Work incentives and the efficiency of tax-transfer reforms under constrained labor supply*

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Using information on desired and actual hours of work, we formulate a discrete choice model of constrained labor supply, where involuntary unemployment as well as over- and underemployment are modelled in a theoretically consistent way. Using data from the German Socio-Economic Panel (SOEP) and the microsimulation model STSM, we find that estimated own wage elasticities in the constrained model are substantially smaller than those obtained from the conventional one using only actual hours. We apply the model to evaluate two hypothetical budget neutral reforms of the German tax-transfer system. Both are aimed at improving labor supply incentives for the working poor, but differ regarding the impact of upward and downward constraints on labor supply reactions. The first increases transfer withdrawal rates, making working few hours unattractive, and redistributes to the lower middle class. The second reform increases taxes and redistributes to the lower middle class. We propose a simple measures to capture the redistributive trade-off of reforms. We find that the first reform is desirable with equal welfare weights, but, with labor market constraints, the effects are limited. In contrast, the second reform is only desirable if the social planner has substantial redistributive taste.

Keywords Tax-benefit systems · Household labor supply · Labor market constraints · Involuntary unemployment

JEL Classification J22 · H21 · D10

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1 Introduction

Policy reforms aimed at improving efficiency of the tax and transfer system usually focus on improving labor supply incentives for low-income households. Recently, a number of studies have argued that substantial efficiency gains are possible by redistributing to the working poor, similarly to the Earned Income Tax Credit (EITC) in the US (e.g. Immervoll et al. 2007; Blundell et al. 2016). However, this group often faces labor market constraints and cannot adjust their hours of work at will.[1] Moreover, a substantial share of the unemployed are involuntarily unemployed and cannot take up work when incentives improve (see Subsection 2.1 and, e.g, Bargain et al. 2010 for evidence for Germany). On the other hand, labor market constraints might even increase the efficiency gains of policy reforms if workers faced with increased marginal tax rates cannot reduce their hours of work. Therefore, it is important to model these restrictions for the ex-ante evaluation of policy reforms in countries with substantial labor market constraints. As we document in this paper, this is the case in Germany, which is the focus of this study.

This paper makes three key contributions: First, we extend a standard discrete-choice labor supply model by introducing involuntary unemployment and hours constraints. Second, we incorporate the constrained labor supply model in a microsimulation model and evaluate two hypothetical tax-transfer reforms for Germany aimed at increasing labor supply incentives for low to middle income households. Third, we summarize the redistributive trade-off of the reforms in a simple policy measure. The first simulated reform makes working at very low earning levels unattractive, while increasing income at middle to high income levels. The second—more conventional—reform redistributes from higher income earners to the lower middle class.

Our study adds to the literature on labor market constraints in structural labor supply models (see, e.g., Blundell et al. 1987; Bingley and Walker 1997; Euwals and van Soest 1999; Bryan 2007; Bargain et al. 2010; Beffy et al. forthcoming). Our approach makes use of a major advantage of the German Socio-Economic Panel (SOEP): It contains information on both *actual* and *desired* hours of work. Using both variables, we first estimate the probability to be constrained for specific numbers of working hours. This includes modeling involuntary unemployment. In a second step, we estimate a discrete choice labor supply model to obtain households' utility functions using information on desired hours of work and the actual budget constraint. The budget con-

[1] For the documentation of constrained hours of work see, e.g., Bryan (2007) and Chetty et al. (2011) and for Germany Knaus and Otterbach (2019) and papers cited therein.

straint is calculated using the microsimulation model STSM. In a third step, we use information on constraints as well as the estimated utility functions to predict labor supply responses.

Our approach differs from previous work in several ways. Blundell et al. (1987), Bingley and Walker (1997), and Bargain et al. (2010) model only involuntary unemployment, but not other constraints in the choice of work hours. Using information on desired hours of work, Euwals and van Soest (1999) model restrictions for several hours categories. However, for computational tractability it is assumed that, if a given hours category is preferred, but not available, other hours categories are ranked according to their distance to the preferred one. The approach proposed in this paper does not impose this restriction. Another important difference between this study and previous work is that we model involuntary unemployment and other labor market restrictions jointly.[2] For couple households, our approach assumes joint utility maximization and accounts for the complementarity or substitutability of spouses' leisure.

Our study is related to the recent literature about efficient reforms of the tax and transfer system. Typically, these studies focus on the working poor. In a recent study, Blundell et al. (2016) find for the UK that increases in tax credit are a relatively efficient way to increase welfare. Chan (2013) argues that a further EITC expansion results in substantial efficiency gains, especially among low-wage individuals. Jessen et al. (2017a) show that—under standard assumptions regarding the redistributive taste of the social planner—an optimal tax-transfer schedule for singles in Germany would imply substantially higher net income for the working poor.

Finally, our study is related to papers that quantify the equity-efficiency trade-off of policy reforms. If individuals work more as a consequence of a reform of the tax and transfer system, the government needs to tax less than one Euro away from one group in order to redistribute one Euro to another group. Therefore, policy reforms of the tax and transfer system often aim at improving labor supply incentives and thus efficiency. Immervoll et al. (2007) quantify the equity-efficiency trade-off of two types of reforms. While their approach offers the advantage of closed-form solutions, it is limited to particular types of reforms. Moreover, it imposes strict constraints on the modelling of labor supply, which in that study is characterized through two elasticities. Building on this, Eissa et al. (2008) quantify the equity-efficiency trade-off for actual past reforms in the US. Again, labor supply is calibrated through extensive and intensive labor supply elasticities. In contrast, in this paper we build a structural labor supply model, which allows

[2] Euwals and van Soest (1999) treat involuntary unemployment and constraints for specific positive hours choices separately.

for non-constant, heterogeneous labor supply responses. The reforms are carefully calibrated to be budget neutral, taking into account their effects on labor supply. We then directly measure the redistributive trade-off of the reforms by comparing winners and losers.

The hypothetical reforms analyzed in this study are motivated by features of the tax-transfer systems of other countries that aim at improving labor supply incentives of low income earners. The EITC in the US is a prominent example for a policy which aims at *making work pay* for low-income families. The program served as a role-model for several European countries, which introduced tax credits or subsidies for social security contributions (SSC, see Bargain et al. 2010). However, the specific designs of the programs vary strongly. For instance, the *Working Tax Credit* in the UK entails a minimum hours condition that varies depending on the household composition.[3] In Belgium, the *Bonus à l'Emploi* (Employment Bonus) focuses exclusively on persons with low earnings capacity by referring to full-time equivalent earnings rather than actual earnings and increases in the working hours of the subsidized employee (see Dagsvik et al. 2011). France recently expanded the size and target group of its in-work program *Prime d'activité*. Other similar programs exist in Ireland, the Netherlands and Finland. In Germany, there is a tax and social-security exemption on so-called Mini jobs which exempts *marginal employment* characterized by monthly earnings of up to 450 Euro from income tax and employees' SSC. It has been subject to several empirical evaluations (see, e.g., Steiner and Wrohlich 2005), which show that the labor supply of secondary earners is depressed by the potentially high marginal tax rates imposed by this regulation.

The policy reforms analyzed in this study replace Mini job exemptions with basic allowances for SSC of 237 Euro per month on an individual level. In contrast to the status quo, these exemptions do not entail high marginal tax rates for individuals earning slightly above the Mini job threshold. The two reforms differ in the ways in which budget neutrality is achieved. In case of the first reform (*Withdrawal*), transfer withdrawal rates are increased to 100%. In case of the second reform (*Taxation*), taxes for higher income earners and the upper social security threshold are increased. These two types of reforms are of particular interest for the constrained labor supply model. In case of the first reform financial incentives to work very small hours are reduced—if full-time jobs are rationed, people might stop working altogether. In this case labor market rationing would limit the potential efficiency gains of the reform. In case of the second reform

[3]The benefit is gradually being replaced by the new *Universal Credit* which aims at integrating all means-tested welfare benefits and in-work tax credits into a single program (see Brewer et al. 2012).

people with high productivity are likely to want to reduce working hours. This effect could be limited through rationing, which would reduce the potential efficiency loss at the higher end of the income distribution.

We find that the *Withdrawal* reform is efficiency increasing, but the efficiency gains are more limited when imposing labor supply constraints. In contrast, the *Taxation* reform leads to efficiency losses using the conventional labor supply model, while the efficiency effects are negligible under labor market constraints.

The next section gives a descriptive overview of actual and desired hours of work and describes the model of constrained labor supply. Section 3 presents the two hypothetical reforms that we simulate as an illustration of the model. Section 4 presents simulated reform effects and Section 5 concludes.

2 Constrained Labor Supply Model

2.1 Actual and Desired Working Hours

The study is based on data from the Socioeconomic Panel (SOEP), an annual representative survey of German households with more than 20,000 observations per year, see Wagner et al. (2007). We use wave 32, which contains retrospective information for the year 2014. The sample is restricted to households with at least one person with flexible labor supply. Reform effects are calculated for this sample only. Tables 1 and 2 display the joint distribution of desired and actual weekly working hours of females and males, respectively. In the spirit of our labor supply model, continuous hours of work are summarized in discrete hours categories. The categories included represent the peaks in the distributions of reported hours. For each individual and working time measure we assign an hours category based on the minimum distance of reported hours from those hours categories.[4] The main diagonal contains individuals that are satisfied with their current hours of work. In general, women are more likely to be dissatisfied with their working time. About 45% of all females would like to increase or decrease working hours, with underemployment and

[4]The zero hours category is only assigned to individuals reporting less than one hour of weekly working time. Individuals whose desired hours are not observed due to item non-response are assigned their actual hours category. For the unemployed, we only observe whether they are looking for a part-time job, a full-time job, or whether they are indifferent between those two. We assign randomly one of the part-time ($<$30 hours) or full-time ($\geq$ 30 hours) categories, with probability weights given by the observed shares for employed people.

overemployment equally relevant. Men are less likely to be underemployed. For men in couple households, underemployment becomes even less relevant. Contrarily, single men are relatively often found to be involuntarily unemployed (not reported). In general, non-coincidence of desired and actual hours is more relevant at the extremes of the distribution. Three out of four men working 50 hours would prefer to work less.

Table 1: Distribution of desired and actual weekly working hours of women (in percent)

	Desired hours						
	0	10	20	30	40	45	*Total*
Actual hours							
0	6.4	2.1	4.7	1.1	1.0	0.0	15.4
10	0.0	6.3	3.0	0.9	0.6	0.0	10.6
20	0.0	1.3	11.0	2.8	1.4	0.1	16.7
30	0.0	0.3	3.5	12.2	2.7	0.2	18.8
40	0.0	0.0	0.8	11.2	18.0	0.9	30.9
45	0.0	0.0	0.2	2.2	4.1	1.1	7.6
Total	6.4	10.1	23.2	30.4	27.7	2.3	100.0

Notes: Numbers weighted by the SOEP weighting factors.

Source: Own calculation based on the SOEP v33.1 (2016).

2.2 Discrete-choice labor supply

The conventional labor supply model uses information on *actual* hours of work and households budget constraints to estimate utility functions. These are used to predict changes in probabilities for different employment outcomes of households, when their budget constraints change.

Households' budget constraints under the *status quo* and hypothetical reform scenarios are calculated using the microsimulation model STSM, see Steiner et al. (2012). In addition to the income tax formula and transfers it accounts for deductions, allowances, social security payments and child benefits as well as the interactions of the different components of the tax and transfer system on the household level. See Jessen et al. (2017b) for budget constraints for a wide range of household types.

Table 2: Distribution of desired and actual weekly working hours of men (in percent)

	Desired hours				
	0	20	40	50	*Total*
Actual hours					
0	2.1	0.8	3.6	0.6	7.1
20	0.0	2.8	1.8	0.1	4.6
40	0.0	6.2	64.9	2.6	73.7
50	0.0	0.6	10.5	3.6	14.7
Total	2.1	10.3	80.7	6.9	100.0

Notes: Numbers weighted by the SOEP weighting factors.

Source: Own calculation based on the SOEP v33.1 (2016).

For constrained labor supply, labor supply reactions to reforms are obtained in two steps. First, households' utility functions are estimated using information on *desired* hours of work. Second, the probability that a household changes its labor supply is calculated using its utility function and constraint probabilities.

The specification of the structural household labor supply model follows van Soest (1995) and Aaberge et al. (1995). Households are assumed to jointly maximize utility, which depends on hours worked and consumption. Given their hourly wage and the tax and transfer system, agents make a discrete choice of weekly working hours. The discretization of working hours into j alternatives allows for the precise calculation of net incomes associated with labor supply decisions using the STSM and does not impose any restrictions on the form of the budget set, such as convexity. This is a major advantage relative to continuous labor supply models. The approach accounts for joint labor supply decisions of couples in a consistent way.

Working hours per week of single women and women with inflexible partners are discretized into 0, 10, 20, 30, 40 and 45 and those of single men and men with inflexible partners into 0, 20, 40, and 50 hours.[5] As the procedure to calculate employment outcome probabilities in the constrained model becomes computationally very burdensome for a high number of hours choices, see Subsection 2.3, couple households are restricted to combinations of 0, 20 and 40 hours lead-

[5]To assign working hours categories we again follow the minimum distance approach described above (subsection 2.1).

ing to nine alternatives. Labor supply is assumed to be inflexible for civil servants, self-employed, pensioners, people on parental leave, soldiers, apprentices, and disabled people who work in sheltered workshops. Gross labor income is given by the product of working hours and the hourly wage. Potential hourly wages of the unemployed are predicted using a selectivity-corrected wage regression, where selection is accounted for by the two-step Heckman (1979) approach with binary variables for young children in the household, marital status, non-labor income, and indicators for health as exclusion restriction.[6]

Let Lf denote leisure of the female partner, Lm leisure of the male partner, C consumption, and ε a random disturbance. We suppress individual subscripts in the following. The utility of a household given a choice alternative z is given by

$$V_z = U(Lf_z, Lm_z, C_z) + \varepsilon_z. \tag{1}$$

The deterministic part of the utility function is given by

$$\begin{aligned} U = {} & \beta_1 ln(C_z) + \beta_2 ln(C_z)^2 + \beta_3 ln(Lf_z) + \beta_4 ln(Lf_z)^2 + \beta_5 ln(Lm_z) \\ & + \beta_6 ln(Lm_z)^2 + \beta_7 ln(C_z) ln(Lf_z) + \beta_8 ln(C_z) ln(Lm_z) + \beta_9 ln(Lf_z) ln(Lm_z). \end{aligned} \tag{2}$$

Heterogeneity between households is incorporated through observed household characteristics that affect some of the coefficients of the utility function:

$$\begin{aligned} \beta_1 &= \alpha_0^C + X_1' \alpha_1^C, \\ \beta_3 &= \alpha_0^{Lf} + X_2' \alpha_1^{Lf}, \\ \beta_5 &= \alpha_0^{Lm} + X_3' \alpha_1^{Lm}, \\ \beta_9 &= \alpha_0^{LmLf} + X_4' \alpha_1^{LmLF}. \end{aligned} \tag{3}$$

X_1, X_2 and X_3 contain individual and household characteristics like age, disability indicators, a dummy for whether the observed person is a German citizen, and number and age of children (see Table B.12 for the exact specification of the utility function).

The error terms ε_z are assumed to be independently and identically distributed across hour categories and households according to the Extreme-Value type I (EVI) distribution. The probability

[6] An alternative strategy would be to estimate potential wages jointly with the preference parameters. However, we do not follow this approach because the small sample properties of the coefficient estimates might be better without joint estimation and chances of misspecification increase under joint estimation. Additionally, the approach would necessitate an approximation of the budget constraint instead of an exact microsimulation for every household.

that alternative z is preferred by a household is then given by a conditional logit model (McFadden 1974):

$$P_d^z = Pr(V_z > V_j, \forall j = 1 \dots J) = \frac{exp(U_z)}{\sum_{j=1}^{J} exp(U_z)}, z \in J. \tag{4}$$

Alternative z is chosen if it implies a higher utility than any other alternative. The subscript d denotes desired hours of work. See Table B.12 in the appendix for estimation results.

Changes in net income associated with specific hours points lead to changes in the choice probabilities given by equation (4). For the conventional labor supply model, actual instead of desired hours are used for the calculation. Then the equivalent of equation (4) can be used directly to calculate aggregate labor supply effects of the hypothetical reforms by comparing choice probabilities conditional on the budget set under the status quo and under a reform scenario. For the constrained labor supply model, the estimated utility functions need to be combined with information on the availability of work hours categories.

2.3 State Probabilities under Constraints

In the conventional model using actual working hours equation (4) gives the probability that a household supplies a specific number of hours. In this sense, observed working hours are treated as revealed preferences. This approach would be valid if there were no constraints in the choice of working hours. In contrast, in the model with hours constraints, the same equation estimated using desired hours of work gives the probability that a household *prefers* a specific number of hours.

State probabilities — We derive household state probabilities using estimates for the probability that individuals are constrained in given hours categories. In contrast to standard models of involuntary unemployment, constraint probabilities are allowed to differ between positive hours categories and between individuals. The derived state probabilities respect joint utility maximization of couples and are therefore fully consistent with the structural labor supply model.

Denote by ψ^z the probability that a household can choose labor supply category z, i.e. that it is unconstrained for this choice. Let subscripts a and d denote actual and desired hours respectively. We start with the case of two potentially constrained positive hours categories z and j. The hours category 0, unemployment, is always available. The state probability P_a^z for a given hours category $z \neq 0$ is given by

$$P_a^z = \psi^z \left[P_d^z + (1-\psi^j) P_d^j \frac{P_d^z}{P_d^0 + P_d^z} \right], \tag{5}$$

i.e., by the probability that the household is unconstrained for this alternative times the probability that it prefers category z or chooses it as a fallback option because the preferred alternative j is unavailable. The first term in brackets gives the probability that category z is preferred. The second term gives the probability that category j is preferred, but unavailable, times the probability that the household prefers working in category z instead of not working, category 0. The probability that a specific hours category is preferred is obtained from equation (4).

Now consider the case of three positive hours categories. Denote by CS the three elements set of positive hours choices in the household's choice set.[7] Now the probability of employment outcome $z \in CS$ is

$$P_a^z = \psi^z \left[P_d^z + \sum_{j \in CS \setminus \{z\}} (1-\psi^j) P_d^j \left(\frac{P_d^z}{1-P_d^j} + (1-\psi^k) \frac{P_d^k}{1-P_d^j} \frac{P_d^z}{P_d^0 + P_d^z} \right) \right]. \tag{6}$$

Again, the first term in brackets is the probability that the household prefers alternative z. The remaining terms give the probability that a different category j is preferred, but unavailable and z is chosen as fallback. For each alternative $j \in CS \setminus \{z\}$ this is given by the probability that j is preferred, but unavailable $\left((1-\psi^j) P_d^j \right)$ times the probability that z is preferred to all remaining categories $\left(\frac{P_d^z}{1-P_d^j} \right)$ or that category $k \in CS \setminus \{z, j\}$ is preferred from the remaining categories, but unavailable $\left((1-\psi^k) \frac{P_d^k}{1-P_d^j} \right)$, and z is preferred to unemployment $\left(\frac{P_d^z}{P_d^0 + P_d^z} \right)$.

The general formula for a finite number of potentially constrained alternatives forming choice set CS is given by

$$\begin{aligned} P_a^z \;=\; & \psi^z \Big[P_d^z + \sum_{j \in CS \setminus \{z\}} (1-\psi^j) P_d^j \Big(\frac{P_d^z}{1-P_d^j} + \sum_{k \in CS \setminus \{z,j\}} (1-\psi^k) \frac{P_d^k}{1-P_d^j} \Big(\frac{P_d^z}{1-P_d^j-P_d^k} \\ & + \sum_{l \in CS \setminus \{z,j,k\}} (1-\psi^l) \frac{P_d^l}{1-P_d^j-P_d^k} \Big(\ldots + (1-\psi^y) \frac{P_d^y}{1-\sum_{m \in CS \setminus \{z,y\}} P_d^m} \frac{P_d^z}{P_d^0 + P_d^z} \Big) \Big) \Big) \Big]. \end{aligned} \tag{7}$$

[7] In addition, the household can choose not to work, thus it has up to four choices in total.

The first line of (7) is equivalent to equation (6), only that there is a sum over $k \in CS \setminus \{z, j\}$ alternatives. The last term of the second line of equation (7), $(1-\psi^y)\frac{P_d^y}{1-\sum_{m\in CS\setminus\{z,y\}} P_d^m}\frac{P_d^z}{P_d^0+P_d^z}$, denotes the probability that alternative $y \in CS \setminus \{z, j, ..., x\}$ is preferred from the remaining labor supply alternatives unemployment, alternative z, and alternative y $\left(\frac{P_d^y}{1-\sum_{m\in CS\setminus\{z,y\}} P_d^m}\right)$. However, y is unavailable $(1-\psi^y)$, so the household chooses category z. The equation contains $(|CS|-1)!$ summations, in practice limiting the number of possible constrained alternatives for computational reasons.

The state probability for hours category 0, which is always unconstrained, is given simply by unity minus the sum of state probabilities for positive hours alternatives,

$$P_a^0 = 1 - \sum_{i \in CS} P_a^i. \tag{8}$$

Constraint probabilities — For all hours categories z, we separately estimate the probability that an individual is unconstrained, ψ^z, using a logit model on all individuals that prefer category z or prefer another category but choose z due to constraints. Only those who actually work in this category are unconstrained. Estimations are carried out separately for women and men on desired and actual hours information pooled over the years 2011–2015. Using these estimates, constraint probabilities are predicted for all individuals for all hours categories. Explanatory variables contain the supply-side factors that also enter the hourly wage equation like education, experience, disability, as well as a proxy for the state of the regional labor market, and dummies for firm size and occupation. The rationale for the inclusion of the latter two variables is that in some occupations working full-time may be the norm, e.g. due to efficiency gains and fixed costs of work, while in other occupations this is not the case. Additionally the possibility to work full-time or part-time may depend on the size of the employing firm. For example, it might be easier for larger firms to adjust to changes of work hours by a single employee. On the other hand, there might be social norms prevalent in larger firms that prevent employees from working part time. Of course, employees are not bound to specific firms and could be offered a better suited job by another employer. Therefore, it has to be assumed that search costs exceed the expected utility gain from changing the workplace due to the limited number of suitable employers.[8]

[8]For Germany, Knaus and Otterbach (2019) document that job movers are not much more likely to resolve hours mismatch than job movers. This points to a limited importance of job changes as a means to hours adjustments.

Table 3: Uncompensated Own-Wage Hours Elasticities

	Conventional		*Pure incentive*		*Constrained*	
Household type	female	male	female	male	female	male
Relative change in total hours worked						
Flexible couples	0.18	0.07	0.04	0.03	0.06	0.04
Couples w. flexible female	0.17		0.07		0.09	
Couples w. flexible male		0.06		−0.00		−0.00
Female singles	0.17		0.03		0.03	
Male singles		0.20		0.03		0.01

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.
$\frac{\Delta H}{H} / \frac{\Delta W}{W}$, simulated with a 1-% wage increase.

2.4 Labor Supply Elasticities

Table 3 shows uncompensated labor supply elasticities for the different labor supply models. They are estimated by increasing hourly gross wages by one percent and comparing simulated labor supply before and after this wage increase. The elasticities capture adjustments at both intensive and extensive margins. The first two columns show elasticities obtained using the conventional model based on revealed preferences alone as is common in the literature. Females' elasticities are generally larger than males' which is in line with most findings in the literature (see Blundell and Macurdy 1999; Keane 2011). Columns 3 and 4 are based on the same simple model but using desired hours without taking labor market constraints into account. In other words, individuals are treated as if they worked in their desired hours category. The implied elasticities are substantially smaller than those based on actual hours worked.[9] The last two columns show elasticities based on the model of constrained labor supply using information on desired hours as well as constraint probabilities. While smaller than those of the conventional model, the labor supply elasticities of the constrained model for flexible couples are—perhaps surprisingly—larger than those based on preferences alone (*Pure Incentive*). The reason is the important role of overemployment. For

[9]This is in line with Bargain et al. (2010) who also find that elasticities based on desired hours are smaller than those based on actual hours. They ascribe this to a "participation bias", which results from unduly allowing the (involuntary) unemployed to switch to participation in the model using actual hours. Participation elasticities shown in Table 5 confirm the importance of the "participation bias".

Table 4: Uncompensated Own-Wage Intensive Hours Elasticities

	Conventional		*Pure incentive*		*Constrained*	
Household type	female	male	female	male	female	male
Relative change in total hours worked						
Flexible couples	0.08	0.02	0.02	0.02	0.01	0.01
Couples w. flexible female	0.11		0.05		0.06	
Couples w. flexible male		0.05		−0.00		−0.00
Female singles	0.12		0.02		0.02	
Male singles		0.14		0.02		0.01

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.
$\frac{\Delta H}{H} / \frac{\Delta W}{W}|_{H>0}$, simulated with a 1-% wage increase.

example, an individual might want to increase hours of work from 20 to 40 hours because of a wage increase. If a job with 40 hours is not available, she might settle for one with 45 hours of work instead. This leads to larger labor supply elasticities than without constraints. In contrast, for single males the labor supply elasticity shrinks further in the constrained model, pointing to the larger role of involuntary unemployment.

Table 4 shows intensive own wage labor supply elasticities. The pattern is very similar to that of total own wage elasticities displayed in Table 4 and the estimated elasticities are just slightly smaller. This indicates that the total elasticities are mainly driven by intensive elasticities. Table 5 displays own-wage participation elasticities for the same household types. Again, the pattern is similar to the one of total hours elasticities. The largest participation elasticities are estimated using the conventional model, while the pure incentive model yields the smallest elasticities. Under the conventional model the participation rates of females in couples react stronger to wage changes than those of males. In contrast, under the constrained model the participation semi-elasticities for males and females in flexible couples are the same. Even though both intensive elasticities and participation semi-elasticities for men and women in flexible couples are equal under the constrained model, the total hours elasticity reported in Table 5 is larger for women. The reason is that the participation rate of women is smaller than that for men. Therefore the same participation semi-elasticity translates into a larger percentage increase in hours of work.

Table 5: Uncompensated Own-Wage Participation Semi-Elasticities

	Conventional		*Pure incentive*		*Constrained*	
Household type	female	male	female	male	female	male
Absolute change in the participation rate						
Flexible couples	0.08	0.05	0.02	0.01	0.03	0.03
Couples w. flexible female	0.05		0.02		0.03	
Couples w. flexible male		0.01		0.00		0.00
Female singles	0.04		0.00		0.01	
Male singles		0.06		0.00		0.00

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.
Δpart. rate$/\frac{\Delta W}{W}$, simulated with a 1-% wage increase.

3 Two Policy Reforms for Germany

We analyze two hypothetical reform scenarios for Germany. Both reforms redistribute to the (full-time) working poor by introducing a basic allowance to social security contributions. To provide insights into the impact of both upward and downward constraints on labor supply adjustment, the reforms differ in the way budget neutrality is achieved. The first reform (*Withdrawal*) makes working low hours unattractive by increasing transfer withdrawal rates to 100%, which allows to analyze constraints to positive responses at the intensive margin. The second reform (*Taxation*) increases marginal tax rates, which might induce individuals to work less, and therefore sheds light on potential downward constraints. The newly introduced SSC allowance replaces the existing exemption from income tax and social security contributions, which is restricted to jobs with very low earnings (Mini jobs). This change lifts the number of individuals profiting from SSC exemptions to the total number of employees.[10] Due to the non-progressive nature of SSC in Germany, the level of the SSC reduction is constant for earnings above the SSC allowance. In contrast to income tax reforms, the policy measure of SSC allowances relieves working individuals over almost the entire range of the income distribution, particularly low to moderate earners who pay little or no income tax. Additionally, the allowance does not have a regressive effect due to uniform SSC

[10] In Germany, SSC are due up to a specified earnings threshold. The SSC reforms are designed such that employees always profit from the SSC allowance even if their income lies above this threshold.

rates. However, the subsidy interacts with the income tax and means tested transfers[11] such that the net effect on disposable income varies across individuals. The current legislation and the two reforms are summarized in Table 6.

The long-term unemployed receive the means-tested transfer *Unemployment Benefit II*, about 400 Euro per person and month, plus transfers for rent and heating. The first 100 Euro of monthly labor income are exempted from withdrawal. For earnings above this threshold, in the *status quo* the effective marginal tax rate is 80% up to gross monthly incomes of 1,000 Euro, 90% between 1,001 and 1,200 Euro (1,500 Euro for households with children), and 100% for incomes above the upper thresholds. For the *Withdrawal* reform, budget neutrality is achieved by increasing the marginal transfer withdrawal rate to 100% from 100 Euro.

The current German income tax schedule is characterized by a basic allowance, two "progressive zones" with increasing marginal tax rates, starting with MTRs of 14% and 24% respectively, and two linear zones with marginal tax rates of 42% and 45% respectively.[12] The *Taxation* reform scenario stipulates increases in marginal tax rates by transforming the tax schedule from currently two progressive and two linear zones into three progressive and one linear zone. The starting rate of the third zone increases from 42% to 45%. Marginal tax rates thus begin to increase relative to the *status quo* already from the lower threshold of the second progressive zone at 13,469 Euro of yearly taxable income for a single. The top marginal tax rate rises from 45% due from about 250,000 Euro annual taxable income to 48% due from 70,000 Euro annual income. Finally, the threshold up to which social security contributions for health and long-term care are due is lifted to the same upper threshold as for old age insurance in western Germany (5,950 Euro).

Figure 1 shows the budget constraint under the *status quo* and the two reform scenarios of a stylized single household without children and eligible for Unemployment Benefit II at low levels of labor income. The figure depicts how monthly disposable income varies with monthly gross labor income for earnings up to 3,500 Euro (Subfigure (a)) and higher earnings between 3,500 and 7,000 Euro (Subfigure (b)). Under the *status quo*, the household is eligible for Unemployment Benefit II up to a monthly labor income of about 1600 Euro. Most working individuals who receive transfers under the *status quo* are worse off under the *Withdrawal* scenario, in which earnings above 100 Euro are completely withdrawn, leading to an effective marginal tax rate of 100% for very low

[11] SSC are largely deducted from taxable income and deducted from gross income when calculating claims to means-tested transfers.

[12] The effective marginal tax rate is slightly higher because of the so-called solidarity surcharge of additional 5.5% of the tax liability for tax liabilities of at least 972 Euro per year for singles.

Table 6: Current System and Changes under Alternative Reform Scenarios

Status Quo (2014)	Withdrawal	Taxation
Marginal Income Tax Rates (MTRs)		
Tax exemption of Mini jobs	–	–
1st progressive zone: from 8,354 Euro	No change	No change
2nd progressive zone: from 13,469 Euro	No change	
3rd progressive zone: –	–	increasing MTR starting with 0.45 from 52,882 Euro
1st linear zone: MTR of 0.42 from 52,882 Euro	No Change	MTR of 0.48 from 70,000 Euro
2nd linear zone: MTR of 0.45 from 250,731 Euro	No Change	–
Social Security Contributions (SSC)		
Exemption up to 450 Euro/month (Mini jobs)	–	–
Phase-in of SSC up to 850 Euro/month (Midi jobs)	–	–
Marginal SSC of 0.20175 from 851 Euro/month up to earnings threshold of 4050 Euro/month for health and long term care insurance	from 238 Euro No change	from 238 Euro 5950 Euro
Allowance: –	237 Euro	237 Euro
Marginal Transfer Withdrawal Rates (MWRs)		
Allowance of 100 Euro/month	No Change	No Change
MWR of 0.8 up to labor income of 1,000 Euro/month	MWR of 1	No Change
MWR of 0.9 between 1,001 and 1,200 Euro/month (1,500 Euro with children in household)	MWR of 1	No Change
MWR of 1 afterwards	No Change	No Change

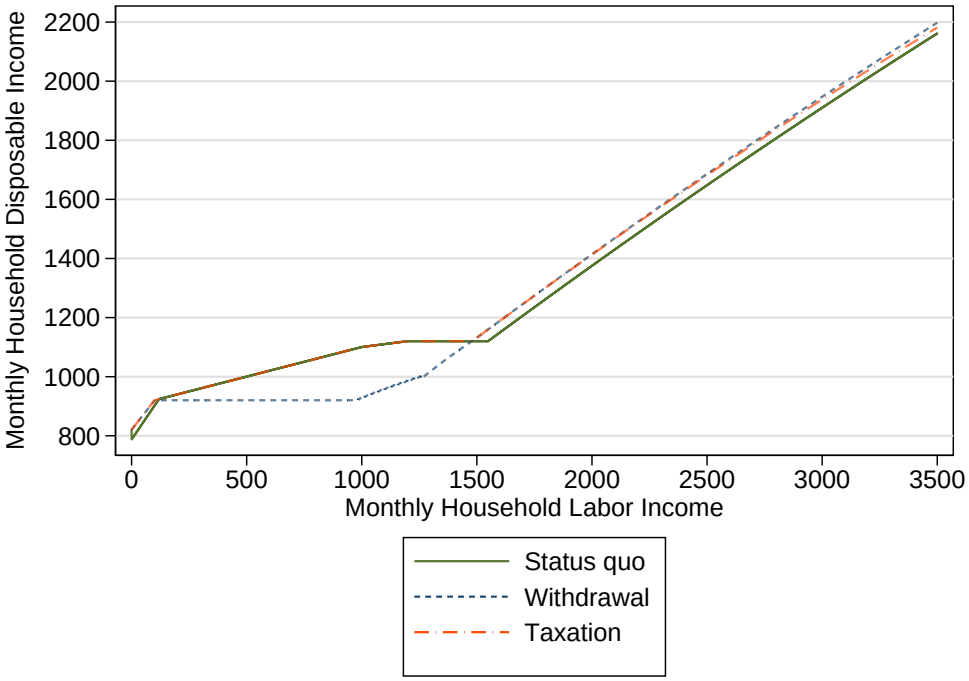
labor incomes. However, for this household the effective marginal tax rate decreases relative to the *status quo* for labor incomes between about 950 and 1,550 Euro. Under the *Taxation* scenario, disposable income does not deviate from the *status quo* for transfer recipients. The abolishment of Mini and Midi jobs hardly impacts the budget constraint of this household because the income loss is compensated by higher transfer payments.[13] However, as net income before transfers increases under both reforms for earnings above the former Mini job threshold, transfers are fully withdrawn at lower earnings than under the *status quo*. If the household earns more than about 1,500 Euro per month, it is better off under both reform scenarios relative to the *status quo*. The maximal financial gain produced by the two reforms is about 40 Euro per month. Under the *Taxation* scenario, this gain decreases and turns negative at earnings of about 4200 Euro due to the increase in marginal tax rates and the increase of the SSC earnings threshold. In contrast, under the *Withdrawal* scenario the household is better off even for very high earnings.

While the replacement of Mini and Midi jobs with an SSC allowance does not impose financial gains or losses on households receiving means-tested transfers like Unemployment Benefit II, two-earner couples can suffer considerable income losses in some cases. The current regulation benefits couple households with secondary earners employed in a Mini job through the tax exemption of Mini jobs. Married couples can opt for joint taxation with income splitting such that, due to progressive taxation, tax benefits of the Mini job increase in the income level of the primary earner. When the secondary earner earns slightly more than the Mini job threshold of 450 Euro per month, earnings are fully taxed. Thus, working slightly more leads to a *decrease* in disposable household income.

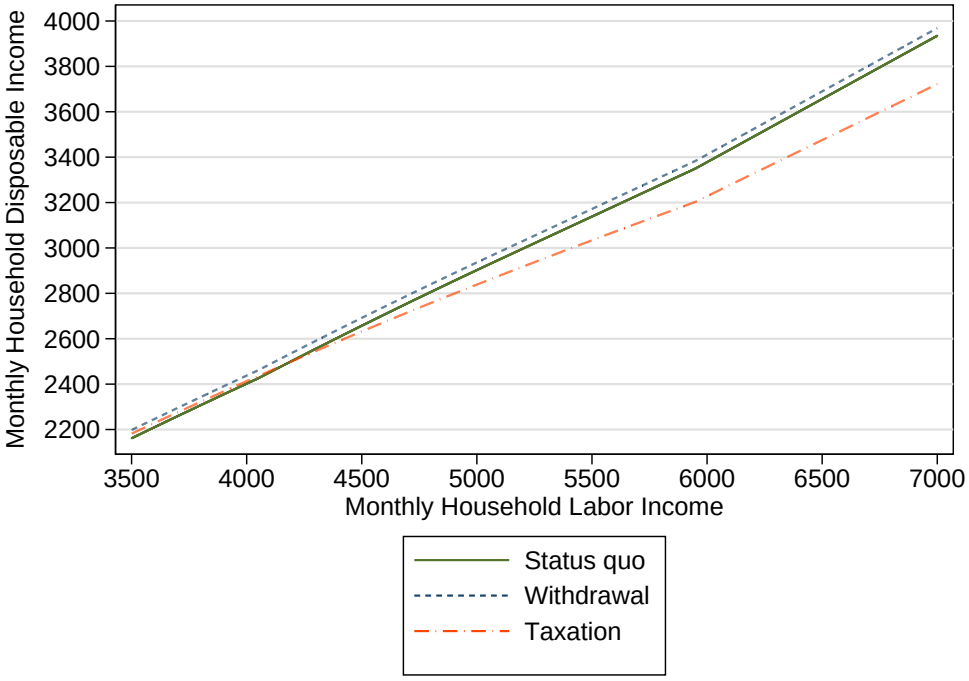
While potentially improving labor supply incentives, abolishing this tax relief makes some households worse off under the reform scenarios since secondary earners' income becomes subject to income tax from the first Euro. However, in the proposed reform scenarios these households are partly compensated by the introduction of the SSC allowance, which benefits both first and secondary earners. Figure A.3 in the Appendix illustrates how the reforms impact on the budget constraint of an exemplary household—a married couple with two children, with the primary earner's income held fixed at 4000 Euro per month.

The changes in budget constraints of stylized households as described above provide a first impression of likely efficiency gains and losses. Since the effective marginal tax rate under the

[13] Individuals with labor incomes up to about 115 Euro per month are better off under both reform scenarios due to minimum overall (employer plus employee) contributions in Mini jobs to old age insurance under the *status quo*.



(a) Labor Income up to 3500 Euro



(b) Labor Income between 3501 and 7000 Euro

Figure 1: Budget Constraint of a Single Household Without Children. *Source*: Own calculations based on a modified version of the STSM.

Withdrawal scenario only changes for low earnings, labor supply reactions can also be expected to be concentrated at low income levels. The full withdrawal of transfers disincentivizes positive labor supply at low earnings and therefore imposes a negative impetus on labor supply at the extensive margin. On the other hand, working more hours becomes more attractive relative to part-time work. For those households profiting from tax and SSC exemptions in Mini jobs under the *status quo*, the labor supply effect is unclear a priori. Individuals might switch to a higher number of working hours or stop working altogether.

Under the *Taxation* scenario, employments with low to moderate earnings become more favorable compared to very low or medium-to-high earnings. Depending on the individual productivity and preferences, those employees worse off compared to the *status quo* might opt for extending or reducing working hours. Importantly, for both reform scenarios, labor supply reactions depend on the availability of hours alternatives. In the following, we account for potential labor supply constraints.

4 Main Results

4.1 Reform effects

Labor supply effects — Table 7 shows simulated labor supply effects of the two reforms obtained using the constrained labor supply model. Results are displayed by deciles of potential net equivalent income under the *status quo* regime, i.e., net income if all adults in the household worked full time adjusted by the OECD equivalence scale.[14] Using the potential instead of the actual income decile offers the advantage that the government might be more interested in effects on the "deserving poor", i.e., those who would still be poor if they worked full time, instead of effects on those who have a low income only because they enjoy high amounts of leisure (see Decoster and Haan 2015). Additionally, results are displayed by household composition.

The *Withdrawal* reform leads to a small increase in labor supply of women and a small decrease in labor supply of men in the first decile. Thus for the latter group the effect of increased transfer withdrawals outweighs the positive labor supply incentives brought about by the SSC basic allowance. In the second to eighth decile, labor supply effects are positive, while they are virtually zero in the highest decile. The effect is strongest for the 3rd to 5th decile with generally substan-

[14] Net income divided through one plus 0.5 for every additional adult and 0.3 for every child under 14.

Table 7: Simulated Labor Supply Effects of the Reform Scenarios Under Constraints

	Withdrawal			*Taxation*		
	Women	Men	Total	Women	Men	Total
Changes in Hours Worked (in Percent)						
By Deciles of Potential Net Equivalence Income						
1st	0.1	−0.1	0.0	0.1	0.0	0.0
2nd	0.3	0.0	0.2	0.1	0.0	0.1
3rd	0.7	0.1	0.4	0.1	0.0	0.1
4th	0.7	0.1	0.4	0.1	0.0	0.1
5th	0.5	0.2	0.3	0.1	0.0	0.0
6th	0.4	0.2	0.3	−0.0	0.0	0.0
7th	0.3	0.1	0.2	−0.1	0.0	−0.0
8th	0.1	0.1	0.1	−0.1	−0.0	−0.1
9th	0.1	0.1	0.1	−0.1	−0.0	−0.1
10th	−0.0	0.0	0.0	−0.3	−0.1	−0.2
By Household Type						
Couples, 0 Children	0.2	0.1	0.2	0.0	0.0	0.0
Couples, 1 Child	0.2	0.1	0.2	−0.0	0.0	0.0
Couples, 2+ Children	0.3	0.1	0.2	0.1	0.0	0.0
Singles, 0 Children	0.5	0.0	0.2	−0.0	−0.0	−0.0
Singles, 1 Child	0.4	0.0	0.4	−0.0	0.0	−0.0
Singles, 2+ Children	0.3	0.0	0.3	0.0	−0.0	0.0
All Households	0.3	0.1	0.2	−0.0	−0.0	−0.0

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.

tially larger effects for females than for males. The effects by *household types* are all positive on average and strongest for single females. The total labor supply effect is positive, 0.2 percent.

The *Taxation* reform leads to small increases in labor supply for the lower six deciles, while it leads to decreases in labor supply for the upper four deciles with the strongest effect for the top ten percent (-0.2 percent). For households with relatively low income, social security contributions are more important, while for higher income households, the tax increases worsen labor supply incentives. Again, female labor supply reacts stronger to the reform. The analysis by household type shows slight increases in labor supply for couples with children and decreases for singles. The total labor supply effect of this reform is very small, but negative.

Table 8 shows participation effects for both reforms. For the *Withdrawal* reform these effects are negative in the first two deciles. However, as shown in Table 7, the positive intensive labor supply response dominates the negative participation effect, leading to a positive overall hours effect. For some individuals, increased withdrawal rates make working unattractive. However,

both the SSC basic allowance as well as high transfer withdrawal rates make working *more* hours conditional on working attractive too. The latter effect dominates. For all other deciles, participation rates increase overall; however, female participation rates increase only negligibly for higher deciles. For this group the abolishment of Mini jobs, which are particularly attractive for secondary workers reduces participation rates. Participation rates decrease both for single men and women, with and without children. In contrast, participation effects are positive for couples. The reason is that secondary earners are not affected by the increase in the marginal withdrawal rate if primary earners have a relatively high labor income.

The results for the *Taxation* reform are qualitatively similar to the effects on total labor supply with very small increases in the participation rate for lower income households and very slight decreases for higher-income households.

Overall, the labor supply effects of the two reform proposals are relatively limited—more so than under the conventional model (not reported). In case of the *Withdrawal* reform, this is true especially for participation effects in the two lowest deciles, for which the conventional model predicts decreases of about one percentage point. At the same time, the conventional model predicts positive participation effects of 0.2 - 0.5 percentage points for the 4th to 8th decile. The overall hours effect is substantially larger when applying the conventional model (0.6 percent compared to 0.2 percent). For the *Taxation* reform, the negative hours effects in the highest deciles are also much more pronounced under the conventional model (e.g. -0.7 percent compared to -0.2 percent for the highest decile). This is also true with respect to the positive response found for low to middle income households, resulting in an overall effect that is quantitatively similar to that obtained under the constrained model.

Distributional effects — Table 9 shows changes in disposable net equivalent income caused by the two reforms with and without behavioral adjustments. The mechanical and total effect of the *Withdrawal* reform in the lower three deciles is a decrease in income. Positive labor supply effects lead to a smaller decrease after labor supply effects (total effects). The upper seventy percent of the income distribution gain both before and after labor supply adjustments with the largest post-labor supply reaction effect, an increase of 1.4 percent occurring at the 6th and 7th decile. The analysis by household type shows positive mechanical effects for couples with zero or one child and slight negative mechanical effects for couples with two children, which become slightly positive after labor supply adjustments. Incomes of childless singles increase, while lone parents are hit hard and suffer income losses of more than one percent, even after increasing labor supply.

Table 8: Simulated Participation Effects of the Reform Scenarios Under Constraints

	Withdrawal			*Taxation*		
	Women	Men	Total	Women	Men	Total
Changes in Participation Rates (in Percentage Points)						
By Deciles of Potential Net Equivalence Income						
1st	−0.2	−0.1	−0.1	0.0	0.0	0.0
2nd	−0.1	−0.1	−0.1	0.0	0.0	0.0
3rd	0.0	−0.0	−0.0	0.0	0.0	0.0
4th	0.0	0.0	0.0	0.0	0.0	0.0
5th	−0.0	0.1	0.1	0.0	0.0	0.0
6th	0.0	0.1	0.1	0.0	0.0	0.0
7th	−0.0	0.1	0.0	0.0	0.0	0.0
8th	−0.0	0.1	0.0	0.0	0.0	0.0
9th	−0.0	0.1	0.0	0.0	−0.0	0.0
10th	0.0	0.0	0.0	−0.0	−0.0	−0.0
By Household Type						
Couples, 0 Children	0.0	0.1	0.0	0.0	0.0	0.0
Couples, 1 Child	−0.0	0.1	0.0	0.0	0.0	0.0
Couples, 2+ Children	−0.0	0.1	0.0	0.0	0.0	0.0
Singles, 0 Children	−0.0	−0.0	−0.0	0.0	0.0	0.0
Singles, 1 Child	−0.1	−0.0	−0.1	0.0	0.0	0.0
Singles, 2+ Children	−0.2	−0.0	−0.1	0.0	−0.0	0.0
All Households	−0.0	0.1	0.0	0.0	0.0	0.0

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.

Under the *Taxation* reform scenario, the lower 80 percent of the income distribution enjoy an increase in income. The effects of labor supply reactions on income are much more limited in this scenario. The highest increases in income are enjoyed in the 4th and 5th decile, 1.5 percent. The ten percent with the highest income suffer substantial net income losses of 2.7 percent after labor supply adjustments. On average couples with zero or one child and childless singles are nearly unaffected by the reform, while couples with at least two children loose, and lone parents enjoy income increases. In line with the overall efficiency loss, individuals on average lose 0.1 percent income under this reform scenario. Again, the reform effects are moderate compared to those obtained under the conventional model, which predicts an overall income increase of 0.6 percent for the *Withdrawal* reform and a 0.3 percent decrease for the *Taxation* reform. However, qualitatively the results remain similar.

Table 9: Simulated Distributional Effects of the Reform Scenarios under Constraints

	Withdrawal		*Taxation*	
	Mechanical	Total	Mechanical	Total
Changes in Net Equivalized Income (in Percent)				
By Deciles of Potential Net Equivalence Income				
1st	−4.8	−4.7	0.7	0.7
2nd	−4.0	−3.9	0.9	0.9
3rd	−1.8	−1.6	1.3	1.3
4th	0.3	0.5	1.5	1.5
5th	0.8	1.0	1.3	1.3
6th	1.1	1.3	0.9	0.9
7th	1.2	1.3	0.8	0.7
8th	1.2	1.3	0.2	0.2
9th	1.0	1.0	−0.7	−0.8
10th	0.7	0.7	−2.5	−2.7
By Household Type				
Couples, 0 Children	0.6	0.7	0.0	0.0
Couples, 1 Child	0.2	0.3	−0.0	−0.1
Couples, 2+ Children	−0.1	0.0	−0.3	−0.3
Singles, 0 Children	0.1	0.2	−0.0	−0.1
Singles, 1 Child	−1.4	−1.2	0.2	0.2
Singles, 2+ Children	−1.7	−1.5	0.3	0.2
All Households	0.1	0.3	−0.0	−0.1

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.

4.2 Measuring Efficiency of Redistributive Policies

As in Immervoll et al. (2007), we measure the redistributive trade-off of each of the revenue neutral reforms. In contrast to that paper, we allow for a fully flexible labor supply model, which allows for income effects, and therefore do not obtain closed form expressions. Instead, we first calibrate the reforms to be budgetary neutral after labor supply reactions and in a second step we calculate the efficiency measure. Efficiency gains and losses are caused by labor supply reactions to changes in households' budget constraints, i.e., they result from behavioral revenue gains and losses. In the case of efficiency gains, the government needs to tax less than one Euro away from the losers in order to redistribute one Euro to the gainers of the reform.

The efficiency measure is given by the ratio of the sum of mechanical increases and decreases in disposable income:

$$\Theta = \frac{L}{G}, \tag{9}$$

where L denotes the overall mechanical decrease in disposable income of losers of the reform and G denotes the overall mechanical increase for reform winners. In the case of Pareto improving reforms without losers the measure equals zero. In contrast, the more the government has to tax away from the losers in order to redistribute one Euro to reform winners, the higher is Θ. In the case of no efficiency gains/losses, e.g., with fixed labor supply, the measure is equal to one. Values higher than one indicate efficiency losses.

Consider the simple case with quasi-linear utility (as in Immervoll et al. 2007), where an additional Euro in consumption is associated with an increase in utility by one for all individuals. Then L and G can be interpreted as the unweighted sums of welfare gains and losses, respectively.[15] The situation is more nuanced with flexible utility functions and when marginal social welfare weights w_i differ between individuals. These weights measure the value for the social planner of redistributing one Euro to a specific individual (Saez 2002). In this case a reform is desirable if

$$\sum_{i}^{N_g} w_i g_i > \sum_{j}^{N_l} w_j l_j, \tag{10}$$

where g_i and l_i denote the individual mechanical gain/loss, while N_g and N_l indicate the numbers of winners and losers, respectively. Equation (10) can be rewritten as

$$\sum_{i}^{N_g} s_i w_i \times G > \sum_{j}^{N_l} s_j w_j \times L, \tag{11}$$

where $s_i = g_i/G$ indicates the share of individual i of the total gain G and $s_j = l_j/L$ the corresponding variable for losers of the reform. Rearranging yields

$$\sum_{i}^{N_g} s_i w_i / \sum_{j}^{N_l} s_j w_j > \Theta. \tag{12}$$

The left hand side denotes the ratio of the sum of marginal welfare weights of winners and losers weighted by the share of each individual's gain or loss in total gains or losses. Usually, individuals with lower income have higher social welfare weights. Thus, the more gains are concentrated on low income individuals, the larger this term. The right hand side simply denotes the ratio of total losses to gains

Suppose for simplicity that the social planner puts the same weight on all individuals in one group, i.e., all winners of the reform have the same weight w_g and all losers have the same weight

[15] This is true for small reforms, for which the envelope theorem can be applied and welfare effects due to behavioral adjustments are negligible.

Table 10: Efficiency of the Reform Scenarios under Constraints, by Net Equivalence Income

	Withdrawal				*Taxation*			
	winners		losers		winners		losers	
Income decile	share	∅ gain	share	∅ loss	share	∅ gain	share	∅ loss
1st	0.21	402.01	0.57	-1047.43	0.51	221.62	0.22	-34.64
2nd	0.21	442.81	0.77	-1450.28	0.62	208.48	0.30	-26.26
3rd	0.41	459.25	0.58	-1671.90	0.69	318.79	0.25	-63.00
4th	0.70	515.94	0.30	-1796.88	0.86	447.82	0.13	-189.70
5th	0.88	558.66	0.12	-1451.52	0.90	530.00	0.10	-410.58
6th	0.93	583.04	0.07	-1200.15	0.87	542.28	0.13	-446.71
7th	0.96	573.30	0.04	-871.31	0.77	499.37	0.23	-621.86
8th	0.96	590.19	0.04	-736.58	0.70	464.84	0.30	-667.17
9th	0.98	551.22	0.02	-669.16	0.36	407.40	0.64	-668.69
10th	0.98	499.57	0.02	-706.58	0.05	246.23	0.95	-1943.52
all	0.72	541.18	0.25	-1411.21	0.63	420.79	0.33	-850.09

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.
share is the share of households who gain/loose w/o taking labor supply responses into account. ∅ *gain*/*loss* is the conditional average gain/loss in disposable incomes per year by group (winners/losers), income decile, and reform scenario.

w_l. Then equation (12) simplifies to $w_g/w_l > \Theta$ and a reform is desirable if the ratio of the marginal social welfare weights of the groups of winners and losers exceeds Θ. For instance, if there are no labor supply adjustments ($\Theta = 1$), a reform is desirable as long as the social planner values an additional Euro of consumption for the winners more than an additional Euro of consumption for the losers. If Θ equals the ratio of the marginal social welfare weights of the groups of winners and losers, the respective policy reform does not impose a change to social welfare and the social planner is indifferent whether to implement the reform. Table 10 shows the composition of both groups by deciles of net equivalence income as well as the average conditional gain and loss per household. For the *Withdrawal* reform, the group of losers is heavily concentrated at the lower half of the income distribution. However, even in the lowest quintile, about one fifth of all households are better off. Concerning the *Taxation* scenario, the group of winners is concentrated at the middle of the income distribution, while the group of losers consists primarily of households from the top of the distribution.[16]

[16]In the three lowest deciles, about one fourth of all households loose from the *Taxation* reform (due to the abolishment of Mini jobs), however, the average loss is quite low.

Table 10 shows how mechanical gains and losses of the reforms are distributed over income deciles. For each decile, it displays the share of winners and losers as well as average gains and losses. Net incomes of the remaining share are unchanged. Losses of the *Withdrawal* reform are concentrated at the lower four deciles, while gains are concentrated on the upper half of the distribution. Thus, a social planner, who puts a higher weight on low income individuals would find this reform desirable only if the efficiency gain was substantial. In contrast, gains of the taxation reform are more evenly distributed, while the largest losses due to tax increases occur at top of the income distribution. An inequality averse social planner might thus find the reform desirable even if it entailed an efficiency loss as measured by Θ.

Table 11 shows the measure for efficiency Θ of the two reforms under both the conventional and the constrained labor supply model. Thus, the reform is desirable as long as the weighted average marginal social welfare weight of winners is at least 91 percent of that of the losers of the reform. Under the constrained model, 91 cents need to be taxed away from the losers of the reform in order to redistribute one Euro to the winners. The efficiency gain is even larger under the conventional model, where only 81 cents have to be taxed away for each Euro redistributed to the winners. In contrast, the *Taxation* reform leads to efficiency losses under both labor supply models. Even though the average labor supply effect is close to zero, as reported above, the fiscal effect of labor supply reactions is negative because higher income earners reduce labor supply, which leads to a higher loss in tax income than an equivalent adjustment at the lower end of the distribution. Nonetheless these efficiency losses are modest in size. Correspondingly, the efficiency measure is close to one. Under the constrained model, only four cents are lost due to behavioral adjustments for every redistributed Euro. The reform is thus desirable if the marginal social welfare weight of the winners is at least four percent higher than that of the losers. Under the conventional model the efficiency loss is more important, 15 cents for every redistributed Euro. The comparison between the two models shows that in our example efficiency gains and losses are more limited, when taking labor market constraints into account than when they are ignored.

Table 11: Efficiency of the Reform Scenarios under Constraints and using the Conventional Model

Reform	*Constrained*	*Conventional*
Withdrawal	0.91	0.81
Taxation	1.04	1.15

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.

5 Conclusion

This paper makes three key contributions. First, it proposes a theoretically consistent model of constrained labor supply. Incorporating hours restrictions in a standard discrete-choice household labor supply model for Germany shows that labor supply elasticities are smaller than the conventional model would suggest. Second, two hypothetical budget neutral reforms aimed at increasing labor supply incentives for the working poor are simulated and evaluated. Finally, it proposes a way to capture the redistributive trade-off of reforms of the tax and transfer system in an intuitive measure. Allowing for detailed microsmiulation and a flexible labor supply model, this measure is not limited to particular types of reforms.

Both reform proposals analyzed in this study include social security basic allowances. In contrast to tax reductions, reforms of social security contributions have a substantial impact on the budget constraints of lower income workers. The first reform is financed by increasing transfer withdrawal rates to 100 percent and the second reform is financed through tax increases for higher income workers. We find that efficiency gains are achieved only by the first reform. These efficiency gains are stronger under the conventional labor supply model. The second reform leads to severe efficiency losses under the conventional model, while the efficiency losses are more limited, but still relevant, when imposing labor market constraints. This shows that using the constrained model based on desired hours instead of the conventional model makes a difference.

A major drawback of the first type of reform, *Withdrawal*, is that it decreases disposable income of lone parents, a particularly vulnerable group. In future research, a similar reform could be simulated that includes elements to explicitly counter this negative side-effect. A second line of future research would be to explore the causes of labor market constraints and how these constraints can be overcome. This exercise would be worthwhile in order to achieve stronger efficiency gains through reforms of the tax-transfer system.

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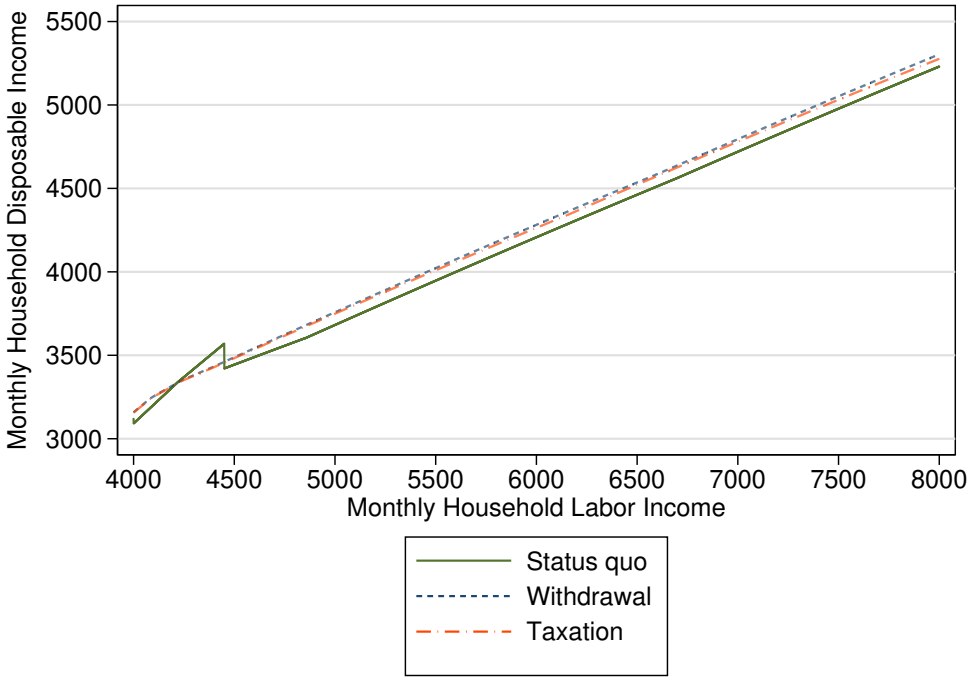
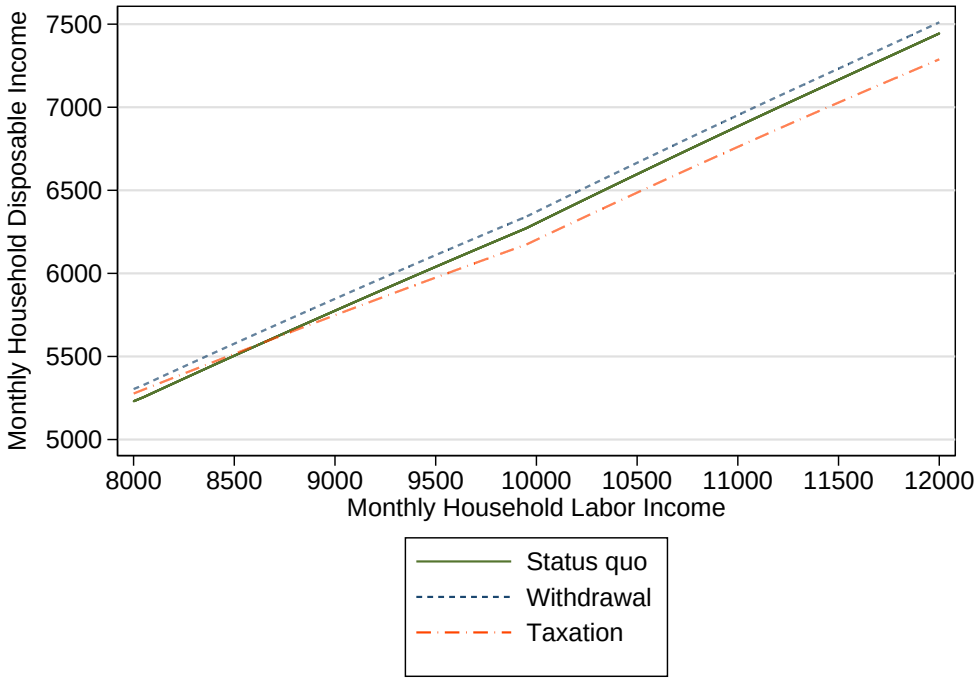
Appendix

A Figures (next page)



(a) First Earner: 4000 Euro Labor Income, Second Earner: up to 4000 Euro Labor Income



(b) First Earner: 4000 Euro Labor Income, Second Earner: 4001–8000 Euro Labor Income

Figure A.3: Budget Constraint of a Married Couple Household With Two Children

B Tables

Table B.12: Estimation Results for Labor Supply Model, Dependent Variable: Desired Hours Category

Variables	Flexible Couples	Women with Inflexible Spouse	Men with Inflexible Spouse	Single Men	Single Women
Log Net Income	-25.22^{**}	-19.05^{***}	-0.982	-3.249	-13.84^{***}
	(8.829)	(4.178)	(8.688)	(5.078)	(3.741)
(Log Net Income)^2	0.833^{**}	0.750^{***}	-0.0208	0.221	0.436^{***}
	(0.306)	(0.170)	(0.340)	(0.166)	(0.122)
Log Net Income	-0.314	1.342	-0.283		1.542^{**}
$\times$ German Female	(0.548)	(0.700)	(0.474)		(0.565)
Log Leisure Female	90.85^{***}	68.84^{***}			94.69^{***}
	(6.169)	(5.288)			(7.731)
Log Leisure Female	1.732^{***}	0.953^{***}			1.260^{**}
$\times$ Log Net Income	(0.326)	(0.285)			(0.451)
(Log Leisure Female)^2	-14.25^{***}	-9.851^{***}			-13.69^{***}
	(0.410)	(0.450)			(0.581)
Log Leisure Female	-0.659^{*}	-0.369			-0.447
$\times$ German Female	(0.319)	(0.383)			(0.458)
Log Leisure Female	-0.238^{**}	-0.230^{**}			-0.193
$\times$ Age Female	(0.0818)	(0.0879)			(0.0997)
Log Leisure Female	0.00419^{***}	0.00440^{***}			0.00374^{**}
$\times$ (Age Female)^2	(0.000972)	(0.00101)			(0.00117)
Log Leisure Female	1.436^{**}	0.149			1.493^{**}
$\times$ Disability I	(0.483)	(0.551)			(0.488)
Log Leisure Female	3.333^{**}	2.966^{**}			2.977^{**}
$\times$ Disability II	(1.045)	(1.029)			(0.913)
Log Leisure Female	2.810^{***}	3.010^{***}			3.101^{***}
$\times$ Children under 3 Years	(0.256)	(0.356)			(0.612)
Log Leisure Female	2.170^{***}	1.728^{***}			1.538^{***}
$\times$ Children 7 to 16 Years	(0.194)	(0.271)			(0.303)
Log Leisure Female	2.136^{***}	1.584^{***}			2.539^{***}
$\times$ Children 4 to 6 Years	(0.213)	(0.306)			(0.442)

Table continued on next page.

Variables	Flexible Couples	Women with Inflexible Spouse	Men with Inflexible Spouse	Single Men	Single Women
Log Leisure Female	0.565*	0.226			−0.758*
× Children over 17 Years	(0.222)	(0.302)			(0.353)
Log Net Income	0.138	−0.205	1.081	0.00772	
× German Male	(0.728)	(0.371)	(0.904)	(0.980)	
Log Net Income	0.741		0.197	−0.117	
× Log Leisure Male	(0.497)		(0.569)	(0.552)	
Log Leisure Male	2.591		121.5***	122.8***	
	(10.34)		(8.789)	(10.25)	
(Log Leisure Male)^2	−2.634**		−16.37***	−16.24***	
	(0.919)		(0.622)	(0.810)	
Log Leisure Male	0.0216		0.0221	−0.191	
× German Male	(0.445)		(0.557)	(0.787)	
Log Leisure Male	−0.0442		−0.0563	0.00607	
× Age Male	(0.112)		(0.113)	(0.116)	
Log Leisure Male	0.00112		0.000981	0.000670	
× (Age Male)^2	(0.00123)		(0.00130)	(0.00136)	
Log Leisure Male	2.485***		1.370	1.823**	
× Disability I	(0.383)		(0.727)	(0.635)	
Log Leisure Male	2.104**		4.800***	1.090	
× Disability II	(0.647)		(1.052)	(0.965)	
Log Leisure Male	0.0322				
× Log Leisure Female	(0.0988)				
× German Male					
Log Leisure Male	1.273*				
× Log Leisure Female	(0.601)				
N	35,460	12,234	5,764	3,836	11,754

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Own calculations based on the SOEP v33.1 (2016) and a modified version of the STSM.