Adjust Me if I Can't: The Effect of Firm Incentives on Labor Supply Responses to Taxes

Alisa Tazhitdinova*

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Abstract

In this paper I provide theoretical and empirical evidence on the importance of statutory incidence in labor markets in presence of asymmetric frictions. Using a theoretical model I show that labor supply responses are stronger when the statutory incidence of taxes or labor rules falls on firms. The asymmetry of response stems from the assumption that firms have a greater ability to respond to incentives than workers because it is easier for firms to change working hours. The result holds even if wages adjust to equalize differences in labor costs stemming from taxes and regulations. I explore these mechanisms by studying labor responses to incentives generated by the "Mini-Job" program aimed at increasing labor supply of low-income individuals in Germany. Using administrative data, I show evidence of a strong behavioral response – in the form of sharp bunching – to the mini-job threshold that generates large discontinuous changes both in the marginal tax rates and in the total income and payroll tax liability of individuals in Germany. Sharp bunching translates into elasticity estimates that are an order of magnitude larger than has been previously estimated using the bunching approach. To explain the magnitude of the observed response, I show that in addition to tax rates, fringe benefit payments also change at the threshold. Using a large survey of businesses and a household survey, I compare wages and fringe benefits around the mini-job threshold and find that mini-job workers are paid higher gross wages but receive smaller yearly bonuses and fewer vacation days than regular workers. These results indicate that lower fringe benefits make mini-jobs attractive to employers, thus facilitating labor supply responses in accordance with the model's predictions.

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1 Introduction

The public finance literature has largely ignored the role of firms and firms' incentives when evaluating labor supply responses to tax policies. Under standard neoclassical assumptions and in presence of perfectly elastic labor demand, workers are paid their marginal products, leading to full passthrough of income and social security taxes to employees regardless of the statutory incidence of taxes. This incidence result effectively eliminates firms' involvement in the determination of equilibrium quantities of labor supplied and wages paid. However, this simple framework does not take into account two factors. First, labor regulations and fairness concerns can limit the ability of employers to pass through taxes to workers,[1] giving firms incentives to either avoid taxes by changing the labor structure or to evade taxes.[2] Second, the simple neoclassical setting does not take into account the intrinsic differences between employers and employees: workers are more likely to suffer from search costs and information frictions as well as behavioral biases than firms. Firms therefore have the ability to either exacerbate these biases by taking advantage of individuals,[3] or on the opposite, mitigate frictions, e.g. by informing workers.[4]

In this paper I challenge the traditional view that the statutory incidence of taxes and other labor costs is irrelevant in labor markets. Instead, I argue that in the presence of frictions, statutory incidence matters through its effect on firm incentives. Taxes, which statutory incidence falls on firms, generate short-run incentives to hire workers of the tax-advantaged type. These incentives allow firms to act as a conduit to workers' preferences, facilitating labor supply responses. On the other hand, taxes, which statutory incidence falls on workers, do not distort relative wages and therefore do not generate such incentives, leaving it up to workers to find their desired jobs.

I provide empirical evidence on the importance of statutory incidence by studying a large tax notch and kink generated by the "Mini-Job" program aimed at increasing labor supply of low-income individuals in Germany similarly to the Earned Income Tax Credit program in the U.S. or the Working Tax Credit in the U.K. Mini-jobs, are defined as employment in which earnings do not exceed a predetermined monthly threshold.[5] Because mini-job earnings are exempt from income and employee-paid social security taxes, the mini-job threshold generates large discontinuous changes both in the total tax liability (a notch) and in the marginal tax rates of individuals (a kink). Despite the low value of the threshold - which ranged between €325 to €450 since 1999 – approximately 7.3 million individuals, or 18% of the labor force, hold mini-jobs.[6] Using administrative data on a 2%

[1] Several studies show that the social security taxes might not be fully borne by the employees, e.g. Anderson and Meyer (1997), Anderson and Meyer (2000), Saez et al. (2012), and even income taxes can be partially borne by the employers, e.g. Bingley and Lanot (2002), Kubik (2004), Leigh (2010) and Rothstein (2010).

[2] Firms can respond by hiring more employees with tax-advantaged status or by paying workers under the table. Similar types of optimizing behaviors have been observed in other contexts, e.g. Garicano et al. (2013) show that firms in France limit the number of employees in order to avoid labor regulations. Similar behavior in Italy has been documented by Garibaldi et al. (2004) and Schivardi and Torrini (2008).

[3] It has been shown in many settings that firms take advantage of customer bias, e.g. DellaVigna and Malmendier (2004), Gabaix and Laibson (2006), Ellison and Ellison (2009). See also Akerlof and Shiller (2015).

[4] Best (2014) shows that workers in Pakistan improve their knowledge of the tax schedule from firms' wage offers, which make them more responsive to income taxation.

[5] In addition to earnings requirement, employments were limited to 15 hours per week prior to 2003.

[6] The number of mini-jobs increased from about 4 million in 1999. Source: Federal Employment Agency.

representative sample of the German population, I find sharp bunching at the mini-job threshold, which is consistent with employees reducing labor supply to avoid larger tax liabilities. I show that bunching is persistent over time and across demographic groups and follows the threshold precisely.

To estimate the magnitude of the behavioral response, I extend the methodological approach of Saez (2010) and Kleven and Waseem (2013) to frameworks with large discontinuous marginal and average tax rate changes.[7] The approach separately accounts for the bunching due to a kink and due to a notch, thus generating an unbiased estimate of the earnings elasticity. Elasticity point estimates range from 0.20 to 0.37 for women and from 0.09 to 0.25 for men, depending on the year. Calculated elasticities are 5 to 10 times larger than has been previously estimated using the bunching method and are more in line with other studies in the labor supply literature. To explain the magnitude of the observed response, I focus on firm incentives. I find that prior to 2003, when *cumulative* earnings were subject to the mini-job threshold, individuals with multiple jobs and at least one regular job were still bunching at the mini-job threshold. Since these individuals have no incentive to bunch, the presence of a substantial excess mass at the threshold presents direct evidence of firms' response to mini-job rules.[8]

To better understand how firm incentives can affect the magnitude of labor supply responses, I develop a partial equilibrium tax incidence model with job search costs and endogenous hour constraints. In the model, firms offer two types of contracts: regular jobs subject to high taxes, and mini-jobs which are bound by an earnings threshold but are subject to lower taxes. Employees draw job offers from the aggregate distribution of hour-contract combinations offered by firms and accept or reject offers based on individual consumption-leisure preferences and job-search costs. I show that in the presence of search costs, the magnitude of labor supply responses depends on the statutory incidence of taxes and the elasticity of substitution between the individuals working in different tax regimes.

The theoretical model predicts that in the presence of search costs, labor supply responses will be stronger if the statutory incidence of taxes or other labor costs falls on firms rather than workers. Since the statutory incidence of mini-job tax breaks falls on workers, I consider two other types of costs which statutory incidence falls on firms. First, lax labor enforcement might allow firms to reduce fringe benefit payments to mini-job employees as compared to other workers as has been suggested by survey evidence.[9] Second, employers might find mini-jobs attractive because they allow for more flexibility both at the extensive and intensive margins.[10] I investigate these channels using a firm and household survey data that provide information on working hours and earnings of employees in Germany. I find that while many mini-job workers are paid substantially less than the part-time workers liable for social security contributions, at the threshold, gross wages

[7] See Kleven (2016) for a detailed review of the bunching approach and the related literature.

[8] Such firm response has been termed "firm bunching" and has been first documented by Chetty et al. (2011). See also Best (2014).

[9] See Bachmann et al. (2012), Wippermann (2012) and Weinkopf (2014).

[10] Mini-jobs may also be attractive to firms because the incidence of the tax exemption given to employees might be shared between workers and employers, leading to lower wages for mini-job workers. As the theoretical model shows, tax breaks can only be passed through if mini-job and regular workers are not perfect substitutes. This requirement and the findings below make this channel unlikely.

paid to mini-job workers are approximately 6% higher than gross wages paid to regular part-time workers. In addition, I find that mini-job workers receive smaller yearly bonuses and fewer vacation days than regular employees, suggesting that higher gross wages paid to mini-job workers reflect the lower fringe benefit payments they receive. Next, I rule out the second channel (flexibility of hours) by showing that mini-job workers have more stable employment than regular part-time workers. These findings indicate that in addition to tax rates, fringe benefit payments also change at the threshold. Because the statutory incidence of fringe benefits falls on firms, differences in fringe benefit rates make mini-jobs attractive to employers, thus facilitating labor supply responses in line with the model's predictions.

The results of this study are policy relevant for two reasons. First, understanding the seeming popularity of mini-jobs is important because similar types of policies have been proposed in other countries.[11] It has been further argued that the flexibility of the German labor market system, and the existence of mini-jobs in particular, are the reasons why Germany faired in the Great Recession better than other countries.[12] Second, since the statutory incidence of taxes is relatively easy to change, the results in this paper suggest that statutory incidence can be used as a policy tool and the choice of statutory incidence should depend on the outcomes the government is trying to achieve. If the policymakers would like to reduce distortions arising from taxes and labor rules, taxes and rules should apply to workers. The results of this paper caution against policies that give employers incentives to hire certain tax-advantaged groups. Mini-jobs in their current form incentivize people to enter the labor force but then stay locked in in low-paying jobs. On the other hand, if the government wishes to stimulate job creation, giving incentives directly to firms might lead to faster employment, because such policies generate immediate incentives to hire workers, instead of relying on workers' ability to put downward pressure on equilibrium wages.

This paper contributes to several literatures. An emerging literature in public finance shows that adjustment frictions and search costs (Chetty et al. (2011), Chetty (2012), Kleven and Waseem (2013), Gelber et al. (2013)), as well as information frictions (Chetty and Saez (2013) and Chetty et al. (2013)) can affect the magnitude of responses to taxes. This paper is the first to show how the interrelationship between the statutory incidence of labor costs and search costs affects labor supply responses to taxes. Several papers show the economic incidence of taxes and the tax revenue collected may vary with the statutory incidence and remittance mechanism if the ability to evade or avoid taxes varies across economic agents (Slemrod (2008) and Kopczuk et al. (2013)),[13] or if the salience of taxes depends on the statutory incidence (Chetty et al. (2009)). This paper contributes to the literature by explaining the mechanism through which statutory incidence of labor costs can affect the magnitude of labor supply responses to taxes and provides empirical evidence supporting the model's predictions.

[11] Specifically, in Spain `http://www.expansion.com/2011/12/07/economia/1323268271.html`, and in the UK `http://www.theguardian.com/society/2012/aug/19/treasury-boost-employment-mini-jobs`.

[12] See Burda and Hunt (2011) for a review.

[13] A related literature argues for superiority of the value-added tax (VAT) over the retail sales tax. The efficiency of VAT stems not only from the differences in ability to evade, but also from the self-enforcing nature of the VAT payment and refund process. See de Paula and Scheinkman (2010) and Pomeranz (2013).

This paper also contributes to a small literature that studies the role of firms in workers' earnings responses to taxes. Kopczuk and Slemrod (2006) stress that firms' central role in the tax collection process should not be overlooked. Chetty et al. (2011) show that firms help workers respond to taxes by tailoring the distribution of hours offered to workers' preferences. Similar evidence has been found by Best (2014) in Pakistan. This paper argues that when the statutory incidence of labor taxes falls on employers, firms will offer more jobs of the tax-advantaged type and as a result the distribution of offered hours is more likely to resemble the distribution of hours preferred by workers. This paper shows that firms' incentives are important even in circumstances where wages are able to adjust freely and the economic incidence of taxes does not change with the statutory incidence.

This paper also closely relates to the vast literature that estimates how measures of labor supply respond to taxes and to various programs that aim at increasing labor supply of low-income workers. While the approach taken in this work is closest to studies that estimate elasticity of taxable income (e.g. Saez (2010), Chetty et al. (2011), and Kleven and Waseem (2013)), I estimate an elasticity of wage earnings, which can be directly compared to other labor studies that measure changes in hours (e.g. MaCurdy (1981), Eissa and Hoynes (2006), Blundell et al. (1998) and Ziliak and Kniesner (1999)). This paper makes a methodological contribution by showing how the elasticity of earnings can be estimated in the presence of large kinks and notches. By looking at a subset of single individuals, who only experience changes in social security taxes at the mini-job threshold, this study also contributes to a smaller literature that estimates responses to payroll taxes specifically (Gruber (1997), Saez et al. (2012), Liebman and Saez (2006), Lehmann et al. (2013) and Tazhitdinova (2015)). The results in this paper suggest that it is unlikely that workers value social security benefits at actuarially fair rates. This paper also provides evidence on the distortionary nature of tax notches and suggests that a policy that is effective at increasing labor supply at the extensive margin may lock in workers in low-paying jobs due to strong phase-out incentives. I argue that this lock-in effect may be very strong when the statutory incidence of some tax breaks falls on the employers.

Finally, the paper makes several contributions to a literature that specifically studies mini-jobs in Germany. First, this paper documents a large bunching at the mini-job threshold. Second, it calculates the magnitude of behavioral responses by estimating an elasticity of earnings with respect to net-of-tax rate.[14] Third, this paper provides compelling empirical evidence that mini-jobs are attractive to firms because of the lower fringe benefit costs. Previous studies, see Bachmann et al. (2012) and Wippermann (2012), relied on small surveys of mini-job workers and found that mini-job workers are less likely to receive benefits such as vacation, holiday and sick day pay. These studies, however, surveyed mini-job workers only, providing no evidence as to whether the benefits are not

[14]Caliendo and Wrohlich (2010) use differences-in-differences approach to study the effect of the 2003 reform and find small intensive margin responses, but an increase in the number of mini-jobs as secondary employment. Steiner and Wrohlich (2005) use a structural model and household data data to simulate the effects of the 2003 reform.

given to mini-job workers specifically, or part-time workers in general.[15,16]

The rest of the paper is organized as follows. Section 2 explains the institutional setting and provides an overview of the labor market in Germany. In Section 3 I provide evidence of behavioral responses to the mini-job threshold and estimate earnings elasticities with respect to net-of-tax rate. Section 4 presents a partial equilibrium tax incidence model with job search costs and endogenous hour constraints. I show how the statutory incidence of taxes affects labor responses in presence of search costs. Section 5 provides empirical support to the assumptions of the model and shows that in addition to tax rates, fringe benefit payments also change at the threshold. Section 6 concludes with policy implications.

2 Institutional Setting

Marginal employment[17] or, as they are more commonly known, *mini-jobs*, have existed in Germany since 1977. From 1999 until April 2003 mini-jobs were defined as jobs in which employees earned less than €325 per month and worked less than 15 hours per week.[18] The employer paid 22% social security tax while the employee was exempt from *both* social security and income taxes. Marginal employment thus offered substantial savings compared to regular jobs that were subject to approximately 40% social security tax which was equally split between the employees and employers. If individuals hold several mini-jobs, the threshold applied to the sum of earnings. If earnings exceeded the mini-job threshold, employees were subject to the usual rules – both in terms of social security contributions and income taxes – on the entire earnings. Because the employer portion of regular social security tax fluctuated around 20%, crossing the €325 threshold had negligible effects on the employer's tax liability. On the other hand, the €325 threshold represented a large notch for employees: workers immediately incurred the full employee portion of social security taxes (roughly 20%) on the entire amount of earnings and could be liable for large income taxes if married.[19] For mini-job workers with high-earning spouses, the €325 threshold represented a very large notch, since the entire earnings were subject to the spouse's top marginal tax rate.

The Hartz II reforms introduced on April 1, 2003 made mini-jobs more attractive by abolishing

[15] See page 45 in Bachmann et al. (2012) and page 59 in Wippermann (2012).

[16] Several other papers study the substitutability of regular and mini-jobs. For example, Bauer and Riphahn (2002) study the effect of payroll taxes and mini-job rules on labor demand using dynamic factor models and found little effect of payroll taxes on employment levels. Freier and Steiner (2010) estimate that the own-wage elasticities for marginal employment range between 0.13 for male workers and 1 for for women. Jacobi and Schaffner (2008) study substitutability of regular employment by mini-job positions. They detect high substitution elasticities with respect to three skill categories of regular employment in both time periods and find that the substitutability of unskilled full-time workers increased significantly after the reform.

[17] In German: *Geringfügige Beschäftigung*.

[18] There are two types of marginal employment in Germany: employments with earnings below the mini-job threshold (which are the focus of this paper) and short-term marginal employments, in German *kurzfristige Beschäftigung*, which are not subject to an earnings limit but are limited in duration to 50 working days or two months per year. This second type of employment is significantly less popular than mini-jobs and is not the focus of this paper.

[19] In Germany, married couples are taxed based on the joint income, though there is no marriage penalty. The income schedule for married couples is based on brackets that are twice the size of single individuals. However, spouses may elect, if they choose, to be taxed separately.

the hour constraint and increasing the monthly earnings limit to €400.[20] The employer's social security tax rate on mini-jobs was increased from 22% to 25%. In addition, the reform smoothed the social security notch at the new threshold by introducing *midi-jobs*. Upon exceeding the €400 threshold workers enter midi-employment which subjects them to lower social security taxes than regular jobs.[21] The reduced tax liability is fully phased out upon reaching €800, at which point both employees and employers are subject to regular social security taxes. The midi-job rules thus substituted the notch in the total amount of social security tax due (by employees and employers) with a kink. The reform, however, did nothing to smooth the tax notch in the income tax liability of married individuals: the reduced midi-job rate does not apply to income taxes.

The mini-job threshold, social security tax rates and average income tax rates are summarized in Table 1. The budget constraints of individuals are shown in Figure 1.

The 2003 reform also allowed workers in regular employment to hold one mini-job tax-free. While multiple mini-jobs are still added up to determine one's social security tax liability, individuals who hold at least one job subject to regular social security taxes, i.e. earning more than €400, can now hold an additional mini-job that would be subject to the mini-job rules. The reform thus made mini-jobs an attractive addition to workers in regular employment, allowing them to earn extra income without paying social security or income taxes on that income. The mini-job contribution rate was further increased from 25% to 30% on July 1, 2006, but the €400 threshold remained intact until April 1, 2012, at which point the €400 and €800 thresholds were increased to €450 and €850 respectively.

It is worth noting that while employers pay "social security" taxes on mini-job earnings, these contributions do not qualify mini-jobbers for social security benefits. In other words, employees in marginal employment do not earn pension and unemployment credits and do not qualify for medical insurance on *their own* record. Only upon exceeding the €325 or €400 respectively, do employees qualify for medical insurance and start earning credits. However, there are several ways mini-jobbers can obtain social security benefits while in marginal employment. First, spouses of workers in regular employment qualify for medical insurance on their spouse's behalf; a similar rule applies to children under age 18 and students under age 25. Second, all individuals qualify for *unemployment assistance* or means-tested social support.[22] Both types of assistance, which were merged in 2005 into a means-tested, flat-rate unemployment benefit II, provide individuals with monthly stipends and medical insurance. Contrary to *unemployment insurance*[23] which is contributory-based, unemployment assistance and social support, were and remain to be non-contributory.[24]

[20]For a comprehensive review of the Hartz reforms in English see Jacobi and Kluve (2006). For a review of the labor market policy in Germany in 1991–2005 see Ebbinghaus and Eichhorst (2007).

[21]The total amount of tax to be paid when one earns between €400 to €800 is equal to $[400 \cdot \tau_{Mini}/\tau_{Full} + (2 - \tau_{Mini}/\tau_{Full})(X - 400)] \cdot \tau_{Full}$, where X is individual's income, τ_{Mini} denotes the prevailing mini-job tax rate and τ_{Full} denotes the prevailing full social security tax rate. Because employers are still responsible for their usual share of taxes, the employees' tax amounts to $[400 \cdot \tau_{Mini}/\tau_{Full} + (2 - \tau_{Mini}/\tau_{Full})(X - 400)] \cdot \tau_{Full} - 0.5 \cdot \tau_{Full} X$. Once the earnings exceed €800, individuals pay regular social security taxes, i.e $0.5 \cdot \tau_{Full} X$ each.

[22]In German: *Arbeitslosenhilfe* and *Sozialhilfe* respectively.

[23]In German: *Arbeitslosengeld I*.

[24]The aforementioned reform of unemployment benefits was introduced on January 1, 2005. Prior to 2005, individuals receiving unemployment benefits or unemployment assistance were allowed to keep their benefits as long as

It is important to point out that prior to January 1, 2015 Germany did not have a universally applicable minimum wage. Instead industry-specific minimum wages were established through bargaining by respective labor unions. These bargaining agreements covered a large number of full-time workers, however, were not necessarily applicable to part-time workers and especially mini-job workers because coverage depends on workers' union membership. As I show in Section 5 most mini-job employees work less than 15 hours per week and earn between €7 to €10 per hour. However, some mini-job employees report working nearly full-time hours and earning less than €4 per hour.[25]

3 Behavioral Responses to the Mini-Job Threshold

3.1 Conceptual Framework

Previous studies have treated kinks, discrete changes in *marginal* tax rates, and notches, discrete jumps in the overall tax liability, in isolation. The bunching approach pioneered by Saez (2010) allows researchers to calculate the elasticity of taxable income with respect to the net-of-tax rate by estimating the excess mass at the kink of the tax schedule. The approach relies on the fact that the definition of elasticity implies a proportional relationship between the elasticity and the amount of excess mass at the tax threshold in the distribution of earnings. Saez (2010) applies the method to study responses to kinks in the personal income tax and Earned Income Tax Credit schedules in the U.S. Kleven and Waseem (2013) have extended the bunching method by applying it to small notches in the personal income tax schedules in Pakistan. Both approaches rely on the ability of a researcher to credibly estimate the counterfactual distribution – hypothetical earnings distribution in the absence of tax change – and therefore bunching at the kink or notch. But while kinks and notches both lead to bunching at the threshold they have different implications on the shape of the counterfactual earnings distribution. A kink leads to a left-ward shift in the distribution of the earnings, resulting in no missing mass to the right of the threshold.[26] A notch, on the other hand, generates a strictly dominated region of earnings to the right of the threshold and therefore leads to a missing mass. Therefore, kinks and notches require different approaches to recover the counterfactual distribution. When estimating elasticities, Kleven and Waseem (2013) explicitly assume that the entire response is driven by the notch and therefore the entire bunching could be redistributed to the right of the threshold to recover the counterfactual earnings density. Because

they worked less than 15 hours per week. Earnings below the larger of €165 per month or 20% of one's previous earnings did not affect one's unemployment insurance payments, but earnings above that limit were withdrawn at a 100% rate. After the 2005 reform, individuals receiving contributory-based unemployment benefits continued to be subject to the €165 limit. At the same time, those receiving newly created unemployment benefits II were subject to a lower limit of €100. Any earnings above the €100 limit, however, were subject to an 80% withdrawal rate up to a gross income of €800 and 90% above. Besides changing the exemption limits, the unemployment benefit reform has also decreased the generosity of unemployment benefits (both type I and type II) and decreased the duration of type I unemployment benefits. Overall, the reform incentivized the return to the labor force.

[25]These survey reports are consistent with anecdotal evidence of very low wages in Germany. For example, in a 2012 article, Reuters quote a head of a local job agency report that some employees earn as little as 55 cents per hour, see `http://tinyurl.com/reuters2012-lowwages`. See also `http://tinyurl.com/nytimes2011-lowwages`.

[26]While there will be no missing mass, there could be a discontinuous jump or a drop in the distribution of observed earnings depending on whether the counterfactual distribution is increasing or decreasing.

the authors study small discrete changes in the proportional tax rates – tax rates increase by 2.5% percentage points – this assumption is reasonable. The assumption is no longer valid in case of mini-jobs in Germany. At the mini-job threshold the marginal tax rate increases by roughly 20 percentage points for single individuals and even more for married. In addition, individuals experience a large discontinuous jump in the total tax liability, ranging from €28 to €145 depending on year and marital status. Because of such dramatic changes in tax liability at the threshold, it is necessary to separately account for the effect of the changing marginal tax rate and a discrete change in tax liability in order to generate an unbiased estimate of earnings elasticity.

In this section I extend the framework of Saez (2010) and Kleven and Waseem (2013) to consider large changes in marginal tax rates and large discrete jumps in tax liability at the thresholds. I assume individuals maximize utility functions $u(c, z)$ that are increasing in consumption c and decreasing in before-tax income z subject to a budget constraint $c = z - T(z)$. The crucial assumption of the framework is that under a flat tax t, individuals' density of incomes $h(z)$ is smooth and continuous. For simplicity of exposition, I assume that the heterogeneity in incomes z stems only from the heterogeneity in abilities imbedded in utility functions $u(c, z)$. I will return to the more generous case, where individuals' labor supply elasticities vary with ability, at the end of the section. Suppose that individuals' actual tax liability $T(z)$ depends on an individuals' gross income z:

$$T(z) = \begin{cases} t_1 z & \text{if } z \leq K \\ \Delta T + t_1 K + t_2(z - K) & \text{if } z > K, \end{cases} \tag{1}$$

where t_1 and t_2 are marginal tax rates below and above threshold K and ΔT is a lump-sum tax individuals must pay whenever their earnings exceed K. The tax schedule thus presents a combined kink-notch at K, where $t_2 - t_1$ determines the size of the kink, i.e. an increase in the marginal tax rate, and ΔT the size of the notch, i.e. a discrete change in the tax liability at the threshold.

Figure 2 illustrates the effects of kinks and notches on labor supply separately. Panel A shows the resulting budget constraint, drawn in bold. The increase in the tax rate from t_1 to t_2 rotates the budget constraint at the threshold, resulting in a dashed line. Individuals who wish to earn between K and z_{kink} under the tax rate t_1 would instead bunch and earn income K when the tax rate increases to t_2. Thus, the kink will generate some bunching as shown in Panel B and lead to a parallel leftward shift of the distribution of earnings. The discrete increase in the tax liability generated by the pure notch ΔT will shift the budget constraint downward from the dashed line to a bold line, as shown in Panel A of Figure 2. This notch will create a region of strictly dominated incomes, so that no individual would choose to earn between K and z_{notch}. The notch will thus lead to further bunching at the threshold K and generate a hole in a final distribution of incomes, as shown in Panel B with a bold curve. Panels A and B of Figure 2 thus show that the size of the missing mass and the proportion of bunching attributed to the notch will depend on the relative magnitudes of the marginal tax rate change and the discrete jump in tax liability. Because the construction of the counterfactual depends on the accurate identification of the missing mass to the right of the threshold, as a first step one must determine what proportion of bunching is to

be attributed to the notch. To do so recall that the size of the response to either kink or notch is determined by the elasticity of earnings. Using the definition of taxable income elasticity with respect to the net-of-tax-rate

$$e \equiv \frac{dz/z}{dt/(1-t)}, \tag{2}$$

one can approximate the amount of bunching due to the kink as in Saez (2010):

$$B_{kink} \approx \Delta z_{kink} \cdot h(K) = e \cdot \frac{t_2 - t_1}{1 - t_1} \cdot K \cdot h(K), \tag{3}$$

where $h(K)$ denotes the counterfactual density at the threshold K. Because the elasticity is determined by *marginal* changes, in order to relate elasticity of taxable earnings to the notch, one must approximate the discrete change in total tax liability with an equivalent implicit marginal tax rate change as suggested by Kleven and Waseem (2013). From the definition of marginal tax rate it follows that an increase in the tax liability due to the notch of size ΔT can be approximated as an increase in marginal tax rate from t_1 to

$$\hat{t}_3 \approx \frac{T(K + \Delta z_{notch}) - T(K)}{\Delta z_{notch}} = \frac{[\Delta T + t_1 K + t_1 \Delta z_{notch}] - [t_1 K]}{\Delta z_{notch}} = t_1 + \frac{\Delta T}{\Delta z_{notch}}. \tag{4}$$

Using definition (2) and equation (4) one can approximate the bunching resulting from a notch ΔT as

$$B_{notch} \approx \Delta z_{notch} \cdot h(K),$$

where Δz_{notch} solves

$$e = \frac{\Delta z_{notch}/K}{(\Delta T/\Delta z_{notch})/(1-t_1)}.$$

Solving for Δz_{notch} yields

$$B_{notch} \approx \Delta z_{notch} \cdot h(K) = \sqrt{\frac{eK\Delta T}{1-t_1}}. \tag{5}$$

Together equations (3) and (5) relate the amount of total bunching at the threshold K, $B_{kink} + B_{notch}$, to the elasticity of earnings with respect to net-of-tax rate. Moreover, they specify the proportion of total bunching attributable to the kink and to the notch respectively. Several observations are worth noting from equations (3) and (5). First, when $\Delta T = 0$ then $B_{notch} = 0$ and therefore the entire bunching is due to the kink. Similarly, when $t_2 = t_1$ then $B_{kink} = 0$ and the entire bunching will be due to the notch. However, for any small changes in tax rates some bunching will always be attributed to the kink only. Second, while bunching due to the kink increases proportionally to the elasticity, bunching attributed to the notch increases at a slower rate.[27] Therefore when calculating the proportion of the bunching due the notch one must know the underlying elasticity – which is usually unknown and is typically the variable of interest. To

[27] The intuition behind this result is that while a kink changes marginal incentives for all individuals located to the right of the threshold, the notch only influences individuals closest to the threshold, with strongest incentives for individuals located in the strictly dominated region.

solve this, I implement an iterative procedure that starts with an elasticity guess and iterates until a fixed point is found.

Elasticity formulas derived in (3) and (5) assume that elasticities are constant across individuals. These formulae also apply to cases where elasticities are heterogeneous. If the distribution of elasticities is independent from the distribution of ability, (3) and (5) estimate average elasticity in the population. If, on the other hand, the distribution is joint, (3) and (5) estimate average elasticity of individuals at income level K.[28]

3.2 Elasticity Estimation Procedure

The conceptual framework presented in the previous section allows me to estimate elasticities of taxable income with respect to the net-of-tax rate by estimating the excess mass at the mini-job threshold in Germany. The estimation strategy relies on accurate estimation of the counterfactual density – the density that describes what the earnings distribution would be if all jobs in Germany followed mini-job rules – using observed density of earnings. I begin by grouping individuals into small bins of €X based on workers' monthly incomes. Let C_j denote the number of individuals in income bin j, for example, bin C_1 records the number of individuals earning (€0, €X] and so forth.

Combining the approaches of Chetty et al. (2011) and Kleven and Waseem (2013), I proceed as follows. I start with a guess of elasticity, e_0, and estimate a corresponding proportion of bunching due to the notch, $\pi_{notch} \equiv B_{notch}/(B_{notch} + B_{kink})$, using equations (3) and (5). Next, I identify a counterfactual distribution by estimating the following regression:

$$C_j = \sum_{i=0}^{q} \beta_i \cdot (Z_j)^i + \sum_{i=z_l}^{z_u} \gamma_i \cdot \mathbf{1}[Z_j = i] + \varepsilon_j^0, \tag{6}$$

where C_j represents the number of individuals in income bin j described above, Z_j is the average income level in bin j, q is the order of polynomial which is fitted to the counts, z_l and z_u determine the size of the excluded region around the mini-job threshold, such that $z_l < K \leq z_u$.[29]

[28] To see this, suppose ability and elasticities are jointly distributed according to some distribution $\psi(z, e)$. Then $h(K) = \int_e \psi(K, e)de$. Define $\bar{e}_K \equiv \int_e e\psi(K, e)de/h(K)$ to be the average elasticity at earnings level K. Then from (3) follows that the number of individuals bunching at K due to a kink of size $t_2 - t_1$ is equal to

$$B_{kink} = \int_e eK(t_2 - t_1)/(1 - t_1)\psi(K, e)de = \bar{e}_K h(K)K(t_2 - t_1)/(1 - t_1).$$

Note that the independence of ability and elasticity distributions implies

$$\bar{e}_K \equiv \int_e e\psi(K, e)de/h(K) = \int_e \phi(e)de = \bar{e},$$

where $\phi(e) = \psi(z, e)/h(z)$. Similarly, from (5) follows that bunching due to a notch ΔT is equal to

$$B_{notch} = \int_e \sqrt{\frac{eK\Delta T}{1 - t_1}}\psi(K, e)de = \sqrt{\frac{K\Delta T}{1 - t_1}} \int_e \sqrt{e}\psi(K, e)de \leq \sqrt{\frac{e_K K\Delta T}{1 - t_1}},$$

where the last step follows from Jensen's inequality. Therefore, if there is heterogeneity in the population, the elasticities estimated will represent the lower bound on the magnitude of true behavioral response.

[29] Here I assume that bunching will fall into the interval $[z_l, K]$ because individuals are unable to precisely locate at

The counterfactual distribution is defined by the predicted values from (6) omitting the dummies: $\hat{C}^0 = \sum_{i=0}^{q} \hat{\beta}_i^0 \cdot (Z_j)^i$. Excess mass $\hat{B}^0$ and missing mass $\hat{M}^0$ are calculated as the difference between observed empirical density counts C_j and estimated counterfactual counts $\hat{C}_j^0$ in the earnings intervals $(z_l, K]$ and $(K, z_u]$ respectively: $\hat{B}^0 = \sum_{j=z_l}^{K}(C_j - \hat{C}_j^0) = \sum_{j=z_l}^{K} \hat{\gamma}_j^0$ and $\hat{M}^0 = \sum_{j=K}^{z_u}(\hat{C}_j^0 - C_j) = -\sum_{j=K}^{z_u} \hat{\gamma}_j^0$. The lower bound of the excluded region z_l is estimated visually.[30] To estimate z_u, I make use of the fact that the amount of bunching due to the notch should be equal to the missing mass to the right of the threshold. I start by setting $z_u = K + 1$ and keep increasing z_u by one bin until the estimated excess mass due to the notch equals the estimated missing mass, i.e. until $\pi_{notch} \cdot \hat{B}^0 = \hat{M}^0$.

The resulting counterfactual, $\hat{C}_j^0$, does not account for the fact that the excess mass due to the kink comes from the individuals moving from points of the distribution to the right of the threshold, and therefore $\hat{B}^0$ resulting from (6) overestimates the true excess mass. To correct for this I adjust the estimated counterfactual distribution upward until the area under the counterfactual equals the area under the empirical distribution. This iterative procedure is equivalent to estimating the following regression:

$$C_j \left(1 + \mathbf{1}[j > z_u] \frac{\hat{B}}{\sum_{j=z_u+1}^{\infty} C_j}\right) = \sum_{i=0}^{q} \beta_i \cdot (Z_j)^i + \sum_{i=z_l}^{z_u} \gamma_i \cdot \mathbf{1}[Z_j = i] + \varepsilon_j. \tag{7}$$

The final estimate of bunching for the original guess of elasticity is then calculated as $\hat{B} = \sum_{j=z_l}^{K}(C_j - \hat{C}_j) = \sum_{j=z_l}^{K} \hat{\gamma}_j$ where $\hat{C}_j = \sum_{i=0}^{q} \hat{\beta}_i (Z_j)^i$ are the fitted values from regression (7).[31] In line with the previous research, see Chetty et al. (2011) and Kleven and Waseem (2013), I define a measure of total excess bunching $\hat{b}$:

$$\hat{b} \equiv \frac{\hat{B}}{\hat{h}(K)} = \frac{\hat{B}}{\sum_{j=z_l}^{K} \hat{C}_j / (K - z_l + 1)}. \tag{8}$$

The elasticity of earnings with respect to the net-of-tax rate can then be calculated by substituting $\frac{\hat{B}_{kink}}{\hat{h}(K)} = \pi_{kink} \cdot \hat{b}$ into equation (3), or alternatively, by substituting $\frac{\hat{B}_{notch}}{\hat{h}(K)} = \pi_{notch} \cdot \hat{b}$ into equation (5).

The described calculations provide an elasticity estimate $\hat{e}$ based on the original guess e_0. Provided the estimated elasticity does not match the guess, i.e. $\hat{e} \neq e_0$, I update the guess to $\hat{e}$ and repeat the calculations for the new guess. I proceed with these iterations until a fixed point is achieved, such that $\hat{e} = e_0$.

Standard errors are calculated using a parametric bootstrap procedure where a large number

the threshold. Because having income just above the threshold would still subject a worker to a lump-sum tax notch, the excess mass will be located strictly to the left of the threshold. The interval $(K, z_u]$ determines the interval of earnings where the observed distribution will lie below the counterfactual distribution.

[30] This is a standard approach in bunching methodology. While such selection might sound ambiguous, in practice it is not. Bunching around the threshold is very sharp, and with well-defined bounds.

[31] This adjustment effectively corrects for the shift of the counterfactual due to the kink. Such shift generates a discontinuous drop in the observed earnings distribution at the threshold. The upward adjustment corrects for this drop.

of estimated vector of errors ε_j are drawn from (7) with replacement. The new errors are used to generate a large number of earnings distributions and, employing the technique above, corresponding estimates of $\hat{b}$. Standard errors are defined as the standard deviation of the distributions of excess bunching measures $\hat{b}$ and elasticities $\hat{e}$. The bootstrap procedure takes into account both iterative processes: it incorporates both a search for an optimal missing mass, i.e. finding z_u, and a search for a fixed point elasticity.

3.3 Earnings Data Description: SIAB

The main source of data is the weakly anonymous Sample of Integrated Labor Market Biographies (Years 1975 - 2010).[32] The Sample of Integrated Labor Market Biographies (SIAB) provides information on employment, job search and receipt of unemployment benefits for a 2% sample of the wage-earners in Germany.[33] The SIAB provides labor histories of 1,639,325 individuals from 1975 until 2010. However, the information on mini-job workers who are the main subject of this study is only available starting from 1999. Employment histories consist of employer notifications which are submitted when an employee is hired, is terminated, switches contribution groups, or changes health insurance company, when an employment is interrupted, or when an employer changes payroll system. In addition, all employment relationships that exist as of December 31 generate an end-of-the-year notification. Thus if no changes are made to the employment relationship then only one notification is recorded per year. Otherwise, multiple notifications, that are precise to the day, are recorded. Because the SIAB data includes all notifications submitted by employers on behalf of their employees, some duplicate entries are present. Appendix A carefully describes how duplicate observations are identified and the number of dropped observations. The data provides demographic and establishment variables such as sex, age, citizenship status, education, occupation, economic activity of the establishment, number of employees at the establishment and the median wage. In addition to labor histories, detailed information on the receipt of unemployment benefits and job search is available.[34] Marital status and number of children is known only for benefit recipients and those engaged in job search.[35]

To study the effect of payroll and income taxes on labor supply I aggregate wages reported throughout the year to calculate average monthly earnings. For individuals with one full year of uninterrupted employment average monthly income is calculated as the reported daily wage times 365 divided by 12. For individuals with multiple employment periods, earnings from all individual periods are added (calculated as daily wage times the number of days in the period), and either

[32]Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and subsequently remote data access.

[33]The 2% sample comprises of all individuals who were subject to Social Security or received unemployment benefits according to Social Code books II and III (since 1975), have been marginally employed (since 1999), or registered as a job seeker or participated in a training measure (since 2000). In short, the SIAB dataset presents a 2% sample of the *non-self-employed* labor force in Germany.

[34]Prior to 2005, spells of unemployment benefits and unemployment assistance are recorded, while after 2005 the data includes information on the receipt of unemployment benefits I and II.

[35]Thus the marital status and the number of children are only known for years when individuals received unemployment benefits or engaged in job search.

divided by 12 – if the total number of days in all periods is greater or equal to 365 – or divided by the total number of days and multiplied by 30.[36]

The core sample is restricted to individuals in regular and marginal jobs; employments of other types, e.g. trainees, casual workers, etc, are dropped. Unless otherwise noted I further restrict the sample to individuals aged 26 through 59. I do so for two reasons: first, a large number of secondary and postsecondary students receive funding through the Federal Training Assistance Act (BAföG). While the students are allowed to hold part-time jobs, BAföG stipends are withdrawn euro per euro when earnings exceed €400 per month. BAföG stipends can be, in principle, received at any age, therefore some individuals in my sample might be responding to the BaföG incentives rather than the mini-job threshold. The number of such individuals older than 25, however, should be small and is unlikely to have any effect on the estimates.[37] Second, individuals in partial retirement, for which they may qualify starting from age 60, become subject to an earnings test on their retirement benefits if their earnings exceed €400.

3.4 Size of the Kink and Notch

Earnings elasticity formulas (3) and (5) relate the amount of bunching at the threshold to the prevailing marginal tax rates t_1 and t_2 and the lump-sum tax ΔT. When calculating earnings elasticities I will follow the standard neoclassical framework and assume that the social security and income taxes are fully passed through to the employee. Further, I focus on changes in marginal tax rates that apply to *gross* earnings – actual wages paid plus the employer portion of social security taxes. I will refer to three tax rates: τ_{Mini} denotes the prevailing mini-job social security rate that employers must pay on mini-job earnings, τ_{Full} determines the full social security tax rate that is split equally between employers and employees, and τ_{Income} refers to the marginal income tax rate at the mini-job threshold K. Note that the threshold K applies to *posted* earnings – wages paid to the workers by firms before income taxes and the employee portion of social security taxes are withheld.

The budget constraint (1) in terms of *gross* earnings prior to April 1, 2003 can be summarized as

$$T(X_g) = \begin{cases} \frac{\tau_{Mini}}{1+\tau_{Mini}} \cdot X_g & \text{if } X_g \leq \bar{K} \\ \Delta T_{income} + \frac{(\tau_{Full}+\tau_{Income})\bar{K}}{1+0.5\tau_{Full}} - \frac{(\tau_{Mini}+\tau_{Income})\bar{K}}{1+\tau_{Mini}} & \\ \qquad + \frac{\tau_{Mini}}{1+\tau_{Mini}} \cdot \bar{K} + \frac{\tau_{Full}+\tau_{Income}}{1+0.5\tau_{Full}}(X_g - \bar{K}) & \text{if } X_g > \bar{K}, \end{cases} \tag{9}$$

where $\bar{K} \equiv (1+\tau_{Mini})K$. Equation (9) shows that mini-jobs are exempt from income and employee-paid social security taxes, while both types of taxes are due upon crossing the mini-job threshold.[38]

[36] For individuals with multiple jobs throughout the year, this measure will give the average income from all jobs combined. For individuals that worked only part of the year, the measure will give average earnings while working, disregarding periods of unemployment.

[37] From 2004 through 2013 the total number of BAföG recipients ranged from 532,000 to 620,000, among these less than one third was given to postsecondary students. See the Federal Ministry of Education and Research statistics, `http://www.bmbf.de/pubRD/10_Year_Overview_.pdf`.

[38] Since jobs with monthly *posted* earnings below the mini-job threshold are exempt from income taxes and the

I separate the income tax into a lump-sum and marginal tax rate portions because Germany has continuously progressive marginal tax rates. Therefore income tax rate τ_{Income} is not fixed. Thus, ΔT_{Income} gives the true value of income tax due when *posted* income equals the mini-job threshold K, while τ_{Income} approximates the marginal tax rate at the threshold. After the 2003 reform, the tax schedule (1) becomes

$$T(X_g) = \begin{cases} \frac{\tau_{Mini}}{1+\tau_{Mini}} \cdot X_g & \text{if } X_g \leq \bar{K} \\ \Delta T_{Income} + \left(\frac{1}{1+0.5\tau_{Full}} - \frac{1}{1+\tau_{Mini}}\right)(2\tau_{Full} - \tau_{Mini} + \tau_{Income})\bar{K} & \\ \qquad + \frac{\tau_{Mini}}{1+\tau_{Mini}}\bar{K} + \frac{2\tau_{Full}-\tau_{Mini}+\tau_{Income}}{1+0.5\tau_{Full}}(X_g - \bar{K}) & \text{if } X_g > \bar{K}, \end{cases} \tag{10}$$

where $\bar{K} \equiv K(1 + \tau_{Mini})$. Equation (10) shows a decrease in the size of the notch at the mini-job threshold because the social security liability has been reduced.[39]

Equations (9) and (10) specify how marginal and average tax rates change at the mini-job threshold. Table 1 summarizes the social security, τ_{Mini} and τ_{Full}, and *average* income notch ΔT_{Income} and marginal tax rate τ_{Income} for men and women. Corresponding budget constraints are shown in Figure 1. Because Germany allows for joint taxation of married couples, the size of the income tax notch ΔT_{Income} and marginal income tax rate τ_{Income} depend on individual's marital status. Since the SIAB data does not contain information on spousal earnings, I estimate the size of the average income tax notch at the mini-job threshold using the German Socio-Economic Panel (SOEP). In other words, ΔT_{income} and τ_{Income} that I use in (9) and (10) represent the average marginal tax rate and average tax notch experienced by individuals who earn approximately the mini-job threshold amount.[40] When calculating spousal incomes I take three types of earnings into account: labor earnings (regular and self-employed), social security pensions (old-age, disability, and widowhood) and private retirement pensions (supplementary civil servant pension income, company pensions, private pensions and pension income from "other" sources as reported in the SOEP).[41]

Figure 1 shows that the social security notch was almost fully erased in 2003, when the social security liability was smoothed at the mini-job threshold. Table 1 show that women experience the largest income tax notch at the threshold, ranging between €80 to €99 depending on the year. Men experience smaller income notch at the threshold, ranging from €28 to €34. Tax notches also

employee portion of social security contributions, *gross* wages X_g below the mini-job threshold are subject to a total tax $T(X_g) = \tau_{Mini} \cdot X_p = \frac{\tau_{Mini}}{1+\tau_{Mini}} \cdot X_g$. Prior to April 1, 2003, posted wages X_p above the mini-job threshold were subject to a total tax $T(X_g) = \Delta T_{income} + \tau_{Full} X_p + \tau_{Income} \cdot (X_p - K) = \Delta T_{income} + \tau_{Full} \frac{X_g}{1+0.5\tau_{Full}} + \tau_{Income}\left(\frac{X_g}{1+0.5\tau_{Full}} - K\right)$, where ΔT_{Income} is the lump-sum amount of income tax a person must pay when earning precisely K, and τ_{Income} is the MTR at K.

[39] Starting from April 1, 2003, employees pay reduced social security rates when their earnings exceed the mini-job threshold, but remain under €800. The total tax liability for posted wages X_p is $T(X_g) = [K\frac{\tau_{Mini}}{\tau_{Full}} + (2 - \frac{\tau_{Mini}}{\tau_{Full}})(X_p - K)] \cdot \tau_{Full} + \tau_{Income} X_p = \frac{2\tau_{Full}-\tau_{Mini}+\tau_{Income}}{1+0.5\tau_{Full}} X_g - 2K(\tau_{Full} - \tau_{Mini}) + \Delta T_{Income} - \tau_{Income} K$.

[40] For details of the calculations see Appendix B.1.

[41] Prior to 2005 statutory pensions were tax-exempt. Starting from 2005, 50% of pension earnings are subject to income tax, and the percentage has been increasing by 2 percentage points each year. Taxation of private pensions vary, but for simplicity I assume that the entire amount of pension is subject to income tax. In the Appendix B.1 I consider alternative income specifications and show that calculations are again not sensitive to the specification.

vary greatly by age. The largest notch is experienced by middle-aged women and smallest by young individuals under age 25.

3.5 Labor Responses to Mini-Job Threshold

3.5.1 Graphical Evidence

Figures 3 and 4 show the distribution of monthly *posted* wage earnings of women and men by calendar year. Each point shows the number of individuals in a €25 bin, scaled to represent the German population in that year from a 2% SIAB representative sample. The vertical red lines identify mini-job thresholds: €325 prior to 2003 and €400 thereafter. Several observations are striking. First, both men and women show strong responses to tax incentives in the form of sharp bunching at the threshold. Second, bunching is concentrated just below the threshold with little excess mass above the threshold consistent with the existence of a notch. Since the tax liability is incurred immediately upon crossing the mini-job threshold, individuals optimize by earning at or below the mini-job threshold. Third, bunching is substantially larger for women than for men. Typically, there are about 4 times more women working in at-the-threshold mini-jobs than men, which is consistent with women having higher labor supply elasticities than men. Fifth, when the threshold increases from €325 to €400 on April 1, 2003, bunching follows rapidly. In the year of the change, in 2003, there is substantial bunching at the new threshold. Already by the end of 2004 roughly two thirds of the excess mass is shifted to the new threshold. Such rapid shift in the the hours worked suggests that both individuals and firms are able to adjust labor hours quickly. Finally, in addition to bunching at the mini-job threshold there is some bunching at €165 and €100 due to incentives generated by the unemployment benefits.[42]

Figures 3 and 4 show earnings distributions by year for men and women aged 26 through 59. In Figure 5 and 6, on the other hand, I plot earnings distributions for men and women by 5 age groups: under 25, 25-25, 35-45, 45-55 and 55-65 year olds. For comparison I show respective earnings distributions in 1999-2002 and in 2003-2010. Bunching patterns in Figures 5 and 6 show substantial heterogeneity between men and women of different age groups. For women, bunching shows inverse U-shaped relationship with age, with most bunching observed for 35-45 year old women. This observation is consistent with tax incentives experienced by women: as spousal income increases with age, the incentive to bunch increases, while child-rearing responsibilities further reduce incentives to work long hours. For men, bunching shows U-shaped relationship, with most bunching observed for young men (likely corresponding to students receiving BAföG stipends) and older men in early retirement. This relationship is again consistent with work needs throughout

[42]Individuals receiving unemployment insurance – both UI and unemployment assistance prior to 2005 and unemployment benefits type I from 2005 on – can earn part-time income as long as they work less than 15 hours per week and earn less than €165 or 20% of previous earnings, whichever is smaller. If earnings exceed the €165 limit, unemployment benefits are reduced at a 100% withdrawal rate. It is thus not surprising to see stronger bunching for men than women, since men are more likely to claim unemployment benefits. The €100 threshold was introduced in 2005 and affects individuals receiving unemployment benefit type II. If their earnings exceed €100, benefits are withdrawn at a rate of 80% up to €800 and 90% for higher incomes.

men's lives: younger and older men prefer part-time employment, while middle-age men seek out full-time jobs. Figures 5 and 6 also show considerable heterogeneity in the speed of adjustment to the new threshold. Younger individuals adjust the fastest, as can be seen by relatively small excess bunching at the €325 threshold in 2003-2010. Older individuals adjust slower with oldest men adjusting the slowest: large number of males aged 55-65 continued to bunch at the old threshold in 2003-2010.

3.5.2 Elasticity Estimation Assumptions

As discussed in Section 3.1, the bunching approach relies on one crucial assumption: in absence of the mini-job notch and kink, under a flat tax schedule, the distribution of earnings would have been continuous. The empirical approach outlined in Section 3.2 then recovers average elasticity in the population if the distributions of ability and elasticities are independent and an average elasticity of individuals at the mini-job level of income if ability and elasticities are distributed jointly.

I make two more simplifying assumptions. First, I assume that individuals perceive social security contributions as a tax and do not value social security benefits gained from regular employment. Social security contributions provide individuals with three main benefits: unemployment insurance, health insurance and pension insurance. For married women with working spouses, health insurance can be obtained through the spouse, however, unemployment and pension insurance are based on individual contribution record. This assumption is weakly consistent with evidence that people do not assign high value to pension benefits, see Fitzpatrick (2014) and Tazhitdinova (2015), and means that the estimated elasticities represent a *lower* bound on the true magnitude of behavioral response.

Second, I explicitly assume that only tax liabilities of individuals change at the threshold. This assumption thus further disregards the possibility that mini-jobs and regular jobs differ in fringe benefits they provide or job security and likelihood of promotion. If regular jobs offer better job security or increase the probability of being promoted, the elasticity estimates described in this section represent a *lower* bound on the true elasticities of earnings with respect to net-of-tax rate. The assumption further disregards the possibility that gross wages of mini-job and regular workers of identical abilities differ, in which case gross earnings do not accurately reflect the working hours of individuals. I study the wage differential between mini-jobs and regular jobs in Section 5 and find that mini-job gross wages are approximately 6% higher than gross wages of regular employees, reflecting lower fringe benefits paid to mini-job workers. I discuss how these differences in gross wages and fringe benefits affect elasticity estimates in Section 5.5. Because most fringe benefits paid to regular workers carry substantial monetary values, they are likely to be valued at actuarially fair rates.[43] Under this assumption, elasticities shown in Figure 7 are estimated correctly.

[43]Results in Section 5 suggest that mini-job workers receive smaller bonuses and fewer paid vacation days. Bachmann et al. (2012) and Wippermann (2012) find that in addition to aforementioned benefits, mini-job workers also do not receive such benefits as statutory holiday pay, sick day pay, maternity leave pay, and company training. Since these benefits carry clear monetary value, they are likely to be valued by individuals in actuarially fair way.

3.5.3 Elasticity Estimates

I follow the estimation procedure outlined in Section 3.2 and tax rate changes described in Section 3.4 to calculate the earnings elasticities with respect to net-of-tax rate. Figure 7 summarizes elasticity estimates and corresponding excess mass (recall definition (8)) by year for men and women.[44] To calculate elasticities, I fit a 5th degree polynomial to the empirical distribution of *gross* earnings: it is important to use the distribution of gross earnings because the posted earnings (shown in Figures 3–6) already account for differences in employer-paid social security taxes below and above the threshold, making the comparison inappropriate.[45,46] The lower bound of the exclusion region z_l is determined visually and ranges from 3 bins (not including the threshold bin) 1999-2002 to 6 bins in 2006. The estimation procedure starts with an initial guess of $e_0 = 0.05$ and iterates until a fixed point is reached. Bootstrap standard errors are based on 1000 iterations. The estimated elasticities are not very sensitive to the specification. In Appendix B.2 I describe the estimation process and consider smaller income bins (€12.5) and different degree of polynomial ($d = 4, 5, 6$).

The results in Figure 7 show that yearly elasticity point estimates range from 0.20 to 0.37 for women and 0.09 to 0.25 for men. Excess bunching, on the other hand, shows smaller variation, ranging from 7.16 to 10.79 for women and from 3.05 to 5.59 for men. Results show a decrease in elasticities in 2003-2005 for women and in 2001-2002 for men, followed by a steady increase from 2005 on. The standard errors are relatively small for women, and show a clear increase in elasticities from 2004 on. The results for men are much noisier, but the difference between elasticities in earlier years (1999–2002) and later years (2006-2010) is statistically significant.

Calculated elasticities are substantially larger than has been previously estimated using the bunching method and it is unlikely that the institutional and demographic differences alone can explain the magnitude. For comparison, Saez (2010) finds elasticities of 0.003–0.025 (statistically insignificant) for wage earners around the EITC limits in the USA; Chetty et al. (2011) estimate elasticities of approximately 0.01 for all wage earners, 0.02 for women, and 0.06 for married women professionals in Denmark; and Bastani and Selin (2014) find statistically significant elasticity of 0.001 for wage earners in Sweden. The elasticities estimated in this paper are of comparable magnitude to elasticities estimated using non-bunching methods. For example, point estimates of the elasticity of working hours with respect to net-of-tax wage estimated by MaCurdy (1981), Eissa and Hoynes (2006), Blundell et al. (1998) and Ziliak and Kniesner (1999) range between 0.09 to 0.44.

There are two institutional reasons why elasticities derived from the responses to the mini-job

[44] The actual fits of the counterfactual distributions are available in the Web Appendix.

[45] Assuming wages reflect all labor costs, an individual earning €400 in a mini-job in 2010 would have to work more hours than a person earning €400 in a regular job, because the employer-paid social security tax rate for mini-jobs was approximately 10% higher than for regular jobs.

[46] The empirical distributions are generated by multiplying reported posted earnings of mini-job workers by $1+\tau_{Mini}$ and earnings of regular employees by $1+0.5\tau_{Full}$. Because $\tau_{Mini} > \tau_{Full}$ there is a small number of regular employees whose gross earnings fall in the interval $(K(1+0.5\tau_{Full}), K(1+\tau_{Mini})]$. These individuals are dropped, so that all observations below the gross mini-job threshold $K(1+\tau_{Mini})$ correspond to observations below the official posted mini-job threshold K.

threshold may be larger than previous estimates. First, this study focuses on part-time workers who are likely to have greater ability to adjust working hours and locate at the mini-job threshold. Second, the magnitude of the notch and kink at the mini-job threshold is particularly large, providing stronger incentives to optimize. In the rest of this section I argue that while these explanations are likely to account for part of the magnitude, they do not present a sufficient explanation.

Saez (2010) finds little response among the part-time workers to the first kink of the EITC (which has been set at approximately $8,500), lending little support to the notion that part-time workers must show stronger responses. In a related setting, Tazhitdinova (2015) studies labor supply responses to the kink generated by the payroll tax exemption threshold in the UK. In the UK, earnings below the primary/secondary payroll threshold are exempt from employee/employer portions of the National Insurance Contributions (NIC). For several years, from 2001 to 2007, this payroll threshold coincided with the income tax exemption threshold and ranged in value from £4,525 to £5,200. Crossing the threshold implied an increase in combined payroll-income tax from 0% to 30%.[47] While the kink also affects part-time workers, Tazhitdinova (2015) finds small bunching at the threshold and estimates elasticities of around 0.04-0.08.

The combined kink and notch at the mini-job threshold is indeed the largest among previous studies. The comparison, however, is inappropriate because previous studies focused on the income tax changes alone and disregarded payroll taxes, while in this study, payroll tax rates are incorporated into the calculation of the magnitude of the kink and notch. For example, Bastani and Selin (2014) study responses to a kink which increases the income tax from 36.4% to 59.7%. When one does not account for payroll taxes, the simple percent change in taxes is $\frac{t_2-t_1}{1-t_1} = 36.6\%$, however, if one incorporates flat payroll tax of 20%, the tax change increases to 53.4%.[48] In short, if previous studies would have incorporated the underlying payroll taxes, as this study does, the elasticity estimates would have been even smaller.

As suggested by Chetty et al. (2011), sharper tax changes generate strongest incentives for individuals to optimize and thus could lead to stronger observed responses when workers incur large job search costs. Chetty (2012) estimates that if one accounts for frictions, previous studies suggest an average Hicksian labor supply elasticity of 0.33, which is in line with many estimates from Figure 7. Such comparison, however, implies that individuals experience zero adjustment costs in Germany, which is a strong assumption and is unsupported by the presence of individuals immediately to the right of the threshold in 1999-2002 when the threshold presented a notch for all individuals. The counterfactual fits show that nearly 35% to 55% of individuals are unresponsive to tax incentives and experience sufficiently high adjustment costs that prevent them from moving away from the strictly dominated region. Kleven and Waseem (2013) use the share of unresponsive workers to scale elasticities to account for the percent of individuals affected by the frictions costs in Pakistan and calculate an upper bound on the taxable income elasticity of less than 0.094 for wage earners. Applying this approach to this paper would make elasticities 1.5-2 times larger.

[47] Calculated as the sum of employee (11%) and employer (12.8%) payroll taxes, and 10% income tax divided by one plus employer payroll tax of 12.8%.

[48] Calculated as $\frac{0.597-0.364}{1-0.364-0.2} = 53.4\%$.

Finally, it is worth noting that the earnings distributions are completely smooth with the exception of bunching at the mini-job threshold and at the unemployment insurance threshold. From 2004 until 2008 the first bracket of income tax started at €7,664 (corresponding to a monthly wage of €639) and introduced a 15% kink in the tax schedule of individuals. If individuals have an average elasticity of 0.3, following (3) this kink would lead to an excess mass of $b = 0.3 \cdot 0.15 \cdot 7,664/12/25 \approx 1.14$. However, there is no apparent bunching in the vicinity of €639 in Figures 3 and 4 in 2004–2008. A possible explanation is that bunching is diffused because of the joint taxation in Germany. However, distributions of men and women under age 25, who are likely to be single, in Figures 5 and 6 are also smooth. There is also no bunching around the first kink of the income tax schedule in a subsample of single individuals. Unfortunately, a similar exercise cannot be applied to other tax brackets because the income tax schedule in Germany consists of continuously increasing marginal tax rates. As an additional robustness check, I estimate elasticity of taxable income around the first kink of the income tax schedule in 1998 and 2001 using Wage and Income Tax public-use datasets.[49] I find small taxable income elasticities, ranging from 0.04 to 0.09, see Figure 8. These elasticities are several times smaller than the elasticities estimated in this study, despite reflecting both real responses – reductions in hours worked – and potential avoidance responses – through income deductions. In a recent study Doerrenberg et al. (2015) estimate that the elasticity of taxable income in Germany is likely to be 2-3 times larger than the elasticity of earnings exclusive of deductions. Another observation from Figures 3 and 4 is that individuals also do not respond to a concave kink point at €800. Recall that starting from 2003, the social security taxes paid by individuals are gradually phased out in the monthly earnings interval of [€400,€800]. For monthly income $X \in$ [€400,€800], the total amount of social security tax due is equal to $[400 \cdot \tau_{Mini}/\tau_{Full} + (2 - \tau_{Mini}/\tau_{Full})(X - 400)] \cdot \tau_{Full}$, and therefore the combined marginal tax rate changes from $\frac{2\tau_{Full} - \tau_{Mini} + \tau_{Income}}{1+0.5\tau_{Full}}$ to $\frac{\tau_{Full} + \tau_{Income}}{1+0.5\tau_{Full}}$ at €800. Assuming $\tau_{Income} = 0.24$ (average MTR of women from Table 1), the joint marginal tax rate decreased from approximately 68.5% to 54.5% in 2003–2006 and from 60.25% to 52.7% in 2006–2010. Despite an approximately 10% tax change, there is no missing mass in the distribution of earnings around €800 in Figures 3 and 4. These findings suggest that strong *real* responses along the intensive margin at the mini-job threshold are unlikely to be attributed to low friction costs of workers in Germany.

3.5.4 Heterogeneity of Labor Responses and "Firm Bunching"

The results in the previous section suggest that earnings responses to the mini-job threshold are large. If the magnitude of observed response is driven by individuals' preferences, we should observe substantially smaller bunching for individuals who experience smaller tax changes at the mini-job threshold. On the other hand, if the large bunching is due to firms readily offering mini-job positions, at-the-threshold jobs will be "diffused" across population groups and we will see substantial bunching regardless of individuals' status. In this section I investigate how the magnitude of response changes with individual incentives. To do so, I divide population into several groups: single

[49] See Lohn- und Einkommensteuerstatistik datasets at `http://www.forschungsdatenzentrum.de/bestand/lest`.

individuals, individuals with multiple jobs, women and men of different ages, and individuals working in different industries. The results in this section imply that at-the-threshold jobs are readily available in the labor market and are often taken up by individuals who have small incentives to bunch (e.g. singles) or none at all (individuals with multiple jobs before 2003). I also find substantial heterogeneity in the relative magnitude of bunching across age groups and industries.

Figure 9 focuses on individuals with multiple jobs. Prior to 2003, the mini-job threshold applied to the cumulative earnings, therefore, individuals who had a regular job had no incentive to bunch at the mini-job threshold, since doing so would not reduce their tax bill. Nevertheless, Figure 9 shows substantial bunching at the mini-job threshold among individuals who hold another job with monthly earnings of at least €325 in 1999–2002.[50] Of particular interest is that in addition to bunching at the mini-job threshold, the distribution shows a permanent drop at the threshold. Figure 9 implies that for the vast majority of individuals who hold multiple jobs, the second job is effectively a mini-job. This bunching has been termed "firm bunching" by Chetty et al. (2011) and is a direct evidence of firm responses to the mini-job threshold. Firms make at-the-threshold jobs available either because this helps them to fill positions or because they find mini-jobs attractive for some other reasons. Starting from 2003, individuals with a regular job are allowed to hold one-mini job tax-free. This reform lead to an increase in take up of secondary jobs, with a large number of these jobs being at-the-threshold jobs.

Table 2 shows how labor supply responses vary by gender, age, marital status and industry. Women display stronger behavioral responses as they become older, while men's responses are U-shaped, with larger elasticities for males under age 25 and over 60. Table 2 also shows elasticities for a sample of single individuals. Recall that mini-jobs provide two types of tax breaks: first, they exempt workers from employee-paid social security taxes, and second, they exempt workers from income taxes. The income tax exemption is irrelevant to single individuals, because their total earnings remain too low to qualify for income taxes. Therefore, bunching at the mini-job threshold identifies responses to changes in social security liability. The SIAB earnings data does not provide information on individual's marital status, however, this information is available when individuals apply for unemployment insurance (UI) benefits or register with an employment agency. In my sample of "single" individuals I include workers who report the same marital status at least twice during 1999–2010 with at least a 3 year gap between UI and/or job search applications. I then assume that these individuals had the same marital status in *between* these reports. The obtained subsample, of course, is not a representative sample of single individuals, since individuals are selected based on their unemployment experience. To partially mitigate this concern, I require that these individuals have at least a 3 year gap between UI applications. The results show reasonable estimate of elasticity in 1999–2002 when single individuals experienced a large social security notch. However, when the notch was substantially reduced in 2003–2010, the elasticity estimate doubles,

[50] To generate these figures, I restrict the sample to individuals with only 2 jobs per year that are held concurrently at different establishments. Individuals who switch jobs in the middle of the year are dropped. Because the SIAB data provides job status identifiers, I can verify that these secondary employments are indeed subject to social security taxes. Figure 9 thus presents the lower bound on the total amount of bunching in secondary jobs, because individuals who work at 3 or more establishments during the year are not included.

reflecting similarly large number of individuals in at-the-threshold jobs despite a decrease in tax incentives to bunch.

Finally, Table 2 shows how elasticities vary with the industry of employment. I focus on women because of the larger sample sizes. The results show large variation across industries. Largest responses are observed in construction, motor vehicles (sales and repair), food manufacturing, wholesale, finance and insurance. Labor supply responses in these industries are two to three times larger than in education, organizations, professional services. Some of this variation is quite surprising and suggests that in industries that typically hire few part-time workers, many part-time jobs are offered in the form of mini-jobs. Further research is required to better understand what determines the popularity of mini-jobs in a given industry.[51]

3.6 Robustness Checks

3.6.1 Extensive margin

There are two types of extensive margin responses that can affect the estimation process. First, some individuals may choose not to work because of the notch itself. Such responses would make the observed distribution to the right of the threshold lower than it would be otherwise, and leave the distribution to the left unchanged. Therefore, when fitting the counterfactual, we might slightly overestimate the amount of bunching. The amount of overestimation is likely to be very small for two reasons. First, because bunching at the notch remains within individuals' budget set, only those individuals whose outside option is strictly greater than the utility derived by working at the threshold could be affected. Intuitively, only workers who have barely satisfied the participation constraint absent the notch may choose to exit the labor force. Second, what matters is not the total number of individuals who exit the labor force, but the percent of these individuals in each bin, which is likely to be very small.[52]

The second type of extensive margin response possible is the overall effect of the outside option on the distribution as a whole, disregarding the presence of the notch/kink. Changes to the outside

[51] As an attempt to understand this variation I studied how elasticities vary with such industry indicators as presence of bargaining agreements, industry growth in dollars, volume or total hours employed. With the exception of growth measured in total hours employed, no indicators appear to be good predictors of high elasticities. However, I find a robust inverse relationship between changes in total hours employed and the elasticity of earnings in a given industry.

[52] Suppose the total amount of mass at the threshold is B and the true counterfactual value is c. Then ideally, we would like to estimate the excess bunching as $(B-c)/c$. Let p identify the percent of individuals who choose to exit the labor force, then we will underestimate the counterfactual by approximately $p \cdot c$ and therefore the estimated excess bunching will be $\frac{B-c(1-p)}{c(1-p)}$. The absolute value of bias is $\frac{Bp}{c(1-p)}$, or as proportion of excess mass, $\frac{B}{B-c}\frac{p}{(1-p)}$. Since the $c \ll B$ in case of mini-job, the size of the bias will be driven by the magnitude of the extensive margin response $\frac{p}{(1-p)}$. The bias effectively overestimates intensive margin elasticity by incorporating extensive margin responses. This type of bias applies to the bunching approach around kinks also, though the bias is likely to be stronger for notches. The reform in 2003 reduced the size of the notch and therefore should have "returned" some workers back to the labor force and potentially "lifted" up the distribution to the right of the threshold. In the Web Appendix I overlap 2002 and 2003 distributions for women. We see a small increase in the number of people immediately to the right of the threshold, and no differences further away from the threshold, consistent with intensive margin responses rather than extensive margin responses.For individuals just to the right of the threshold, by the revealed preference argument, bunching at the threshold should be preferable to exiting the labor force, since the change in utility is the smallest. At the same time, 2003 and 2004 distributions overlap perfectly to the right of the threshold.

option effectively shift the entire distribution of earnings up when the outside option decreases and down when the outside option increases. Such shifts should not bias the estimate because the entire distribution is affected. Therefore, not just the counterfactual will shift up or down, but also the amount of bunching will increase or decrease accordingly.

3.6.2 Evasion

It is possible that some of the bunching observed at the mini-job threshold is due to evasion. Evasion, however, would require collusion between employers and employees since mini-job earnings are third-party reported. Such collusion is likely to be profitable only to firms that experience losses that cannot be carried over to other periods, since by reducing individuals' pay, these employers simultaneously reduce the amount of labor costs they can deduct against profits. Alternatively, collusion can also be profitable to firms if the savings obtained by employees are passed through to the employers. Both scenarios, however, imply that the optimal strategy is not to reduce employees' pay to the mini-job threshold, but to as close to zero as possible, since by doing so firms would also save on their share of social security taxes.

As a robustness check I study how the amount of bunching and estimated elasticities change with firm size, since collusive behavior is unlikely to be prevalent among larger firms. In the Web Appendix I show that bunching is indeed larger for smaller firms but the difference is not substantial. Beyond evasion, mini-jobs can be attractive to smaller firms because of lower administrative costs.[53]

4 Theoretical Framework

The results in the previous section show that in contrast to previous studies that find weak bunching at kinks and notches of tax schedules, workers in Germany are able to find at-the-threshold mini-jobs with ease. To explain the magnitude of response, I consider firm incentives and study how these incentives affect workers' ability to respond to taxes. In this section I extend the framework of Chetty et al. (2011) and develop a partial equilibrium tax incidence model with job search costs and endogenous hour constraints. I start with the baseline scenario of zero search costs and show that the strength of labor supply responses depends on the magnitude of tax change and on the elasticity of substitution between the individuals working under different tax regimes. Next, I extend the model to a case where individuals have positive search costs and show that the magnitude of labor supply responses to taxes further depends on the statutory incidence of taxes and on the incidence of job search burden. The model predicts that labor supply responses are strongest when the statutory incidence of taxes falls on the firms.

[53] Social security reporting and remittance is very complicated for regular workers, since different types of social security contributions must be remitted to different offices. Mini-job social security taxes, on the other hand, are simpler to administer because all taxes are paid to the Minijob Zentrale. These results are also consistent with findings of Späth and coauthors, Späth (2013a), Späth (2013b) and Koch et al. (2013), who show that marginal employment and other flexible contracts are particularly popular with young firms, which are likely to be small.

4.1 Baseline Model with Zero Search Costs

In this model firms offer two types of employment: mini-jobs which are subject to employee-paid tax t_1 and employer-paid tax ϕ_1 and regular jobs which are subject to employee-paid tax t_2 and employer-paid tax ϕ_2. Tax rates t_1, t_2, ϕ_1 and ϕ_2 should be interpreted as a sum of all taxes – social security and income – as well as other auxiliary costs such as fringe benefit payments that are required by law and which statutory incidence falls on employees or employers respectively. In the model, regular jobs are fully unrestricted and allow workers to earn any amount, while mini-job earnings are limited by a fixed threshold K, uniform to all workers. For simplicity of presentation, I will identify mini-jobs with subscript 1 and regular jobs with subscript 2. In this baseline model I assume that individuals and firms experience zero search costs.

Labor Supply. Individual k chooses a job from the aggregate distribution of hours offered with corresponding wages (w_1, w_2) that maximizes his utility

$$\max_{c,l} u(c,l) = c - \alpha_k^{-1/\varepsilon} \frac{l^{1+1/\varepsilon}}{1+1/\varepsilon}, \tag{11}$$

given his individual ability parameter α_k and subject to one of the two constraints:

$$c = (1-t_1)w_1 l = \hat{w}_1 l \text{ and } w_1 l \leq K \tag{12}$$

or

$$c = (1-t)w_2 l = \hat{w}_2 l, \tag{13}$$

where w_1 is the wage offered in type 1 jobs and w_2 is the wage offered in type 2 jobs. For simplicity, I assume that all individuals have the same elasticity of labor supply ε.

If equilibrium wages are such that $\hat{w}_2 > \hat{w}_1$, individuals will always prefer job of type 2 and work $l_k = \alpha_k \hat{w}_2^{\varepsilon}$, since earnings in type 2 jobs are unrestricted. Therefore an interesting case arises when after-tax wages $\hat{w}_1$ exceed after-tax wages $\hat{w}_2$, since jobs of type 1 are constrained by the earnings threshold K. Define $\alpha_1^* \equiv \hat{K}/\hat{w}_1^{\varepsilon+1}$, where $\hat{K} = (1-t_1)K$, then all individuals with $\alpha_k \leq \alpha_1^*$ will choose jobs of type 1. Next, let α_2^* solve $u(\hat{K}, \hat{K}/\hat{w}_1) = u(\alpha \hat{w}_2^{\varepsilon+1}, \alpha \hat{w}_2^{\varepsilon})$.[54] Individuals with $\alpha_k \in (\alpha_1^*, \alpha_2^*]$ would like to work more hours under wage $\hat{w}_1$ but are unable to do so due to the threshold K. Because they find it suboptimal to work $l_k = \alpha \hat{w}_2^{\varepsilon}$ hours under lower wage $\hat{w}_2$, they will bunch at the threshold K and work $l_k = \hat{K}/\hat{w}_1$ hours in jobs of type 1. Finally, individuals with $\alpha_k > \alpha_2^*$ will work $l_k = \alpha \hat{w}_2^{\varepsilon}$ in jobs of type 2. In summary, individuals with ability α_k will work l_k^* hours, where

$$l_k^* = \begin{cases} \alpha_k \hat{w}_1^{\varepsilon} & \text{if } \alpha_k < \alpha_1^* \\ \hat{K}/\hat{w}_1 & \text{if } \alpha_1^* \leq \alpha_k \leq \alpha_2^* \\ \alpha_k \hat{w}_2^{\varepsilon} & \text{if } \alpha_k > \alpha_2^*. \end{cases} \tag{14}$$

[54] Individuals with ability α_2^* are indifferent between earning K in job type 1 and working $l = \alpha \hat{w}_2^{\varepsilon}$ hours in job of type 2.

Thus for a skill distribution α with a cdf $F_\alpha(\cdot)$ and a density $f_\alpha(\cdot)$, the total labor supply of jobs type 1 and 2 will be given by

$$L_1^S = \int_{-\infty}^{\alpha_1^*} \alpha \hat{w}_1^\varepsilon f(\alpha) d\alpha + \int_{\alpha_1^*}^{\alpha_2^*} \hat{K}/\hat{w}_1 f(\alpha) d\alpha \quad \text{and} \quad L_2^S = \int_{\alpha_2^*}^{\infty} \alpha \hat{w}_2^\varepsilon f(\alpha) d\alpha. \tag{15}$$

Labor Demand. A continuum of identical firms offers two types of employment: mini-jobs that incur employer-paid taxes ϕ_1 and regular jobs which impose employer-paid tax ϕ_2. In line with Chetty et al. (2011), I assume that firms cannot change hours worked after the firm has been matched with a worker. Each firm posts job offers for each type of employment; combined these postings generate an aggregated distribution of hours offered $G(l)$.

Both types of labor are employed in a one-factor production technology that produces goods sold at a fixed price. Here I explicitly assume that type 1 and type 2 workers are perfectly substitutable. This assumption relies on the intuition that because the threshold K is set exogenously and is driven by government policy needs, there is no reason to believe that workers just below and just above the threshold are inherently different. Each firm i determines optimal quantities of total labor hours in each type of jobs, L_{1i} and L_{2i}, by minimizing costs subject to a quantity constraint:

$$\min_{L_{1i}, L_{2i}} C_i = \underbrace{(w_1 L_{1i} + w_2 L_{2i})}_{\text{Wages}} + \underbrace{(w_1 \phi_1 L_{1i} + w_2 \phi_2 L_{2i})}_{\text{Auxiliary Labor Costs}} \text{ s.t. } Q(L_{1i} + L_{2i}) = \bar{Q}, \tag{16}$$

where $Q(\cdot)$ is the production function, and w_1 and w_2 denote wages. For each firm i, let Q_i' denote the marginal product of labor for firm i, then aggregating the first order conditions across a spectrum of firms yields a system of labor demand equations

$$L_{1i}: \quad w_1 + \phi_1 w_1 - \lambda Q' = 0 \tag{17}$$

$$L_{1i}: \quad w_1 + \phi_1 w_1 - \lambda Q' = 0 \tag{18}$$

It follows from (17)–(18) that when L_{1i} and L_{2i} are perfectly substitutable, the wage differential w_1/w_2 will only depend on employer-paid taxes ϕ_1 and ϕ_2:

$$w_1 = \frac{\lambda Q'}{1+\phi_1} \quad \text{and} \quad w_2 = \frac{\lambda Q'}{1+\phi_2}. \tag{19}$$

Therefore any tax differences which statutory incidence falls on the workers will not affect the wage differential between the jobs of type 1 and type 2. The equilibrium wages and quantities of labor, however, will depend on all taxes. Equilibrium wages w_1^* and w_2^* will solve

$$w_1 = \frac{\lambda Q'(L_1^S(w_1, w_2) + L_2^S(w_1, w_2))}{1+\phi_1} \quad \text{and} \quad w_2 = \frac{\lambda Q'(L_1^S(w_1, w_2) + L_2^S(w_1, w_2))}{1+\phi_2}, \tag{20}$$

where L_1^S and L_2^S are functions of wages given by (15). The intuition for this result is simple: when inputs are perfectly substitutable, employers will always hire the cheapest form of labor, thus

in equilibrium employer costs of different types of labor must align in order for employers to be indifferent. Since the subsidies given to the employees do not directly affect firms' labor costs, they will not affect the relative prices of two labor inputs. However, the equilibrium levels of wages will depend on elasticities of labor supply and demand.

Applying this insight to the case of mini-jobs in Germany implies that if mini-job workers and regular workers are perfect substitutes, the subsidies given to the workers (e.g. exemption from income taxes and social security payments) can affect the overall levels of wages of *all* workers, but not the wages of one group in particular. In practice, there is no intrinsic reason for mini-job workers to be more or less productive than regular workers. However, "productivity differences" can arise due to the earnings threshold that implicitly limits the number of hours a mini-job worker can supply, and therefore the total number of employees required. If handling more employees increases costs non-linearly (e.g. due to complexities of supervision or training needs), workers will not be perfectly substitutable.

4.2 Labor Supply Responses in Presence of Frictions

In this section I use the results derived in the previous section to show that when individuals experience adjustment and search costs, the amount of bunching at a kink or a notch will depend on two factors: first, the statutory incidence of taxes, and second, the incidence of burden of search. In the following section, I will further extend the model to consider frictions experienced by firms.

Economists have long focused on the economic, rather than the statutory incidence of taxes. However, in many empirical applications the statutory incidence may play an important role. Slemrod (2008) shows theoretically and Kopczuk et al. (2013) provide empirical evidence that the economic incidence of taxes and the tax revenue collected may vary with statutory incidence if the ability to evade or avoid taxes varies across economic agents. Chetty et al. (2009) show that the statutory incidence of taxes is important if it affects the salience of taxes. In this section I argue that the statutory incidence of taxes affects the magnitude of labor supply responses if individuals experience search costs and the burden of search falls on the workers.

What do I mean by the burden of search? We can think of the labor market clearing process in two ways. Under the first approach, firms post jobs and individuals choose jobs among the available postings. This search process is usually modeled with the individuals drawing a job from the distribution of all postings (or its subset) at random, with the ability to re-draw a job by paying some cost C. In this framework the burden of search is fully borne by the workers: individuals have to "pay" for the quality of the job match, while firms are not penalized for the duration of the search process or the costs it imposes on the workers. Under the second approach, individuals advertise desired working hours, and firms search for workers. In this framework the burden of search is fully borne by the firms. The second framework is likely to apply in markets for rare talent, where firms are willing to spend resources to seek out the best of the best. In the majority of labor markets, however, firms can have access to numerous qualified applicants by simply posting a job opening.

Let $f(l;\mathbf{w})$ and $F(l;\mathbf{w})$ represent the probability density function and the cumulative distri-

bution function of the distribution of "ideal" hours l^* given by (14) for a vector of before-tax wage levels $\mathbf{w} = (w_1, w_2)$. In other words, F represents the desired distribution of hours given some after-tax wages $\hat{w}_1$ and $\hat{w}_2$ if individuals had zero search costs. Note that because $\hat{w}_1 > \hat{w}_2$, all jobs with hours $l \leq K/w_1$ will be of type 1, and all jobs with hours $l > K/w_1$ will be of type 2. When the burden of search falls on the workers, the search process proceeds as follows. Individuals observe the offered distribution of hours $G(l; \mathbf{w})$ and corresponding wages $\mathbf{w} = (w_1, w_2)$ and draw a job at random. At this point workers must decide whether to accept the offer or search for an alternative. If a worker with ideal hours l^* declines the offer, he will draw a new offer from a distribution $\hat{G}_{l^*}(l; G, C, \mathbf{w})$ that depends on his ideal hours l^*, the distribution of offered hours G and search costs C. I assume that $\hat{G}_{l^*} = G$ whenever search costs are infinite and $\hat{G}_{l^*} = \mathbf{1}_{\{l=l^*\}}$ whenever search costs are zero. Thus $\hat{G}_{l^*}$ determines the distribution of alternative offers that individual has access to given his individual preferences and search cost function C. Aggregating across workers, we find the distribution of accepted offers

$$G_{accepted}(l; \mathbf{w}) = P(l; G, \mathbf{w}|F(l; \mathbf{w})) \cdot G(l; \mathbf{w}) + (1 - P(l; G, \mathbf{w}|F(l; \mathbf{w})) \cdot \hat{G}(l; G, F, C, \mathbf{w}), \qquad (21)$$

where $P(G|F)$ represents the probability that a job is accepted given the distribution of ideal hours F and offered hours G, and $\hat{G}(G, F, C)$ represents the aggregated distribution of accepted offers when individuals engage in job search.

Now suppose the burden of search falls on firms. From the cost-minimization problem of firms (16) follows that firms will accept any distribution of hours offered by individuals, as long as the cumulative hours offered equal the cumulative hours demanded. Because firms' labor costs and output depend on the total hours employed, rather than the distribution of hours, firms only optimize with respect to the quantity of hours hired, rather than the distribution of hours.[55]

Suppose we start with an equilibrium where employees and employers pay identical taxes on both types of labor, so that $1 - t_1 = \frac{1}{1+\phi_1} = 1 - t_2 = \frac{1}{1+\phi_2}$. The government decides to reduce the tax rate on type 1 workers by setting either $t_1 = 0$ or $\phi_1 = 0$. Does the choice of statutory tax break affect the magnitude of equilibrium labor response? If neither firms nor individuals experience search costs, the equilibrium wages w_1^* and w_2^* are equal to tax-adjusted marginal products of labor given by (20) and the equilibrium quantities of labor supplied can be found by substituting w_1^* and w_2^* into (15). Regardless of whether the government exempts firms from tax ϕ_1 or individuals from tax t_1, the after-tax wage $\hat{w}_1^*$ will be the same since $\frac{\lambda}{1+\phi_1} = \lambda(1 - t_1)$, hence, equilibrium quantities of labor supply will also be equal.[56]

Now let us consider what happens when either individuals or firms experience search costs. To answer this question I consider 4 cases. In the first two cases I assume the burden of search falls on the firms, and in the last two cases, the burden of search will fall on workers. I will show that labor supply responses will be weakest when the burden of search and the statutory incidence of taxes

[55] At the end of this subsection I discuss firm incentives when wages cannot adjust to incorporate all differences across worker types.

[56] This result relies on one additional assumption: that the threshold remains the same in *gross* value. In present notation, setting $t_1 = 0$ below a threshold K is equivalent to setting $\phi_1 = 0$ below threshold $K \cdot (1 + \phi_1)$.

falls on the workers. In this model I assume that wages cannot adjust instantaneously and for wages to reach equilibrium, the quantity of labor supplied must equal the quantity of labor demanded.

Case 1. Government sets $t_1 = 0$ and the burden of search falls on firms.
Because wages for all workers are the same, firms are indifferent between hiring type 1 and type 2 workers and therefore will accept any distribution of hours offered by the individuals, as long as the cumulative hours offered equal the cumulative hours demanded. Note that the ideal distribution of hours F satisfies this condition at equilibrium wage. Therefore, to maximize their utility, individuals will offer the distribution of ideal hours $F(l; \mathbf{w}^*)$ at equilibrium wages $\mathbf{w}^*$ given by (20) and firms will accept.

Case 2. Government sets $\phi_1 = 0$ and the burden of search falls on firms.
Because $\phi_1 < \phi_2$ and wages do not adjust immediately, type 1 workers incur lower labor costs for firms than type 2 workers and therefore all firms will want to hire type 1 workers. Due to high demand the equilibrium wages of type 1 workers will increase until the total labor costs have equalized and $\frac{w_1^*}{w_2^*} = 1 + \phi_2$. The offer distribution G that firms will be willing to accept must reflect the largest number of type 1 jobs individuals would be willing to accept at equilibrium wages. Because firm preferences align perfectly with individuals' preferences at equilibrium wages, individuals will offer the distribution of ideal hours $F(l; \mathbf{w}^*)$ at equilibrium wages $\mathbf{w}^*$ given by (20) and firms will accept.[57]

Case 3. Government sets $t_1 = 0$ and the burden of search falls on workers.
Because $\phi_1 = \phi_2$, equilibrium wages are equal and firms are indifferent between hiring type 1 and type 2 workers. In equilibrium, the distribution of hours offered by firms, $G(l; \mathbf{w})$, should equal the distribution of accepted hours, given by (21). Therefore, a distribution of hours $G(l)$ is an equilibrium if it satisfies the following two conditions:

$$\mathbf{w}^* = (w, w) \text{ with } w = \frac{\lambda Q'(\int_0^\infty l \, dG)}{1 + \phi_1} \tag{22}$$

$$G(l) = P(l; G, \mathbf{w}^* | F(l; \mathbf{w}^*)) \cdot G(l) + (1 - P(l; G, \mathbf{w}^* | F(l; \mathbf{w}^*)) \cdot \hat{G}(l; G, F, C, \mathbf{w}^*). \tag{23}$$

Condition (22) determines equilibrium wages $\mathbf{w}^*$ given the total amount of labor hours $L_1 + L_2 = \int_0^\infty l \, dG$ implied by the distribution G and follows from (19). Condition (23) ensures that the distribution of offered hours equals the distribution of accepted hours at the equilibrium wage level $\mathbf{w}^*$. From (23) follows that when search costs are zero, $\hat{G} = F$ and the only equilibrium solution is $G = F$, since it is the only fixed point of equation (23). On the other hand, when search costs are infinite, $\hat{G} = G$ and any distribution of hours offered will be accepted. Note that while $G = F$ always satisfies equilibrium condition (23), it need not be the only solution. As search costs increase, the set of possible equilibria increases and the equilibrium distribution of hours need

[57] In this case the assumption that wages cannot adjust instantaneously is not important and the same equilibrium would be achieved even if wages can adjust immediately because the distribution of ideal hours $F(l; \mathbf{w}^*)$ is the ideal outcome for workers and firms alike.

not represent F closely. The reason why multiple equilibrium distributions of hours are possible is because individuals find job search costly, and therefore would be willing to accept offers that do not satisfy optimality condition (14) precisely.

Case 4. Government sets $\phi_1 = 0$ and the burden of search falls on workers.
Because $\phi_1 < \phi_2$ and wages do not adjust immediately, type 1 workers incur lower labor costs for firms than type 2 workers and therefore all firms will want to hire type 1 workers. Due to high demand the equilibrium wages of type 1 workers will increase until the total labor costs have equalized and $\frac{w_1^*}{w_2^*} = 1 + \phi_2$. The offer distribution G therefore will reflect the largest number of type 1 jobs the individuals would be willing to accept at equilibrium wages. Define Ω_G to be the set of all distributions G that satisfy

$$\mathbf{w}^* = \left(w, \frac{w}{1+\phi_2} \right) \text{ with } w = \lambda Q' \left(\int_0^\infty l \, dG \right) \tag{24}$$

$$G(l) = P(l; G, \mathbf{w}^* | F(l; \mathbf{w}^*)) \cdot G(l) + (1 - P(l; G, \mathbf{w}^* | F(l; \mathbf{w}^*)) \cdot \hat{G}(l; G, F, C, \mathbf{w}^*). \tag{25}$$

Then the set of equilibria is the set of all $G \in \Omega_G$ that in addition to (24) and (25) satisfy

$$\int_0^{K/w} l \, dG = \max_{G \in \Omega_G} \left\{ \int_0^{K/w} l \, dG \right\}. \tag{26}$$

Conditions (24) and (25) are similar to conditions (22) and (23) and ensure that at equilibrium prices, the distribution of hours offered equals the distribution of hours accepted. The intuition behind (26) is the following: firms will not be willing to pay higher wages to type 1 workers, unless they are exhausting the supply of workers willing to take type 1 jobs. Therefore, for wages of type 1 to adjust upward, employers must hire the maximum number of people willing to take type 1 offers. Condition (26) ensures that the wage equilibrium is achieved, and the quantity of type 1 labor demanded equals the quantity of type 1 labor supplied.[58] Since $F \in \Omega_G$, condition (26) implies that there will be as many type 1 hours offered in equilibrium as people ideally would like, or maybe more. Note that while incentives to hire more type 1 workers exist in the short run only, the long run equilibrium must still satisfy condition (26). If the condition is not satisfied, labor supply of type 1 workers will exceed labor demand and wages will decrease, again generating incentives to hire more type 1 workers.

These 4 cases demonstrate that in presence of search costs, the equilibrium distribution of hours depends both on the statutory incidence of taxes and on the incidence of search costs. If individuals are able to advertise their desired hours, then an optimal distribution of hours F is an equilibrium regardless of the statutory incidence of taxes. In cases 1 and 2 firms accept F because firms optimize with respect to the total hours hired and have no preferences regarding the

[58] Condition (26) thus stems from the assumption that wages cannot adjust instantaneously. If wages could adjust immediately, firms would not find type 1 workers attractive, and would have no incentive to increase demand for type 1 workers. However, this would mean that wages can adjust upward without a corresponding increase in labor demand, which is implausible.

breakdown of hours across workers. If firms had own preferences on the structure of hours and experienced low search costs, the equilibrium distribution of hours would be different. Cases 3 and 4 demonstrate that the statutory incidence of taxes becomes important when the burden of search falls on the workers. If the statutory incidence of taxes falls on individuals, the magnitude of response will depend on the ability of individuals to seek out, negotiate or otherwise convince employers to provide at-the-threshold jobs. If search costs are prohibitively high, individuals would be willing to accept whatever distribution of hours that is offered by employers. On the other hand, if the statutory incidence of taxes falls on the firms, firms have an incentive to hire a large number of mini-job workers in the short run. Because mini-jobs are readily offered by firms, individuals need not engage in costly search process and therefore equilibrium labor supply response will be strong. Note that the model does not predict what portion of type 1 hours will be offered in the form of the at-the-threshold jobs, merely that the total number of hours in type 1 jobs will satisfy the labor supply preferences. It is imaginable that firms would find it easiest to satisfy their strong (short run) preferences for type 1 workers by offering numerous at-the-threshold jobs.

These results can be extended to markets where type 1 and type 2 workers are not perfectly substitutable. Lack of perfect substitution between workers means that even when the statutory incidence falls on the workers, equilibrium wages will be different. For such equilibrium to be reached, conditions (24)–(26) must be satisfied. Therefore, the statutory incidence is not important when type 1 and type 2 workers are not perfect substitutes. However, in case of most taxes and labor rules, workers are likely to be perfectly substitutable.

It is difficult to characterize the set of equilibria defined by equations (23), (25) without making strong assumptions on the functional form and distribution of individual preferences. To illustrate the intuition behind the possibility of multiple equilibria, consider the following example. For simplicity, suppose firms are perfectly competitive, workers are perfectly substitutable and production function exhibits constant returns to scale. Then wages $\hat{w}_1^*$ and $\hat{w}_2^*$ are fixed and equal to the marginal product of labor. Suppose all individuals in the economy would like to work h^* hours per week and have utility function given by (11) with $\alpha_k = h^*/\hat{w}_2^{\varepsilon}$.[59] The density of the ideal distribution of hours F therefore satisfies:

$$f(h^*) = 1 \text{ and } f(h) = 0 \text{ whenever } h \neq h^*.$$

Suppose that by exerting some effort $\sigma C(1/\bar{l})$, with $C' > 0$ and $\sigma > 0$, individuals can narrow their search interval to $[l^* - \bar{l}, l^* + \bar{l}]$ from which they will draw a job at random from the distribution of hours offered G. Following our notation,

$$\hat{G} = \frac{G \cdot \mathbf{1}_{l \in (l^* - \bar{l}, l^* + \bar{l})}}{G(l^* + \bar{l}) - G(l^* - \bar{l})}.$$

Because effort $\sigma C(\cdot)$ is decreasing in $\bar{l}$, individual will choose $\bar{l}$ that maximizes his expected utility

[59] Without loss of generality, I assume that all individuals would like to hold type 2 job.

from job search process:

$$\bar{l}^* = \arg\max_{\bar{l}} \ \mathbb{E}_G\Big[u(l)\Big| \ l \in (l^* - \bar{l}, l^* + \bar{l})\Big] - \sigma C(1/\bar{l}), \tag{27}$$

where $u(l) = u(w(l), l)$ given by (11) and $w(l) = \hat{w}_1^*$ if $l \leq K/w_1$ and $w(l) = \hat{w}_2^*$ otherwise. It follows that optimal $\bar{l}$ depends on the distribution of offered jobs $G(l)$ and individual's ideal job l^*, i.e. $\bar{l} = \bar{l}(l^*, G)$. Moreover, $d\bar{l}/d\sigma > 0$, so that if $\sigma = 0$ and individual experiences zero search costs, the optimal interval will be reduced to a single optimal point – the ideal hours l^*.

Now consider a probability density function g that satisfies:

$$g(h^* - \hat{h}) = q_1, g(h^*) = q_2, g(h^* + \hat{h}) = q_3, \text{ and } g(h) = 0 \text{ otherwise}$$

for some values $\hat{h}$. Then any combination of $(\hat{h}; q_1, q_2, q_3)$ that satisfies the following two conditions at equilibrium prices $\hat{w}_1^*$, $\hat{w}_2^*$ is an equilibrium:

$$q_1 u(h^* - \hat{h}) + q_2 u(h^*) + q_3 u(h^* + \hat{h}) > u(h^*) - \sigma C(\hat{h}) \tag{28}$$

$$q_1 + q_2 + q_3 = 1, \tag{29}$$

where $u(l) = u(w(l)l, l)$ given by (11). Condition (28) is derived from (27) and ensures that all individuals prefer to not pay the search cost and draw a job from the entire distribution at random rather than pay the smallest necessary search cost – $\sigma C(\hat{h})$ – to make the interval small enough, so that only $h = h^*$ could be drawn. Condition (28) effectively implies that $\hat{G} = G$ and therefore G is by default a solution to condition (23) or (25). Finally, condition (29) ensures that the triple (q_1, q_2, q_3) represents a probability density function. It is easy to see that there are numerous combinations of $(\hat{h}; q_1, q_2, q_3)$ that would satisfy conditions (28) and (29) for most cost function $\sigma C(\cdot)$. Further, higher values of cost shifter σ would lead to a larger set of $(\hat{h}; q_1, q_2, q_3)$ that satisfy these conditions. Intuitively, as the cost of searching for a job increases, more individuals would be willing to draw a job at random rather than engage in costly search process. This example can be easily generalized to a case where individuals restrict their search to an asymmetric interval around h^*, where firms offer more than two choices of "non-ideal" hours, where these additional hours are asymmetric around the ideal hours h^*, and even to continuous distributions around h^* hours.[60] The example can further be generalized to discrete or continuous distributions of ideal hours F.

If multiple equilibria are possible, which equilibrium will be observed in the market? Because firms offer the hour distributions and individuals search among posted jobs, firms can incorporate the choice of the offered hour distribution into the profit-maximizing function. In other words, in addition to choosing the total optimal hours of work L_{1i} and L_{2i}, each firm chooses the distribution of hours it offers, G_i. Because individuals experience positive search costs, the hours supplied will no longer be given by (15), instead labor supply will be determined by individuals' ideal hours (14) transformed by the offered distribution of aggregated hours G as in (23). There are many reasons

[60] Under asymmetric distribution, offered hours would include $h^* - \hat{h}_1$, h^*, and $h^* + \hat{h}_2$, with $\hat{h}_1 \neq \hat{h}_2$.

why firms might prefer one distribution of hours over the other. If firms experience fixed production costs per employee, then the optimal hour distribution would include as few workers as possible. For example, employee training requires the same amount of expenditures regardless of how many hours an employee is going to work in the future. In case of mini-jobs in Germany, the existence of such fixed costs would lead to a double peaked distribution: with a large number of individuals working at the mini-job threshold and a large number of individuals working the maximum number of hours allowed. The amount of bunching at the threshold therefore will be exaggerated, because there will be too few workers with low number of hours. Effectively, there will be some additional bunching due to firms' fixed costs, that is coming from the left. It is important to note that this larger bunching should exist regardless of whether wages are able to adjust to reflect difference in labor costs. If wages cannot adjust, for example because firms are worried that workers will find it unfair to be paid different wages for the same type of work, then firms will have a direct incentive to hire workers at the maximum allowed hours. If, on the other hand, wages can adjust, equilibrium conditions (24)–(26) will apply and workers would be willing to take more at-the-threshold jobs *because* they offer higher wages.

Labor regulations can also influence firms' preferred hour distributions. For example, recently introduced Affordable Care Act requires large firms to pay for full-time workers' health insurance coverage, but not for part-time workers' coverage. Employees are considered to be full-time if their weekly hours exceed 30 hours. The law thus incentivizes firms to offer more 29-hours-or-less jobs than 30-hours-or-more jobs. The equilibrium outcome in this case would depend on whether wages can adjust to reflect differential costs of part-time and full-time workers, and whether individuals value provided health insurance. If wages of full-time workers can adjust downward and individuals value the health insurance provided, then no bunching will be present because individuals will be willing to accept lower wages in exchange for health insurance. However, if wages cannot adjust firm and workers incentives diverge. Firms will have an incentive to hire more 29-hour workers. At the same time, workers, because they value health insurance, will prefer to work 30 hours or more since they can gain additional benefits while receiving the same wages. Hence, workers' preferences and firms' preferences conflict. The equilibrium outcome will depend on the magnitude of search costs experienced by workers. If the search costs are high, firms will "win" and more 29-hour jobs will be offered. If, on the other hand, search costs are low and firms find it hard to fill 29-hour positions, bunching will be small.

4.3 Incorporating Firm Frictions

In the previous section we considered a framework where firms experience zero frictions and are able to offer any hour contracts. In reality firms are likely to experience three types of frictions. First, some hour contracts can be simply illegal (e.g. workers cannot exceed 40 hours per week without incurring overtime surcharges) or be prohibitively expensive (e.g. training and supervision costs likely to exceed any potential savings from employing 1-hour-per-week employees). Such restrictions can be easily incorporated into the model in the previous section by assuming that the distribution

of hour offers G must belong to some set of feasible offers Γ. This would imply that regardless of individual preferences and frictions, firms will never offer distributions outside of the set Γ. It is straightforward to see that for most tax schedules this restriction will not change the predictions of Section 4.2.[61] Second, in practice workers are not perfectly substitutable and therefore finding the right match is costly both for individuals and firms alike. In this paper, I focus on hour constraints and disregard differences in ability. For this reason, I ignore productivity-matching frictions and defer to future work. Third, in many cases firms are not able to change working hours of employees immediately, for example because of contractual obligations. In this section I focus on this type of frictions experienced by firms and show that the conclusions of the previous section remain valid, but the adjustment process is slower.

Consider the following three-period model. In the first period the government sets flat tax rates, so that $1-t_1 = \frac{1}{1+\phi_1} = 1-t_2 = \frac{1}{1+\phi_2}$. Firms and workers are matched as described in the previous section, resulting in an equilibrium distribution of hours G^1 with a corresponding equilibrium wages (w_1^1, w_2^1). Further, assume that with some probability θ contracts expire in the beginning of the second period and with probability $1-\theta$ contracts expire in the beginning of the third period. If the contract expires in the beginning of the third period, then neither firms nor workers can change working hours during the second period. In the beginning of the second period the government announces a reform that reduces the tax on type 1 workers by either setting $t_1 = 0$ or by setting $\phi_1 = 0$. Workers and firms renegotiate contracts and pay applicable penalties. In the third period all contracts expire, workers and firms freely renegotiate contracts.

Suppose the tax break is given to individuals, i.e. $t_1 = 0$. Because firm costs have not changed, firms will not be interested in changing working hours in the second period even for workers whose contracts have expired. On the hand, individuals with ability $\alpha_k < \alpha_2^*$ (recall equation (14)) will want to change working hours. Since some of these workers are locked in until period three, the adjustment to final equilibrium will be slow: only θ fraction of workers will be able to change working hours in the second period. The transitory distribution of hours in the second period will be a sum of distributions G_θ^2, which satisfies equivalents of (22)-(23) and represents new hours of workers whose contracts expire in the beginning of the second period, and distribution $G_{1-\theta}^2$, which represents the distribution of locked-in jobs and therefore is a subset of the first period distribution G^1. The final equilibrium distribution in the third period G^3 will satisfy conditions (22)-(23), and therefore will be identical to that of a one-period model described in the previous section. Note that lower tax rate t_1 will lead to an increase in labor supply which may lead to a lower equilibrium wages in period three. Adjustment to this new level of wages will be gradual, since only a fraction of workers will be able to increase working hours in period two. Hence, the wages will satisfy $w_j^1 \geq w_j^2 \geq w_j^3$ for each type of worker $j = 1, 2$ and $w_1^t = w_2^t$ for each period $t = 1, 2, 3$.[62]

Now suppose the tax break is given to the firms, i.e. $\phi_1 = 0$. Because tax breaks make type

[61] An exception to this rule would be reforms that reduce taxes due on "infeasible" workers. In which case, the equilibrium outcomes will be identical, regardless of whether the tax break is given to individuals or firms, since firms will ignore such incentives.

[62] Whether wages decrease or remain the same will depend on the production function Q and the implied elasticity of labor demand.

1 workers cheaper, all firms would want to hire as many type 1 workers as they can. Since only fraction θ of workers is available in period 2 the adjustment will be gradual. Once again, the transitory distribution of hours in period 2 will be a sum of distributions G^2_θ, which now satisfies equivalents of (24)-(26) and represents new hours of workers whose contracts expire in period 2, and distribution $G^2_{1-\theta}$, which represents the distribution of locked in jobs and therefore is a subset of period 1 distribution G^1. The wage level adjustment will be gradual with period 2 wage level of type 2 workers potentially lower than in period 1. However, type 1 workers who sign new contracts in period 2 will immediately enjoy higher wages, since firms will be willing to pay higher wages to enjoy lower taxes. The final equilibrium distribution of hours in period 3 will satisfy conditions (24)-(26), and therefore will be identical to that of a one-period model described in the previous section. The wages will satisfy $w^1_1 = w^1_2$, $w^2_j \geq w^3_j$ for each type of worker $j = 1, 2$ and $w^t_1/w^t_2 = 1 + \phi_2$ for each period $t = 2, 3$.

Intuitively, contractual obligations do not erase asymmetry of search and adjustment frictions experienced by firms, merely slow down the adjustment process to the new equilibrium. The model can be further extended to frameworks where firms can change hours of work at any period by paying some penalty π distributed according to some cumulative distribution F_π with mean $\bar{\pi}$. In this case there exists some critical value of penalty π^*, so that all contracts with penalties $\pi \leq \pi^*$ are cancelled in the beginning of period 2. The speed of adjustment then depends on how costly the penalties are: the lower the average penalty $\bar{\pi}$, the faster is the adjustment process.

Note that in both frameworks – with locked-in contracts or cancellation penalties – the speed of adjustment will depend not only on the strength of frictions, i.e. respective magnitudes of θ and $\bar{\pi}$, but also on their distribution across contracts (assuming these are not randomly assigned). Since the reform mostly affects individuals in type 1 contracts, what matters is how many of type 1 workers end up locked-in in their contracts. If most type 1 workers are associated with contracts with low levels of π or high value of θ, the adjustment will be faster than if the lower levels of π or high levels of θ are associated with type 2 workers.

4.4 Discussion

The results in the baseline model show that the wages of job types 1 and 2 workers will not be equal if at least one of the two conditions is satisfied: employer-paid auxiliary costs are not equal, i.e. $\phi_1 \neq \phi_2$, or labor inputs of type 1 and 2 are not perfectly substitutable and employee-paid taxes change at the threshold, i.e. $t_1 \neq t_2$. The presence of heterogeneous labor costs (either due to employer-paid ϕ_i or due to employee-paid t_i) will incentivize employers to hire the cheapest form of labor, until an equilibrium is achieved and wages have adjusted appropriately. In other words, even if individuals have large search costs, employers will have an incentive to hire workers of type 1 – assuming type 1 jobs incur lower labor costs – until effective labor costs are equalized. Since the demand for such jobs will be highest around the threshold, "threshold jobs" will be offered and hence bunching at the threshold will be large.

The majority of empirical studies that estimate responses to taxes focus on kinks and notches

in the income tax schedules of individuals. From the point of view of firms, workers who earn just below or above the threshold are perfectly substitutable, therefore, income tax differences cannot be passed through to the employer. Since employer-paid taxes do not change at the threshold, neither of the two conditions is satisfied and firms have no incentives to hire more workers just below the kink/notch. Since firms are indifferent, the magnitude of the observed bunching will depend on the strength of employee responses only. Hence, no bunching will be observed if workers experience high search costs and do not seek out "threshold" jobs.

Only a few studies consider settings where employer-paid costs change at the threshold. In many countries, including Germany, social security taxes need not be paid above a predetermined income cap. Hence, employer-paid auxiliary cost of labor decreases above such income cutoff and therefore firms have an incentive to hire more workers "away" from the threshold, thus generating a gap around the income cap.[63] Liebman and Saez (2006) study earnings responses around the Social Security Wage Base threshold and find no missing mass at the threshold. There are two potential explanations for the lack of response. First, such income threshold represents a kink, rather than a notch. Hiring an employee whose earnings exceed the threshold does not exempt employer from the entire social security contributions, merely a portion of earnings above the cutoff. Therefore, potential savings are small. Second, social security income cutoffs are typically set at large income levels, where the majority of employees work full time. The differences in incomes, therefore, often represent the type of work performed rather than the number of hours worked. Firms thus might be limited in their ability to adjust working hours of employees. Tazhitdinova (2015) studies labor supply responses to a kink generated by the payroll tax exemption threshold in the UK. Because earnings below the primary/secondary payroll threshold are exempt from employer portions of the National Insurance Contributions (NIC), employers have an incentive to hire more workers below the threshold. While Tazhitdinova (2015) finds stronger responses to this threshold than do the studies that look at income tax thresholds, bunching is still small. Since the threshold represents a kink, the incentives faced by employers are small as in Liebman and Saez (2006).

5 Source of Employer Incentives

The theoretical model in the previous section shows that if firms experience lower labor costs for mini-job workers as compared to regular workers, the equilibrium distribution of earnings will exhibit a large number of mini-jobs. In the short run, until wages adjust to reflect labor cost differences, firms will want to hire more mini-job workers because they incur lower total costs. In the long run, the equilibrium distribution of hours must still reflect a large number of mini-job workers to ensure the wages remain in equilibrium. In this section I provide empirical evidence that the fringe benefits paid to mini-job workers are lower than those paid to regular employees, but the gross wages of mini-job workers are higher, suggesting that the differences in auxiliary costs are passed through

[63] Note that in some countries, e.g. UK, employer-paid social security taxes are due on the entire earnings, even though employee-paid contributions stop or become reduced at higher levels of income. The above scenario, therefore, only applies to settings where both employees and employers become exempt from social security taxes.

to the workers in the form of higher wages, as would be expected in the long run equilibrium. The results of this section thus show that the conditions of case 4 discussed in Section 4.2 are satisfied, and the large magnitude of bunching at the mini-job threshold can be explained by firms' incentives to make mini-jobs available.

5.1 Empirical Approach

Consider the following experiment. Suppose firms are perfectly competitive and pay respective wages w_1 and w_2 to mini-job and regular workers according to the labor market equilibrium. Assume that firm f production needs at time i require an employee who would work h_i hours per week. A firm searches for a worker in the labor market and hires one as a mini-job worker, if $h_{if} \cdot w_1 \leq K$, and as a regular worker otherwise. Because the mini-job threshold K is set exogenously by the government and production needs arrive at random, we can determine the wage differential $\log(w_1/w_2)$ by estimating

$$\log(w_{if}) = \alpha_0 + \beta_0 \cdot \text{Mini}_{if} + \alpha_1 \cdot D_{if} + \mathbf{X}_i' \cdot \gamma + \mathbf{F}_f' \cdot \theta + u_i, \tag{30}$$

where w_{if} represent hourly gross or net wage of individual i working at establishment f, Mini_{if} indicates whether the job individual holds is a mini-job, $\mathbf{X}$ is a vector of individual controls, and $\mathbf{F}$ is a vector of firm controls. The coefficient β_0 identifies the wage differential $\log(w_1/w_2)$.

In practice, observed individual controls $\mathbf{X}$ omit such important wage determinations as ability, work ethics, etc. Failure to control for omitted variables will lead to a bias in the estimate of β_0. The problem can be ameliorated using two approaches. The first approach restricts the sample to individuals with plausibly similar skills. A reasonable proxy for skills is income itself: individuals earning similar incomes are likely to have similar abilities. The second approach uses income directly as a proxy for skills by including a polynomial of income in specification (30). As a final specification, I estimate the following econometric model:

$$\log(w_{if}) = \alpha_0 + \beta_0 \cdot \text{Mini}_{if} + \alpha_1 \cdot D_{if} + \alpha_2 \cdot D_{if}^2 + \beta_1 \cdot D_{if} \cdot \text{Mini}_{if} + \beta_2 \cdot D_{if}^2 \cdot \text{Mini}_{if} + \mathbf{X}_i' \cdot \gamma + \mathbf{F}_f' \cdot \theta + u_i, \tag{31}$$

where $D_{if} \equiv (Y_{if} - K)/K$ is the percent difference between individual's income Y_{if} and the mini-job threshold K. The coefficient of interest, β_0, captures the discontinuity of wages at the mini-job threshold, when mini-job tax exemptions are removed. I use two approaches to control for the relationship between one's income and one's wage. Under the first approach, I control for wage trends by including D_{if}, which measure the percent distance between monthly income and the mini-job threshold. Because I restrict the sample to employments with monthly earnings under €1,500 per month, only polynomials of second degree are included. Under the second approach, I restrict the sample to a narrower window around the mini-job threshold, specifically, $[K - €50, K + €100]$. Note that a slightly larger window is used to the right of the threshold because the number of observations is smaller. The second approach thus relies on the assumption that within a small window of monthly earnings, wage trends are absent.

A natural concern of specification (31) is that individuals might select into mini-jobs based on

unobserved preferences or abilities. Alternatively, only certain types of jobs, which qualities are not observed to the researcher, might be allowed under the mini-job status. As the results will show, mini-jobs typically offer worse working conditions than regular part-time jobs,.therefore selection into mini-jobs should primarily depend on one's savings due to the mini-job tax exemptions rather than anything else. To control for this type of selection, I include, whenever available, a measure of tax savings a mini-job offers to each individual, which depends on individual's marital status and spousal earnings. The results show that mini-job workers are paid slightly higher wages but lower fringe benefits, suggesting that these differences cannot be attributed to selection among workers: if workers are negatively (positively) selected into the mini-job status, they should receive both lower (higher) wages and lower (higher) fringe benefits. Selection concerns are further mitigated by the fact that the study focuses on part-time workers with low incomes. The majority of workers are employed in low-skilled occupations, naturally limiting the variation in skills or qualities that may lead to differential wages.

The datasets used to estimate equation (31) provide information on earnings and working hours, but do not have information on wages. Therefore, two types of measurement error are possible under specification (31). First, working hours might be reported with noise. Since 2003, working hours only affect the value of wages and do not determine one's job status (mini-job vs. regular job), as a result the estimate of the effect of mini-job status on wages β_0 will remain unbiased and consistent, so long as the measurement error in hours is not correlated with the independent variables. Prior to 2003, mini-jobs were restricted by the amount of monthly earnings and weekly hours. Therefore, when mini-job identifiers are not available, measurement error in hours would lead to a positive bias in the estimate of β_0, since overstated hours would understate wages and increase the likelihood of assigning that individual to a regular job status, while at the same time, understated hours would both overstate wages and decrease the likelihood of assigning an individual to a mini-job status. Unfortunately, none of the datasets provide mini-job identifiers prior to 2003. For this reason I focus on observations from 2003 on. Of larger concern is when income is reported with error. Intuitively, an overstated income would overstate both wages and increase the likelihood of assigning that individual to a regular job status. At the same time, understated income would both understate wages and increase the likelihood of assigning an individual to a mini-job status. Therefore, measurement error in income leads to a negative bias in the estimate of β_0. Fortunately, this type of error is easily alleviated as long as we can correctly assign individuals to the mini-job status. Among the two datasets I use to study estimate (31), one dataset (a firm survey) provides mini-job identifiers and therefore eliminates the possibility of a negative bias.

5.2 Data Description

I estimate specification (31) using two distinct datasets: a survey of businesses and a survey of households. The survey of businesses is a large dataset that provides reliable information on working hours, however, the dataset is not representative of the German population since only firms with 10 or more employees are surveyed. Moreover, the data does not include information of family

structure and therefore individuals' incentives to hold mini-jobs. The household survey, on the other hand, is representative of the population and includes detailed family structure, however, this survey more likely to suffer from measurement error due to the self-reported nature of hours. In this section I describe each dataset and provide summary statistics.

5.2.1 Firm survey – VSE

The first dataset consists of 2006 and 2010 waves of the Structure of Earnings Survey (VSE).[64] To create the VSE the German Federal Statistical Offices survey a large sample of firms with ten employees or more in selected industries. The inclusion of industries has changed over time: VSE 2006 did not include businesses operating in agriculture and fishing, public administration and defense.[65] VSE 2010 added employees working in public administration, defense and social security, as well as. The main advantage of the VSE is that it provides working hour information that was reported by the firms and therefore is likely to be more accurate than from household surveys such as the SOEP, where the hour data is reported by individuals and therefore is more likely to suffer from measurement error. In addition to working hours, the VSE contains information about the employees themselves (age, sex, experience, training), their jobs (working hours, overtime hours, regular pay and bonuses, number of vacation days), and firms' characteristics (number of employees, industry, applicable bargaining agreements, geographical location). I restrict the core sample to individuals working in regular jobs and mini-jobs earning from €50 to €1500 per month in 2006/2010.[66] The core sample is restricted to individuals between the ages of 16 to 80 who work more than 1 hour but not more than 45 hours per week. Finally, I drop individuals with gross hourly wage of less or equal to the 1st percentile and greater or equal to the 99th percentile.[67] Appendix Table C.5 provides summary statistics separately for five income groups: with posted earnings of [€50,€375], [€375, €400], [€400, €500], [€500, €1000], [€1000, €1500] per month.

The VSE 2006/2010 provide two estimates of working hours. The first estimate is based on the regular working hours defined as the mutually agreed regular hours or customary hours in the survey month.[68] The second measure is based on the total paid hours worked during the survey month, actual or estimated by the firm. As expected, the first measure of hours is often missing for part-time workers who do not have fixed hour schedules, but the second measure of hours is almost

[64] In German: *Verdienststrukturerhebung*, VSE.

[65] In other words, VSE 2006 included businesses operating in mining and quarrying; manufacturing; energy and water supply; construction; trade; maintenance and repair of motor vehicles and personal and household goods; hotels and restaurants; transport, storage and communications; financial intermediation; real estate, renting and business activities; education, health and social work, other public and personal services sectors.

[66] Prior to 2010, short-term marginal employees might be included in the sample and are likely to be assigned the status of "mini-job" whenever earnings do not exceed the mini-job threshold, these employments, however, are not included in 2010. There are two types of mini-jobs in Germany: employments with earnings below the mini-job threshold (which are the focus of this paper) and short-term marginal employments, in German *kurzfristige Beschäftigung*, which are not subject to an earnings limit but are limited in duration to 50 working days or two months per year. This second type of employment is significantly less popular than classical mini-jobs.

[67] Due to the statistical confidentiality rules the 1st and 99th percentiles cannot be disclosed. However, Panel B of Figure 10 suggest that $p1 \in$ (€3,€5) and $p99 >$€21.

[68] October 2006 and 2010 respectively.

fully complete. For my main estimates I rely on the second measure of hours – hours worked in the month of survey – complemented with the first measures – regular hours – whenever missing.[69] The results that rely on the first definition of hours are very similar.

5.2.2 Household Survey – SOEP

The second dataset I use to estimate equation (31) is the German Socio-Economic Panel (SOEP) introduced in Section 3.4. While the SOEP data is more likely to suffer from measurement errors, it provides two advantages. First, the SOEP is representative of the entire German population and therefore includes employees working in all industries and at the establishments of all sizes. Second, the SOEP provides detailed information on family structure and therefore allows me to control for selection into mini-jobs based on individual tax incentives. Finally, the SOEP supplies more detailed information of worker's characteristics, such as education, total working experience, citizenship status. The SOEP includes a self-reported marginal employment status identifier but the quality of this variable is very poor: many of the individuals who self-report as marginal workers earn substantially more than the mini-job threshold.[70] For these reasons, I identify mini-job workers based on the self-reported income only. To reduce the impact of measurement error I restrict my sample to 2004-2011, when the threshold has been set at €400 and hour requirements have been abolished. Since prior to 2003 mini-jobs were restricted to employments under 15 hours per week, including earlier years would likely bias the results substantially due to large measurement errors in hours. The core sample is selected similarly to the VSE sample: individuals between the ages of 16 to 80 with earnings between €50 to €1500 per month, working more than 1 hour per week but less than 45 hours per week. Observations with gross hourly wages at or below the 1st and at or above the 99th percentiles are dropped. Because a few yearly bonus observations show very high values, all yearly bonuses above the 99th percentile were set equal to the 99th percentile. A few individuals reported net wages that exceed posted wages. For these individuals net wage was set equal to the posted wage. Summary statistics from the SOEP are available in the Appendix Table C.6.

5.3 Results

5.3.1 Graphical Evidence

Before estimating (31) I examine how reported hours, wages and fringe benefits change with workers' earnings visually in Figures 10 and 11. Figure 10 uses firm survey data. Panel A shows how average hours, as well as 25th and 75th percentiles of hours, change as income rises. There is a clear increasing trend with no apparent discontinuity at the mini-job threshold. Panel B shows that

[69] There are 0 missing hour observations in 2010 and a total of 69,661 missing hour observations in 2006, of these 60,198 are reported by establishments working in education and 66,049 have reported incomes of less than €375 per month. Because missing hours are concentrated within one industry and within one income group, they are unlikely to bias the results.

[70] Moreover, the difference between gross and net wages for these individuals is large which is contradictory to mini-jobs being exempt from social security and income taxes. In contrast, for the majority of mini-job workers in the VSE 2006/2010 social security and income taxes are reported to be zero, consistent with mini-job rules.

gross hours increase dramatically as income increases. Interestingly, the trend is much stronger for low-income jobs (under the mini-job threshold) than for regular jobs above the threshold. Again, there is no clear discontinuity at the threshold. In the Web Appendix I show the distributions of weekly hours and gross wages for at-the-threshold mini-jobs and regular part-time workers. The majority of these individuals report working less than 20 hours per week earning less than €13 per hour. Nearly 20 percent of individuals report earning very lower wages – under €7 per hour. Panels C and D show the evolution of posted and net wages over the income distribution. Posted wages show no apparent discontinuity, while net wages, as expected, show strong discontinuity at the threshold, since all individuals become liable for social security taxes and some for income taxes. Finally, Panels E and F show how yearly bonuses and the number of vacation days change with income. Very few people in mini-jobs receive yearly bonuses (which include holiday, Christmas and performance bonuses, severance payments, profit sharing, bonuses for improvement suggestions, allowances for inventions, and the taxable value of stock options), and there is a clear discontinuity at the threshold. The number of vacation days for which a person is eligible also increases dramatically with income, and again there is a clear discontinuity at the threshold.[71] Surprisingly, at least 25% of workers are reported to qualify for zero vacation days despite vacation allowances being a legal requirement in Germany. This evidence is consistent with survey evidence of Bachmann et al. (2012) and Wippermann (2012), who find that many individuals are unaware of their rights and do not receive required by law holiday pay. Similar figures by year are available in the Web Appendix.

Figure 11 shows graphical evidence similar to Figure 10 but based on household survey data. Panel A again shows that weekly working hours increase rapidly with income and that there is a clear discontinuity at the mini-job threshold. Gross wages reported in Panel B are substantially lower than reported in the VSE, corresponding to higher working hours in Panel A. Panel B also shows a discontinuity in gross wages at the mini-job threshold. Panels C and D show the evolution of posted and net wages across income bins. Posted wages show no clear discontinuity at the threshold, but net wages are higher for mini-job workers around the threshold. Finally, Panel E shows the size of the yearly bonus (which includes 13th and 14th month pay, christmas and holiday bonus, and profit sharing payments). The the vast majority – more than 75% – earning less than €400 per month report receiving zero bonuses. The magnitude increases slightly for higher incomes but remains small when compared to Figure 10. Unfortunately, no information on the number of vacation days is available in the SOEP.

Higher reported hours in the SOEP could either be due to measurement errors, due to sample selection, or due to reporting rules. It is possible that individuals working in smaller firms – with 10 employees or less – earn lower hourly wage. Since VSE only surveys firms with 10 employees or more this would lead to a negative bias in hours reported in the VSE. On the other hand, survey respondents in the SOEP might include all hours worked, regardless of whether they were paid for these additional hours or not. Further, the SOEP hour variable includes overtime hours, while in the VSE overtime hours are reported separately. The number of overtime hours reported in the

[71] Employers were asked to provide the number of full-time equivalent vacation days a worker is entitled to during the survey year.

VSE is very small since most of the individuals are part-time workers and thus it is unlikely to explain the difference.

The preliminary evidence from Figures 10 and 11 indicates that mini-jobs are attractive to firms because they incur lower fringe benefits as compared to regular jobs. The graphical evidence, however, does not account for the fact that some individuals with incomes below the mini-job threshold are regular employees, while some individuals with incomes above the threshold are mini-job workers.[72] If one restricts the sample to individuals whose incomes and mini-job status correspond precisely, the discontinuity in gross wages at the mini-job threshold becomes apparent in the VSE data. See Figure 12. In addition, the results in Figures 10 and 11 do not control for observable characteristics such as occupation, industry, or geographical location. For this reason, I turn to regression evidence.

5.3.2 Gross Wage Differential and Fringe Benefits

Results from the VSE (firm survey) are presented in Table 3. Columns (1) through (5) estimate specification (31) within a narrow window of earnings around the mini-job threshold: only individuals earning between €375 to €500 are included. Columns (6) through (9) extend the window to the core sample – individuals earning between €50 and €1500 per month. Table 3 provides results for several dependent variables: logarithm of hourly gross, posted and net wages, yearly bonus (in euros), the number of vacation days, and the logarithm of total gross wage calculated as the sum of all yearly payments divided by total yearly hours. Firm fixed effects are included in columns (2), (3), (4), (7) and (9). Table 3 shows that gross wages are 6-9% higher for mini-job workers than regular employees, the results are robust across all 9 specifications. Including firm fixed effects increases the wage differential, a likely explanation is that firms that hire mini-job workers are more "frugal" and pay lower wages. Such firm selection is then implicitly absorbed in the mini-job coefficient β_0 when firm fixed effects are not included. Since wages show increasing trends both below and above the mini-job threshold, including linear and quadratic trends also increases the wage differential between the gross wages paid to mini-job and to regular workers. Note that in contrast to Panel C of Figure 10, which shows gross wage just below the threshold approximately equal to gross wage just above, specification (1) implies that mini-job wages are approximately 6% higher. This discrepancy is due to the fact that not all workers below the threshold are mini-job workers, and vice versa. When one restricts the sample to individuals whose incomes and mini-job status correspond precisely, the discontinuity at the mini-job threshold becomes apparent. See Figure 12 in the Appendix.

In contrast to gross wages, hourly posted wages are extremely similar, with a statistically significant difference of plus/minus 2% depending on the specification. In other words, in the market, mini-job workers and regular workers are paid similar posted wages, but employers are liable for

[72] Because the mini-job threshold applies to combined earnings, individuals with several low-paying jobs might be subject to regular taxation. Alternatively, workers who usually receive higher incomes, might temporarily experience low hours and hence report earnings below the mini-job threshold. Finally, mini-job workers are allowed to exceed the threshold several times per year.

larger social security taxes on mini-jobs, which generates a higher gross wage for those employees. Net wages are approximately 15 to 23% larger for mini-job workers than regular employees, which roughly corresponds to the difference expected from Table 1.[73]

Consistent with graphical evidence from Figures 10, regression evidence shows that fringe benefits are smaller for mini-job workers than regular employees. Table 3 shows that mini-job workers receive smaller yearly bonuses – €60-100 less – and fewer vacation days – 2-3 days less – than regular employees. Including firm fixed effects reduces the difference, again consistent with the notion that firms that hire the mini-job workers offer worse wages and benefits in general. Finally, the last dependent variable incorporates fringe benefits (bonuses and vacation day pay) into a measure of total gross wage and shows that accounting for bonus and vacation pay does not equate the wages of mini-job workers and regular employees, but it reduces the difference substantially.[74] Unfortunately, the yearly bonuses and vacation days do not cover all fringe benefits received by the employees. For example, sick day pay, statutory holiday pay, and maternity leave payments are not included. The fact that mini-job workers are paid slightly higher wages but lower fringe benefits suggests that these differences cannot be attributed to selection among workers: if workers are negatively selected into the mini-job status, they should receive both lower wages and lower fringe benefits. Similarly, if workers are positively selected into the mini-job status, they should receive both higher wages and higher fringe benefits. The results in Table 3 therefore suggest that employers are willing to pay mini-job workers higher gross wages because they incur lower fringe benefit costs. This finding leads support to the theoretical model in Section 4.2: workers in Germany are able to bunch at the mini-job threshold because the labor cost structure differs for mini-job and regular workers.

The regression results from the SOEP (household survey) are available in Table 4 and reinforce the finding that mini-job wages are higher at the threshold than regular wages. Columns (1) and (6) can be directly compared to columns (1) and (6) of Table 3, while columns (3) and (8) provide the closest comparison to columns (4) and (8) of Table 3 respectively. The gross wage differential varies between 6.5% to 13.7%, and thus is quite a bit larger in the SOEP than in the VSE. In columns (2), (4), (5), (7) and (9), I control for incentives to bunch at the threshold by including the variable *individual notch* which measures the size of the tax notch experienced by a worker at the mini-job threshold and is based on spousal earnings. Results in columns (2), (4), (5), (7) and (9) suggest that controlling for marital status and tax incentives does not have a large effect on the wage differential. This finding is reassuring in light of my inability to control for family characteristics in the firm survey results, and again supports that idea that selection is unlikely to explain the differences in wages and fringe benefits.

[73] Recall that women must pay an average of €90 in income taxes, while men an average of €30. Together with €40 euros of social security contributions due, this implies a combined notch of €70 to €130, which corresponds to a drop of 17.5 to 32.5% in net wages at the mini-job threshold. The total amount of social security contributions changes smoothly at the mini-job threshold, but the relative shares change discontinuously: employers switch from paying 30% contributions in mini-jobs to roughly 20% in regular jobs. The differential is picked up by the workers, hence, crossing the threshold implies paying a minimum of €40 in social security taxes.

[74] The dependent variable is calculated as the sum of all yearly gross wages plus yearly bonuses plus the number of vacation days times 7.5 hours times the gross wage divided by the yearly equivalent of hours worked.

Posted wages are slightly larger for mini-job than regular workers, but the difference is not statistically significant. Net wages are reported to be 15.5-19% larger for mini-job workers than regular employees. In the household survey data, yearly bonus appears to be smaller for mini-job workers, but not all coefficients are statistically significant, as can be seen in Table 4. Not surprisingly, including bonus in gross wage calculation does not decrease the wage differential between mini-job workers and regular employees substantially: the magnitude of reported bonuses is smaller in the SOEP as compared to the VSE. This difference could either be due to measurement error – individuals forget to report received bonuses – or due to firm selection – firms with 10 employees or more might give larger bonuses than smaller firms.

Together the results in Tables 3 and 4 provide strong evidence that the wage differential between mini-job and regular workers is positive and it reflects the differences in fringe benefits between the two types of jobs. Because I do not have data on all fringe benefits paid, I am not able to show that the total labor costs – inclusive of wages, taxes and benefits paid – are equal for mini-job and regular workers, but the estimates in the last row of Table 3 suggests that this is likely to be the case. Following the prediction in Section 4.2, the large amount of bunching at the mini-job threshold can then be explained by the differences in labor costs between mini-job and regular part-time workers. Originally, lower fringe benefits made mini-jobs attractive to firms because mini-job workers incurred lower costs. In the long run – when mini-jobs wages have adjusted upward – the number of mini-jobs remains to be high to ensure wage equilibrium.[75]

Tables 5 repeats specifications (4) and (9) from Table 3 but interacts the mini-job indicator with gender and age indicators, and indicators of collective agreements. Columns (1) and (4) show that the wage gap is slightly bigger for males, but the difference is extremely small. Most interaction terms with age variables are not statistically significant in columns (2) and (3). Finally, columns (3) and (6) study the effect of collective agreements. For each firm up to three types of collective agreements are reported, these include industry-level collective agreements which only cover workers from specific industry, firm collective agreements that cover workers of the firm, and enterprise level collective agreement which cover workers at the enterprise level. None of these agreements typically apply to mini-job workers. Moreover, not all agreements affect wages, some agreements only regulate working hours, overtime, vacancy postings, etc. Industry agreements are most common, however, these need not apply to all workers at the firm, merely to the workers who are part of the respective union. Results in column (3) suggest that only the presence of an enterprise-level agreement affects the wage differential between mini-job workers and regular employees, completely eliminating the difference. The magnitude of this effect is smaller in column (6). The presence of an industry agreement, on the other hand, increases the wage differential in specification (6).

Appendix Tables C.7 and C.8 show that estimates are robust to sample selection and hour definition.

[75] If the number of mini-jobs were to decrease, the labor supply of mini-jobs would exceed labor demand, and wages would decrease, again generating incentives for firms to hire mini-job workers.

5.4 Employment Duration

It is possible that mini-jobs are attractive to firms because of potentially lower dismissal costs. In this section I argue that such incentive is unlikely to be the driving mechanism behind the popularity of mini-jobs. In Germany labor protections do not apply during the first 6 months of employment. Therefore, if temporary help is needed firms can hire regular part-time workers without worrying about future termination costs. Figure 13 provides further evidence that at-the-threshold mini-job employments are more stable than those of similar part-time workers. Figure 13 shows the cumulative distribution of employment durations with a given enterprise based on the SIAB data. I consider employment spell terminated if individual quits labor force, switches to a different establishment, or employment is interrupted for more than 30 days. The results show that more than 50% of non-threshold mini-job workers, i.e. individuals earning less than mini-job threshold minus €25 per month, and regular part-time workers, i.e. individuals earning between mini-job threshold and €400 per month, are employed for 6 months or less at any given establishment. In contrast, less than 35% of individuals in at-the-threshold jobs are terminated within 6 months. In general, at-the-threshold mini-jobs offer longer employment spells compared to other part-time jobs. Most mini-job workers are also not flexible along the intensive margin. As can be seen in Figures 3 and 4, the vast majority of mini-job workers are employed in at-the-threshold jobs. Since these individuals already work the maximum number of allowed hours, their hours cannot be extended as necessary. Hence, mini-jobs should not be attractive to firms that are looking for flexibility in the number of hours worked.

5.5 Re-evaluating Elasticity Estimates

When estimating earnings elasticities in Section 3.5.3, I assume that only tax liabilities change at the threshold. The results in this section provide clear evidence that this is not the case: in addition to tax liabilities, gross wages and fringe benefits, e.g. vacation pay and yearly bonuses, also change at the threshold. How does this finding affect the estimates of elasticities in Section 3.5.3? The answer to this question depends on what we believe about individuals' valuation of fringe benefits. If individuals value fringe benefits in full and wages adjust appropriately to reflect differences in employer labor costs, then elasticity estimates are correct as long as we estimate them using the distributions of total pay, i.e. earnings inclusive of all benefits. On the other hand, if fringe benefits are not valued by workers, and mini-job wages are higher than wages in regular jobs, then in addition to tax-induced notch and kink, individuals experience an additional kink at the mini-job threshold due to the difference in wages.

Vacation pay and bonus payments are monetary benefits that are likely to be valued by individuals at their face value. Bachmann et al. (2012) and Wippermann (2012) find that mini-job workers are also less likely to receive sick day pay, statutory holiday pay, maternity pay and company training. All these benefits, with the exception of company training are monetary payments received in the near future and therefore there is no reason to believe individuals would not value them. The distribution of earnings used to estimate elasticities in Section 3.5.3 is inclusive of bonus payments,

as well as vacation, sick day and statutory pay. Therefore elasticities estimated in Section 3.5.3 should provide accurate estimates of the true elasticity of earnings with respect to the net-of-tax rate if gross wages reached an equilibrium and reflect differences in employer costs. Results of Table 3 suggest this is likely to be the case. If the wages of mini-job workers are too low, the size of the notch is actually smaller, and elasticities are slightly underestimated.

6 Conclusion

This paper shows evidence of strong behavioral responses – in the form of sharp bunching – to a threshold that generates large discontinuous changes both in the marginal tax rates and in the total income and payroll tax liability of individuals in Germany. I further show that in addition to tax rates, fringe benefit payments also change at the threshold. Using a theoretical model I show that labor supply responses to taxes are strongest when the statutory incidence of tax breaks falls on the employers. I conclude that the differences in fringe benefits make mini-jobs attractive to employers, thus facilitating labor supply responses and leading to large bunching at the threshold.

The results of this paper highlight the inefficiency of notches: even in a presence of substantial adjustment costs notches can generate large distortions. These distortions can be further exacerbated by firm incentives, if policy gives all or part of the tax breaks to firms. These large distortions lead to effective entrapment of workers in low-paying jobs. The finding that many individuals who do not have incentives to limit hours worked end up with below-the-threshold job signifies the magnitude of the distortion. This paper demonstrates that policymakers should design programs that not only incentivize labor force entry, but also foster integration in the labor force. In case of mini-jobs in Germany, integration could be improved by smoothing the mini-job notch with a kink and enforcing labor rules properly, to ensure firms' hiring decisions are not distorted.

The findings of the paper stress the importance of firms in the equilibrium outcomes of labor markets in general. While individuals are likely to suffer from adjustment costs, information frictions and behavioral biases, and therefore are constrained in their ability to respond to tax changes and labor regulations, firms are likely to be more responsive to incentives generated by tax systems and labor rules. To devise effective labor rules, policymakers should not only take into account how policies may influence workers' decisions, but also consider firms' incentives.

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Table 1: Mini-Job Rules, Social Security Tax Rates, Income Tax Notches and Marginal Tax Rates

		Mini-Job	**Social Security**			**Income Tax Women**		**Income Tax Men**	
		Threshold	Mini rate	Phase-out rate	Full Rate	Notch	MTR	Notch	MTR
		K	τ_{Mini}	$2\tau_{Full} - \tau_{Mini}$	τ_{Full}	ΔT_{Income}	τ_{Income}	ΔT_{Income}	τ_{Income}
by year:	1999	325	22	n/a	42	86	27	31	11
	2000	325	22	n/a	42	85	27	30	10
	2001	325	22	n/a	42	80	25	28	9
	2002	325	22	n/a	42	80	25	28	9
	2003	400	25	59	42	99	25	34	9
	2004	400	25	59	42	94	24	31	9
	2005	400	25	59	42	92	24	30	8
	2006	400	30	48	39	92	24	30	8
	2007	400	30	48	39	92	24	30	8
	2008	400	30	48	39	92	24	30	8
	2009	400	30	48	39	91	23	29	8
	2010	400	30	48	39	90	23	28	8
1998-2002:	under 25	325	22	n/a	42	6	3	1	1
	25–40 years old	325	22	n/a	42	84	26	24	8
	40–60 years old	325	22	n/a	42	80	25	41	13
	over 60	325	22	n/a	42	20	6	12	5
2003-2011:	under 25	400	28.13	52	40.13	8	2	1	0
	25–40 years old	400	28.13	52	40.13	92	24	19	5
	40–60 years old	400	28.13	52	40.13	92	24	49	13
	over 60	400	28.13	52	40.13	24	7	10	3

Notes: This table shows the size of the mini-job threshold (in posted earnings); mini-job, the phase out and full social security tax rates; as well as the average income tax notch and income tax marginal tax rate experienced by individuals at the mini-job threshold. Mini-job social security (SS) rate is charged on incomes below or at the mini-job threshold. The phase out SS rate is charged on earnings between €400 and €800 from 2003 on. Regular SS rate is charged on incomes above €400. *Notch* is the average lump-sum payment of income tax an individual must make upon exceeding the mini-job threshold. *MTR* is the average marginal tax rate at the mini-job threshold. For single individuals, spousal income is set to zero. Spousal income includes labor earnings, as well as social security and private pensions. For further details see Section 3.4 and Appendix B.1. *Source*: Author's calculations using Socio-Economic Panel (SOEP), version 30.

Table 2: Heterogeneity of Elasticities by Gender, Age, Marital Status and Industry

		1999-2002		2003-2010			
		e	s.e.(e)	e	s.e.(e)		
Women:	under 25	0.14	(0.01)	0.15	(0.02)		
	25-40 years old	0.26	(0.01)	0.18	(0.01)		
	40-60 years old	0.35	(0.04)	0.26	(0.02)		
	over 60	0.55	(0.03)	0.51	(0.04)		
Men:	under 25	0.16	(0.01)	0.24	(0.02)		
	25-40 years old	0.09	(0.03)	0.16	(0.03)		
	40-60 years old	0.14	(0.03)	0.20	(0.05)		
	over 60	0.64	(0.04)	0.78	(0.11)		
		1999-2002		2003-2005		2006-2010	
		e	s.e.(e)	e	s.e.(e)	e	s.e.(e)
Singles:		0.27	(0.07)	0.65	(0.1)	0.60	(0.16)
Women:	Agriculture	0.27	(0.04)	0.17	(0.03)	0.27	(0.04)
	Food Manufacturing	0.35	(0.04)	0.27	(0.03)	0.38	(0.03)
	Other Manufacturing	0.25	(0.02)	0.24	(0.02)	0.41	(0.03)
	Construction	0.40	(0.05)	0.26	(0.03)	0.42	(0.05)
	Motor Vehicles	0.39	(0.04)	0.29	(0.04)	0.56	(0.08)
	Wholesale	0.30	(0.03)	0.27	(0.03)	0.42	(0.04)
	Retail	0.29	(0.03)	0.19	(0.02)	0.29	(0.02)
	Accommodations	0.18	(0.02)	0.13	(0.02)	0.16	(0.02)
	Food Services	0.15	(0.02)	0.09	(0.02)	0.14	(0.02)
	Transportation and Storage	0.24	(0.03)	0.14	(0.03)	0.23	(0.03)
	Finance and Insurance	0.29	(0.02)	0.22	(0.02)	0.37	(0.04)
	Real Estate and Rentals	0.16	(0.02)	0.14	(0.01)	0.21	(0.03)
	Professional Services	0.16	(0.02)	0.09	(0.01)	0.15	(0.01)
	Education	0.07	(0.01)	0.06	(0.01)	0.11	(0.01)
	Health Services	0.27	(0.02)	0.23	(0.02)	0.34	(0.02)
	Organizations	0.08	(0.01)	0.07	(0.01)	0.14	(0.02)
	Other Activities	0.18	(0.01)	0.13	(0.01)	0.16	(0.02)

Notes: This table shows elasticities of earnings with respect to net-of-tax rate by gender, age group, marital status and industry. These elasticities are estimated using an approach presented in Section 3.2. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table 3: The Effect of Mini-Job Status on Wages, Bonuses and Vacation Days (Firm Survey VSE)

	Monthly Income €375–€500					**Monthly Income €50–€1500**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable: Log(Hourly Gross Wage)									
Mini-Job	0.060***	0.091***	0.057***	0.088***	0.062***	0.094***	0.095***	0.062***	0.070***
	(0.007)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Dependent Variable: Log(Hourly Posted Wage)									
Mini-Job	-0.017***	0.014***	-0.019***	0.012**	-0.014**	0.016***	0.017***	-0.015**	-0.007*
	(0.007)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Dependent Variable: Log(Hourly Net Wage)									
Mini-Job	0.173***	0.191***	0.151***	0.150***	0.147***	0.219***	0.231***	0.174***	0.182***
	(0.007)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.004)	(0.005)	(0.004)
Dependent Variable: Yearly Bonus									
Mini-Job	-141.561***	-80.246***	-81.099***	-60.706***	-94.085***	-134.388***	-108.769***	-112.651***	-89.406***
	(5.195)	(4.434)	(4.628)	(4.834)	(5.120)	(7.427)	(6.115)	(5.744)	(6.112)
Dependent Variable: Vacation Days									
Mini-Job	-6.244***	-3.776***	-3.041***	-1.894***	-2.543***	-6.951***	-5.843***	-4.548***	-3.948***
	(0.320)	(0.171)	(0.170)	(0.170)	(0.210)	(0.274)	(0.138)	(0.291)	(0.220)
Dependent Variable: Log(Hourly Gross Wage incl. Bonus and Vacation Pay)									
Mini-Job	-0.017**	0.053***	0.019***	0.055***	0.015**	0.015*	0.033***	-0.011**	0.008
	(0.009)	(0.006)	(0.005)	(0.006)	(0.007)	(0.008)	(0.004)	(0.006)	(0.005)
Firm FE	No	Yes	Yes	Yes	No	No	Yes	No	Yes
Individual Controls	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Firm Controls	No	No	No	No	Yes	No	No	Yes	No
Linear Wage Trend	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Quadratic Wage Trend	No	No	No	No	No	No	No	Yes	Yes
Number of Observations	107,239	107,239	107,239	107,239	107,239	887,183	887,183	887,183	887,183

Notes: This table shows the coefficients from regressing the listed dependent variables on a mini-job indicator variable. Standard errors are clustered by firm. Individual controls include male indicator, age group indicators, company tenure, education indicators, occupational status and occupation indicators and year indicators. Firm controls include industry indicators, geographical indicators, number of male and female workers, indicators of applicable collective agreements, and indicators of whether a firm is part of a larger enterprise, whether a firm works in handcrafts, and whether a firm is publicly traded. Linear and quadratic trends include both linear/quadratic terms and their interactions with the mini-job indicator. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Verdienststrukturerhebung, 2006 and 2010, author's calculations.

Table 4: The Effect of Mini-Job Status on Wages and Bonuses (Household Survey SOEP)

	Monthly Income €375–€500					**Monthly Income €50–€1500**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable: Log(Hourly Gross Wage)									
Mini-Job	0.086**	0.065*	0.083**	0.069**	0.137**	0.099***	0.086***	0.100***	0.092***
	(0.038)	(0.038)	(0.033)	(0.033)	(0.061)	(0.022)	(0.021)	(0.029)	(0.029)
Indiv. Notch		0.003***		-0.001	-0.001		0.006***		0.004***
		(0.001)		(0.001)	(0.001)		(0.000)		(0.001)
Dependent Variable: Log(Hourly Posted Wage)									
Mini-Job	0.017	-0.004	0.014	-0.000	0.068	0.029	0.016	0.029	0.022
	(0.038)	(0.038)	(0.033)	(0.034)	(0.061)	(0.022)	(0.021)	(0.029)	(0.029)
Indiv. Notch		0.003***		-0.001	-0.001		0.006***		0.004***
		(0.001)		(0.001)	(0.001)		(0.000)		(0.001)
Dependent Variable: Log(Hourly Net Wage)									
Mini-Job	0.196***	0.158***	0.188***	0.150***	0.154**	0.242***	0.230***	0.177***	0.177***
	(0.043)	(0.043)	(0.038)	(0.039)	(0.071)	(0.023)	(0.024)	(0.032)	(0.032)
Indiv. Notch		0.005***		0.002	0.002		0.004***		0.001*
		(0.001)		(0.002)	(0.002)		(0.000)		(0.001)
Dependent Variable: Yearly Bonus									
Mini-Job	-81.028**	-79.377**	-56.797***	-57.303***	-19.068	15.406	5.503	-31.155	-38.612
	(34.184)	(35.239)	(19.326)	(20.189)	(31.994)	(20.987)	(21.776)	(28.693)	(29.099)
Indiv. Notch		-1.399*		-2.493***	-2.509***		3.182***		-0.312
		(0.761)		(0.868)	(0.863)		(0.531)		(0.702)
Dependent Variable: Log(Gros Wage incl. Bonus)									
Mini-Job	0.074*	0.054	0.074**	0.060*	0.132**	0.093***	0.078***	0.092***	0.084***
	(0.038)	(0.038)	(0.033)	(0.034)	(0.061)	(0.022)	(0.021)	(0.030)	(0.030)
Indiv. Notch		0.003***		-0.001	-0.001		0.006***		0.003***
		(0.001)		(0.001)	(0.001)		(0.000)		(0.001)
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indiv. Controls (subset)	No	No	Yes	No	No	No	No	Yes	No
Indiv. Controls (full)	No	No	No	Yes	Yes	No	No	No	Yes
Firm Controls	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Linear Wage Trend	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Quadratic Wage Trend	No	No	No	No	No	No	No	Yes	Yes
Number of Observations	3,373	3,238	3,357	3,357	3,020	20,581	19,979	20,524	18,889

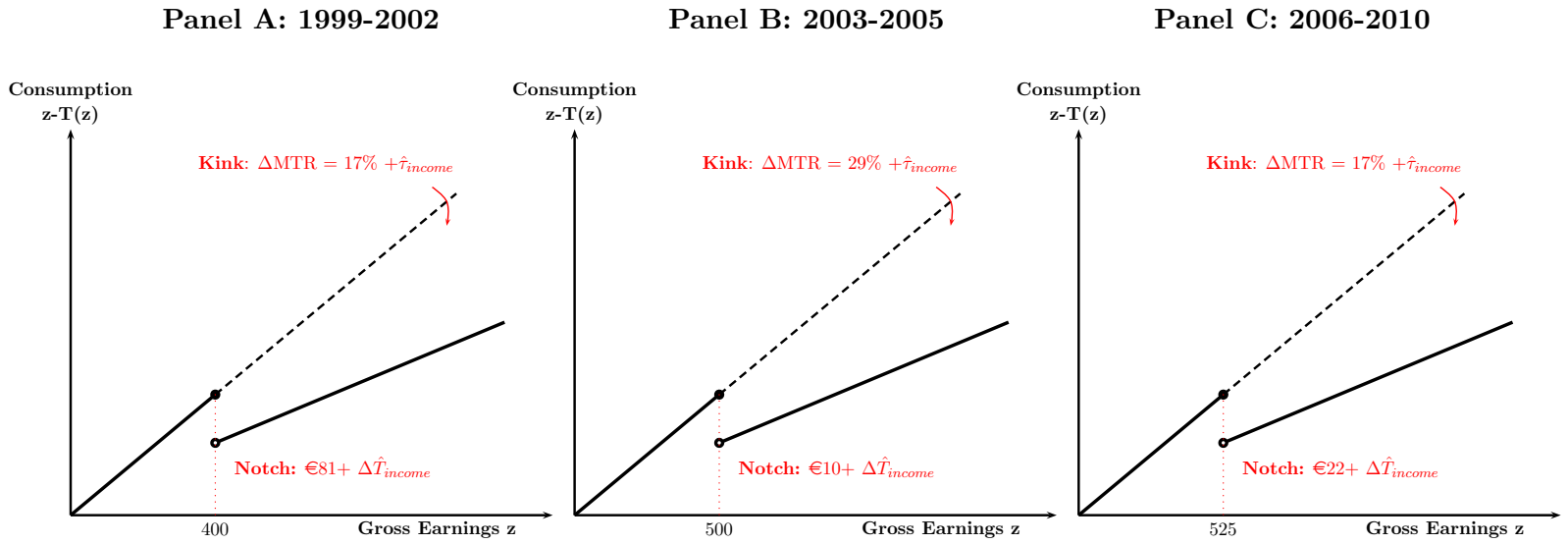
Notes: This table shows the coefficients from regressing the listed dependent variables on a mini-job indicator variable. Standard errors are clustered by individual. Individual controls (subset) include male indicator, age group indicators, company tenure, education indicators and occupation indicators. In addition to above controls, the full set also includes marital status, presence of a partner (if not married), citizenship indicator, indicator of whether a job matches completed training, experience working full time and experience working part time. Firm controls include industry indicators and indicators of size (by number of employees). Linear and quadratic trends include both linear/quadratic terms and their interactions with the mini-job indicator. *Source*: Socio-Economic Panel (SOEP), version 30.

Table 5: The Effect of Mini-Job Status on Gross Wage (Firm Survey VSE)

	Monthly Income €375–€500			**Monthly Income €50–€1500**		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable: Log(Hourly Gross Wage)						
Mini-Job	0.087***	0.087***	0.089***	0.066***	0.075***	0.061***
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Mini-Job x Male	0.001***			0.016***		
	(0.006)			(0.003)		
Mini-Job x Age<25		-0.011			-0.002	
		(0.009)			(0.004)	
Mini-Job x Age 40-60		0.007			-0.012***	
		(0.006)			(0.002)	
Mini-Job x Age 60-65		-0.011			0.011***	
		(0.013)			(0.004)	
Mini-Job x Age >65		0.002			-0.003	
		(0.013)			(0.006)	
Mini-Job x Industry Coll. Agr.			0.008			0.034***
			(0.010)			(0.005)
Mini-Job x Firm Coll. Agr.			-0.023			0.016
			(0.026)			(0.016)
Mini-Job x Enterprise Coll. Agr.			-0.101***			-0.056***
			(0.030)			(0.014)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Occupation Controls	Yes	Yes	Yes	Yes	Yes	Yes
Linear Wage Trend	Yes	Yes	Yes	Yes	Yes	Yes
Quadratic Wage Trend	No	No	No	Yes	Yes	Yes
Number of Observations	107,239	107,239	107,239	887,183	887,183	887,183

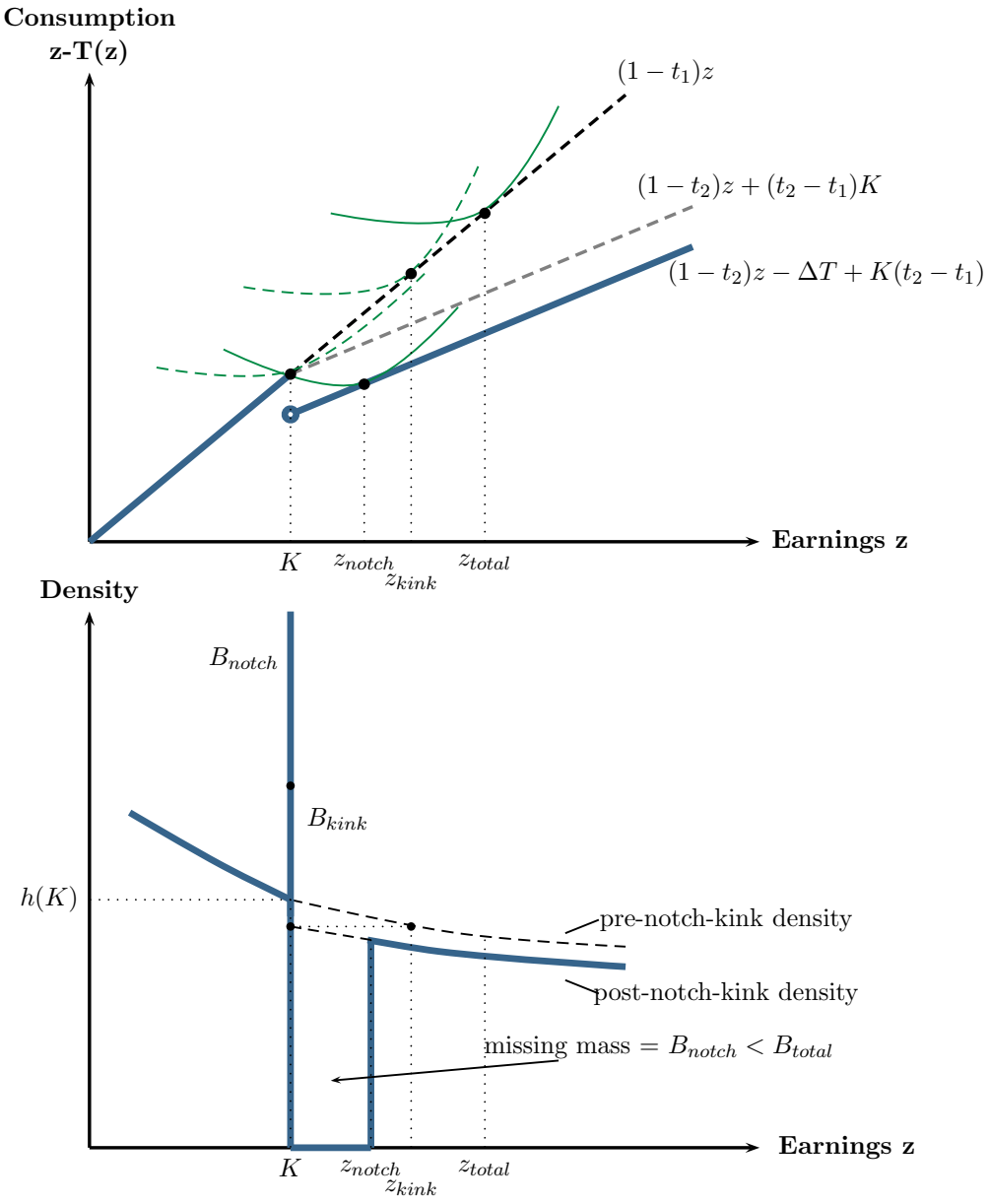
Notes: This table shows the coefficients from regressing the logarithm of gross wage on a mini-job indicator interacted with gender (columns 1 and 4), age (columns 2 and 5), collective agreements (columns 3 and 6). Standard errors are clustered by firm. Individual controls include male indicator, age group indicators, company tenure, education indicators, occupational status and occupation indicators. Linear and quadratic trends include both linear/quadratic terms and their interactions with the mini-job indicator. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Verdienststrukturerhebung, 2006 and 2010, author's calculations.

Figure 1: Budget Constraints Around the Mini-Job Threshold (in Gross Wages)



Notes: This figure shows budget constraints experiences by individuals in 1999-2002, 2003-2005 and 2006-2010 in terms of *gross* earnings. Gross earnings are defined as wages paid inclusive of all income and employee-paid social security taxes plus social security taxes paid by the employer. The budget constraints show the magnitude of the social security notch and the magnitude of change in social security tax rate (absolute difference). In addition to higher social security taxes, individuals must pay income taxes. The magnitude of income tax due, $\hat{\tau}_{income}$ and $\Delta\hat{T}_{income}$, depends on individual's marital status and spousal earnings. For single individuals, $\hat{\tau}_{income} = 0$ and $\Delta\hat{T}_{income} = 0$. For married individuals, $\hat{\tau}_{income} = \frac{\tau_{Income}}{1+0.5\tau_{Full}}$ and $\Delta\hat{T}_{income} = \Delta T + \tau_{income}\bar{K}\left(\frac{1}{1+0.5\tau_{Full}} - \frac{1}{1+\tau_{Mini}}\right)$, where τ_{Mini}, τ_{Full}, and average τ_{Income} and ΔT_{Income} are available in Table 1. For further details see Section 3.4.

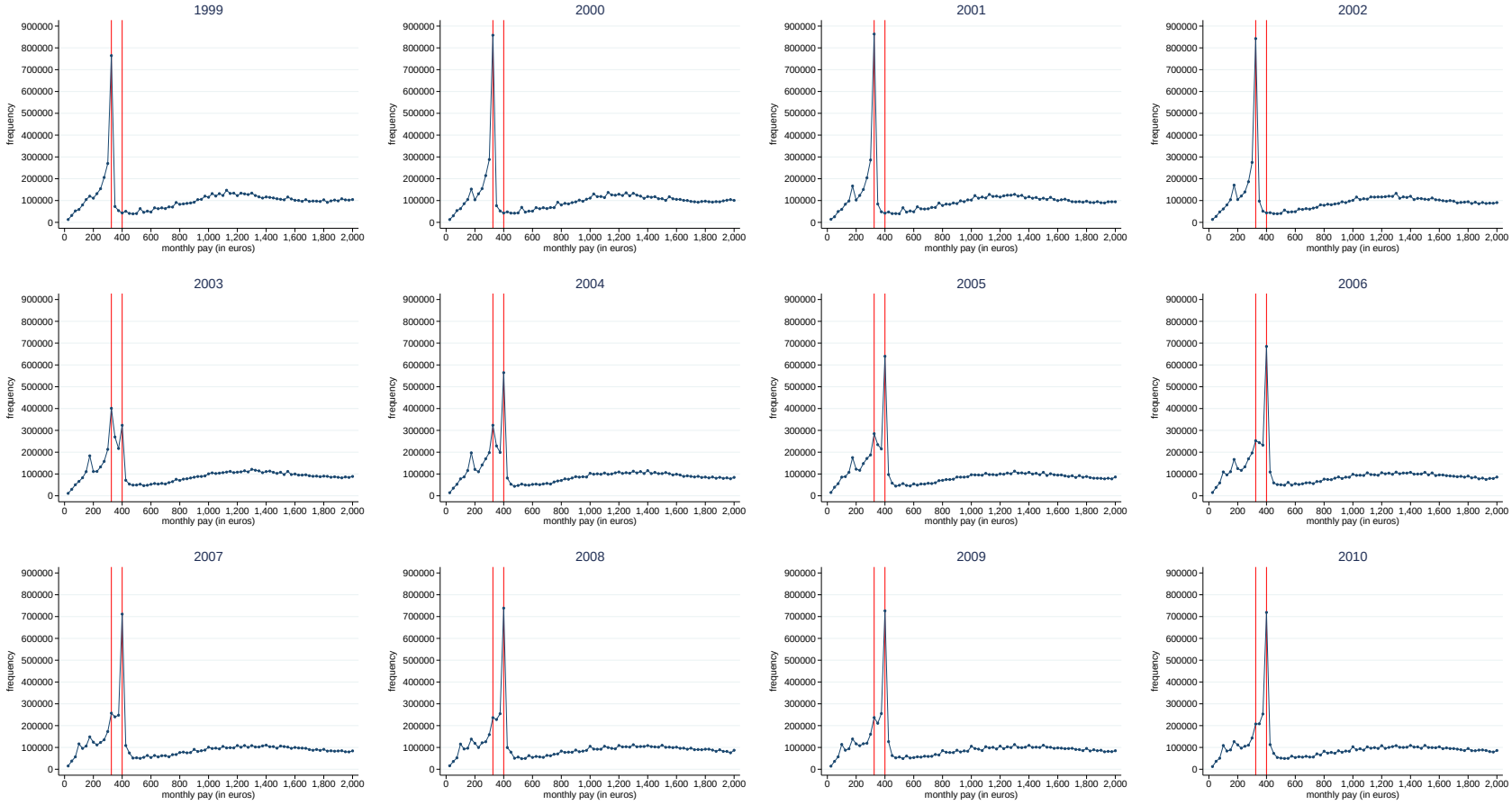
Figure 2: Budget Constraint in Presence of Kink and a Notch



Notes: Panel A shows the budget constraint of an individual whose marginal tax rate increases from t_1 to t_2 and who must pay a lump-sum tax ΔT at the threshold K. Panel B shows the corresponding distribution of earnings in the presence of such tax schedule.

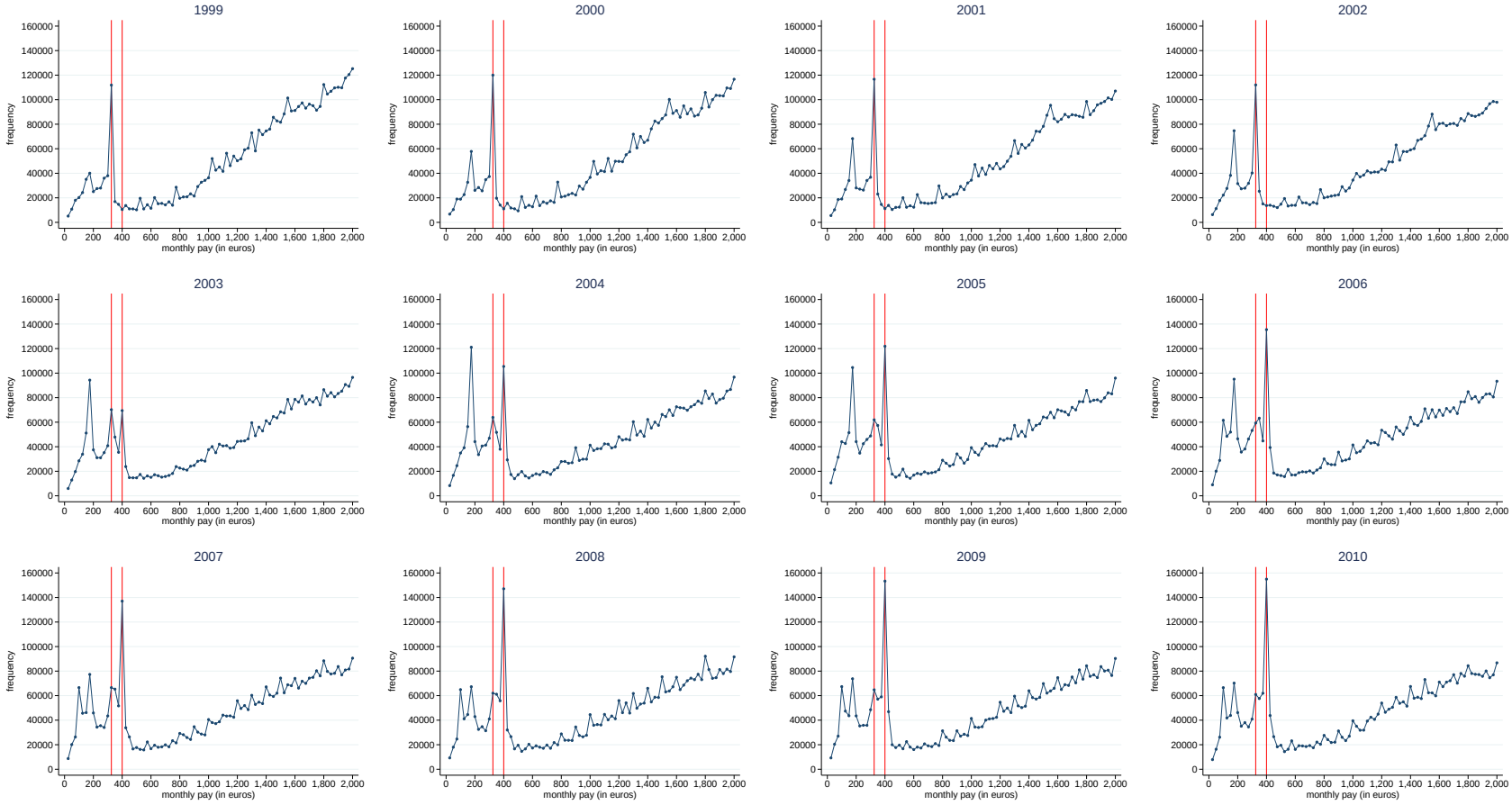
Individuals who wish to earn between K and z_{kink} under the tax rate t_1 would instead bunch and earn income K when the tax rate increases to t_2. The cutoff z_{kink} is chosen such that it is the highest income an individual could have earned under the budget constraint with slope $1-t_1$ and have his indifference curve tangent to the budget constraint with slope $1-t_2$ at the threshold K. The indifference curves of such an individual are shown as dashed green curves. Thus, the kink will generate some bunching as shown in Panel B and lead to a parallel leftward shift of the distribution of earnings. The notch will further create a region of strictly dominated incomes, so that no individual would choose to earn between K and z_{notch}. The cutoff z_{notch} is chosen such that an individual is indifferent between working more and earning z_{notch}, and working less and earning K. The indifference curves of this person are shown as solid green curves. The notch will thus lead to further bunching at the threshold K and generate a hole in the final distribution of incomes, as shown in Panel B with a bold blue curve. The size of the hole to the right of the threshold will not be equal to the entire amount of bunching, but will only account for the bunching generated by the notch.

Figure 3: Earnings in 1999–2010: Women



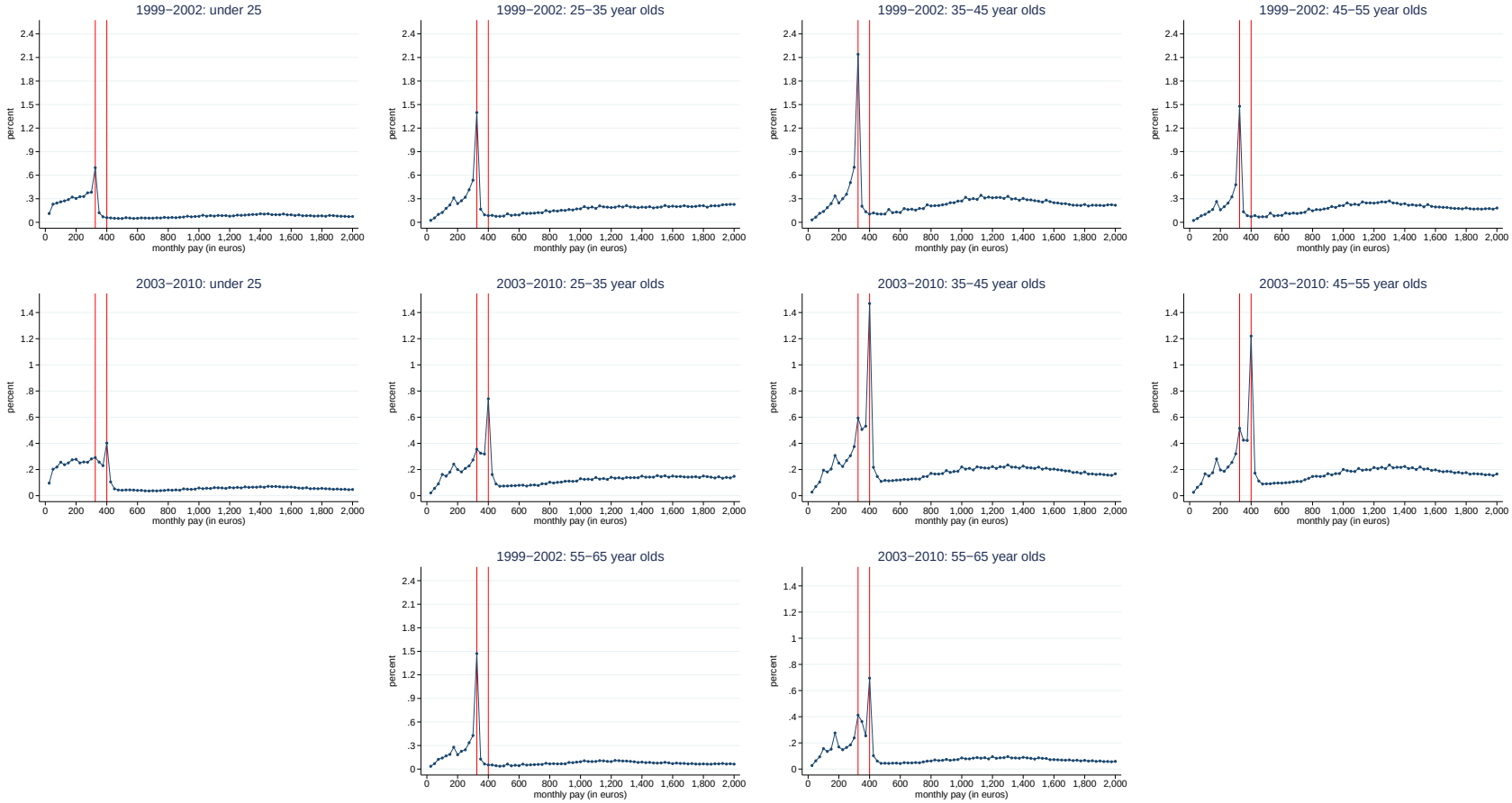
Notes: This figure shows the distribution of monthly wage earnings (posted) of women by calendar year. Each point shows the number of individuals in a €25 bin, scaled to represent the German population in that year from a 2% random sample. The vertical red lines identify the mini-job thresholds: €325 prior to 2003 and €400 thereafter. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 4: Earnings in 1999-2010: Men



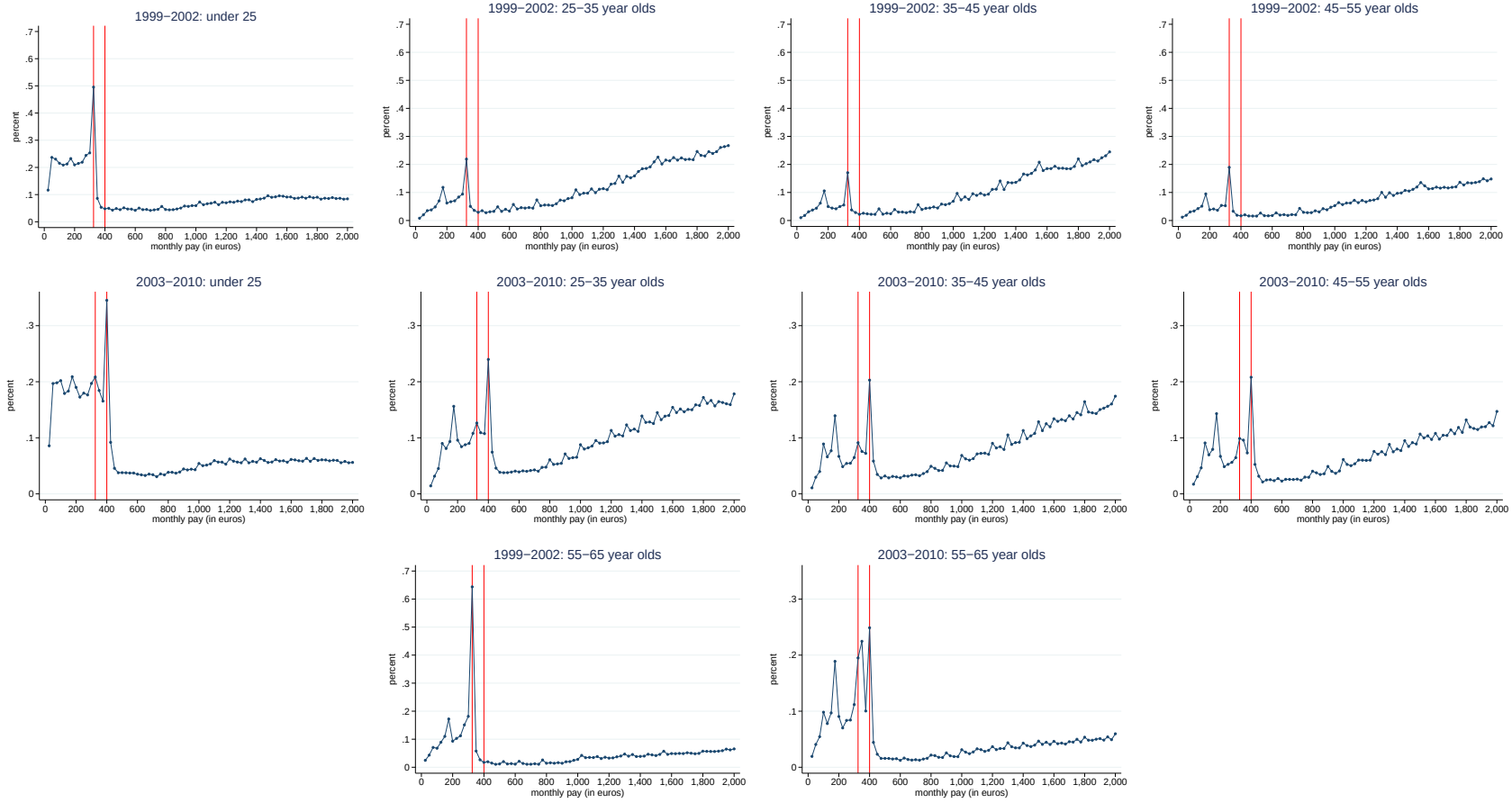
Notes: This figure shows the distribution of monthly wage earnings (posted) of men by calendar year. Each point shows the number of individuals in a €25 bin, scaled to represent the German population in that year from a 2% random sample. The vertical red lines identify the mini-job thresholds: €325 prior to 2003 and €400 thereafter. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 5: Earnings in 1999-2002 and 2003-2010: Women by Age Group



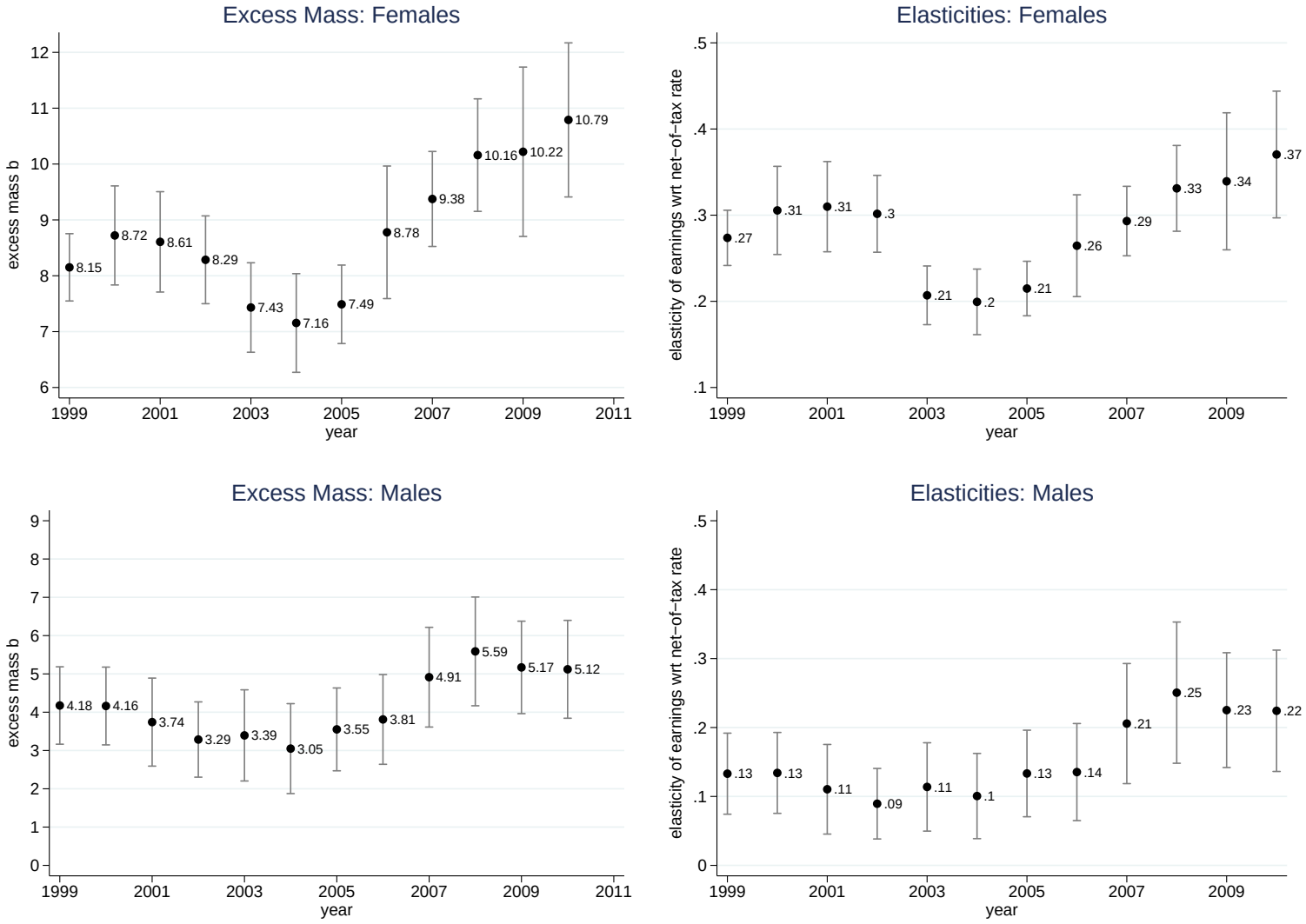
Notes: This figure shows the distribution of monthly wage earnings (posted) of women by age group in 1999-2002 and 2003-2010. Each point shows the number of individuals in a €25 bin divided by the total number of females in that year group. The vertical red lines identify the mini-job thresholds: €325 prior to 2003 and €400 thereafter. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 6: Earnings in 1999-2002 and 2003-2010: Men by Age Group



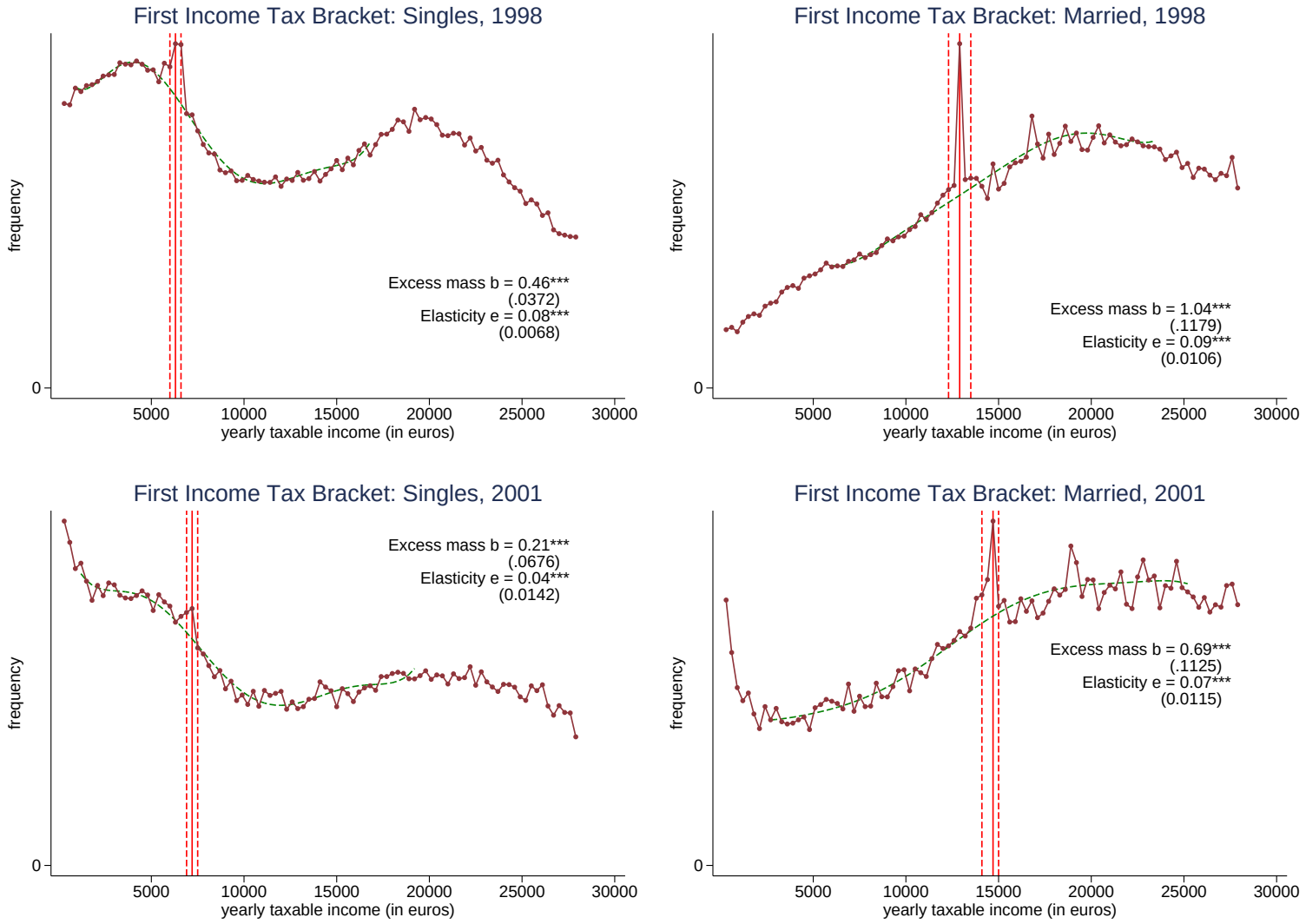
Notes: This figure shows the distribution of monthly wage earnings (posted) of men by age group in 1999-2002 and 2003-2010. Each point shows the number of individuals in a €25 bin divided by the total number of males in that year group. The vertical red lines identify the mini-job thresholds: €325 prior to 2003 and €400 thereafter. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 7: Excess Mass and Elasticity Estimates



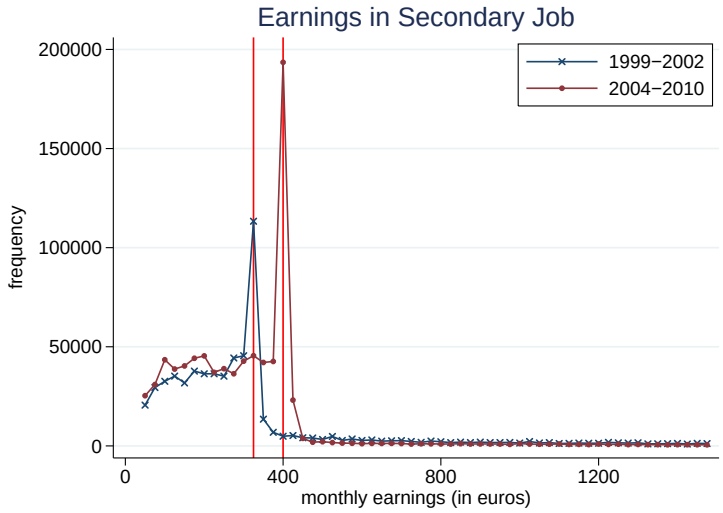
Notes: Excess bunching and elasticities are estimated using the procedure outlined in Section 3.2. I fit a 5th degree polynomial to the empirical distribution of *gross* earnings in €25 bins. The lower exclusion region z_l is determined visually: for women $z_l = 3$ in 1999–2002, $z_l = 5$ in 2003–2005, $z_l = 6$ in 2006, and $z_l = 5$ in 2007–2010; for men, $z_l = 2$ in 1999–2002, $z_l = 4$ in 2003–2005, $z_l = 5$ in 2006, and $z_l = 4$ in 2007–2010. The estimation procedure starts with an initial guess of elasticity $e_0 = 0.05$ and iterates until a fixed point is reached. Bootstrap standard errors are based on 1000 iterations. The corresponding counterfactual fits are available in the Web Appendix. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 8: Behavioral Responses to the First Income Tax Kink in 1998 and 2001



Notes: These figures show the distribution of posted earnings in 1998 and 2001 for single and married individuals around the start of first income tax bracket. In 1998, the marginal income tax rate increased from zero to 25.9% at €6,322 for single and at €12,644 for married individuals. In 2001, the marginal income tax rate increased from zero to 19.9% at €7,206 for single and at €14,412 for married individuals. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Lohn- und Einkommensteuerstatistik Public-Use-Files, 1998 and 2001, author's calculations.

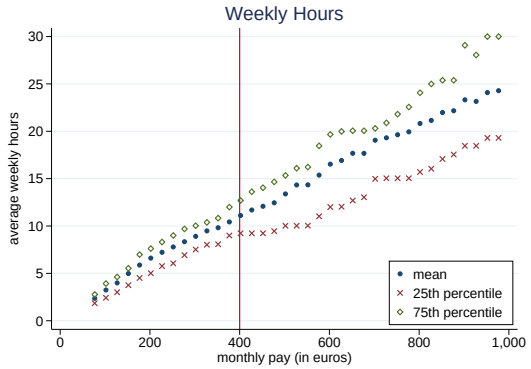
Figure 9: "Firm Bunching" – Individuals with Multiple Jobs



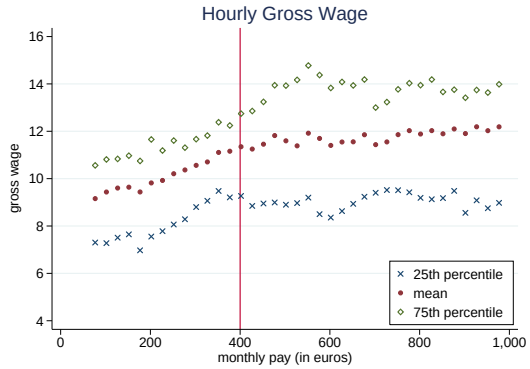
Notes: This figure shows the distribution of *posted* earnings in a secondary job for individuals who concurrently hold a second jobs in addition to "regular" job, defined as a job that pays more than €325 in 1999-2002 or more than €400 in 2004-2010. The distributions shown present averages across respective years. Only individuals who are reported to work at *two* enterprises per year are included. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 10: Earnings Distributions, Weekly Hours and Wages by Income (Firm Survey VSE)

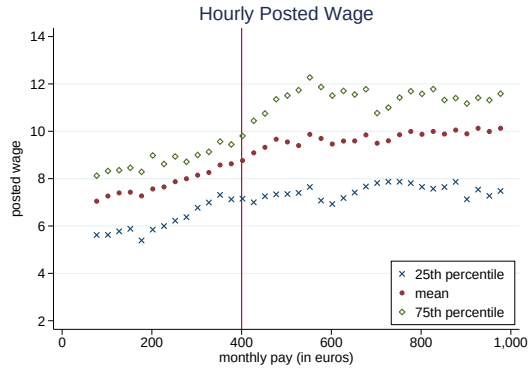
Panel A: Weekly Hours by Monthly Income



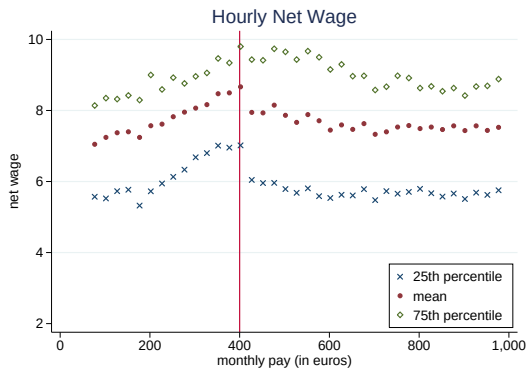
Panel B: Gross Wages by Monthly Income



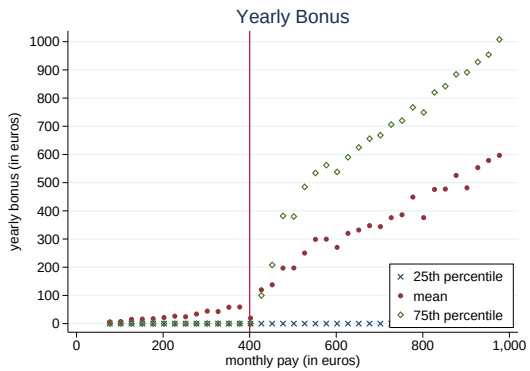
Panel C: Posted Wages by Monthly Income



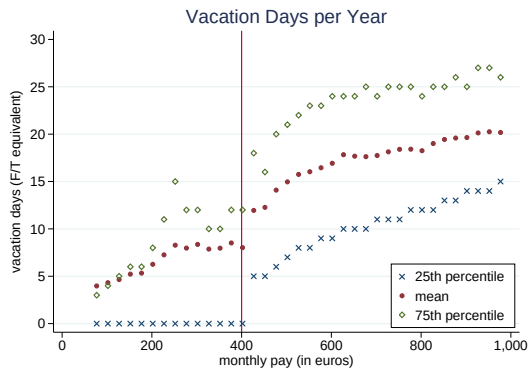
Panel D: Net Wages by Monthly Income



Panel E: Yearly Bonus by Monthly Income



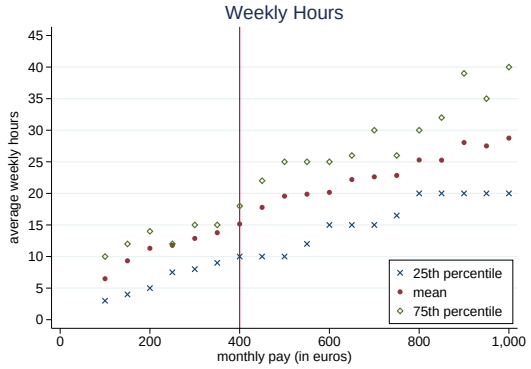
Panel F: Vacation Days by Monthly Income



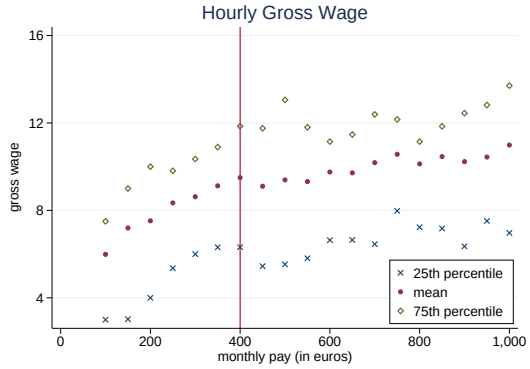
Notes: All results are based on the combined 2006 and 2010 waves of Verdienststrukturerhebung (VSE) Survey. Panel A shows the mean, as well as the 25th and 75th percentiles of weekly hours by €25 bins of monthly pay. Panel B, C and D show the mean, as well as the 25th and 75th percentiles of hourly gross, posted and net wages by €25 bins of monthly pay. Panel E and F shows the mean, as well as the 25th and 75th percentiles of yearly bonus and the number of full-time equivalent vacation days by €25 bins of monthly pay. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Verdienststrukturerhebung, 2006 and 2010, author's calculations.

Figure 11: Earnings Distributions, Weekly Hours and Wages by Income (Household Survey SOEP)

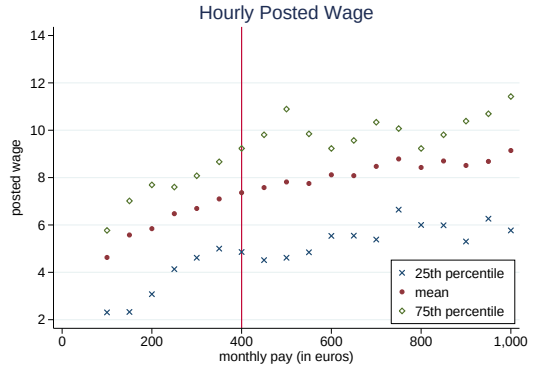
Panel A: Weekly Hours by Monthly Income



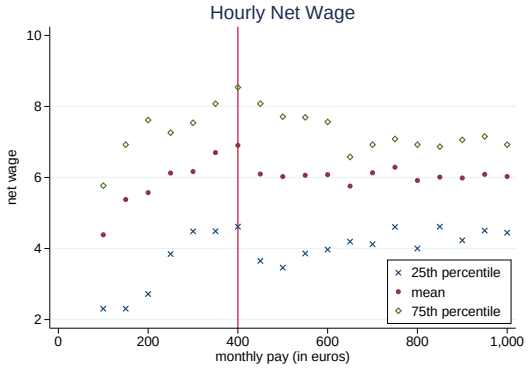
Panel B: Gross Wages by Monthly Income



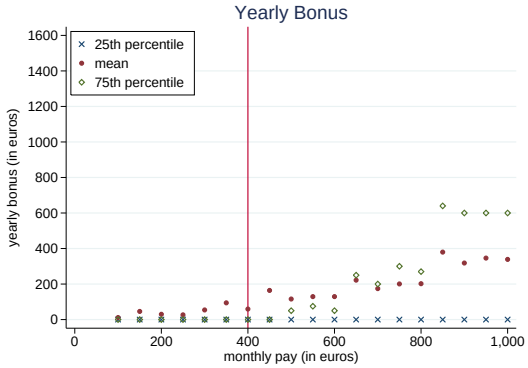
Panel C: Posted Wages by Monthly Income



Panel D: Net Wages by Monthly Income

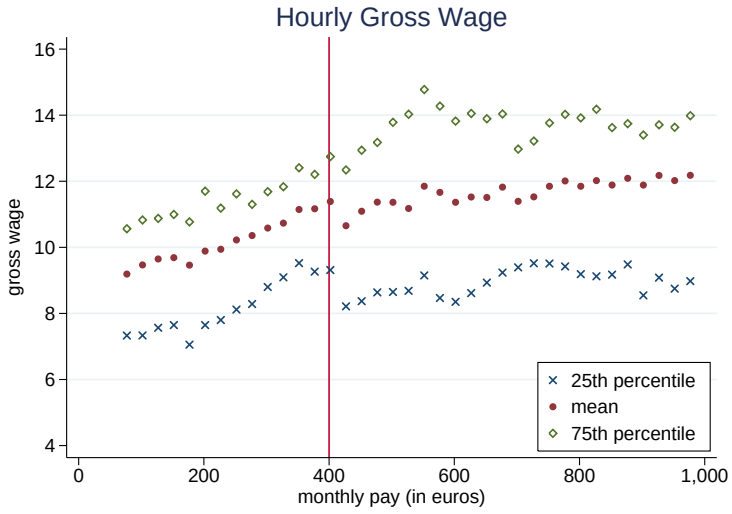


Panel E: Yearly Bonus by Monthly Income



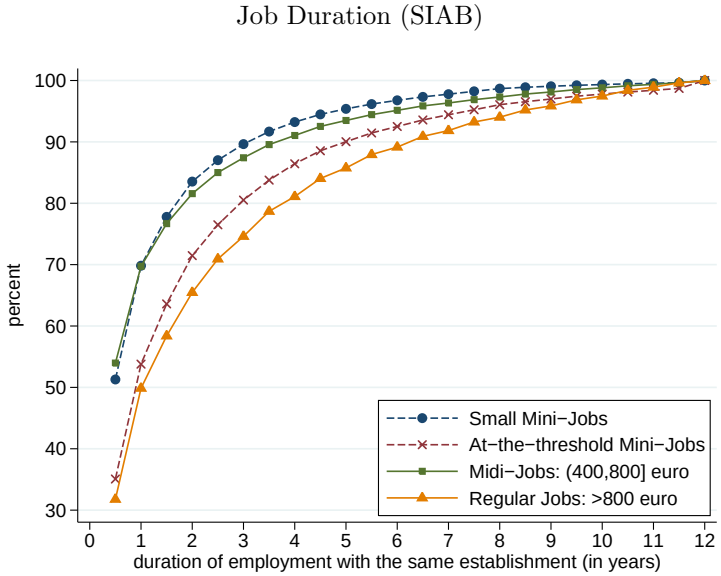
Notes: Panel A shows the mean, as well as the 25th and 75th percentiles of weekly hours by €25 bins of monthly pay. Panel B, C and D show the mean, as well as the 25th and 75th percentiles of hourly gross, posted and net wages by €25 bins of monthly pay. Panel E and F shows the mean, as well as the 25th and 75th percentiles of yearly bonus and the number of full-time equivalent vacation days by €25 bins of monthly pay. *Source*: Socio-Economic Panel (SOEP), version 30, author's calculations.

Figure 12: Hourly Gross Wage by Income: Subsample (Firm Survey VSE)



Notes: This figure shows the mean, as well as the 25th and 75th percentiles of hourly gross wage by €25 bins of monthly pay in 2006 and 2010. The sample is restricted to mini-job workers with monthly posted earnings below the mini-job threshold and regular workers with monthly posted earnings above the mini-job threshold. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Verdienststrukturerhebung, 2006 and 2010, author's calculations.

Figure 13: Job Duration by Type of Employment



Notes: This figure shows the cumulative distribution function of job durations (within the same establishment) based on the SIAB 1999-2010 data. Job duration is calculated as the time spent at any given establishment with employment breaks of less than 30 days. Cumulative distributions are based on monthly earnings in the first year of employment. Mini-jobs are defined as employments with monthly earnings of less than €300 before 2003 and less than €375 from 2003 on. At-the-threshold mini-jobs are defined as employments with monthly earnings of [€300,€325] or [€375,€400] respectively. Midi-jobs are defined as employments with monthly earnings of (€325, €800] or (€400,€800] respectively. Finally, regular jobs are defined as employments with monthly earnings of more than €800. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

APPENDIX

A SIAB Data and Sample Selection

This study uses the weakly anonymous Sample of Integrated Labour Market Biographies (Years 1975 - 2010).[76] The SIAB data includes all notifications submitted by the employers on behalf of their employees, therefore some duplicate entries are present. Below I describe the procedure I use to obtain the final sample of labor histories used in this paper.

Since the study focuses on wage responses to payroll taxes, I focus on individuals appearing in the Employment History reports (Beschäftigten-Historik or BeH). There are a total of 29,741,469 split episode BeH observations in the SIAB and 26,312,013 unsplit episodes. First, I drop all observations from years before 1999, leaving 11,595,496 unsplit observations. Next, I drop 165,048 observations that report a zero wage. I also drop all individuals that during a year are reported to have a job of any type other than regular, part-time, or marginal employment. In other words, I drop individuals that have reported working as trainees, partially-retired, interns, student trainees, or casual workers in *that* particular year. These drops reduce the dataset to 10,076,812 observations.

Next, I remove duplicate entries. First, I delete all perfect duplicates – 99 observations. Second, I remove all duplicate observations that differ only by notification reason ("grund") – 22 observations deleted. Third, I remove all duplicate observations that differ only by employment status ("erwstat") – 3 observations. Fourth, I drop observations that differ only by occupational status and working hours ("stib") – 2 observations. Fifth, I drop observations that differ only by occupation ("beruf") – 2 observations. Sixth, I keep observations with the largest reported earnings when observations *only* differ by the amount of earnings – 13,533 deleted. Finally, I keep observations with the largest earnings when observations differ only by reason for notification ("grund") – 1,145 deleted. The remaining sample consists of 10,062,006 unsplit episode observations or 7,599,850 person-year observations, and covers 1,019,061 individuals who have worked at 1,102,561 distinct establishments.

B Robustness Checks

B.1 Income Tax Notch and Marginal Tax Rate Calculations

To calculate income tax notches and marginal tax rates I use a 95% extract from the longitudinal version of the Socio-Economic Panel (SOEP), version 30.[77] There are a total of 592,864 non-duplicate year-person observations for years 1984 through 2013 with nonempty and nonzero household and personal weights covering 72,842 individuals (including children and elderly). I restrict my sample to individuals who reported posted wage earnings between [€300,€325] in 1996–2003 or [€375,€400] in 2004–2013. I also drop all individuals whose spouses report earning more than €20,000 per month or

[76] For more detailed information, see IAB's webpage at `http://fdz.iab.de/en/FDZ_Individual_Data/integrated_labour_market_biographies/SIAB_Outline.aspx`.

[77] In accordance with the German law only a 95% random sample can provided to researches from outside the European Union.

whose spousal labor earnings are missing (married individuals only). My final sample thus includes 6,068 year-person observations over 1996–2013 and 4,413 over 1990-2010, of these 3,283 between ages 25 and 60. I restrict my sample to workers in mini-jobs earning in a narrow €25 bracket below or at the threshold for two reasons. First, we are interested in estimating the tax notch and marginal tax rate at the threshold, therefore the narrowest window should offer the most accurate estimates of tax incentives. Second, despite the self-reported nature of the data, most individuals report earning the threshold amount, closely resembling distributions observed in the SIAB data. Third, increasing the size of the bracket to €50 or €75 decrease the size of the estimated notch. Therefore elasticity calculations present a lower bound on labor earnings elasticities with respect to net of social security and income tax rates.

To calculate the notch, I first calculate the amount of income tax the household must pay if the individuals remains in a mini-job, i.e. $T(12 \cdot Y_i^{spouse})$. Second, I calculate the amount of income tax due should the individual get a regular job that pays a salary equal to the mini-job threshold, i.e. $T(12 \cdot (Y_i^{spouse} + K))$ and the corresponding marginal tax rate associated with income $12 \cdot (Y_i^{spouse} + K)$. The income tax notch is then calculated as the difference between the two tax amounts, $T(12 \cdot (Y_i^{spouse} + K)) - T(12 \cdot Y_i^{spouse})$.

Ideally, one would want to observe the spousal income of all mini-jobbers in every year and calculate tax notches and marginal tax rates accordingly. Unfortunately, such administrative data is not available. The SOEP data contains spousal earnings but sample sizes are small, with only 170-350 observations per year. To improve the quality and consistency of estimates across years I consider three approaches to calculating income tax notches and MTRs. First, I calculate the true average in year j by restricting the sample to mini-job workers in year j. Second, I expand the sample to also include mini-job workers in years $j-3$ through $j+3$. While the sample is selected based on the true notch in those years, i.e. when calculating the average notch in year 2004, I consider workers who earned between €300-€325 in 2001–2003 but €375-€400 in 2004–2007, the size of the notch is based on the actual threshold in the target year j. Therefore for 2004, I calculate $T(12 \cdot (Y_i^{spouse} + 400))$, since the mini-job threshold was set at €400 in 2004. Finally, the third approach mimics the second approach but further expands the sample by including mini-job workers from 1999 through 2010.

I further consider four definitions of spousal income. The first, and simplest, only includes spouse's labor earnings, including those from self-employment. The second definition includes social security pensions in addition to labor earnings: old-age, disability, and widowhood. Note that prior to 2005, statutory pensions were not subject to income tax. Starting from 2005, 50% of the pension is subject to income tax, and this percentage share increases by 2% percentage points every year. While the majority of pensioners in Germany rely on statutory pension only, some individuals also receive income from private pensions. Thus, the third definition of income further includes private pensions: supplementary civil servant pension income, company pensions, private pensions and pension income from "other" sources as reported in SOEP. Taxation of private pensions vary, but for simplicity I assume that the entire amount of pension is subject to income tax. Finally, the

fourth definition of income also includes household asset income: from interest, dividends, and rent. Once again, taxation of financial income depends on income but for simplicity the entire amount is assumed to be subject to income tax. Whenever any of the additional income information is missing, it is set to zero, however, observations with missing spousal labor income have been dropped. My preferred definition of income is the third specification, that includes both labor and all pension income. I choose not to include financial earnings since these are not accurately reported in the survey data and thus are likely to introduce more bias.

The results of these calculations are presented in Tables C.3–C.2. In Table C.3 I use my preferred definition of income (the 3rd – labor plus pension earnings) to compare income tax notches and marginal tax rates by sample selections. The first column shows calculations of the "true income" notches and tax rates. The results are very volatile across years. The second column is based on spousal earnings of mini-job workers within 3 years of the target year. Finally, the third column includes all mini-job workers from years 1999-2010. Table C.3 show that the estimated tax rates and notches are very similar across all three specifications for both men and women, despite chosen samples.

Tables C.1 and C.2 compare notches and tax rates by definition of income, relying on 3rd sample approach (all years 1999-2010 included). As expected, the notch and marginal tax rate are smallest when only labor earnings are included. The magnitude of the notch increases as pension and asset incomes are included, especially in the later years (after 2005), when the statutory pension becomes partially subjected to income tax. Nevertheless the difference is not substantial and has negligible effect on the magnitude of elasticities. Note that the income definition matters more for women than men, since spouses of women are more likely to have larger statutory or private pensions. Also note that when calculating tax notches and marginal tax rates by age, true samples are included, i.e. only mini-job workers earning €300-€325 in 1998–2002 and €375-€400 in 2003-2011 are included.

B.2 Elasticity Estimation

The elasticity estimation procedure relies on several parameters: (a) the bin width used to generate the observed distribution, (b) the degree of the polynomial that is fit to the observed distribution, (c) the width of the estimation window, and (d) the width of the bunching window. Of these parameters, (d) is estimated visually and in most applications of bunching method – including this study – the choice is practically unambiguous. For empirical distributions in €25 bins, $z_l = 3$ in 1999–2002, $z_l = 6$ in 2003–2006, $z_l = 5$ in 2007–2010 for women, and $z_l = 2$ in 1999–2002, $z_l = 4$ in 2003–2005, $z_l = 5$ in 2006, and $z_l = 4$ in 2007–2010 for men. For empirical distributions in €12.5 bins, $z_l = 7$ in 1999–2001, $z_l = 6$ in 2002, $z_l = 10$ in 2003–2005, $z_l = 11$ in 2006, $z_l = 10$ in 2007–2010 for women, and $z_l = 3$ in 1999–2002, $z_l = 10$ in 2003–2005, $z_l = 11$ in 2006, and $z_l = 9$ in 2007–2010 for men. Parameter (c) – the width of the estimation window – identify which part of the observed distribution is used to estimate the counterfactual distribution. A window that is too short will make estimation of the counterfactual imprecise, while too large of a window can put too much emphasis on the global, rather than local fit of the counterfactual. In this study, the estimation

window is bounded on the left by zero – since no individuals report earning negative wages. I choose to limit the estimation window to the right by €1500 for women and by €1750 for men. Note that earnings distribution of women is highest around €1,500 per month and the earnings distribution of men is highest around €2,500. The amount of bunching at the mini-job threshold is not sufficient to generate a one-peaked distribution, thus the resulting counterfactual (shown in Web Appendix), display two small humps: around the mini-job threshold and at approximately €1,500/2,500. The windows were chosen to avoid "over-fitting". The results are not very sensitive to the choice of the window.

In Table C.4 I show how the elasticity estimates vary with (a) the bin width used to generate the observed distribution and (b) the degree of polynomial fitted. Specification (1) shows the amount of bunching b (recall definition (8)) and elasticity e estimated using an empirical distribution of €12.5 bins. Specifications (2)–(4), on the other hand, use distribution of €25 bins. For convenience, specification (3) repeats the results from Figure 7. Elasticity estimates in specifications (1) and (3) are very similar for all years. Note that the amount of bunching b is inversely proportional to the bin size, therefore to compare bunching amounts, the result of specification (1) should be divided by 2 to be comparable to the amount of bunching from specifications (2)–(4). Specifications (2)–(4) show elasticity estimates when the counterfactual is estimated by fitting a polynomial of 4th, 5th and 6th degrees respectively. Because 4th degree polynomials are less flexible than polynomials of the 5th degree, the elasticity estimates are larger in earlier years in specification (2) when the density rose sharply as earnings increased from €0 per month to €400. The estimates in specifications (2) and (3), however, are nearly identical starting from 2006 on. Polynomials of 6th degree, on the other hand, are much more flexible than polynomials of the 5th degree. For this reason, elasticity estimates are much larger in specification (4) for later years – from 2008 on – but the results in specifications (3) and (4) are very similar in earlier years. The results in Table C.4 suggest that higher degree polynomial provide similar results in earlier years (1999–2005), and lower degree polynomial provide similar results in later years (2006–2010). The shape of the observed empirical distribution dictates a polynomial fit that is neither too restricted, e.g. 4th degree or lower, nor is too flexible, e.g. 6th degree or higher. A polynomial of the 5th degree offers the best compromise. Overall Table C.4 suggests that the elasticity estimates are robust across specifications, though some variation is present. Specification (3) – which is presented in the main body of the paper – provides the best fit across specifications and also generates the most conservative elasticity estimates.

B.3 Wage Differential Robustness Checks

A natural concern is whether the results in Table 3 are driven by outlier observations within the 1st to 99th percentiles of gross wages. Table C.7 presents several robustness checks by repeating specifications (3), (4) and (9) of Table 3. In columns (1), (2) and (7) I consider a different definition of gross wage, which includes overtime hours and pay. Since overtime hours are paid at a higher rate and are more likely to be reported for regular employees, we would expect a smaller wage differential. This is precisely what we observe in columns (1), (2) and (7) (which can be directly

compared to columns (3), (4) and (9) of Table 3). The wage differential decreases by approximately 1 percentage point. Next, I restrict the sample to individuals earning gross wages of more than €6 in columns (3), (4) and (8). The results remain unchanged. Finally, I restrict the sample to individuals earning a gross wage of more than €6 but less than €15 per hour in columns (5), (6) and (9). The coefficients decrease slightly, by approximately 1 percentage point. In addition to results shown in Table C.7 I have verified that the results are not sensitive to the earnings interval studied and inclusion of higher order wage trends. As an additional robustness check, I show the firm survey results by year in the Web Appendix. Robustness checks confirm that the results in Table 3 are not driven by the definition of hours used or due to sample selection.

The quality of the household data is of substantial concern because so many individuals report earning less than €5 per hour (especially among regular workers) and more than €21. Therefore the large wage differential observed in Table 4 and Figure 11 could be driven by outlier observations. As a robustness check, I repeat specifications (3), (5), (8) and (9) from Table 4 in Table C.8 but restrict the interval of allowed gross wages. Requiring the gross wage to be at least €3 does not have a strong effect on the estimates (see columns (1)-(2) and (7)-(8)). Requiring wages to be at least €5 per hour removes the wage differential. This result is not surprising in light of Panel B of Figure 11: more regular workers report larger gross wages (€15 and more) than mini-job workers. Finally, restricting the sample to individuals earning between €5 and €15, makes the coefficient statistically insignificant in columns (5) and (6) and marginally significant in columns (11) and (12). The coefficients are positive but smaller than in Table 4. The smaller magnitude of the coefficients is consistent with the presence of the negative bias due to measurement errors and with our inability to control for firm selection.[78] These robustness checks suggest that while the magnitude of the wage differential estimated using household data is inaccurate, the wage differential between mini-job and regular jobs is positive and statistically significant.

[78]Recall that adding firm fixed effects increases the wage gap between mini-job and regular gross wages.

C Appendix Tables and Figures

Table C.1: Income Tax Notches and MTRs. Women: Comparison of Income Definitions

		Labor Only		**Plus SS**		**Plus All Pensions**		**Plus Assets**	
		Notch	MTR	Notch	MTR	Notch	MTR	Notch	MTR
by year:	1999	86	25	86	27	86	27	87	27
	2000	84	25	84	26	85	27	86	27
	2001	79	24	79	25	80	25	81	25
	2002	79	24	79	25	80	25	81	25
	2003	98	24	98	25	99	25	100	26
	2004	93	23	93	24	94	24	95	24
	2005	91	22	92	23	92	24	93	24
	2006	91	22	92	23	92	24	93	24
	2007	91	22	92	23	92	24	93	24
	2008	91	22	92	23	92	24	94	24
	2009	90	22	91	23	91	23	93	24
	2010	89	22	90	23	90	23	92	24
1998-2002:	under 25	6	2	6	3	6	3	7	3
	25–40 years old	84	25	84	26	84	26	85	26
	40–60 years old	80	24	80	25	80	25	81	25
	over 60	19	6	19	6	20	6	22	7
2003-2011:	under 25	8	2	8	2	8	2	10	3
	25–40 years old	92	22	92	24	92	24	93	24
	40–60 years old	90	22	91	24	92	24	94	24
	over 60	14	3	19	6	24	7	28	8

Notes: This table shows the average income tax notch and marginal tax rates experienced by women at the mini-job threshold. *Notch* is the average lump-sum payment of income tax an individual must make upon exceeding the mini-job threshold. *MTR* is the average marginal tax rate at the mini-job threshold. For single individuals, spousal income is set to zero. For further details see Appendix B.1. *Source*: Socio-Economic Panel (SOEP), version 30.

Table C.2: Income Tax Notches and MTRs. Men: Comparison of Income Definitions

		Labor Only		**Plus SS**		**Plus All Pensions**		**Plus Assets**	
		Notch	MTR	Notch	MTR	Notch	MTR	Notch	MTR
by year:	1999	31	10	31	11	31	11	33	11
	2000	30	9	30	10	30	10	31	11
	2001	28	9	28	9	28	9	29	10
	2002	28	9	28	9	28	9	29	10
	2003	34	9	34	9	34	9	36	10
	2004	31	8	31	9	31	9	33	9
	2005	30	8	30	8	30	8	32	9
	2006	30	8	30	8	30	8	32	9
	2007	30	8	30	8	30	8	32	9
	2008	30	8	30	8	30	8	32	9
	2009	29	8	29	8	29	8	31	9
	2010	28	8	28	8	28	8	30	9
1998-2002:	under 25	1	1	1	1	1	1	6	2
	25–40 years old	24	8	24	8	24	8	25	8
	40–60 years old	41	13	41	13	41	13	44	14
	over 60	12	5	12	5	12	5	16	7
2003-2011:	under 25	1	0	1	0	1	0	3	1
	25–40 years old	19	5	19	5	19	5	20	6
	40–60 years old	49	13	49	13	49	13	52	14
	over 60	10	3	10	3	10	3	14	4

Notes: This table shows the average income tax notch and marginal tax rates experienced by men at the mini-job threshold. *Notch* is the average lump-sum payment of income tax an individual must make upon exceeding the mini-job threshold. *MTR* is the average marginal tax rate at the mini-job threshold. For single individuals, spousal income is set to zero. For further details see Appendix B.1. *Source*: Socio-Economic Panel (SOEP), version 30.

Table C.3: Income Tax Notches and MTRs. Comparison of Sample Selections

	True Average				Plus/Minus 3 Years				All Years			
	Notch	MTR	N	Income	Notch	MTR	N	Income	Notch	MTR	N	Income
	Women:											
1999	92	29	148	2677	87	27	1347	2587	86	27	2860	2689
2000	83	25	320	2453	84	26	1560	2550	85	27	2860	2689
2001	81	24	313	2606	78	24	1677	2564	80	25	2860	2689
2002	75	23	309	2504	78	24	1761	2586	80	25	2860	2689
2003	90	23	252	2490	96	24	1849	2609	99	25	2860	2689
2004	91	22	202	2708	92	23	1765	2661	94	24	2860	2689
2005	91	23	217	2774	90	23	1669	2701	92	24	2860	2689
2006	94	24	236	2900	92	24	1581	2774	92	24	2860	2689
2007	94	26	236	2819	94	24	1518	2829	92	24	2860	2689
2008	94	25	217	2892	94	25	1579	2794	92	24	2860	2689
2009	97	26	221	2922	93	25	1591	2814	91	23	2860	2689
2010	95	24	189	2780	92	24	1593	2767	90	23	2860	2689
	Men:											
	True Average				**Plus/Minus 3 Years**				**All Years**			
	Notch	MTR	N	Income	Notch	MTR	N	Income	Notch	MTR	N	Income
1999	16	5	20	317	30	10	130	647	31	11	310	755
2000	37	11	28	752	27	10	142	638	30	10	310	755
2001	49	15	24	1213	26	9	155	646	28	9	310	755
2002	24	8	31	591	23	8	168	597	28	9	310	755
2003	16	4	18	406	32	9	179	666	34	9	310	755
2004	25	7	22	630	31	9	180	746	31	9	310	755
2005	5	2	25	266	29	8	183	750	30	8	310	755
2006	36	9	31	783	31	9	181	803	30	8	310	755
2007	49	14	29	1231	31	9	189	811	30	8	310	755
2008	40	10	27	1110	33	9	193	882	30	8	310	755
2009	34	10	29	863	34	10	198	952	29	8	310	755
2010	24	6	26	679	33	9	197	948	28	8	310	755

Notes: This table shows the average income tax notch and marginal tax rates experienced by women, age 26 through 59 inclusive, at the mini-job threshold. *Notch* is the average lump-sum payment of income tax an individual must make upon exceeding the mini-job threshold. *MTR* is the average marginal tax rate at the mini-job threshold. *N* is the number of observations used to calculate the average marginal tax rate, income notch and average spousal income. *Income* is the average income of a spouse of a mini-job worker earning [€K-25,€K] per month, where *K* denotes the mini-job threshold. For single individuals, spousal income is set to zero. Spousal income includes labor earnings, as well as social security and private pensions. For further details see Appendix B.1. *Source*: Socio-Economic Panel (SOEP), version 30.

Table C.4: Elasticity Estimates Robustness Check

Year	(1) Bins €12.5				(2) Degree 4				(3) Degree 5				(4) Degree 6			
	b	s.e.(b)	e	s.e.(e)	b	s.e.(b)	e	s.e.(e)	b	s.e.(b)	e	s.e.(e)	b	s.e.(b)	e	s.e.(e)
	Women:															
1999	15.67	0.60	0.25	0.02	9.60	0.56	0.36	0.03	8.15	0.27	0.27	0.01	7.94	0.34	0.26	0.02
2000	16.79	0.68	0.28	0.02	10.12	0.55	0.39	0.03	8.72	0.34	0.31	0.02	8.65	0.44	0.30	0.02
2001	16.70	0.70	0.29	0.02	9.97	0.57	0.39	0.04	8.61	0.42	0.31	0.02	8.57	0.66	0.31	0.04
2002	15.19	0.56	0.25	0.01	9.35	0.42	0.35	0.03	8.29	0.68	0.30	0.04	8.25	0.64	0.29	0.04
2003	13.25	0.65	0.17	0.01	8.80	0.53	0.27	0.02	7.43	0.40	0.21	0.02	10.75	1.79	0.35	0.08
2004	13.62	0.68	0.19	0.02	8.42	0.59	0.26	0.03	7.16	0.45	0.20	0.02	9.27	1.04	0.30	0.05
2005	14.41	0.61	0.20	0.01	8.76	0.62	0.27	0.03	7.49	0.39	0.21	0.02	7.97	0.51	0.24	0.02
2006	15.60	0.55	0.22	0.01	9.26	0.43	0.29	0.02	8.78	0.39	0.26	0.02	9.35	1.06	0.29	0.05
2007	17.52	0.69	0.26	0.02	9.55	0.42	0.30	0.02	9.38	0.49	0.29	0.02	9.47	0.79	0.30	0.04
2008	19.15	1.76	0.30	0.05	10.15	0.45	0.33	0.02	10.16	0.51	0.33	0.03	10.28	0.89	0.34	0.04
2009	18.85	1.31	0.30	0.03	10.11	0.40	0.33	0.02	10.22	0.72	0.34	0.04	10.58	1.41	0.36	0.08
2010	20.29	2.14	0.33	0.06	10.86	0.45	0.37	0.02	10.79	0.53	0.37	0.03	11.77	1.20	0.42	0.07
	Men:															
1999	7.84	0.68	0.11	0.02	4.76	0.49	0.17	0.03	4.18	0.43	0.13	0.02	4.09	0.56	0.13	0.03
2000	7.96	0.82	0.12	0.02	4.70	0.56	0.16	0.03	4.16	0.54	0.13	0.03	3.89	0.53	0.12	0.03
2001	7.53	0.73	0.11	0.02	4.28	0.51	0.14	0.03	3.74	0.59	0.11	0.03	3.51	0.60	0.10	0.03
2002	6.75	0.60	0.09	0.02	3.92	0.49	0.12	0.03	3.29	0.47	0.09	0.02	3.03	0.50	0.07	0.02
2003	6.63	0.99	0.10	0.03	4.29	0.78	0.17	0.05	3.39	0.65	0.11	0.03	3.92	0.74	0.15	0.04
2004	5.80	1.12	0.09	0.03	4.19	0.75	0.17	0.04	3.05	0.67	0.10	0.04	3.19	0.83	0.11	0.05
2005	7.27	0.99	0.13	0.03	4.79	0.62	0.21	0.04	3.55	0.59	0.13	0.03	3.82	1.52	0.15	0.11
2006	7.32	0.90	0.12	0.03	4.87	0.68	0.20	0.05	3.81	0.57	0.14	0.03	5.17	8.61	0.23	0.92
2007	9.48	1.00	0.19	0.03	5.57	0.61	0.25	0.04	4.91	0.61	0.21	0.04	6.56	4.18	0.32	0.39
2008	11.48	1.35	0.26	0.05	6.13	0.65	0.29	0.05	5.59	0.63	0.25	0.04	7.95	4.81	0.43	0.45
2009	10.06	1.22	0.21	0.04	5.75	0.73	0.27	0.05	5.17	0.73	0.23	0.05	6.77	3.29	0.35	0.29
2010	10.69	1.23	0.24	0.04	5.65	0.63	0.26	0.04	5.12	0.75	0.22	0.05	6.81	5.15	0.35	0.48

Notes: Excess bunching and elasticities are estimated using the procedure outlined in Section 3.2. In specification (1) I fit 5th degree polynomial to an empirical distribution of *gross* earnings of €12.5 bins. In specifications (2), (3) and (4) I fit 4th, 5th and 6th degree polynomials respectively to an empirical distribution of *gross* earnings of €25 bins. Bootstrap standard errors are based on 100 iterations. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table C.5: Summary Statistics (Firm Survey VSE)

	Income: [€50,€375] N=210,273			Income: [€375; €400] N=86,157			Income: [€400, €500] N=21,082			Income: [€500, €1000] N=186,503			Income: [€1000, €1500] N=379,117		
	mean	sd	p50	mean	sd	p50	mean	sd	p50	mean	sd	p50	mean	sd	p50
Male	0.35	0.48	0.00	0.35	0.48	0.00	0.26	0.44	0.00	0.17	0.37	0.00	0.27	0.44	0.00
Age: 26-40 year old	0.25	0.43	0.00	0.29	0.45	0.00	0.33	0.47	0.00	0.32	0.47	0.00	0.32	0.47	0.00
Age: 40-60 year old	0.36	0.48	0.00	0.39	0.49	0.00	0.45	0.50	0.00	0.54	0.50	1.00	0.54	0.50	1.00
Age: 60-65 year old	0.07	0.26	0.00	0.06	0.24	0.00	0.05	0.21	0.00	0.04	0.18	0.00	0.03	0.17	0.00
Age: $>$ 60 year old	0.10	0.30	0.00	0.12	0.32	0.00	0.05	0.22	0.00	0.02	0.13	0.00	0.00	0.07	0.00
No HS, No Voc. Tr.[a]	0.18	0.38	0.00	0.13	0.34	0.00	0.18	0.39	0.00	0.19	0.39	0.00	0.16	0.37	0.00
No HS + Voc. Tr.	0.22	0.42	0.00	0.29	0.45	0.00	0.32	0.47	0.00	0.45	0.50	0.00	0.58	0.49	1.00
HS, No Voc. Tr.	0.06	0.24	0.00	0.02	0.15	0.00	0.04	0.19	0.00	0.02	0.14	0.00	0.01	0.09	0.00
HS + Voc. Tr.	0.01	0.11	0.00	0.02	0.14	0.00	0.02	0.14	0.00	0.03	0.16	0.00	0.03	0.18	0.00
Fachhochschule	0.01	0.08	0.00	0.01	0.09	0.00	0.01	0.10	0.00	0.02	0.13	0.00	0.02	0.13	0.00
College/University	0.01	0.08	0.00	0.01	0.10	0.00	0.01	0.11	0.00	0.01	0.10	0.00	0.01	0.12	0.00
Educ. Unknown	0.51	0.50	1.00	0.52	0.50	1.00	0.42	0.49	0.00	0.28	0.45	0.00	0.19	0.39	0.00
Company Tenure[b]	47.04	67.17	24.00	44.03	58.51	25.00	73.33	98.51	37.00	94.69	107.04	57.00	105.35	110.33	66.00
Salaried Employees	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.15	0.00	0.10	0.30	0.00
Homeworkers	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.03	0.00	0.00	0.02	0.00
Part-time $<$18 h/w	1.00	0.04	1.00	1.00	0.06	1.00	0.88	0.33	1.00	0.35	0.48	0.00	0.05	0.23	0.00
Part-time $\geq$18 h/w	0.00	0.04	0.00	0.00	0.06	0.00	0.12	0.32	0.00	0.54	0.50	1.00	0.52	0.50	1.00
Skilled Hourly Employee	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.15	0.00	0.11	0.32	0.00
Civil Servants	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.01	0.11	0.00	0.02	0.14	0.00
Monthly Hours	33.25	14.14	33.00	48.11	12.15	47.00	53.38	18.71	51.50	90.49	34.44	86.60	128.17	37.34	130.35
Posted Hourly Wage	7.94	2.53	7.84	8.76	2.50	8.37	9.37	3.16	8.72	9.84	3.45	9.21	10.80	3.47	9.65
Gross Hourly Wage	10.29	3.28	10.17	11.34	3.24	10.84	11.50	3.93	10.76	11.85	4.16	11.10	13.00	4.17	11.61
Net Hourly Wage	7.88	2.57	7.72	8.66	2.51	8.26	7.97	2.96	7.54	7.50	2.70	6.95	7.73	2.42	6.96
Yearly Bonus	34.29	124.55	0.00	20.00	115.08	0.00	156.85	328.63	0.00	441.67	574.39	230.00	763.81	877.49	591.00
Vacation Days[c]	7.09	8.47	4.00	8.03	8.50	6.00	13.13	12.49	10.00	18.78	10.68	16.00	21.86	7.29	23.00
Subcompany[d]	0.41	0.49	0.00	0.32	0.47	0.00	0.39	0.49	0.00	0.44	0.50	0.00	0.47	0.50	0.00
Handcraft Business	0.05	0.21	0.00	0.08	0.27	0.00	0.05	0.22	0.00	0.05	0.21	0.00	0.04	0.21	0.00
N. of Male Empl.[e]	289.13	1714.66	26.00	68.11	396.71	21.00	225.63	1652.06	22.00	414.39	3036.00	22.00	575.93	3679.26	29.00
N. of Female Empl.[e]	334.27	1416.63	41.00	97.47	552.98	26.00	604.52	2804.48	42.00	929.78	4260.35	51.00	1402.95	5637.35	46.00

Notes: This tables shows summary statistics (mean, standard deviation and median) for the combined 2006 and 2010 waves of the VSE Survey. The following categories have been omitted: 25 year old or younger, unskilled salaried workers. [a] HS stands for High School, Voc. Tr. stands for Vocational Training. [b] Company tenure is measured in months. [c] Vacation days represent the full-time equivalent number of vacation days per year based on a 5-day working week. [d] Subcompany refers to establishments that are part of larger firms. [e] Number of male and female employees at the establishment of the employee, rather than the larger firm. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Verdienststrukturerhebung, 2006 and 2010, author's calculations.

Table C.6: Summary Statistics (Household SOEP)

	Income: [€50,€375] N=11,404			Income: [€375; €400] N=2,965			Income: [€400, €500] N=2,509			Income: [€500, €1000] N=20,622			Income: [€1000, €1500] N=34,114		
	mean	sd	p50	mean	sd	p50	mean	sd	p50	mean	sd	p50	mean	sd	p50
Male	0.17	0.38	0.00	0.18	0.39	0.00	0.17	0.37	0.00	0.19	0.39	0.00	0.38	0.48	0.00
Age: 26-40 year old	0.32	0.47	0.00	0.35	0.48	0.00	0.36	0.48	0.00	0.38	0.49	0.00	0.39	0.49	0.00
Age: 40-60 year old	0.38	0.49	0.00	0.42	0.49	0.00	0.43	0.50	0.00	0.41	0.49	0.00	0.40	0.49	0.00
Age: 60-65 year old	0.08	0.27	0.00	0.06	0.23	0.00	0.04	0.20	0.00	0.03	0.17	0.00	0.02	0.15	0.00
Age: > 65 year old	0.06	0.23	0.00	0.06	0.23	0.00	0.03	0.16	0.00	0.01	0.10	0.00	0.00	0.05	0.00
Married	0.66	0.47	1.00	0.72	0.45	1.00	0.65	0.48	1.00	0.64	0.48	1.00	0.55	0.50	1.00
Partner (Not married)	0.05	0.22	0.00	0.05	0.23	0.00	0.09	0.29	0.00	0.08	0.27	0.00	0.11	0.31	0.00
No HS[a]	0.02	0.15	0.00	0.02	0.12	0.00	0.02	0.13	0.00	0.02	0.15	0.00	0.03	0.17	0.00
HS, No Voc. Tr.	0.17	0.37	0.00	0.14	0.35	0.00	0.20	0.40	0.00	0.15	0.35	0.00	0.12	0.33	0.00
HS + Voc. Tr.	0.31	0.46	0.00	0.30	0.46	0.00	0.31	0.46	0.00	0.33	0.47	0.00	0.35	0.48	0.00
Further Voc. Tr	0.38	1.11	0.00	0.42	1.14	0.00	0.38	1.07	0.00	0.40	1.03	0.00	0.41	1.00	0.00
Fachhochschule	0.02	0.14	0.00	0.03	0.17	0.00	0.03	0.16	0.00	0.02	0.13	0.00	0.02	0.14	0.00
College/University	0.05	0.21	0.00	0.06	0.23	0.00	0.05	0.22	0.00	0.07	0.25	0.00	0.06	0.24	0.00
Company Tenure[b]	68.33	88.24	33.60	69.29	86.94	36.00	83.99	91.85	48.00	85.65	95.91	48.00	99.74	100.81	64.80
Monthly Hours	57.85	38.38	43.33	70.17	37.13	65.00	95.09	48.44	86.67	124.29	44.35	117.00	155.02	34.36	173.33
Posted Hourly Wage	5.79	3.44	5.21	7.15	3.62	6.15	6.37	3.95	5.31	7.22	3.43	6.29	8.76	3.02	7.90
Gross Hourly Wage	7.14	4.30	6.40	9.14	4.64	8.00	7.62	4.75	6.29	8.63	4.13	7.51	10.46	3.65	9.38
Net Hourly Wage	5.37	3.27	4.88	6.53	3.30	6.15	4.72	2.96	3.85	4.93	2.34	4.38	5.85	1.99	5.39
Yearly Bonus	71.51	265.25	0.00	78.57	383.66	0.00	181.27	388.16	0.00	381.54	486.06	204.00	796.77	722.54	716.00
Full Time Experience	8.62	10.49	5.00	8.34	10.15	5.00	8.12	9.46	5.00	9.76	9.94	6.70	12.56	10.91	9.00
Part Time Experience	6.06	6.78	3.60	7.31	7.13	5.10	7.22	8.20	4.20	5.50	7.15	2.50	3.13	5.87	0.00
Training Matching	0.29	0.46	0.00	0.30	0.46	0.00	0.34	0.47	0.00	0.47	0.50	0.00	0.52	0.50	1.00
Firm Size: <20	0.48	0.50	0.00	0.51	0.50	1.00	0.39	0.49	0.00	0.34	0.47	0.00	0.26	0.44	0.00
Firm Size: 20-200	0.21	0.41	0.00	0.27	0.44	0.00	0.27	0.44	0.00	0.29	0.45	0.00	0.31	0.46	0.00
Firm Size: 200-2000	0.09	0.29	0.00	0.08	0.28	0.00	0.15	0.35	0.00	0.17	0.38	0.00	0.21	0.41	0.00
Firm Size: >2000	0.07	0.26	0.00	0.06	0.23	0.00	0.10	0.30	0.00	0.15	0.36	0.00	0.18	0.39	0.00

Notes: This tables shows summary statistics (mean, standard deviation and median) for the combined 2004–2011 waves of the Socioeconomic Panel (SOEP). The following category has been omitted: 25 year old or younger. [a] HS stands for High School, Voc. Tr. stands for Vocational Training. [b] Company tenure is measured in months. *Source*: Socio-Economic Panel (SOEP), version 30.

Table C.7: Robustness Checks (Firms Survey VSE)

	Monthly Income €375–€500						**Monthly Income €50–€1500**		
	Incl. Overtime		**Wage > €6**		**Wage ∈ (€6,€15]**		**Incl. Overtime**	**Wage > €6**	**Wage ∈ (€6,€15]**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable: Log(Hourly Gross Wage)									
Mini-Job	0.0485***	0.080***	0.057***	0.085***	0.052***	0.074***	0.057***	0.042***	0.055***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear Wage Trend	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Quadratic Wage Trend	No	No	No	No	No	No	Yes	Yes	Yes
Number of Observations	107,239	107,239	105,637	105,637	93,760	93,760	887,183	862,420	674,859

Notes: This table shows the coefficients from regressing the logarithm of gross wage on a mini-job indicator variable. Standard errors are clustered by firm. In columns (1), (2) and (7), gross wage is calculated as all monthly income (including overtime pay) divided by total hours worked (including overtime). In columns (3), (4) and (8), the sample is restricted to individuals with gross wages of more than €6 per hour. In columns (5), (6) and (9), the sample is restricted to individuals with gross wages of more than €6 per hour but less than €15 per hour. Individual controls include male indicator, age group indicators, company tenure, education indicators, occupational status and occupation indicators. Linear and quadratic trends include both linear/quadratic terms and their interactions with the mini-job indicator. *Source*: FDZ der Statistischen Ämter des Bundes und der Länder, Verdienststrukturerhebung, 2006 and 2010, author's calculations.

Table C.8: Robustness Checks (Household Survey SOEP)

	Monthly Income €375–€500						**Monthly Income €50–€1500**					
	Wage > €3		**Wage > €5**		**Wage ∈ (€5,€15]**		**Wage> €3**		**Wage > €5**		**Wage ∈ (€5,€15]**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable: Log(Hourly Gross Wage)												
Mini-Job	0.084**	0.067**	-0.017	-0.025	0.027	0.022	0.106***	0.102***	-0.002	0.003	0.038*	0.039**
	(0.033)	(0.033)	(0.029)	(0.031)	(0.023)	(0.023)	(0.029)	(0.028)	(0.026)	(0.026)	(0.020)	(0.020)
Indiv. Notch		-0.001		-0.001		0.000		0.003***		0.003***		0.002***
		(0.001)		(0.001)		(0.001)		(0.001)		(0.000)		(0.000)
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indiv. Controls (subset)	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Indiv. Controls (full)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear Wage Trend	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Quadratic Wage Trend	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Number of Observations	3,264	2,934	2,933	2,648	2,662	2,417	20,007	18,436	18,893	17,455	15,857	14,695

Notes: This table shows the coefficients from regressing the logarithm of gross wage on a mini-job indicator. Standard errors are clustered by individual. In columns (1), (2) and (7), the sample is restricted to individuals with gross wages of more than €3 per hour. In columns (3), (4) and (8), the sample is restricted to individuals with gross wages of more than €5 per hour. In columns (5), (6) and (9), the sample is restricted to individuals with gross wages of more than €5 per hour but less than €15 per hour. Individual controls (subset) include male indicator, age group indicators, company tenure, education indicators and occupation indicators. In addition to above controls, the full set also includes marital status, presence of a partner (if not married), citizenship indicator, indicator of whether a job matches completed training, experience working full time and experience working part time. Firm controls include industry indicators and indicators of size (by number of employees). Linear and quadratic trends include both linear/quadratic terms and their interactions with the mini-job indicator. *Source*: Socio-Economic Panel (SOEP), version 30.