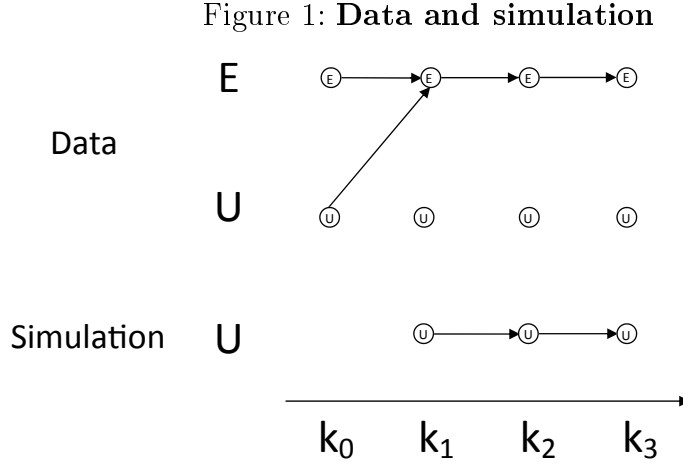
$$\begin{aligned}
 PTR_h^l &= \frac{NPV(T(y_h^E)) - NPV(T(y_h^U))}{NPV(y_i^{E,w})} \\
 &= \frac{\sum_{k=1}^{K=3} d_k \cdot [T(y_{h,k}^E) - T(y_{h,k}^U)]}{\sum_{k=1}^{K=3} d_k \cdot y_{i,k}^{E,w}}
 \end{aligned} \tag{3}$$

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 personal income tax reforms between 1998 and 2005 and the major labor market reforms between 2003 and 2005. 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 being in state E over the entire 3-year period (k_1 to k_3) is considered and U is simulated. This procedure is standard in the PTR literature (see, e.g., Immervoll et al., 2007). Simulating U for the in-work population implies to apply the statutory

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.

rules of the tax-benefit system, whereas simulating E for the unemployed would require additional assumptions to estimate potential.⁸ Hence, household income, taxes and transfers in state U are simulated for the in-work population during the years k_1 to k_3 . This is illustrated in Figure 1.

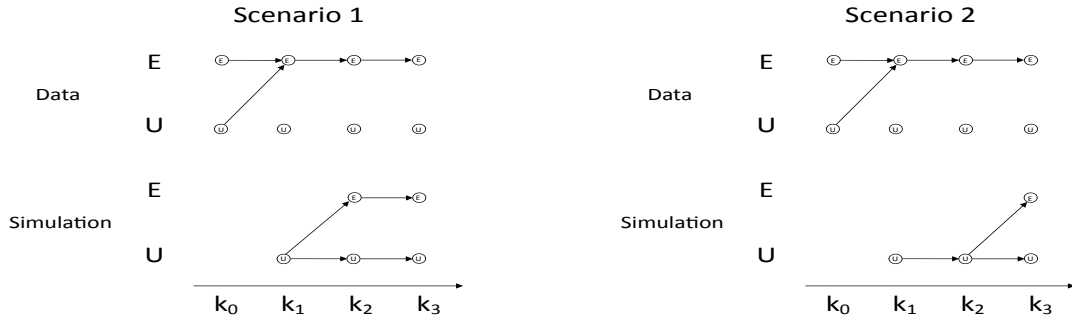


2.3 Participation tax rates with human capital depreciation

Choosing labor market state U not only triggers potential transfer receipt but also carries costs such as matching costs to find a new employer, stigma, unemployment scarring and reduced re-entry earnings due to human capital depreciation (hcd). Not including the costs of non-participation would overestimate the disincentives, particularly if costs accumulate over time spent in non-participation. While the loss in specific human capital is a once-for-all phenomenon due to the separation from the job, the loss in general human capital increases with the duration of non-participation (Mincer/Ofek, 1982). Hence, the baseline scenario of Figure 1 is slightly modified to two alternative scenarios illustrated in Figure 2. In scenario 1, the individual now chooses between not working in the first year and working the two subsequent years (U, E, E) or not working at all (U, U, U) . In scenario 2, the individual chooses between not working for two years and working the year after (U, U, E) or not working at all (U, U, U) .

⁸Not including the unemployed population in the sample potentially underestimates the size of the low-wage earner group and, consequently, underestimate PTRs at the bottom of the distribution.

Figure 2: **Data and simulation with human capital depreciation**



For the simulation of depreciated earnings at re-entry it is assumed that earnings decline by $\alpha = 2\%$ per year of non-participation.⁹ Depreciated earnings at re-entry in k_2 (scenario 1) or in k_3 (scenario 2) are computed as a fraction of the earnings given in the data for state E and are defined as

$$y_i^{E_k, w, hcd} = y_i^{E_k, w} \cdot (1 - \alpha)^{k-1} \quad \text{with } k = 1, 2, 3, \quad (4)$$

where k indicates the number of periods being unemployed.

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 1995.¹⁰

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 55.¹¹ Individuals are dropped who exhibit a missing on labor income not

⁹There exists a number of studies trying to capture the earnings penalty or atrophy rate per year of non-participation. Results range from about 1% (e.g., Kim/Polachek, 1994) to 11% (Gregory/Jukes, 2001) earnings reduction per year.

¹⁰See Haisken-DeNew and Frick (2005), Frick (2006) and Wagner et al. (2007) for further information on the SOEP.

¹¹Excluding first-time employees by raising the cut-off to 30 years of age produces slightly lower PTRs

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 allowance¹² 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 the number of earners. Table 2 presents the number of observations for each period. 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

Source: SOEP.

Employment decisions and earnings are largely correlated with gender. The majority of the observed men and women lives in families as can be taken from Table 3. Women are more probable to work part-time and thus earn less than their mostly full-time working husband. Moreover, working women are more probable to live in two-earner households. The share of single households increases between the two periods for both men and women whereas the share of individuals in two-earner families decreases.

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 and are outlined in detail in Table 4.

since average earnings in the sample increase which in turn leads to slightly lower PTRs. All in all, results are robust. Samples with individuals 25-49 or 30-49 lead to the same patterns.

¹²Subsistence allowance is paid in place of unemployment benefits if the unemployed undertakes vocational training. It is merged to unemployment benefits in 2005.

Table 3: **Share of household types and employment level by gender**

	1995		2005	
	Men	Women	Men	Women
Household type				
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%
Employment level				
Full time	93.2%	59.2%	94.3%	45.6%
Part time	6.8%	40.8%	5.7%	54.4%
Total	100%	100%	100%	100%

Source: SOEP.

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 $y_i^{E,w}$:

$$y_h^U = y_h^E - y_i^{E,w} \quad (5)$$

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

$$t_h^U = T_h^{U,inc}(y_h^U) + T_h^{U,S}(y_h^U) + S_j^U(y_j^{E,w}) \quad (6)$$

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,¹³ maternity benefits and child benefits do not depend on household income and can be taken from state E in the data. Government student assistance¹⁴ 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

$$b_h^U = b_h^E - (b_h^{E,sa} + b_h^{E,ha}) + (b_i^{U,ub} + b_i^{U,ua} + b_h^{U,sa} + b_h^{U,ha}), \quad (7)$$

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.

¹³Direct housing subsidy is granted for owner-occupied houses as a fraction of the acquisition or construction costs of the apartment or house and is abolished in 2006.

¹⁴Means-tested government student assistance will probably increase when a parent is out-of-work. Including this effect would raise the PTR. But the transfer is assumed to play a minor role in a working individual's decision between E and U since the transfer aims at the student and not at the working individual himself. Working students receiving government student assistance are excluded from the sample.

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

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

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.¹⁵ Table 6 provides details to changes in the length of entitlement.

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

¹⁵The entitlement length depends also on the number of months employed subject to social security contributions during the last seven or five years, respectively, according to §147 social code III. For the simulation it is assumed, that individuals were employed in total for at least 24 months during the last seven or five years, respectively, thus being eligible for 12 months unemployment benefits.

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: §147 Social Code III; Steffen (2008); BMAS (2012).

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 have to take place during the last three years, whereas the time horizon is shortened in 2006 to two years according to §142 and §143 Social Code III. However, the level of the benefit as percentage of previous net earnings remains untouched.

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

$$\begin{aligned}
 b_{i,t}^{ua}(c) &= s^{ua}(c) \cdot (y_{i,t-1}^w - t_{i,t-1}^w - S_{i,t-1}) \\
 &\quad - ((y_{h,t-1}^U - t_{h,t-1}^U - S_{j,t-1}) - s^{ua}(c) \cdot (y_{j,t-1}^w - t_{j,t-1}^w - S_{j,t-1})),
 \end{aligned} \tag{9}$$

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 (*Bedarfgemeinschaft*). 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 *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 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 Euro.

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.¹⁶

The sum of household member shares gives the householdsize-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

¹⁶In 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.

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

	1995-97		2005-07
Head	100%		100%
Partner	90%		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.

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

$$b_{h,t}^{sa}(c) = f_{h,t} \cdot sr_{h,t}(r) + hh_{h,t}(r) \quad (10)$$

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 9.¹⁷

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

¹⁷Before 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.

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

$$b_{h,t}^{sa}(c) = \text{Max}(f_{h,t} \cdot sr_{h,t}(r) + hh_{h,t}(r) - ch_{h,t}(c) - \text{Max}(y_h^U - t_h^U + b_{i,t}^{ub}(c) + b_{i,t}^{ua}(c) - \text{Min}(LE, y_h^U) - A_j, 0), 0), \quad (11)$$

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

$$A_{j,t} = \begin{cases} y_{j,t}^w & \text{if } y_{j,t}^w \leq 0.25 \cdot sr_{h,t}(r) \\ 0.15 \cdot y_{j,t}^w & \text{if } 0.25 \cdot sr_{h,t}(r) < y_{j,t}^w \leq 0.5 \cdot sr_{h,t}(r) \end{cases} \quad (12a)$$

$$(12b)$$

Allowances since 2005 are defined as

$$A_{j,t} = \begin{cases} 0.2 \cdot (y_{j,t}^w - 1,200) & \text{if } 1,200 < y_{j,t}^w \leq 9,600 \\ 0.2 \cdot 8,400 + 0.1 \cdot (y_{j,t}^w - 9,600) & \text{if } 9,600 < y_{j,t}^w \leq 14,400 \\ 0.2 \cdot 8,400 + 0.1 \cdot 8,400 & \text{if } y_{j,t}^w > 14,400 \end{cases} \quad (13a)$$

$$(13b)$$

$$(13c)$$

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 instead 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

$$b_h^{ha} = \text{Max}(H_{h,t}^{ha} - (a_i + b_i \cdot H_{h,t}^{ha} + c_i \cdot H_{h,t}^{ha}) \cdot y_{h,t}^{ha}, 0), \quad (14)$$

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 Euro.

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 11.¹⁸

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

	1995	1996	1997	2005-07
West	3,559	3,620	3,743	4,800
East	2,884	3,068	3,190	4,800

Source: §8 Social Code IV; IAB (2012).

Note: Earnings thresholds are in current Euro.

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 vary 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.¹⁹ 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

$$S_{j,t} = \begin{cases} 0 & \text{if } e_t^1 > y_{j,t}^w & (15a) \\ s \cdot (F \cdot e_t^1 + (2 - F)(y_{j,t}^w - e_t^1)) & \text{if } e_t^1 < y_{j,t}^w < e_t^2 & (15b) \\ s \cdot y_{j,t}^w & \text{if } y_{j,t}^w > e_t^2 & (15c) \\ s \cdot RVB_t^{max} & \text{if } y_{j,t}^w > RVB_t^{max} & (15d) \end{cases}$$

¹⁸Up 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.

¹⁹For the simulation the contribution assessment ceiling of social security pensions and unemployment insurance is applied.

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 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 progression 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 Euro.

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.

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).²⁰ Furthermore,

²⁰For details regarding the assessment of $SE_{j,t}^{m1}$ and $SE_{j,t}^{m2}$ see Bönke and Eichfelder (2008).

Table 13: **Lump sum deductions**

	1995-97	2005-06	2007
LE	1,023	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 Euro.

the profit share (*Ertragsanteil*) of social security pensions is added to taxable income.²¹ 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

$$y_{h,t}^{TP} = y_{h,t}^U + b_{i,t}^{ub}(c) + b_{i,t}^{ua}(c) + mat_{i,t}(c) - LE - LS - Min(Max(SE_{j,t}^{m1}, SE_{j,t}^{m2}), S_{j,t}) \quad (16)$$

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

$$y_{h,t}^T = y_{h,t}^U - LE - LS - Min(Max(SE_{j,t}^{m1}, SE_{j,t}^{m2}), S_{j,t}) \quad (17)$$

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.

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

$$T_{h,t}^S = \begin{cases} 0 & \text{if } T_{h,t}^{inc} \leq EL_t^S \quad (18a) \\ Min(T_{h,t}^{inc} \cdot (1 + t^s), T_{h,t}^{inc} + (T_{h,t}^{inc} - EL_t^S) \cdot t^{s*}) & \text{if } T_{h,t}^{inc} > EL_t^S \quad (18b) \end{cases}$$

²¹Only 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%.

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 Euro.

6 Results

There are several factors that lead to variation of PTRs among the population. Individual earnings is a major determinant in the denominator of the PTR-formula. The PTR is higher, the lower wage and/or weekly working hours. On the other hand, real wage growth may lead to lower PTRs and higher work incentives. Hence, the discussion of the results first focuses on PTR as a function of earnings.

Apart from earnings, PTRs heavily depend on the household context that determines the change in net household taxes between E and U in the numerator of the PTR-formula. High PTRs can be generated by both high out-of-work income provided by the welfare state and large reductions in household net taxes when changing to state U . The two terms strongly depend on the level of spouse's earnings and other household income sources. PTRs are thus disaggregated by household type in the second part of the result section.

6.1 Participation tax rates by individual earnings

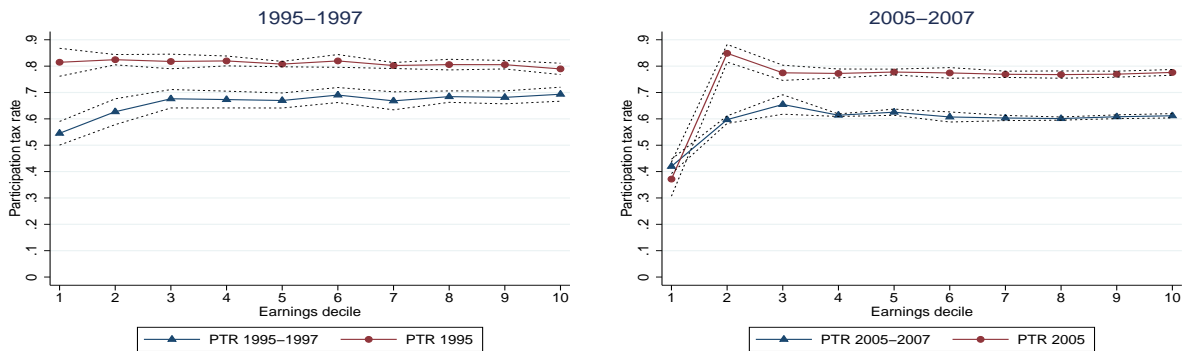
PTRs of working individuals sorted by earnings deciles are displayed in Figure 3. The line denoted by triangles gives the median PTR over a 3-year period (long-term), whereas the line denoted by dots presents the median PTR over a 1-year period (short-term). For PTRs over three years, earnings deciles 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.

PTR can be interpreted as the sum of the in-work tax rate and the out-of-work gross replacement rate. A single median earner, whose only income source is labor income, may serve as an example to illustrate this interpretation. In 1995, median earnings (5th decile) lie at about 24,000 Euro. The short-term PTR of the median earner is at about 80%. This implies that the difference between in- and out-of-work net taxes

$(T(y_h^E) - T(y_h^U))$ is 19,200 Euro which equals $\frac{19,200}{24,000} = 80\%$ of individual gross earnings. Net taxes in E result from taxes on earnings of 11,000 Euros and zero transfers. Net taxes in U result from zero taxes and unemployment benefits of 8,200 Euro. The PTR is attributable to the sum of an in-work tax rate equal to $\frac{11,000}{24,000} = 46\%$ and an out-of-work gross benefit ratio equal to $\frac{8,200}{24,000} = 34\%$.

Figure 3 shows that long-term PTRs are in both periods significantly lower than short-term PTRs. This effect may be due to generous income support for unemployed which drops sharply when unemployment benefits are exhausted and is only captured by long-term PTRs. Thus, the standard measures based on annual concepts overestimate the disincentives created by the welfare state. In 1995-1997, long-term PTRs are about 10 percentage points lower than short-term PTRs. Because of the abolition of unemployment assistance in 2005 income may drop even further to levels of social assistance if the individual is the household's principal earner. 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 4 and 5.

Figure 3: **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 4. 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 in U increase almost with the same rate as earnings over the deciles such that the PTR remains rather constant. This becomes clear when comparing the single median earner outlined above to a single in the 6th decile. 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), 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.

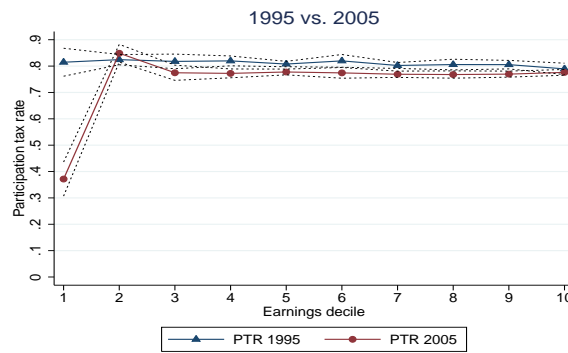
For most earnings deciles, post-reform PTRs decrease slightly. But PTRs decrease sharply for individuals in the lowest earnings decile. In 1995, individuals in the lowest decile earned a maximum of 12,135 Euro (in prices of 2005), whereas in 2005 the decile threshold lies at 7,300 Euro. The earnings drop in the lowest decile reflects the growth of the low-income sector in Germany 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 77% in 1995 to 25% 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 9% in 1995 and 10% 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 the 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 this decile arise for technical reasons: The share of families in the second lowest decile is higher compared to both the year of 1995 and to higher earnings deciles in 2005. The share of families is 72% in 1995 and 76% in 2005. For higher deciles the share of families lies only at about 50% in 2005. Transfers in U are higher for families, which increases PTRs. Both earnings-related unemployment benefits

are higher for families with children and claims on social assistance increase with the number of persons in the household. If the partner is working, additional child benefits introduced in 2005 also contribute to raise families out-of-work benefits in comparison to 1995. The slight decrease of post-reform PTRs in the higher deciles can also be explained by household structures. Neither level of unemployment benefits paid during the first 12 months nor level of social assistance payments were changed substantially by the reform. But in comparison to 1995, the share of families declines for all earnings deciles except for the two lowest. Lower out-of-work benefits and social assistance in the larger number of one- and two-person-household may thus contribute to lower post-reform PTRs in the higher deciles.

Figure 4: **PTR - Short-term**



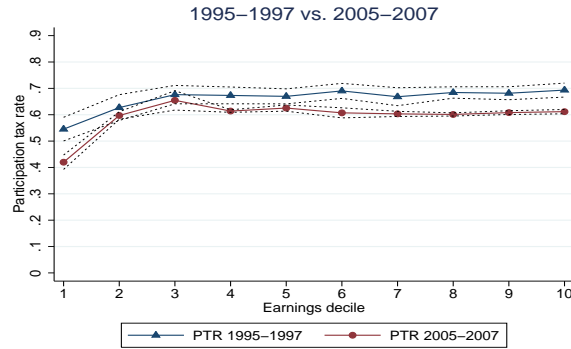
Source: Own calculations.

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on annual earnings. 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 5. The distance to pre-reform PTRs tends to first diminish and then grow with earnings. 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 earns 63,000 Euro in 1995 (72,000 in prices of 2005) and 72,000 Euro in 2005. The out-of-work gross benefit ratio resulting from $\frac{16,700}{63,000} = 27\%$ in 1995 and $\frac{20,800}{72,000} = 29\%$ in 2005 slightly increases because tax cuts enlarge net earnings and thus net earnings-related unemployment benefits. The in-work tax rate declines from $\frac{35,200}{63,000} = 56\%$ in 1995 to $\frac{37,400}{72,000} = 52\%$ in 2005 such that the fraction of the PTR attributable to taxes in E

falls. This effect becomes even more prominent if accumulated over a 3-year period such that the decline of post-reform PTRs is more pronounced for the top of the earnings distribution.

Figure 5: **PTR - Long-term**



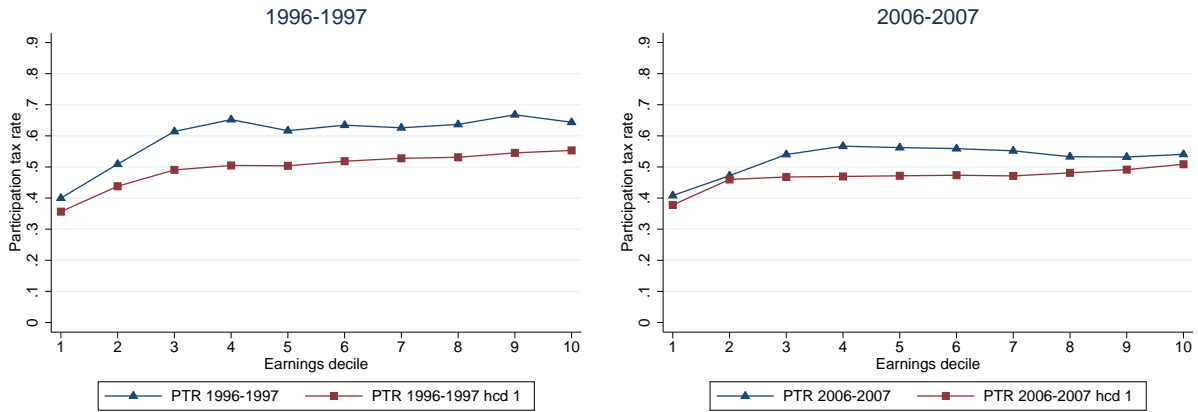
Source: Own calculations.

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

PTRs by earnings decile when including human capital depreciation are presented in Figure 6 and 7. PTRs of scenario 1 are compared to PTRs over 1996-1997 and 2006-2007, respectively, and depicted in Figure 6. PTRs of scenario 2 are compared to PTRs in 1997 and 2007, respectively, and given in Figure 6. See Figure 2 for the scenarios. Including human capital depreciation decreases the PTR in both scenarios vis-à-vis the initial scenario.

PTRs based on the human capital depreciation scenarios are lower because taxes on depreciated earnings are lower and benefit eligibility after a period of unemployment is reduced. Particularly at the upper end of the earnings distributions where marginal tax rates are constant changes in the household's tax burden compared to the baseline scenario are small. Benefit eligibility in the lower end of the earnings distribution is low in the baseline scenario as in the human capital depreciation scenarios, particularly in the post-reform period. This explain the smaller distance between the PTRs of the varying scenarios.

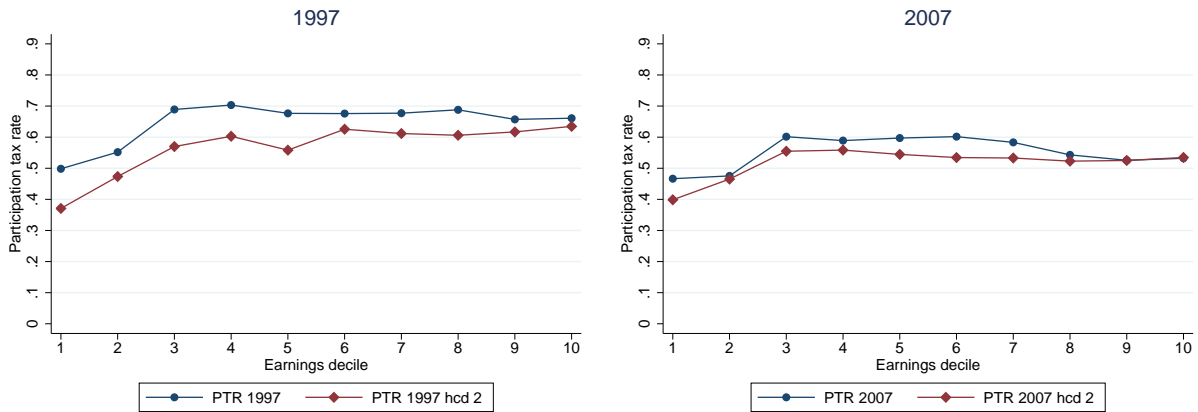
Figure 6: PTR with human capital depreciation 1



Source: Own calculations.

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over three years.

Figure 7: PTR with human capital depreciation 2



Source: Own calculations.

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over three years.

6.2 Distribution of participation tax rates over household types

The reform impact varies greatly over household types. For example, the tax cuts particularly relieving high incomes pan out more for singles than for couples with a high and a low income spouse because of joint taxation in Germany. Table 15 illustrates reform impacts for a single ([A]), a high-income earner in a childless, two-earner household ([B]) and a low-income earner in a childless, two-earner household ([C]). The abolition of unemployment assistance leaves single [A] with social assistance in the second year of unemployment. Social assistance for type [B] in a two-earner household is higher, but partly withdrawn because of his low-income spouse. The threshold for marginal employ-

ment rises from 3,559 or 2,885 Euro in the Old and New Bundeslaender, respectively, to 4,800 Euro in all of the country reducing the share of individuals employed subject to social security contributions. Consequently, the low-income type [C] is neither eligible for unemployment benefits nor eligible for social assistance because of his high-income spouse.

Table 15: **Impact of reforms by household type**

		[A]: $y_i^{E,w} = 72,000$				
year	t_h^E	b_h^E	t_h^U	b_h^U	PTR_h^s	
1995	42,213	0	0	17,872	0.83	
1996	42,213	0	0	15,787	0.81	
2005	37,364	0	0	20,781	0.81	
2006	37,364	0	0	7164	0.53	

		[B]: $y_i^{E,w} = 72,000, y_j^{E,w} = 4,500$					[C]: $y_i^{E,w} = 4,500, y_j^{E,w} = 72,000$				
year	t_h^E	b_h^E	t_h^U	b_h^U	PTR_h^s	t_h^E	b_h^E	t_h^U	b_h^U	PTR_h^s	
1995	35,004	0	945	17,872	0.72	35,004	0	32,018	2133	1.14	
1996	35,004	0	945	15,787	0.69	35,004	0	32,018	1884	1.08	
2005	32,149	0	0	20,781	0.74	32,149	0	30,514	0	0.37	
2006	32,149	0	0	8,466	0.45	32,149	0	30,514	0	0.37	

Source: Own calculations.

The next four tables illustrate how long-term PTRs vary by gender, household type and employment level. Table 16 to 19 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 16 presents the distribution of PTRs by household type for the pre-reform period. A quarter of the male singles face a PTR lower than 69% and three quarter 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%. PTRs between 67% and 73% arise for half of the female singles. 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. The splitting advantage of joint taxation lowers the tax reduction between E and U inducing a lower PTR, too. The results in Table 16 confirm this. In childless couples, the median PTR lies at 66% if male and between 60% and 64% if female. 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 1998.²² Comparing PTR distributions for one-earner and two-earner households 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. This is the case in the UK as demonstrated by Brewer et al. (2008). 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 men living in families with children lie between those of singles and childless couples, whereas no clear pattern emerges for women. Brewer et al. (2008) find for the UK that PTRs are higher for families with children than those without. Median PTRs are between 58% and 71% depending on sex and labor market participation of the partner. Again, higher PTRs may be due to higher benefits for families. On the other hand, means-tested benefits will be withdrawn largely if not completely when the spouse adds earnings to household income. Accordingly, PTRs are lower, if the wife is working. The mixed results for women when differentiating by household groups may result from a broader range of earnings within each group, where part-time low income women and full-time high income women are analysed jointly.

The distribution of PTRs by household type for the post-reform period is given in Table 17. Again, singles have the highest PTRs with a median of 62%. Compared to 1995-1997 PTRs are lower for singles at all centiles of the PTR distribution. Hence, work incentives are strengthened across the entire group of singles.

Overall, the pre-reform order is preserved: Men living in couples with children generally face the second highest PTRs. Additionally, for the majority PTRs are lower than in 1995-1997 and, consequently, work incentives higher. According to the median PTR, the highest reduction of 10 percentage points occurs for single men and male single-earner in childless couples.

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

²²The 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, exhibit higher PTRs.

Table 16: **PTR distribution by household type, 1995-1997**

Household type	Centile					mean
	10th	25th	50th	75th	90th	
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.

being the single earner and living in two-earner families. At the other extreme, PTRs at the 90th decile for women in one-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 may cause a more dispersed distribution of PTRs.

Table 18 and 19 present PTR distributions by employment level²³ for the pre- and post-reform period. Full-time workers experience lower PTR than part-time workers in both periods. Since full-time workers have higher earnings than part-time workers, the lower PTRs may result by construction with earnings in the denominator of the PTR-formula. Only in the post-reform period the very small number of part-time working men (see Table 3) has the same PTR as full-time working men.

Furthermore, women reveal lower PTR than men. This can be explained by the fact

²³The individual is employed full-time, if he works at least 1,820 hours per year which equals a weekly average of 35 hours. Part-time work is defined as more than 52 and less than 1,820 hours per year.

Table 17: PTR distribution by household type, 2005-2007

Household type	Centile					mean
	10th	25th	50th	75th	90th	
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.

that women are more likely to live in two-earner households being the side-earner. Hence, the change in household net taxes is smaller as if the husband becomes unemployed. Being the side-earner also provokes that, by and large, women in two-earner households are not eligible for social assistance. In contrast, a male breadwinner giving up work may receive a reduced or even the full amount of social assistance.

Empirically, the behavioral response of women captured by the extensive labor supply elasticity is higher than for men.²⁴ The higher the extensive elasticities for a certain group, the lower is the optimal PTR for the group.²⁵ I.e., work incentives inherent in the tax-benefit system should be higher and PTR lower for women who are more prone to decide for unemployment and transfer recipience instead of labor market participation. Lower PTRs for women in Germany resulting in higher work incentives may thus point

²⁴The extensive labor supply elasticity measures the share of employed workers who decide to leave the labor force when the difference between net income in E and U decreases by 1 percent (Saez, 2002).

²⁵Brewer et al. (2008) refer to the Ramsey principle of optimal taxation that commodities with relatively more elastic demands should be subject to relatively lower tax rates.

in the right direction. But on the other hand, lower PTRs for women are mainly due to their circumstances of living as a side earner than to work incentives in the tax-benefit system.

Table 18: **PTR distribution by employment level, 1995-1997**

Employment level		Centile			mean
		10th	50th	90th	
Full-Time	men	0.60	0.66	0.77	0.66
	women	0.41	0.58	0.73	0.58
Part-time	men	0.60	0.69	0.78	0.69
	women	0.57	0.65	0.74	0.66

Source: Own calculations.

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

Table 19: **Centile of distribution of PTRs by employment level, 2005-2007**

Employment level		Centile			mean
		10th	50th	90th	
Full-Time	men	0.55	0.62	1.01	0.66
	women	0.30	0.58	0.71	0.55
Part-time	men	0.57	0.62	0.69	0.63
	women	0.56	0.61	0.67	0.61

Source: Own calculations.

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

6.3 Counterfactual participation tax rates

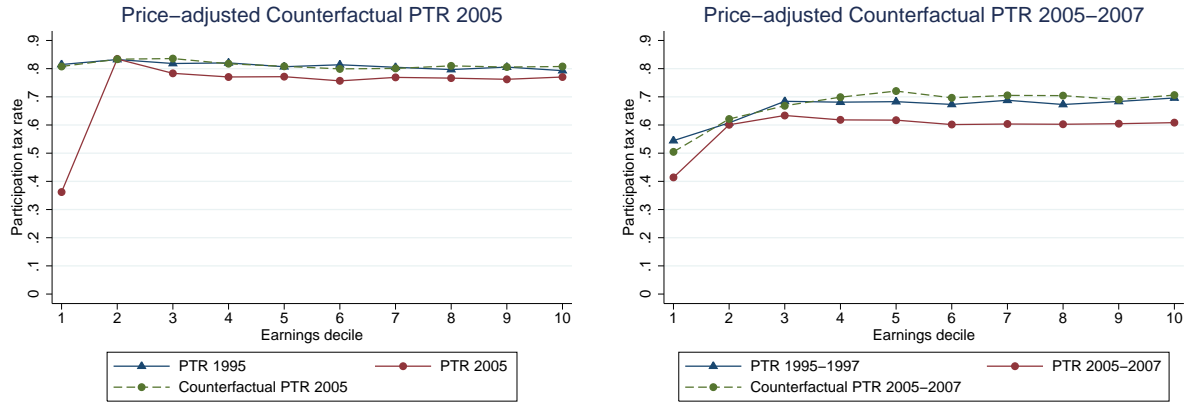
To analyze to what extent recent reforms contributed to improve work incentives, PTRs are simulated for the counterfactual case that the rules of 1995-1997 still applied, i.e. labor market and tax reforms between 1999 and 2005 had not taken place. This is primarily a lower tax allowance and a higher minimal marginal tax rate for low income individuals, a higher top marginal tax rate for high income individuals (see Table 12), the payment of earnings-related unemployment assistance instead of social assistance after the exhaustion of unemployment benefits and lower thresholds for marginal employment (see Table 11). Counterfactual PTRs are obtained by deflating incomes of individuals in the sample in the post-reform period 2005-2007 to price levels of the pre-reform period 1995-1997. To account for growth in real incomes counterfactual PTRs are also computed for incomes adjusted with average income growth between the two periods. Then regulations as of 1995-1997 are applied to price- and growth-adjusted incomes, respectively, and household net taxes as well as PTRs are computed.

The counterfactual short-term and long-term PTRs are given in Figure 8 and 9. Figure 8 depicts PTRs based on price-adjusted incomes. If the rules of 1995 were in force in 2005, PTRs would be higher for most earnings classes. In the short-term higher counterfactual PTRs mainly arise for technical reasons: Counterfactual earnings (denominator of the PTR) are lower which results in higher PTR. Transfers in a 1-year period of unemployment are earnings-related unemployment benefits that remained unchanged by the reforms. The greatest alteration occurs in the lowest decile, where the fraction of individuals eligible for unemployment benefits increases from 25% in 2005 to about 70% in the counterfactual case revising the PTR of the lowest decile upwards. Lower thresholds for marginal employment in 1995 increase the share of individuals employed counterfactually subject to social security contributions and thus eligible for unemployment benefits.

In the long-term, the abolition of unemployment assistance comes into play and the distance between actual and counterfactual PTRs increases even more. 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). If individuals received unemployment assistance in their second and third year of unemployment in 2006 and 2007, they would have a higher PTR and thus lower work incentives. The smaller distance between actual and counterfactual PTR in the lowest deciles can be explained by a larger share of individ-

uals not eligible for unemployment benefits and, hence, not eligible for unemployment assistance as well.

Figure 8: Counterfactual PTR I - Short-term vs. Long-term

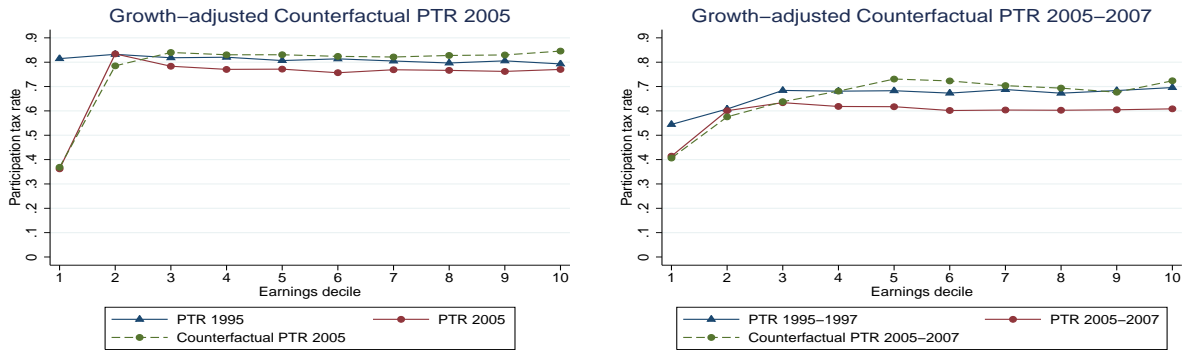


Source: Own calculations.

Notes: PTR are median PTR of the respective earnings decile. Earnings deciles are based on earnings over one year and three years, respectively.

As Adam et al. (2006) point out, growth in real earnings was the driving force behind the gradual strengthening of work incentives in the UK from the early 1980s to the late 1990s. Since most incomes grew faster than prices, growth-adjusted counterfactual incomes are lower than price-adjusted counterfactual incomes. In the lowest decile, this contributes to push more individuals into the low income sector not subject to social security contributions and thus counterfactually not eligible for unemployment benefits in the short-term and unemployment assistance in the long-term. As a consequence, counterfactual PTR are of similar magnitude as actual post-reform PTRs. For middle and high-income earners, the pattern remains the rather similar.

Figure 9: Counterfactual PTR II - 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.

7 Conclusion

This article has examined work incentives in Germany over varying time horizons and over time. Work incentives inherent in the tax-benefit system were measured by the participation tax rate (PTR). The time horizon of one year (short-term) typically surveyed by studies on work incentives was extended to three years (long-term) since standard economic theory suggests that individuals rather condition their participation decision on a longer time horizon than on a year only. Thereby, this study first provides evidence that the work incentives created by the tax-benefit system are significantly higher in the long-term than in the short-term. The disincentives inherent in the tax-benefit system are thus overestimated by standard measures.

To capture alterations over time, PTRs were computed for a pre-reform period 1995-1997 and a post-reform period 2005-2007 after major labor market and tax reforms. Comparing the pre- and post-reform periods reveals that work incentives were strengthened through the changes in the tax-benefit system. Both the traditional measure over a 1-year period and the 3-year PTR show a decrease. However, 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. Consequently, results show that long-term work incentives increased more than short-term work incentives. Particularly for singles, it is financially far less attractive to decide for non-participation.

PTRs fell particularly for the bottom of the distribution. This happens for two reasons: First, 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. Second, 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.

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 bottom of the earnings distribution. Individuals in the lowest decile lack of eligibility for unemployment benefits due to the mark up of the marginal employment threshold.

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