Increasing Hours Worked: Moonlighting Responses to a Large Tax Reform

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Abstract

Holding multiple jobs – or moonlighting – is increasingly popular in OECD countries, with 5 to 10% of workers holding two or more jobs. Yet, little is known about the determinants of moonlighting and its responsiveness to financial incentives: research has been held back by the lack of identifying variation as most policies treat primary and secondary employments equally. This paper circumvents these limitations by studying a unique reform in Germany that allowed workers to hold small secondary jobs tax-free, thus decreasing the tax rate on secondary earnings by 21-74pp. Using a difference-in-differences framework, I document three findings. First, I estimate large participation elasticities that are several times larger than participation elasticities in primary employment. Second, I show that individuals did not substitute primary earnings with secondary jobs, despite large potential savings. Third, the number of small-earnings jobs increased rapidly after reform, and did not result in decreased labor supply among low-income individuals. Finally, I explore mechanisms behind the varying rates of response, and find that job availabilities and hour constraints are key determinants of moonlighting.

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Increasing hours worked is on the agenda of most policymakers. For employed individuals, government policies often incentivize working longer hours through tax subsidies, tax breaks, or detaxation of overtime hours. Recent empirical evidence, however, documents weak intensive margin responses even for policies with strong incentives, commonly attributing the lack of response to adjustment and information frictions.[1] But little is known about the potential responses of employed individuals along the extensive margin – via secondary job holding. Yet, multiple job holding – or moonlighting – is widespread in OECD countries, with rates ranging between 5% of the working population in the United States to over 10% in the UK.[2] Furthermore, the increasing popularity and access to alternative work arrangements and flexible-contract job opportunities, e.g. due to proliferation of digital platforms such as Uber and TaskRabbit, make multiple job holding a potentially important channel of response.

Estimating the responsiveness of moonlighting to financial incentives and understanding the determinants of multiple job holding is challenging due to the lack of identifying variation. The vast majority of tax systems do not differentiate between primary and secondary employments, and apply the tax schedule to the sum of earnings. Therefore changes in marginal income or payroll tax rates leave relative wages of primary and secondary jobs unchanged, providing little scope for identification. Further, even if the primary reason for multiple job holding is hour constraints at the main job, convincing identification requires information on the nature of hour constraints, which is usually not available.

This paper provides the first plausibly causal estimates of secondary job participation elasticities and offers new insights into the moonlighting decisions by studying responses to a unique reform in Germany. Starting from April 2003, part-time and full-time workers earning more than €400 per month are allowed to hold a secondary employment tax-free as long as earnings from the secondary employment do not exceed €400 per month. The reform thus exempted small secondary earnings from a 21% employee social security tax and a 0%-to-53%

[1] For example, Chetty et al. (2013) study intensive margin responses to EITC subsidies; Tazhitdinova (2018a) studies responses to a very large tax break in Germany; and Cahuc and Carcillo (2014) study detaxation of overtime pay in France.

[2] See Lal (2015) for the US statistics, and Heineck (2009) for the UK. About 6% individuals moonlight in Germany (Heineck (2009)), and 5.5% in Canada (Kimmel and Powell (1999)).

income tax, depending on one's marginal tax rate. Full income and social security taxes are due on secondary earnings of €401 or more. Using administrative data on a 2% representative sample of wage earners in Germany, I find three main results.

First, I show that the reform dramatically increased the number of low-paid secondary jobs: the share of the individuals holding secondary employments increased from around 2.3% just prior to the reform to 5% within the first 2 years, and continued growing. By 2010, nearly 6.8% of workers held secondary jobs. Considering that most eligible workers saved between 21 to 74 percentage points of combined social security and income taxes, these responses translate into elasticities of participation between 0.26 to 1.15 in the short run and 0.63 to 2.69 in the long run, depending on primary earnings. The magnitude of response is significantly larger than participation elasticities in primary employment, which are estimated to be between zero and 0.25 for men and between 0 and 0.35 for women.[3] For identification, I employ three difference-in-differences approaches. First, I compare changes in multiple-job holding rates among very high-income individuals (based on pre-reform income), who were less likely to be affected by the reform, to multiple job holding rates of low-income individuals, who were most likely to be affected by the reform. Second, I compare individuals based on current primary income, choosing low-income individuals as a control group. Finally, I also compare changes in the number of low-paid secondary jobs (€400 or less) to changes in the number of high-paid secondary jobs (over €1000), as the tax treatment of the latter was not changed by the reform. All approaches result in similar estimates of participation elasticities.

Second, I find that the observed increase in moonlighting represents genuine increases in labor force participation and is not driven by cheating or shifting of primary working hours into secondary jobs. Once again, I employ a difference-in-differences approach, and compare how primary earnings change relative to the previous year for individuals with *new* secondary jobs and large (over €1000) primary earnings before and after the reform. Since having a secondary job that pays more than €400 does not lead to a tax break, individuals with high-paid secondary jobs constitute a natural control group for individuals with new secondary

[3] See Blundell and Macurdy (1999), Blundell et al. (2011) and McClelland and Mok (2012).

jobs that pay €400 or less. I find that individuals do not substitute high-taxed primary earnings with tax-free secondary earnings. As a further robustness check, I show that the likelihood of primary earnings decrease of approximately €400 – when starting a new secondary job – did not increase after the reform. Finally, while some individuals report having a regular employment and a tax-free secondary job at the *same* establishment, such reports are rare and result in increased combined earnings relative to the previous year, suggesting no cheating behavior.

Third, I show that the number of small-earnings jobs increased rapidly after the reform, absorbing the influx of moonlighters. I find no evidence of decreased labor supply among low-income individuals as a result of the reform. My findings, however, cannot eliminate the possibility that some full-time positions were split into multiple part-time jobs.

Finally, consistent with previous work of Shishko and Rostker (1976) and Paxson and Sicherman (1996), the empirical results show that hour constraints are likely to be the primary cause of moonlighting.[4] The fact that most individuals did not reduce earnings in their primary jobs is the key evidence of hour constraints at the primary employment.[5] Moreover, a large share of secondary employment took form of €0-to-€300 jobs rather than €400 jobs, especially among high-income individuals, which further suggests that hour constraints are not limited to primary employment but also apply to secondary jobs. The overall low take up of secondary employment also suggests that either secondary jobs are not available, are too costly to obtain, or that the available secondary jobs offer substantially lower wages than individuals' primary jobs. The results thus imply that the large financial incentives (a tax break of 21 to 74 percentage points) were partially outweighed by the limited availability of high-paying secondary jobs.

The results of this paper are highly policy-relevant. First, the results demonstrate that low elasticities for primary employment are not representative of

[4] See also: Abdukadir (1992) finds that liquidity constrained individuals are more likely to moonlight when they plan to buy a house or a new car. Krishnan (1990) finds that husband's decision to hold a second job is a substitute for spousal earnings.

[5] In this regard, the results of this study potentially differ from findings of Farrell and Greig (2016) and Koustas (2018), who suggest that digital platform income is used to smooth consumption. The data used in this paper does not provide information on consumption, merely earnings. I do not find any evidence of earnings smoothing through moonlighting.

moonlighting elasticities. The elasticity estimates in this study, instead, are more consistent with recent experimental evidence, that finds large intertemporal or compensated elasticities for Uber drivers and other workers with highly flexible working hours (Angrist et al. (2017), Mas and Pallais (2017)).[6] High elasticity estimates thus predict that as flexible work arrangements become more prevalent (Katz and Krueger (2016); Jackson et al. (2017)), we are likely to observe a large increase in the take up of secondary employments.

Second, the increase in secondary employment is likely to be particularly large because many of the alternative work arrangements are of self-employment nature which makes them harder to tax (Saez et al. (2012)). Even though most digital platform incomes are partially third-party reported through 1099-K and 1099-Misc forms, these earnings can be offset with self-reported business expenses that are hard to verify (Carrillo et al. (2017); Slemrod et al. (2017); Tazhitdinova (2018b)). Hence, lower effective tax rates combined with flexible working schedules would make secondary jobs particularly attractive.

Third, because of the small intensive margin labor supply elasticities, the consensus in the public finance literature is that – barring avoidance and evasion responses – the efficiency cost of income taxation is low (Saez et al. (2012)). This paper's findings suggest that this conclusion may be overoptimistic should the labor market structure change and reduce adjustment frictions.

1 Institutional Setting and Data

1.1 Institutional Setting

There are two broad categories of employment in Germany: regular jobs subject to income and social security taxes, and mini-jobs, also known as marginal jobs, that are exempt from income tax and the employee portion of social security taxes. From 1999 until April 2003 mini-jobs were limited to jobs in which employees earned less than €325 per month and worked less than 15 hours per week.

[6] The only other study that estimates elasticity of secondary earnings to taxes is O'Connell (1979), who finds combined intensive-extensive elasticities of between 0.43 and 0.56. O'Connell (1979) treated primary income as fixed and used a simple variation in marginal tax rates to estimate responses. Thus, the study is likely to suffer from omitted variable bias (Weber (2014)).

All other jobs were considered regular, and were subject to the 21% employee social security tax and income taxes, with marginal tax rate ranging between 0 and 53% depending on own and spousal earnings.[7] If individuals held secondary jobs, the €325 threshold applied to the sum of earnings. Thus for individuals with multiple employments, income and social security taxes were calculated based on the sum of primary and secondary earnings. Employer social security tax liability barely changed at the threshold, decreasing from the 22% "mini-job tax" to the 21% regular employer social security tax.

The Hartz II reforms introduced on April 1, 2003 increased the mini-job threshold from €325 to €400 and abolished the hour constraint. Importantly, the reform made mini-jobs attractive to individuals with regular jobs, by allowing them to hold one secondary mini-job tax free. Thus, a worker who earned more than €400 per month could now obtain a secondary mini-job and pay no income or social security taxes on secondary earnings as long as these earnings did not exceed €400. Secondary employments that earned over €400 per month were subject to the usual income and social security taxes on the full amount. Employer's mini-job tax was increased from 22% to 25% in 2003, and further to 30% in 2006. Employer social security tax, on the other hand, remained at 21% until 2006, at which point it decreased to 19.5%.[8]

To summarize, the mini-job rules generate a large notch at the €325/€400 threshold for individuals with small incomes in all years. For individuals with at least one regular job – i.e. an employment that pays over €325/€400 per month – the mini-job threshold generated a large notch for secondary earnings starting from 2003. Budget constraints are summarized in Figure A.9. From tax perspective, mini-job and regular jobs are similar for employers. However, several recent studies show that mini-job workers receive smaller fringe benefits – e.g. sick day pay, vacation pay, bonuses, etc (Bachmann et al. (2012); Wippermann (2012); Tazhitdinova (2018a)), and for these reasons mini-jobs may be attractive to firms.

[7] Appendix Table B.1 summarizes tax rules and rates.

[8] For individuals with small earnings, the reform substituted the social security notch at the mini-job with a kink. In other words, a worker with primary earnings of €450 per month would pay social security tax on €50 only. The income tax liability would still be based on full €450. This change did not apply to secondary employments.

Despite the low value of the mini-job threshold, mini-jobs are very popular in Germany. In 2010, approximately 7.3 million individuals held mini-jobs. Tazhitdinova (2018a) documents that most mini-jobs last less than one year, earn between €5 and €10 per hour, and imply working hours of 10 to 15 hours per week.

1.2 Data

I use weakly anonymous Sample of Integrated Labor Market Biographies 1975-2010 (SIAB), which provides information on employment, job search and receipt of unemployment benefits for a 2% sample of *wage earners* – 1,639,325 individuals – in Germany from 1975 until 2010.[9] Because the information on mini-job employments, which represent the vast majority of secondary jobs, are only available starting from 1999, I focus on years 1999-2010. Employment histories consist of end-of-the-year notifications and employer notifications which are submitted when an employee is hired, terminated, or when an employment is interrupted. 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. 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. Unfortunately, marital status and number of children are known only for benefit recipients and those engaged in job search.

I restrict the sample to individuals in regular and mini-jobs; employments of other types, e.g. trainees, etc, are dropped. Unless otherwise noted I further restrict the sample to individuals aged 31 through 54, in order to focus on working-age adults. I study job holding at the quarterly level. For each quarter, the observation with the largest monthly earnings is recorded as the main job

[9] 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. For details, see vom Berge et al. (2013). 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.

and the following two employments by earnings level are recorded as the second and third jobs, respectively. Therefore, by construction, primary jobs generate the highest earnings. A very small number of individuals hold more than three concurrent employments, for these individuals, only the three highest-paid jobs are recorded. Earnings from the same establishment and the same employment category (regular or mini-job) are combined in case of multiple records.

To ensure that the identified secondary employments represent actual secondary jobs rather than temporary job overlaps due to job-switching, I proceed as follows. For each month I identify employment of the longest duration. I then delete any job records within that month that do not overlap with this employment by at least 15 days.[10] For months of continuous employment this procedure identifies the main job and the secondary jobs held during that month. In months of job switches, employment spells of the longest duration are recorded. This procedure, therefore, could lead to omission of very short spells of multiple-job holding in between main jobs.[11] The results are not sensitive to the choice of the minimum overlap period (currently set at 15 days). This is not surprising in light of the average duration of secondary jobs – an average individual works at the secondary job for approximately 8 months.

Summary statistics are available in Table 1. After the 2003 reform, the number of secondary jobs increased rapidly, nearly doubling between 2002 and 2004 and nearly tripling by 2010. The vast majority of the secondary employments are mini-jobs with the average earnings of approximately €260 to €300 per month. Earnings in the third jobs are smaller (by sample construction) and average between €120 and €200. Individuals who hold secondary and third jobs tend to have lower primary earnings, though the difference in means and medians is not very large. Finally, while multiple job holding rates increased after the reform, the overall levels remained low, with less than 7% of individuals holding secondary jobs.

[10] If several jobs have the same duration, I use the spell with the highest income as the point of comparison. A very small number of individuals report multiple employment spells of the same longest duration (typically of less than 3 days) and the same level of earnings. In this case a random spell is chosen.

[11] For example, if an individual holds job #1 for 12 days, then works jobs #2 and #3 simultaneously for 10 days, then my procedure would record job #1 spell only.

Figure 1(a) reports the five most common occupations of secondary jobs in 2005, by earnings level. Among small secondary jobs, low-skill occupations prevail: doormen and custodians, waiters, house cleaners, warehouse and transport workers, and office workers represent the majority of employments. High-paying secondary jobs, on the other hand, consist of higher-skilled jobs, such as teachers, medical nurses and assistants, entrepreneurs and consultants, social workers, and office workers. Interestingly, low-paid secondary job occupations do not appear to vary greatly with the primary earnings level. Figure 1(b) shows most common occupations among secondary mini-jobs by individuals' primary earnings and shows that low-skill occupations are most common. Corroborating this finding, Figure 2 shows the percent of individuals whose occupation in the main job matches their occupation in the secondary job. As one would expect from Figure 1, individuals with low primary earnings are more likely to have matching occupations than individuals with higher primary earnings and low-paying secondary jobs. Both the probability of a match and most popular occupations remain relatively stable across the years.

2 Theoretical Predictions

To better understand the incentives generated by the 2003 reform, consider a simple theoretical framework inspired by Shishko and Rostker (1976). For conciseness, I assume that individuals experience no preferences for multiple job holding except for financial incentives or because of hour constraints. However, the predictions of this section can be extended to other explanations for multiple job holding, such as uncertainty (Bell et al. (1997)), complementarities (Lundborg (1995)), skill training (Panos et al. (2014)) and individual preferences (Renna and Oaxaca (2006)).

Consider an individual maximizing utility function

$$U = c - \frac{1}{1+1/\varepsilon}\left(h_1 + h_2\right)^{1+1/\varepsilon} \tag{1}$$

subject to a budget constraint

$$c = (1-\tau_1)w_1h_1 + (1-\tau_2)w_2h_2 \;\text{ and }\; (1-\tau_1)w_1 \geq (1-\tau_2)w_2, \tag{2}$$

with h_i and w_i denoting working hours and wages in job i, respectively. For completeness, corresponding tax rates τ_i are allowed to differ across jobs even though in most countries $\tau_1 = \tau_2$. If the working hours are unconstrained, an individual will hold one job that pays the highest after-tax wage and will work $h_1^* = w_1^{\varepsilon}(1-\tau_1)^{\varepsilon}$ hours. However, if the highest-paid job hours are constrained, individual will work the maximum allowable hours at the highest-paid job and supplement with earnings from the secondary employment.[12] The optimal working hours are $(h_1^*, h_2^*) = \big(\bar{h}_1, \max\{0, w_2^{\varepsilon}(1-\tau_2)^{\varepsilon} - \bar{h}_1\}\big)$, and the total income earned is equal to the total earnings an individual would be willing to achieve if he only worked at the second job. The combined earnings will be lower than if the individual could work optimally at their primary job, unless the after-tax wages are equal in primary and secondary jobs.[13] Importantly, individual will not hold a second job if the after-tax secondary wage is too low or the primary job hours are sufficiently high.

Now suppose instead of (2) individuals face the following budget constraint:

$$c = (1-\tau_1)w_1h_1 + w_2h_2 - T(h_2), \text{ with } T(h_2) = \begin{cases} 0 & \text{if } w_2h_2 \leq K \text{ and } w_1h_1 \geq M \\ \tau_2 w_2 h_2 & \text{if } w_2h_2 > K, \end{cases} \tag{3}$$

thus allowing individuals to earn up to K tax-free in job 2 if they earn at least M in job 1. If the secondary job wage is too low even in absence of taxes, i.e. $(1-\tau_1)w_1 \geq w_2$, and working hours are unconstrained, individual will not obtain a secondary job. However, if the secondary wages are sufficiently high, so that $(1-\tau_2)w_2 < (1-\tau_1)w_1 < w_2$, then individuals will take advantage of secondary job opportunities. If the primary job income threshold M and the secondary

[12] For simplicity, I assume that lower-paid earnings are unconstrained.

[13] Note that the hours worked at the secondary job do not depend on the tax rate at the primary job because of the choice of quasi-linear utility function which does not allow for income effects. In presence of income effects, a decrease in τ_1 would lead to a decrease in working hours at the secondary job only. Unless the tax cut is large enough so that the new $h_1^* < \bar{h}_1$, in which case individual would quit the secondary job and work less in the first job.

job threshold K are sufficiently low, individuals will earn the threshold amount in the secondary job and the rest in the primary job. For higher thresholds, individuals will work just enough to satisfy the main-job threshold, and the rest in the secondary job. Finally, if the primary job threshold is too high, individuals will only hold one job. (Details are available in Appendix A.)

If the primary hours are constrained, then various responses are possible. If the hour constraint at the primary job is not binding given the preference for reduced primary earnings, then constrained individuals will behave the same way as unconstrained individuals. If the constraint is binding but allows individuals to earn M or more at the main job, individuals will work the maximum available hours at the main job and hold a secondary job, with secondary hours greater or equal to the threshold K.[14] If the hour constraint is very binding and individuals earn less than M at the main job, individuals will behave in the same way as prior to the reform, i.e. as if subject to constraint (2). Finally, if the primary working hours cannot be reduced, individuals will still obtain a secondary job. This means that if prior to the reform individuals were working optimally (i.e $\bar{h}_1 = w_1^{\varepsilon}(1-\tau_1)^{\varepsilon}$), individuals will supply more total hours than they would ideally like.

This simple theoretical model does not account for income effects and for the fixed costs of obtaining main and secondary jobs, but the results can be easily extended and predictions would remain largely the same. Results can also be extended to incorporate other reasons for holding multiple jobs such as uncertainty, complementarities, skill training, or personal preferences. As shown by Renna and Oaxaca (2006), a decrease in the secondary job marginal tax rate would lead to increased hours at the secondary job and decreased hours worked at the primary job. The actual hours will depend on individual preferences and hour constraints. The theoretical model thus generates two empirically-testable predictions.

Prediction 1: The reform will lead to an increased rate of multiple job holding for most individuals. *Only* individuals for who the available secondary wage is

[14] Note that individuals will never earn less than K in the secondary job unless they earn precisely M at the primary job, because it is more advantageous to reduce working hours at the primary job than at the secondary.

lower than the after-tax primary wage will not hold secondary jobs. Since this constraint is more likely to bind for very high-income individuals, we expect the strongest increase in multiple job holding rates among mid-income individuals. A small increase in the number of secondary jobs would suggest that individuals are unable to find secondary employments with similar wages to their primary jobs. The distribution of secondary jobs will also change after the reform: we will observe more below-the-threshold jobs, bunching at the mini-job threshold, and fewer just-above-the-threshold jobs than prior to the reform. Thus the reform will lead to substitution of moderately-paying secondary jobs for at-the-threshold secondary jobs.

Prediction 2: Individuals with large primary earnings who are not constrained will shift working hours from primary jobs to secondary employments, resulting in lower primary earnings. Absence of such behavior among the new secondary job holders is evidence of hour constraints at the primary employment. At the same time, a large number of below-the-threshold secondary jobs would also be evidence of hour constraints at the secondary jobs.

3 Empirical Results: Take-Up of Secondary Jobs

3.1 Graphical Evidence

Prediction 1 of Section 2 suggests that we should observe an increase in the number of at-the-threshold secondary jobs and a decrease in above-the-threshold secondary jobs. Figures 3 (a)-(b) confirm this prediction and show the distributions of secondary jobs before (dashed line) and after the reform (solid). Because secondary employment appears to be somewhat seasonal, I show the pre- and post-reform distributions for corresponding months, allowing us to compare the distributions of secondary jobs 3 and 12 months after the reform. Figure 3 documents that the number of secondary jobs increased gradually. Within 3 months of the reform a large share of secondary jobs shifted to the €400 threshold, but the number of lower-paying secondary jobs remained the same. As time progressed, the number of secondary jobs – both low-paying (under €400) and at-the-threshold jobs increased dramatically. Figures 3(c)-(d) zoom on the dis-

tribution above €425 and show a decrease in the number of mid-range secondary jobs, with pre- and post- reform distributions overlapping around €1000 per month.

Next, I explore how the likelihood of moonlighting changes from 1999 until 2010 in Figure 4. Figure 4(a) shows the percent of individuals who held secondary jobs paying less than €400 per month, €400-€1000, or more than €1000 over time. Few individuals moonlighted in Germany prior to the reform – just over 2% held secondary jobs in the beginning of 2003, and the vast majority of these employments earned less than €400. The results confirm Prediction 1: secondary employments with earnings below €400 increased immediately after the reform and kept growing until about 2009. In the last year of data, in 2010, roughly 7% of individuals held secondary jobs. The relatively low levels of moonlighting – despite the large savings – suggest that either the available secondary jobs offer wages that are too low, even if tax-exempt, or that the fixed costs of secondary job holding are very high.

Figure 4(b) allows us to evaluate patterns of secondary jobs paying €400 or more, by changing the y-axis. Figure 4(b) provides further support for Prediction 1: secondary employments in the mid-range, with earnings between €400 to €1000 per month have decreased rapidly after the reform and stagnated ever since. The number of these jobs, however, have stabilized quickly, within 3 years. Finally, we see a small increase in the number of high-paying secondary jobs (over €1000 per month), but this increase is very small. Importantly, Figure 4(b) shows that the increase in the number of secondary mini-jobs cannot be explained by the reduction in earnings of the previously existing secondary jobs, as the number of €400+ secondary jobs was too small before the reform.

3.2 Microdata Regression Estimates

The 2003 reform allowed individuals with regular jobs (i.e. earning more than €400) to hold secondary employment tax-free as long as the secondary earnings do not exceed €400. The most natural identification approach in this setting would be to compare secondary job holding rates of pre-reform ineligible individuals – those with primary earnings of less than €400 per month in March 2003 – to secondary job holding rates of pre-reform eligible individuals – those with

primary earnings of €400 or more in March 2003. There are two complications with this approach. First, individuals with small earnings experience particularly large fluctuation in earnings levels over time, often resulting in higher earnings and thus becoming eligible for the secondary job tax break. Second and more importantly, in addition to changing secondary job incentives, the reform increased the cumulative mini-job threshold from €325 to €400. Recall that tax liability does not start until cumulative earnings from all jobs exceed this mini-job threshold, therefore this reform could have incentivized individuals with small earnings to increase their earnings, perhaps by obtaining a secondary job. For these reasons, I need to use alternative approaches to select a control group.

I use three approaches to estimate the effect of the 2003 reform on moonlighting decisions. First, I assign individuals to treatment and control groups based on their primary earnings in January-March 2003, 3 months before the reform. The control group consists of individuals with primary earnings of €4000 or more, while the treatment groups consist of workers with primary earnings of €400 to €4000, broken down by primary income tranches. The identification is based on the idea that high-income individuals were less likely to be tempted by the secondary job tax break but their behavior, otherwise, should reflect changes in the propensities to hold secondary jobs dictate by other factors. Since these individuals were nonetheless treated, this approach yields a lower bound on the true magnitude of response.

In my second approach, I assign individuals to treatment and control groups based on their current levels of earnings. As a control group I choose individuals with very small primary earnings – less than €162 per month. By sample construction, these individuals' secondary jobs are limited to €162 or less, and therefore their combined income is limited to €325. Hence, these individuals should not be affected by the 2003 reform, as their desired cumulative earnings do not exceed €325. Individuals are assigned to treatment groups by tranches of current income, starting at €400. The main advantage of this approach is that it accurately reflects individuals' incentives. This approach, however, is unusual because the same individual might be assigned to a control group in some years, and to various treatment groups in other years. Treatment group switches do not affect the validity of the empirical approach, merely the interpretation of the re-

sults. The break down of treated individuals into primary earnings groups is done (a) for computational convenience, and (b) to gauge the importance of financial incentives as they vary with one's primary earnings. On the other hand, the possibility of selection into treatment would invalidate my empirical approach. I provide some evidence that such selection is highly unlikely.

For these two approaches, I estimate a linear probability model (LPM):

$$P(2nd_Mini_{it} = 1) = \beta_0 + \beta_1 Treat_{it} + \beta_2 After_{it} + \beta_3 (Treat_{it} \times After_{it}) + \delta X_{it} + \varepsilon_{it}, \quad (4)$$

where variable $2nd_Mini_{it}$ is equal to 1 if the individual holds a secondary mini-job and zero otherwise, while $After$ identifies the after-the-reform months. Variable $Treat$ identifies one of the several treatment groups – individuals with primary earnings of €400 to €1000, €1000-€3000, or over €3000 (based on current or pre-reform earnings level). Available controls X_{it} include demographic characteristics such as gender, age, state (länder), occupation, quarter and year fixed effects, and individual fixed effects. The coefficient of interest β_3 measures an increase in the take up of secondary jobs as a result of the tax break.

I choose the LPM over a nonlinear model such as a logit or a probit for several reasons. First, LPM is easy to interpret and the regression results can be directly compared to graphical evidence. Second and most importantly, LPM is more suitable for including individuals fixed effects as nonlinear models with fixed effects suffer from the incidental parameters problem (Neyman and Scott (1948); Lancaster (2000)). Third, the difference-in-differences approach is harder to interpret within a nonlinear framework. The parallel trend assumption necessary for causal estimation is hard to justify because of the bounded support of the outcome variable, and the estimated interaction term is difficult to interpret (Ai and Norton (2003); Puhani (2012)).

Finally, the third approach utilizes the fact that the reform increased the incentives of holding small secondary jobs but did not affect the incentives of having high-paying secondary jobs. Therefore, the secondary job holding rates of €1000+ secondary jobs could be used as a control for the secondary job holding rates of €0-€400 jobs. In the following sections, I discuss the results and provide

further empirical support for each of these approaches.

3.2.1 Approach 1: Assignment Based on Pre-Reform Primary Earnings

Table 2 shows the results of estimating equation (4) with treatment group assignment based on primary earnings in January-March 2003. The necessary identifying assumption is that the likelihood of secondary employment evolved similarly for individuals with high primary incomes (more than €4000) as for individuals with lower primary incomes (€400 to €4000). Figure 5(a) investigates the validity of this assumption and shows the secondary mini-job holding rates over time. Prior to the reform in April 2003, the percent of secondary job holders appears to follow a similar downward trend for all income groups. Individuals, of course, differ in the levels of multiple job holding: high-income individuals are less likely to hold secondary jobs than individuals with small primary earnings. Appendix Figure B.1 verifies the parallel trend assumption formally, by regressing the outcome variable on treatment indicator, time period indicators and the interaction of treatment indicator with time indicators. The parallel trend holds for lower income groups, however appears to be slightly violated for the highest income group, which should result in a small downward bias.

Columns (1) – (3) focus on short term effects and are estimated using the observations from 2001-2005. Columns (4) – (5) focus on long term effects and are estimated using the observations from 2001-2003 and 2009-2010. For expositional convenience, the outcome variable takes values 0 or 100, and therefore the estimates are presented in percent rather than fractions. Focusing on columns (3) and (6) which include all demographic controls, year and quarter fixed effects, as well as individual fixed effects, Tables 2 documents a large increase in secondary job holding rates over time. For individuals with pre-reform primary earnings of €400-€1000, the 2003 reform increased moonlighting rates by 2.59 pp within 2 years and by 6 pp in 7 years from a pre-reform mean of 4.58%. Higher income groups experienced smaller increases of 1.3-2.88 pp and 0.67- 1.62pp from baselines of 2.72% and 2.03%, respectively.

3.2.2 Approach 2: Assignment Based on Current Earnings

Table 3 shows the results of estimating equation (4) with treatment group assignment based on current primary earnings. The necessary identifying assumption is that the likelihood of secondary employment evolved similarly for individuals with very low primary incomes (less than €162) as for individuals with higher primary incomes (€400 or more). Figure 5(b) investigates the validity of this assumption and shows the secondary mini-job holding rates over time. Prior to the reform in April 2003, the percent of secondary job holders appears to follow a similar downward trend for all income groups except for individuals with highest incomes.

Figure 5 shows that the reform led to a small increase in the fraction of secondary job holders among individuals with primary earnings of less than €162. In contrast, we see a substantial increase in the probability of secondary employment among higher income individuals, with individuals of medium incomes (primary earnings of €400-€1000) showing the strongest response. Appendix Figure B.1 verifies the parallel trend assumption formally, again by regressing the outcome variable on treatment indicator, time period indicators and the interaction of treatment indicator with time indicators. The parallel trend assumption appears to be satisfied for all income group.

While approach 2 is best suited for estimating one's secondary job incentives as it assigns treatment and control status based on current primary income level, it is also most sensitive to selection bias. A natural concern could be that individuals in the control group are negatively selected. To investigate this possibility, I focus on individuals with primary earnings of €162 and then show their earnings 2 years later in Figure B.3. Figure B.3 shows that roughly 25-30% of individuals continue earnings less than €162 per month, an additional 15% increase earnings up to €400 and the rest earn over €400. Importantly, these group changes appear to be persistent over time, with no noticeable differences between the pre- and post-reform periods. While this evidence does not eliminate the possibility of negative selection, it provides some evidence against it.

The results in Table 3 are similar to those from Table 2 and closely mimic the graphical evidence from Figure 5: individuals with large primary earnings show weaker response than individuals with small primary earnings, and the

response strengthens over time. For individuals with primary earnings between €400 to €1000, the likelihood of secondary job holding increased by 2.22 to 3.54 percentage points in the first 2 years after the reform, and by 5.76 to 7.89 percentage points by 2010 (from the initial level of 4.51%). For individuals with primary earnings of €1000 to €3000, the likelihood of secondary job holding increased by 0.64 to 2.02 percentage points in the first 2 years after the reform, and by 1.31 to 4.1 percentage points by 2010 (from the initial level of 2.67%). The highest income group does not show an increase in the take up of secondary jobs relative to the control group.

3.2.3 Approach 3: High-Paid Secondary Jobs as a Control

Finally, I estimate the effect of the reform on the take up of small secondary jobs using counts from Figure 4. Recall that while the incentives to hold a low-paying secondary job increased dramatically after the reform, the incentives to hold a high-paying secondary job did not change. Therefore, one could use the number of high-paying secondary jobs as a control group for the number of secondary mini-jobs. To account for shifting of mid-range secondary jobs (i.e. paying between €400 and €1000) into €400-or-lower jobs, I use the number of secondary employments with monthly earnings of more than €1000 per month as a control group. Formally, I estimate

$$Num_Second_Jobs_{jt} = \gamma_0 + \gamma_1 Treat_{jt} + \gamma_2 After_{jt} + \gamma_3\, t + \gamma_4\, (t \times After_{jt}) + \gamma_5\, (t \times Treat_{jt}) + \gamma_6 (Treat_{jt} \times After_{jt}) + \gamma_7 (t \times Treat_{jt} \times After_{jt}) + \delta Y_{jt} + \varepsilon_{jt}, \tag{5}$$

where $Num_Second_Jobs_{jt}$ measures the number of secondary jobs with income level j in month t as percent. Variable t measures time in months, with 0 identifying April 2003 – the month of the reform, and $After_{jt}$ identifies post-reform months. $Treat_{jt}$ equals to 1 for secondary jobs with earnings of €400 per month or less, and zero for secondary jobs with earnings of €1000 or more. Specification (5) allows for differential time trends before and after the reform.

To control for changes in the labor force overall, I focus on percent rather than actual counts. Parallel trend assumption is verified in Figure 4(b): the identifying

assumption is that the number of secondary mini-jobs evolves similarly to high-paying secondary jobs appears to be satisfied for years immediately prior to the reform – starting from 2001. For this reason, I restrict the sample to 2001-2010. Table 4 shows the results of estimating equation (5). Columns (1) and (2) focus on short term effects and are estimated using the observations from 2001-2005. Columns (3) and (4) focus on long term effects and are estimated using the observations from 2001-2003 and 2009-2010. Finally, columns (5) and (6) include all observations, from 1999 until 2010. The basic differences (not accounting for time trends) suggest that secondary job holding rates of €0-to-€400 jobs increased by 1.73 pp within 2 years after the reform, and by 3.95pp by 2010. Accounting for time trends, the results show that the reform immediately increased the number of small secondary jobs and led to a persistent growth.

3.3 Heterogeneity of Responses

I explore how the magnitude of response differs by individuals' demographics in Figure 6. The results document substantial heterogeneity in moonlighting decisions among individuals with relatively low earnings, less than €2000. For higher levels of earnings, the patterns are less clear. With the exception of high-earning women, women are more likely to hold secondary jobs than men, and respond stronger to tax incentives. Young individuals – younger than 30 – and older individuals – 55 or older – are less likely to moonlight than individuals in the middle of their careers. (More detailed figures by age are available in Appendix Figure B.4.) Finally, Figures 6(e) and (f) explore the importance of occupations by grouping individuals based on the prevalence of these occupations among secondary jobs. Specifically, individuals whose primary occupation is also a common secondary occupation (doorman, custodian, waiter, house cleaner, warehouse or transport worker, or office worker) are shown in Figure (e), all other occupations in Figure (f). The results suggest that familiarity with common secondary occupations significantly increases the likelihood of moonlighting, even after controlling for earnings level.

4 Empirical Results: Primary Earnings Responses

4.1 Graphical Evidence

Prediction 2 of Section 2 states that individuals might take advantage of the tax-break by shifting earnings from their taxed primary jobs to untaxed secondary jobs. Such behavior would manifest in earnings decreases at the primary jobs, but only for individuals with new secondary jobs.

There are several difficulties in identifying such behavior. First, it is imaginable that individuals who obtain a secondary job do so because they experienced an earnings decrease at the primary job. Therefore simply studying the changes in primary earnings upon the take up of a secondary job is not sufficient. Second, one cannot compare average primary earnings over time of individuals with new secondary mini-jobs and new secondary regular jobs because the composition of secondary job holders is likely to change as a result of the reform. In particular, the reform increased the take up of secondary mini-jobs by relatively high-earning individuals. Finally, the reform made secondary jobs more attractive to individuals who have experienced a primary earnings decrease. Thus, observing a drop in primary earnings of individuals with new secondary jobs does not on its own prove earnings shifting. In this section, I use several approaches to investigate primary earnings responses and find no evidence of substitution between primary and secondary earnings.

In order to minimize the importance of selection, I focus on *changes* in primary earnings. Specifically, for each month I identify individuals with new secondary jobs, i.e. individuals who hold a secondary job in that month but who did not hold a secondary job a year ago, and whose primary monthly earnings exceed €1000 both this month and a year ago. Figures 7 shows average *changes* in primary earnings from the previous year, separately for individuals who obtained a new secondary mini-job or a new high-paying secondary job, as well as individuals with no secondary jobs. I focus on yearly changes because individuals' income might show a delayed response to secondary job holding; my approach would "catch" such delays as long as they happen within 12 months. If individuals were shifting earnings from primary employment to the secondary, we would observe a decrease in these changes after the reform for individuals with new sec-

ondary mini-jobs, but not for individuals with new high-paying secondary jobs. No such decrease is apparent. Interestingly, Figures 7 also suggests individuals who obtain a new secondary job do not necessarily do so because of a negative earnings shock in the primary employment.

Finally, I also consider the possibility that employees may collude with their employers to split regular job earnings into a less-paying regular job and a mini-job. While this cheating behavior would be attractive to employees, it would not generate benefits for the employer unless the tax savings are shared because employers must pay social security tax on mini-job wages. Approximately 44,050 individuals held both a regular and a mini-job with the same employer.[15] However, 61% of these new secondary job holders experienced an increase in pay when they first start the new secondary job. For 6.5%, their earnings remained within €100 of previous month's wage. This suggests that few individuals (if any) split their primary jobs into a taxed main job and an untaxed secondary job.

4.2 Regression Estimates

To test the second prediction formally, I use a difference-in-differences approach and compare how primary earnings change relative to the previous year for individuals with small and large *new* secondary jobs and large (more than €1000) primary earnings before and after the reform. Since having a secondary job with earnings above €400 does not lead to a tax break, these individuals constitute a natural control group for individuals with new secondary jobs that pay €400 or less. For the identification approach to be valid, earnings changes should follow a similar trend for individuals with low-paying new secondary jobs and individuals with high-paying secondary jobs. This parallel trend assumption appears to be satisfied in Figure 7.

Formally, I estimate

$$\Delta PrimaryEarnings_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 After_{it} + \beta_3 (Treat_{it} \times After_{it}) + \delta X_{it} + \varepsilon_{it}, \quad (6)$$

[15] Scaled from 881 observations from a 2% random sample of wage earners.

where $\Delta PrimaryEarnings_{it} = PrimaryEarnings_{it} - PrimaryEarnings_{i(t-12)}$ measures the change in primary earnings from 12 months ago for individuals with *new* secondary jobs. $Treat_{it}$ is equal to one for individuals with new secondary jobs paying less than €400 per month, and zero otherwise. If individuals shift earnings from primary to secondary jobs, the coefficient β_3 will be negative and statistically significant. Moreover, since prior to the reform average $\Delta PrimaryEarnings$ was approximately €44, then if all individuals obtain secondary jobs with the purpose of reducing primary earnings, $\beta_3 \approx -356$.

Specification (6) will pick up earnings shifting if the majority of new secondary job-holders decide to optimize by decreasing their primary earnings. This is likely not to be the case. Therefore in addition to estimating changes in levels of earnings, I estimate a linear probability model to investigate whether the likelihood of primary earnings decreases and decreases of approximately €400 became more prevalent among new secondary mini-job holders after the reform. To do so I estimate the following two equations:

$$P(\Delta Primary_Earnings_{it} < 0) = \gamma_0 + \gamma_1 Treat_{it} + \gamma_2 After_{it} + \gamma_3 (Treat_{it} \times After_{it}) + \delta X_{it} + \varepsilon_{it}, \quad (7)$$

and

$$P(\Delta Primary_Earnings_{it} \in [-350, -450]) = \gamma_0 + \gamma_1 Treat_{it} + \gamma_2 After_{it} + \gamma_3 (Treat_{it} \times After_{it}) + \delta X_{it} + \varepsilon_{it}. \quad (8)$$

A positive and statistically significant coefficient γ_3 would imply that an increased number of individuals experience primary earnings decreases when starting a new secondary mini-job, which is suggestive of income shifting.

The results of estimating (6) – (8) are presented in Table 5. While the results are noisy, they strongly suggest that individuals chose not to reduce primary earnings when they obtained new secondary jobs. Table 5 shows no discernible decrease in primary earnings, nor increased likelihood of having an approximately €400 decrease in primary earnings.

5 Interpreting the Results: Participation Elasticities and Determinants of Moonlighting

Secondary Participation Elasticities: The results of Tables 2, 3, and 4 can be used to estimate elasticities of participation in the secondary job market. I define elasticities as

$$\eta \equiv \frac{\%\Delta Participation}{\%\Delta(1-\tau)} = \frac{\%\Delta Participation}{\%\Delta(1-\tau_{SS}-\tau_{Income})}, \tag{9}$$

where $\tau_{SS} = 0.21$ and τ_{Income} identify social security and income taxes on the first dollar of secondary earnings. An appropriate measure of τ_{Income} would take into account spousal earnings, information on which is not available. As an approximation, I use individual's marginal income tax based on their primary earnings alone minus a 20% deduction (following the results of Doerrenberg et al. (2017)). Thus, average τ_{Income} is 13% for individuals with low primary earnings (€400-€1000), 28% for individuals with €1000-€3000 earnings, and 38% for individuals with primary earnings of over €3000. Because married individuals are subject to lower marginal income tax rates, the estimated elasticities present a lower bound on the true elasticities.

Elasticity estimates are summarized in Table 6 with my preferred estimates in columns (3) and (6). The results imply short-term elasticities of 1 to 1.15 and long-term elasticities of 2.59 to 2.69 for individuals with small primary earnings (€400-€1000). For individuals with primary earnings of €1000 to €3000, short-term elasticities range between 0.26 to 0.52, while long-term elasticities vary between 0.53 to 1.15. Finally elasticities for highest income individuals depend on the specification: Table 2 implies elasticities of 0.26 to 0.63, while Table 3 results in negative elasticity estimates. The magnitude of response is significantly larger than participation elasticities for the primary jobs, which are estimated to be between 0 and 0.25 for men and between 0 and 0.35 for women.[16] The results thus imply that moonlighting is highly responsive to tax incentives.

Determinants of Moonlighting: The striking observation from Figure 4 is that while the rates of multiple job holding increased after the reform, the increase

[16] See Blundell and Macurdy (1999), Blundell et al. (2011) and McClelland and Mok (2012).

is moderate, with fewer than 7% of workers holding multiple employments. Lack of secondary employment cannot be explained by hour constraints at the main jobs, since even fully-constrained individuals should obtain a secondary job if the after-tax secondary wage is higher than the after-tax primary wage (result 6 of Appendix A). Instead, low take up of secondary employment suggests that either (1) secondary jobs are not available, (2) that the available secondary jobs offer substantially lower wages than individuals' primary jobs (result 3 of Appendix A), or (3) that individuals have a very high fixed cost of moonlighting.

The rapid take up of secondary employments suggests that secondary jobs were generally available in the labor market. Moreover, mini-jobs have historically been popular in Germany, so secondary want-to-be workers could have competed for these jobs with low-earning primary workers. Therefore, the low take up of secondary jobs is more likely to be explained by the lack of suitable jobs or high fixed costs of moonlighting. One could evaluate the second explanation formally. First, Figure 1 provides strong evidence that high-paying jobs were generally not available. The vast majority of secondary employments represented jobs in low-skilled service sector (house cleaning, warehouse work and etc), even for individuals with large primary earnings. Tazhitdinova (2018a) studies mini-jobs using a firm and a household survey and documents that most mini-job workers are paid an average of €7-€9 per hour in 2006-2010. This hourly wage can be compared, for example, to an unmarried worker with primary earnings of €2000 per month or implied hourly wage of approximately €12 per hour. For this individual, the take home pay would be approximately €7.8 after income and social security taxes, and approximately equal to the prevailing mini-job wage. This back-of-envelope comparison suggests that with the exception of lowest-earning workers – e.g. those with primary earnings of less than €1000 – the reform did not present much of an arbitrage opportunity. At the same time, for most workers, the available secondary jobs would offer a wage approximately equal to that of their after-tax primary job. Finally, Figures 6 (e) and (f) shed some light on the potential fixed costs of obtaining a secondary jobs, and suggest that individuals whose primary occupation matches one of the common secondary jobs occupations are much more likely to moonlight, conditional on primary earnings level. Thus if online platforms such as TaskRabbit expand access to high-paying

secondary jobs, we might observe a large increase in the take up of secondary employments. Importantly, the response is likely to be even larger if these jobs can "avoid" income and payroll taxation.

Table 5 shows that most individuals did not reduce earnings in their primary jobs when they obtained a new secondary job. This finding is key evidence that individuals experience hour constraints at their primary employments and suggest that hour constraints are likely to be the primary explanation for the prevalence of moonlighting. A relatively large share of below-the-threshold secondary jobs (Figure 3 (b)), especially among high-income individuals, further suggests that hour constraints are not limited to primary employments but also apply to secondary jobs. Moreover, the probability of a matching occupation decreases as individuals' primary earnings increase (Figure 2). If job complementarities were a common reason for multiple job holding, we would see an even distribution of secondary jobs among individuals and relatively similar shares of matching occupations. An interesting observation from Figure 2 is that the shares of matching occupations have not changed over time. A large tax subsidy on secondary income could have induced high-income individuals to pick up secondary employments that offer relatively low before-tax wages, leading to even fewer occupation matches. This does not appear to be the case, on the opposite, occupation share matches have slightly increased after the reform (though the difference is not statistically significant).

6 Conclusion

Leveraging a unique reform in Germany that eliminated social security and income taxes on low-paying secondary jobs, this paper estimates the effect of taxes on multiple job holding. The results show that secondary job holding is highly responsive to taxes, with short-term participation elasticities of 0.26 to 1.15 and long-term participation elasticities of 0.63 to 2.69, which are several times larger than extensive margin elasticities for primary employment. The results imply that an increase in secondary job opportunities driven by the "gig" economy can lead to a substantial increase in moonlighting, especially if these employments allow for lower taxation due to reduced reporting. The results also show that

these opportunities would mostly benefit low-income individuals who appear to be substantially more responsive to such tax incentives. Therefore, changes in multiple job holding is likely to reduce inequality.

The observed increases in secondary job holding were not offset by reductions in primary earnings and thus represented an increase in labor force participation. Future studies should further explore reasons behind multiple job holding. The findings of this study suggest that many secondary jobs were not obtained with the goal of covering decreases in primary working hours, and instead led to increases in combined earnings. While this behavior is consistent with the presence of hourly constraints at the primary jobs it could also be consistent with consumption goals. Perhaps individuals take up secondary employment to purchase durable goods or for leisurely spending.

Section 3.1 documents rapid expansion of labor supply by individuals seeking €400-or-less secondary jobs. A natural question arises: did labor *demand* expand quickly and absorb these workers, or did moonlighters effectively "steal" jobs from low-income individuals for who low-earnings jobs are the primary source of income? Figure 8 shows the number of jobs separately for very low-earnings employments of less than €162 and at-the-threshold employments of €162 to €400. Figure 8 provides strong evidence that increased labor supply of moonlighters have not led to a decrease in labor supply of individuals with low primary earnings: the number of primary jobs with earnings of less than €400 have not decreased as a result of the reform. An important caveat is that the 2003 reform might have led to extensive responses within the primary jobs market: since the mini-job threshold was increased from €325 to €400, individuals who previously chose not to work at all, might have joined the workforce. However, such extensive margin responses should only affect the number of at-the-threshold jobs (€162 to €400), but should not affect small jobs (under €162). Figure 8 shows a small increase in the number of primary jobs and a large increase in the number of secondary jobs, suggesting no substitution between these workers. However, it remains a possibility that the increase in secondary jobs came as a result of splitting of larger full-time jobs into multiple mini-jobs. We defer this analysis to future research.

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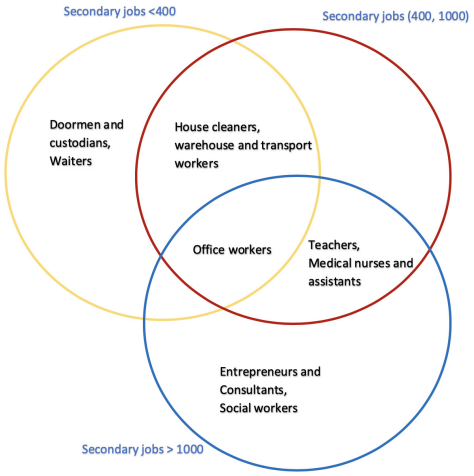
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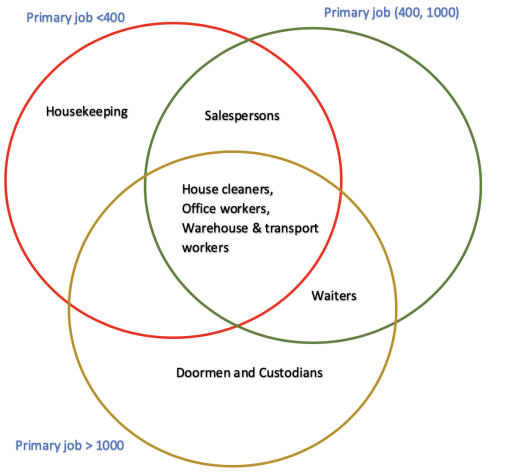
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Figure 1: Top 5 Most Common Secondary Job Occupations

(a) by secondary earnings



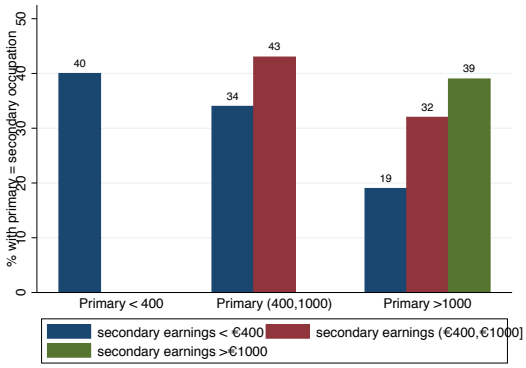
(b) ≤€400, by primary earnings



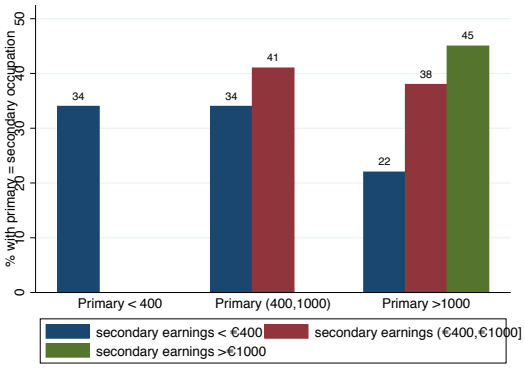
Notes: Figure (a) shows Venn diagrams of the five most common occupations in secondary job by level of secondary job earnings. Figure (b) shows Venn diagrams of the five most common occupations in secondary jobs that earn ≤€400/month by levels of primary earnings: below €400, €400-€1000, and above €1000. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 2: Occupations Matches in Primary and Secondary Employments

(a) 2000



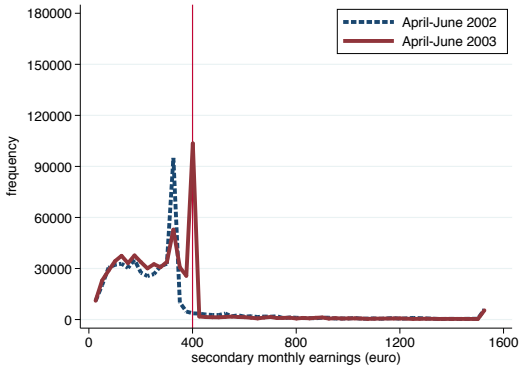
(b) 2010



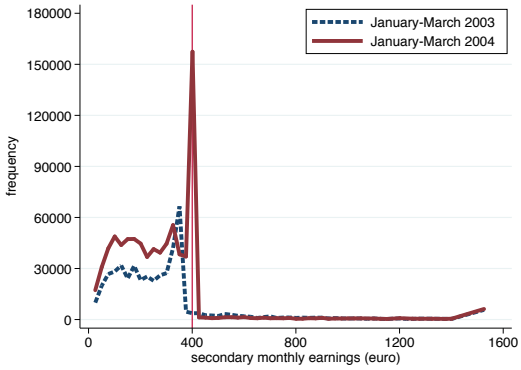
Notes: This figure shows the percent of individuals whose occupation in the primary job matches the occupation in the secondary job, in 2000 and 2010. The matches are broken down by earnings in the primary and secondary jobs respectively. Note that by construction earnings in the secondary job are always lower than earnings in the primary job. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 3: Distributions of Secondary Earnings Before and After the Reform

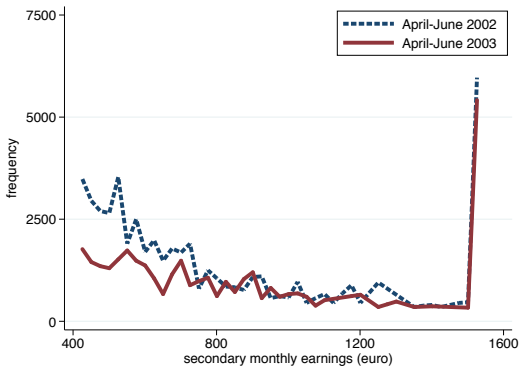
(a) April - June: 2002 and 2003



(b) January - March: 2003 and 2004



(c) April - June: 2002 and 2003



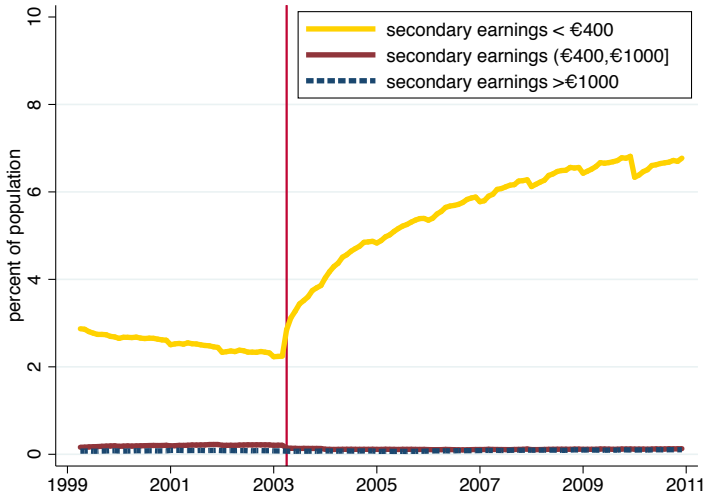
(d) January - March: 2003 and 2004



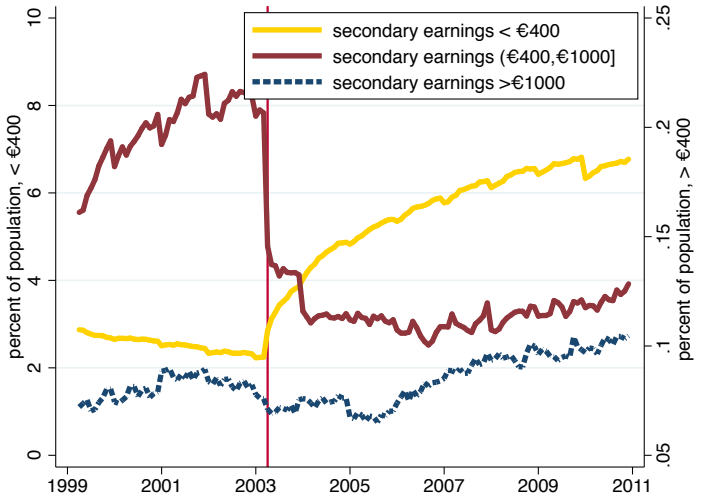
Notes: This figure shows the distributions of (positive) secondary monthly earnings. Each point shows the number of individuals in a €25 bin, scaled to represent the German population in that year from a 2% random sample. The vertical red line identifies the mini-job threshold. Pre-reform distributions shown as dashed lines. Figures (c) and (d) zoom in on the portion of the distribution with secondary earnings of €425 or more. The last bin shows the number of individuals with secondary earnings of €1500 or more. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 4: Secondary Job Holding Rates by Secondary Earnings Level

(a) same axis



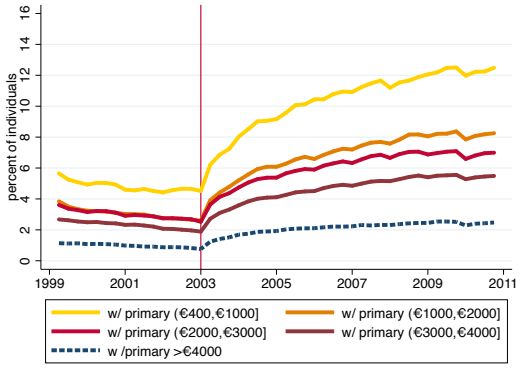
(b) different axis



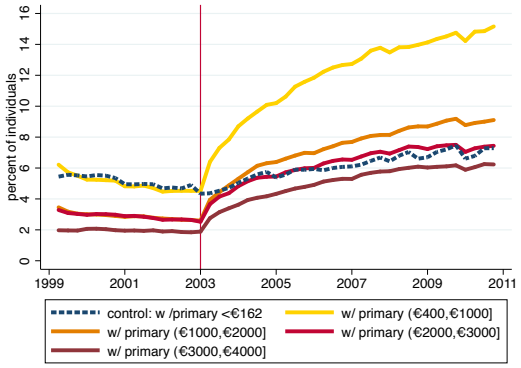
Notes: This figure shows the share of individuals with secondary jobs paying less than €400 per month, paying between €400 and €1000 , or more than €1000 per month. The vertical red line identifies the 2003 tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 5: Secondary Job Holding Rates by Primary Earnings

(a) By Pre-Reform Earnings



(b) By Current Earnings

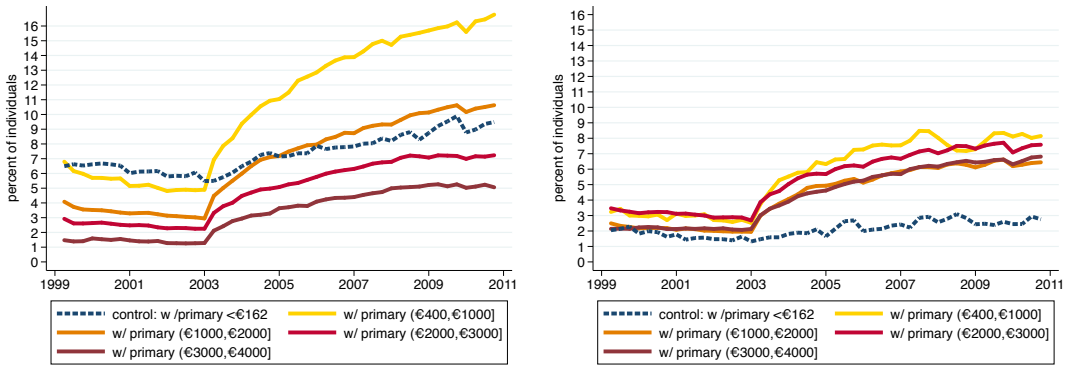


Notes: This figure plots the share of individuals who hold secondary jobs earning up to €400 by levels of primary earnings in January-March 2003 (a) or in current quarter (b). The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 6: Heterogeneity: Secondary Job Holding Rates by Demographics

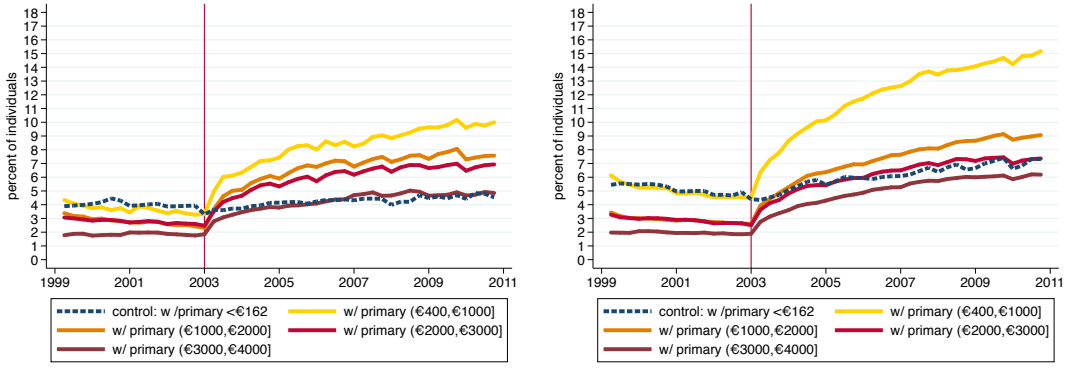
(a) Females

(b) Males



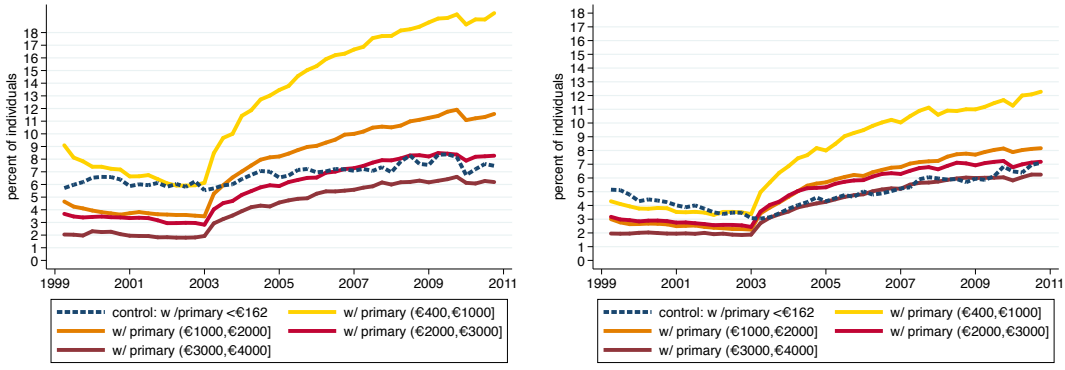
(c) Age $\leq$ 30 or $>$ 55

(d) 30 $<$ Age $\leq$ 55



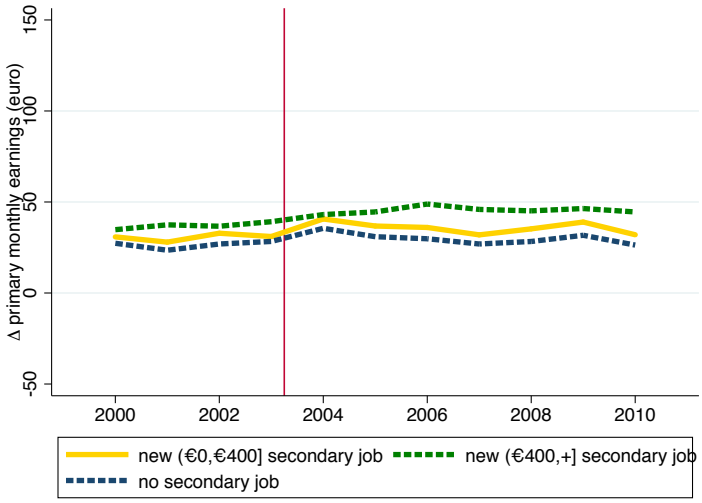
(e) Common Occupations

(f) Uncommon Occupations



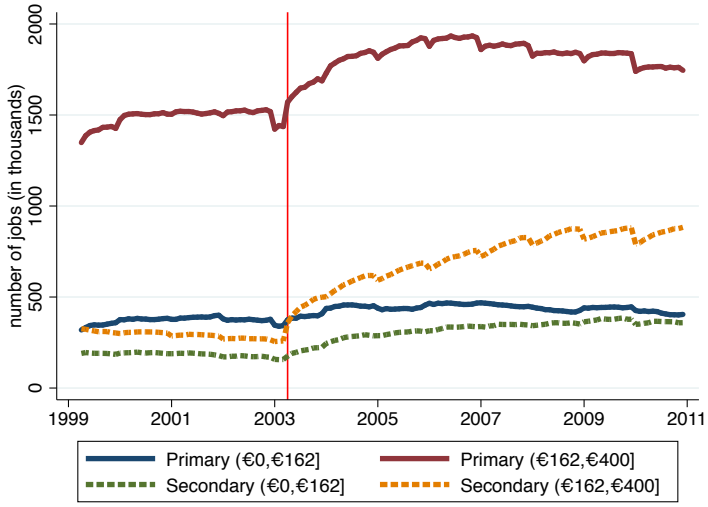
Notes: This figure plots the share of individuals who hold secondary jobs earning up to €400 by levels of primary earnings in current period. Individuals whose primary occupation is also a common secondary occupation (doorman, custodian, waiter, house cleaner, warehouse or transport worker, or office worker) are shown in figure (e), all other individuals in figure (f). The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 7: Change in Primary Earnings from Previous Year



Notes: This figure shows mean changes in primary monthly earnings from a year ago for individuals with new secondary jobs and primary earnings of at least €1000 in the target month and a year ago by 3 levels of secondary earnings: below €400, between €400 and €1000, and above €1000. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 8: Availability of Jobs Over Time



Notes: This Figure shows the number of jobs taken as primary or secondary jobs by monthly earnings level: under €162, between €162 and €400. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table 1: Summary Statistics

		1999		2002		2004		2010	
		Men	Women	Men	Women	Men	Women	Men	Women
All Individuals	Number Individual-Months	1,741,479	1,532,429	2,374,849	2,168,116	2,334,206	2,147,215	2,251,297	2,136,763
	Number Individuals	205,846	185,293	214,761	199,140	211,315	196,772	202,519	194,969
	Average Age	41	42	42	42	42	43	43	44
	Percent East Germany	18	19	17	18	16	18	16	16
	Average Monthly Pay (1st job)	2,676	1,598	2,824	1,689	2,920	1,702	3,118	1,852
	Median Monthly Pay (1st job)	2,572	1,474	2,734	1,552	2,779	1,532	2,977	1,626
With ≥2 jobs	Number of 2nd Jobs Individual-Months	43,762	55,071	53,408	66,511	92,739	119,777	121,638	177,463
	Number of 2nd Mini-Jobs Individual-Months	40,103	50,473	47,712	58,842	89,012	115,033	117,393	171,903
	Number of 2nd Jobs Individuals	4,956	6,285	4,526	5,680	7,893	10,149	10,279	15,109
	Average Monthly Pay (1st job)	2,480	1,342	2,616	1,384	2,654	1,434	2,819	1,517
	Median Monthly Pay (1st job)	2,455	1,216	2,597	1,256	2,609	1,277	2,747	1,312
	Average Monthly Pay (2nd job)	280	247	297	264	290	258	300	271
	Median Monthly Pay (2nd job)	232	225	248	221	273	239	294	267
With ≥3 jobs	Number of 3rd Jobs Individual-Months	1,194	2,448	1,423	3,052	2,053	4,692	2,004	5,930
	Number of 3rd Jobs Individuals	137	276	117	258	178	400	182	474
	Average Monthly Pay (1st job)	2,366	936	2,444	1,014	2,407	889	2,472	924
	Median Monthly Pay (1st job)	2,430	778	2,488	827	2,434	673	2,455	635
	Average Monthly Pay (2nd job)	371	225	452	239	379	237	409	266
	Median Monthly Pay (2nd job)	221	163	259	171	274	159	287	168
	Average Monthly Pay (3rd job)	179	112	199	123	179	116	187	122
	Median Monthly Pay (3rd job)	120	74	136	90	139	80	134	82

Notes: This table shows summary statistics for the data sample described in Section 1.2. Monthly pay in euro per month.
Source: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table 2: Take Up of Secondary Jobs (Approach 1)

Outcome:	Short Term			Long Term		
1 if holds secondary job (€0,€400]	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Treat × After	2.60***	2.59***	2.59***	6.08***	6.06***	6.06***
	(0.14)	(0.14)	(0.14)	(0.26)	(0.27)	(0.27)
Pre-reform Mean Outcome	4.58	4.58	4.58	4.58	4.58	4.58
N of Observations	1,074,375	1,069,300	1,069,300	780,102	776,542	776,542
Treatment Group: Individuals with Primary Earnings of (€1000,€3000)						
Treat × After	1.38***	1.31***	1.30***	3.08***	2.90***	2.88***
	(0.06)	(0.06)	(0.06)	(0.10)	(0.10)	(0.11)
Pre-reform Mean Outcome	2.72	2.72	2.72	2.72	2.72	2.72
N of Observations	3,779,734	3,761,823	3,761,823	2,758,635	2,746,065	2,746,065
Treatment Group: Individuals with Primary Earnings of (€3000,€4000)						
Treat × After	0.70***	0.67***	0.67***	1.76***	1.65***	1.62***
	(0.07)	(0.07)	(0.07)	(0.13)	(0.13)	(0.14)
Pre-reform Mean Outcome	2.03	2.03	2.03	2.03	2.03	2.03
N of Observations	1,627,796	1,619,327	1,619,327	1,190,784	1,184,782	1,184,782
Demographic Controls	no	yes	yes	no	yes	yes
Year, Quarter FE	no	yes	yes	no	yes	yes
Individual FE	no	no	yes	no	no	yes

Notes: Control group: individuals with primary monthly earnings of more than €4000 in January-March 2003. Demographic controls: gender, age, state, and occupation. Short term: April 2001 through February 2005. Long term: April 2001 through April 2003 and January 2009 through December 2010. For more details see Section 3.2.

Table 3: Take Up of Secondary Jobs (Approach 2)

Outcome:	Short Term			Long Term		
1 if holds secondary job (€0,€400]	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Treat × After	3.70***	2.59***	2.22***	7.57***	6.3***	5.76***
	(0.23)	(0.24)	(0.28)	(0.34)	(0.46)	(0.71)
Pre-reform Mean Outcome	4.51	4.51	4.51	4.51	4.51	4.51
N of Observations	546,030	544,016	544,016	445,445	443,868	443,868
Treatment Group: Individuals with Primary Earnings of (€1000,€3000)						
Treat × After	1.99***	1.08***	0.64***	3.15***	1.79***	1.31***
	(0.19)	(0.21)	(0.24)	(0.28)	(0.36)	(0.48)
Pre-reform Mean Outcome	2.67	2.67	2.67	2.67	2.67	2.67
N of Observations	3,513,863	3,497,072	3,497,072	2,762,147	2,749,597	2,749,597
Treatment Group: Individuals with Primary Earnings of (€3000,€∞)						
Treat × After	0.95***	0.13	-0.22	0.81***	-0.6	-2.24***
	(0.19)	(0.22)	(0.256)	(0.28)	(0.42)	(0.74)
Pre-reform Mean Outcome	1.44	1.44	1.44	1.44	1.44	1.44
N of Observations	1,838,904	1,829,444	1,829,444	1,565,619	1,557,433	1,557,433
Demographic Controls	no	yes	yes	no	yes	yes
Year, Quarter FE	no	yes	yes	no	yes	yes
Individual FE	no	no	yes	no	no	yes

Notes: Control group: individuals with primary monthly earnings of less than €162 in the current year. Demographic controls: gender, age, state, and occupation. Short term: April 2001 through February 2005. Long term: April 2001 through April 2003 and January 2009 through December 2010. For more details see Section 3.2.

Table 4: Take Up of Secondary Jobs (Approach 3)

Outcome:	Short Term		Long Term		All Years		
Percent holding secondary jobs	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment Group: Individuals with Primary jobs of >€1000							
Treat × After	1.75***	0.95***	3.95***	4.31***	3.05***	3.05***	1.73***
	(0.122)	(0.062)	(0.028)	(0.134)	(0.100)	(0.104)	(0.089)
t × Treat × After		1.12***		0.12***			0.54***
		(0.057)		(0.023)			(0.028)
Time Trend and Interactions	no	yes	no	yes	no	no	yes
Treat × Month FE	no	yes	no	yes	no	yes	yes
N	102	102	102	102	240	240	240

Notes: Number of secondary jobs measured as percent of the population. Short term: April 2001 through February 2005. Long term: April 2001 through April 2003 and January 2009 through December 2010. All years: January 2001 through December 2010. Before period: January 2001 through March 2003. Control group: number of secondary jobs with monthly earnings of more than €1000. For more details see Section 3.1.

Table 5: Changes in Primary Earnings

	Short Term		Long Term		All Years	
	(1)	(2)	(3)	(4)	(5)	(6)
Outcome: change in primary earnings						
Treat × After	-38.87	10.51	-60.98	-116.54**	-5.86	0.65
	(26.31)	(23.35)	(46.49)	(49.05)	(21.67)	(22.45)
Mean Outcome Treatment Group 2002	44.06	44.06	44.06	44.06	44.06	44.06
Outcome: 100 if primary earnings decreased, 0 otherwise						
		In progress				
Outcome: 100 if primary earnings decreased by €350-€450, 0 otherwise						
Treat × After	1.27	0.91	-0.50	-1.48	-0.54	0.37
	(0.99)	(1.37)	(1.17)	(2.37)	(0.73)	(1.02)
Mean Outcome Treatment Group 2002	2.97	2.97	2.97	2.97	2.97	2.97
Demographic Controls	no	yes	no	yes	no	yes
Individual FE	no	yes	no	yes	no	yes
Year, Month FE	no	yes	no	yes	no	yes

Notes: Treatment group – individuals with new secondary jobs paying less than €400 per month. Control group – individuals with new secondary jobs paying more than €400 per month. Sample selection – individuals with new secondary jobs and primary earnings of at least €1000 in the target month and a year ago. Short term: April 2001 through February 2005. Long term: April 2001 through April 2003 and January 2009 through December 2010. All years: April 1999 through December 2010. For more details see Section 4.2

Table 6: Participation Elasticities Summary

	Short Term			Long Term		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Table 2	1.15	1.15	1.15	2.7	2.69	2.69
	(0.06)	(0.06)	(0.06)	(0.12)	(0.12)	(0.12)
Table 3	1.67	1.17	1	3.41	2.84	2.59
	(0.1)	(0.11)	(0.13)	(0.15)	(0.21)	(0.32)
Treatment Group: Individuals with Primary Earnings of (€1000,€3000)						
Table 2	0.55	0.52	0.52	1.23	1.16	1.15
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Table 3	0.81	0.44	0.26	1.28	0.73	0.53
	(0.08)	(0.09)	(0.1)	(0.11)	(0.15)	(0.19)
Treatment Group: Individuals with Primary Earnings of (€3000,€∞)						
Table 2	0.27	0.26	0.26	0.68	0.64	0.63
	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)
Table 3	0.48	0.07	-0.11	0.41	-0.3	-1.13
	(0.1)	(0.11)	(0.13)	(0.14)	(0.21)	(0.37)
Demographic Controls	no	yes	yes	no	yes	yes
Year, Month FE	no	yes	yes	no	yes	yes
Individual FE	no	no	yes	no	no	yes

Notes: Participation elasticities defined as $\eta \equiv \frac{\%\Delta Participation}{\%\Delta(\tau_{SS}+\tau_{Income})}$, where $\tau_{SS} = 21\%$ and measures employee social security tax rate, and τ_{Income} is equal to individual's marginal income tax based on his/her primary earnings minus 20% deduction, 13%, 28% and 38% respectively. Initial secondary job participation rates are 4.31-4.58%, 2.67-2.72%, and 1.44-2.03%, respectively.

APPENDIX

A Theoretical Framework

Consider an individual maximizing utility function

$$U = c - \frac{1}{1+1/\varepsilon}\left(h_1 + h_2\right)^{1+1/\varepsilon} \tag{10}$$

subject to a budget constraint

$$c = (1-\tau_1)w_1h_1 + (1-\tau_2)w_2h_2. \tag{11}$$

Solving for optimal working hours under various assumptions generates the following results.

Result 1. *If* $(1-\tau_1)w_1 \geq (1-\tau_2)w_2$ *and working hours are unconstrained, optimal working hours are* $(h_1^*, h_2^*) = (w_1^{\varepsilon}(1-\tau_1)^{\varepsilon}, 0)$.

Result 2. *If* $(1-\tau_1)w_1 \geq (1-\tau_2)w_2$ *and main-job hours are constrained with* $h_1 \leq \bar{h}_1 < w_1^{\varepsilon}(1-\tau_1)^{\varepsilon}$ *or* $h_1 = \bar{h}_1 < w_1^{\varepsilon}(1-\tau_1)^{\varepsilon}$*, then optimal working hours are* $(h_1^*, h_2^*) = \left(\bar{h}_1, \max\{0, w_2^{\varepsilon}(1-\tau_2)^{\varepsilon} - \bar{h}_1\}\right)$.

Now suppose instead of (11) individuals face the following budget constraint:

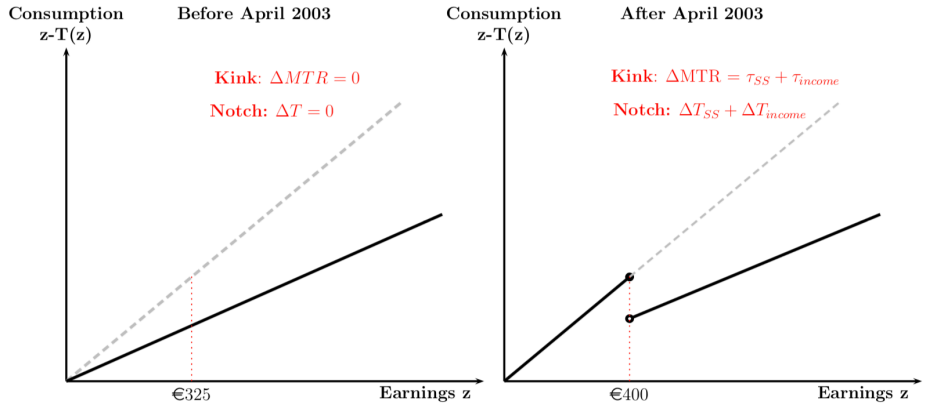
$$c = (1-\tau_1)w_1h_1 + w_2h_2 - T(h_2), \text{ with } T(h_2) = \begin{cases} 0 & \text{if } w_2h_2 \leq K \text{ and } w_1h_1 \geq M \\ \tau_2 w_2 h_2 & \text{if } w_2h_2 > K. \end{cases} \tag{12}$$

Result 3. *If main-job hours are unconstrained and* $(1-\tau_1)w_1 \geq w_2$ *then optimal working hours are* $(h_1^*, h_2^*) = (w_1^{\varepsilon}(1-\tau_1)^{\varepsilon}, 0)$.

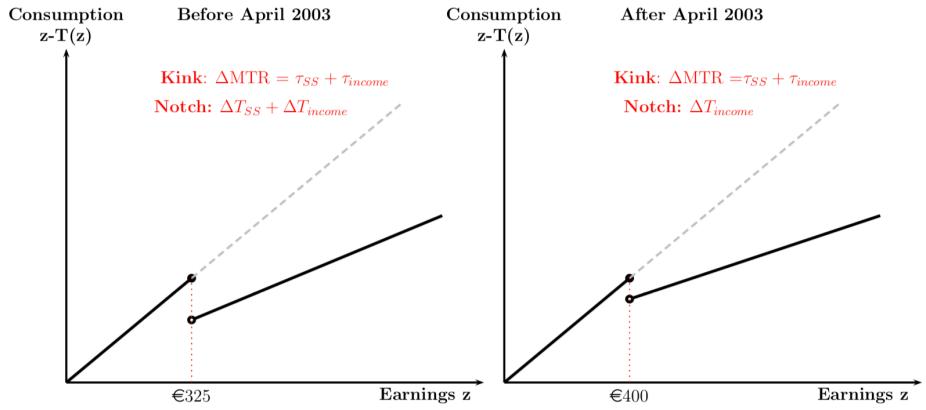
Result 4. *If main-job hours are unconstrained and* $(1-\tau_2)w_2 < (1-\tau_1)w_1 < w_2$

Figure A.9: Budget Constraints

Panel A: Mini-job as Secondary Employment



Panel B: Mini-job as Main Source of Income



Notes: This figure shows budget constraints experiences by individuals in 1999-2003 and 2003-2010. Panel A shows the budget constraint for secondary earnings for an individual with a regular job. Panel B shows the budget constraint for an individual with primary earnings around the mini-job threshold. The magnitude of income tax due, τ_{income} and ΔT_{income}, depends on individual's marital status and spousal earnings.

then optimal working hours are

$$(h_1^*, h_2^*) = \begin{cases} \left(w_1^\varepsilon(1-\tau_1)^\varepsilon - \frac{K}{w_2}, \frac{K}{w_2}\right) & \text{if } w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon \geq M+K \\ \left(\frac{M}{w_1}, \max\{w_2^\varepsilon - \frac{M}{w_1}, K\}\right) & \text{if } M < w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon < M+K \\ (w_1^\varepsilon(1-\tau_1)^\varepsilon, 0) & \text{if } w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon \leq M. \end{cases}$$

Result 5. *If main-job hours are constrained with* $h_1 \leq \bar{h}_1$ *and* $(1-\tau_2)w_2 < (1-\tau_1)w_1 < w_2$*, then optimal working hours are*

$$(h_1^*, h_2^*) = \begin{cases} \left(w_1^\varepsilon(1-\tau_1)^\varepsilon - \frac{K}{w_2}, \frac{K}{w_2}\right) & \text{if } w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon \geq M+K \text{ and } w_1^\varepsilon(1-\tau_1)^\varepsilon - \frac{K}{w_2} \leq \bar{h}_1 \\ \left(\frac{M}{w_1}, \max\{w_2^\varepsilon - \frac{M}{w_1}, K\}\right) & \text{if } M < w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon < M+K \text{ and } \frac{M}{w_1} \leq \bar{h}_1 \\ (w_1^\varepsilon(1-\tau_1)^\varepsilon, 0) & \text{if } w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon \leq M \text{ and } w_1^\varepsilon(1-\tau_1)^\varepsilon \leq \bar{h}_1. \end{cases}$$

Otherwise,

$$(h_1^*, h_2^*) = \begin{cases} \left(\bar{h}_1, \frac{K}{w_2}\right) & \text{if } \bar{h}_1 \geq \frac{M}{w_1}, \quad w_1^{\varepsilon+1}(1-\tau_1)^\varepsilon \geq M+K \\ & \quad \text{and } w_2[w_2^\varepsilon(1-\tau_2)^\varepsilon - \bar{h}_1] < K < w_2(w_2^\varepsilon - \bar{h}_1) \\ \left(\bar{h}_1, (1-\tau_2)^\varepsilon w_2^\varepsilon - \bar{h}_1\right) & \text{if } w_2[w_2^\varepsilon - \bar{h}_1] \geq K \text{ and } \bar{h}_1 \geq \frac{M}{w_1} \\ \left(\bar{h}_1, \max\{0, w_2^\varepsilon(1-\tau_2)^\varepsilon - \bar{h}_1\}\right) & \text{if } \bar{h}_1 < \frac{M}{w_1} \end{cases}$$

Result 6. *If main-job hours are constrained with* $h_1 = \bar{h}_1$ *and* $(1-\tau_2)w_2 < (1-\tau_1)w_1 < w_2$*, then optimal working hours are*

$$(h_1^*, h_2^*) = \begin{cases} \left(\bar{h}_1, \min\left\{w_2^\varepsilon - \bar{h}_1, \frac{K}{w_2}\right\}\right) & \text{if } K > w_2[w_2^\varepsilon(1-\tau_2)^\varepsilon - \bar{h}_1] \text{ and } \bar{h}_1 \geq \frac{M}{w_1} \\ \left(\bar{h}_1, w_2^\varepsilon(1-t_2)^\varepsilon - \bar{h}_1\right) & \text{if } K \leq w_2[w_2^\varepsilon(1-\tau_2)^\varepsilon - \bar{h}_1] \text{ and } \bar{h}_1 \geq \frac{M}{w_1} \\ \left(\bar{h}_1, \max\{0, w_2^\varepsilon(1-t_2)^\varepsilon - \bar{h}_1\}\right) & \text{if } \bar{h}_1 < \frac{M}{w_1} \end{cases}$$

B Appendix Tables and Figures

Table B.1: Mini-job Rules and Personal Income Tax Rates

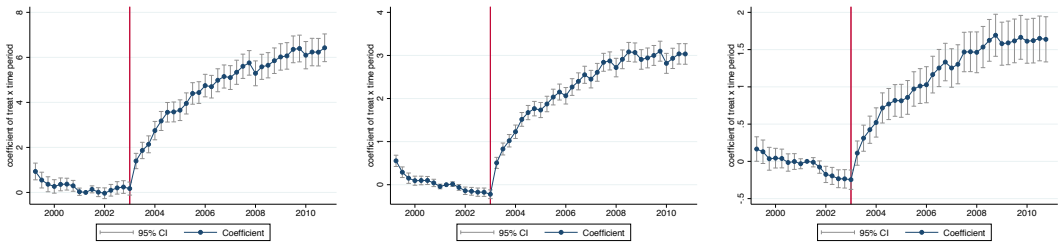
	Mini-Job Rules		Income and Social Security Tax Rates							
Year	Mini-Job	2nd Job	SS	Tax-free	First Linear Progressive Zone		Second Linear Progressive Zone		Higher Income Zone	
	Threshold	tax-free?	MTR	Allowance	income bracket	MTR	income bracket	MTR	income bracket	MTR
1999	325	No	42	6,681	6,682 to 8,724	23.9 to 26.7	8,725 to 33,932	26.7 to 36.69	33,933 to 61,376	36.69 to 53[a]
2000	325	No	42	6,902	6,903 to 8,945	22.9 to 25	8,946 to 58,643	25 to 51	from 58,644	51
2001	325	No	42	7,206	7,207 to 9,249	19.9 to 23	9,250 to 54,998	23 to 48.5	from 54,999	48.5
2002	325	No	42	7,235	7,236 to 9,251	19.9 to 23	9,252 to 55,007	23 to 48.5	from 55,008	48.5
2003	400	Yes	42	7,235	7,236 to 9,251	19.9 to 23	9,252 to 55,007	23 to 48.5	from 55,008	48.5
2004	400	Yes	42	7,664	7,665 to 12,739	16 to 24.05	12,740 to 52,151	24.05 to 45	from 52,152	45
2005	400	Yes	42	7,664	7,665 to 12,739	15 to 23.97	12,740 to 52,151	23.97 to 42	from 52,152	42
2006	400	Yes	39	7,664	7,665 to 12,739	15 to 23.97	12,740 to 52,151	23.97 to 42	from 52,152	42
2007	400	Yes	39	7,664	7,665 to 12,739	15 to 23.97	12,740 to 52,151	23.97 to 42	from 52,152	42[b]
2008	400	Yes	39	7,664	7,665 to 12,739	15 to 23.97	12,740 to 52,151	23.97 to 42	from 52,152	42[b]
2009	400	Yes	39	7,834	7,835 to 13,139	14 to 23.97	13,140 to 52,551	23.97 to 42	from 52,552	42[b]
2010	400	Yes	39	8,004	8,005 to 13,469	14 to 23.97	13,470 to 52,881	23.97 to 42	from 52,882	42[c]

Notes: This table shows mini-job rules, income tax brackets in euros and corresponding marginal tax rates in percent for single individuals. Incomes of married individuals are added up, divided equally, and then are subjected to the same schedule. Incomes within the linear progressive zones are subject to linearly increasing marginal tax rates. Social security marginal tax rate is the combined employer and employee tax rates.

[a] For incomes above €61,376 the marginal tax rate was 53%. [b] For incomes above €250,001 the marginal tax rate was 45%. [c] For incomes above €250,731 the marginal tax rate was 45%. Examples and detailed calculations of income tax are available at the Ministry of Finance website: https://www.bmf-steuerrechner.de/ekst/

Figure B.1: Parallel Trends Test (Approach 1)

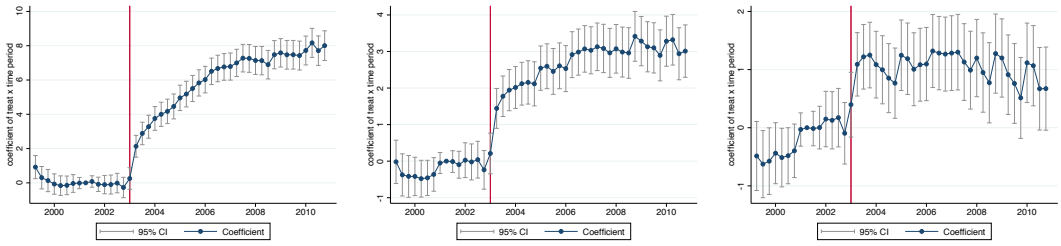
(a) €400-€1000 (b) €1000-€3000 (c) €3000-€4000



Notes: This figure plots the share of individuals who hold secondary jobs earning up to €400 by levels of primary earnings. The vertical red line identifies the tax reform. First quarter of 2001 is omitted. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

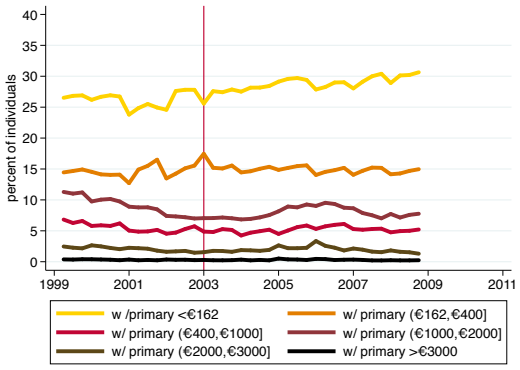
Figure B.2: Parallel Trends Test (Approach 2)

(a) €400-€1000 (b) €1000-€3000 (c) €3000-€4000



Notes: This figure plots the share of individuals who hold secondary jobs earning up to €400 by levels of primary earnings. The vertical red line identifies the tax reform. First quarter of 2001 is omitted. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

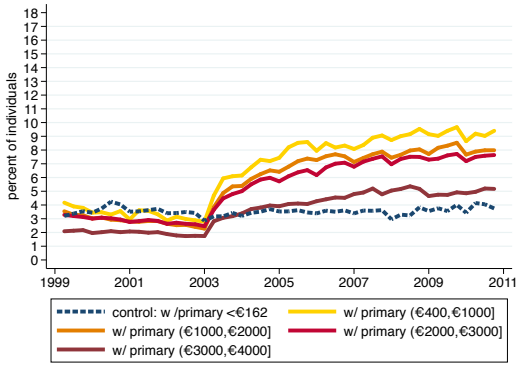
Figure B.3: Income Group Switches



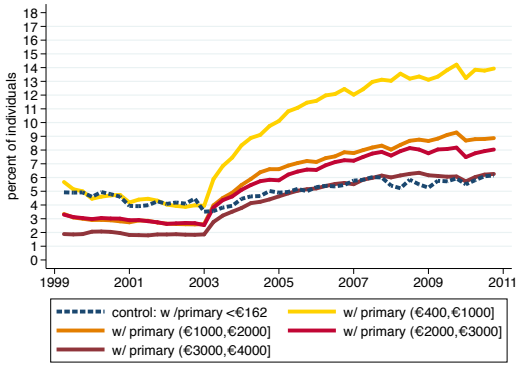
Notes: This figure plots the share of individuals who hold primary employment with earnings of less than €162, between €162 and €400, etc, 2 years after earning €162 or less. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure B.4: Heterogeneity: Age

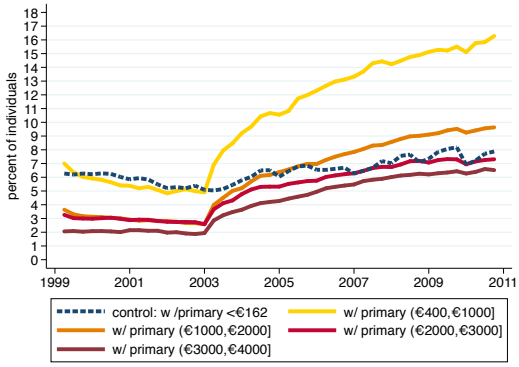
(a) Age $\leq$ 30



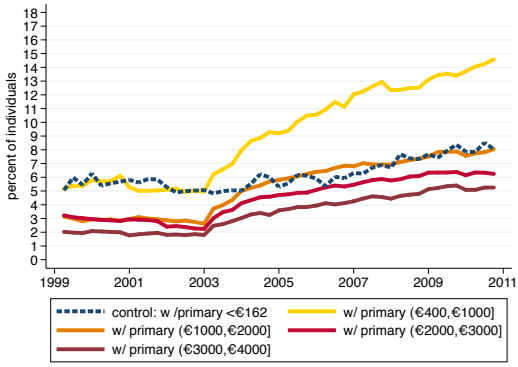
(b) 30 $<$ Age $\leq$ 40



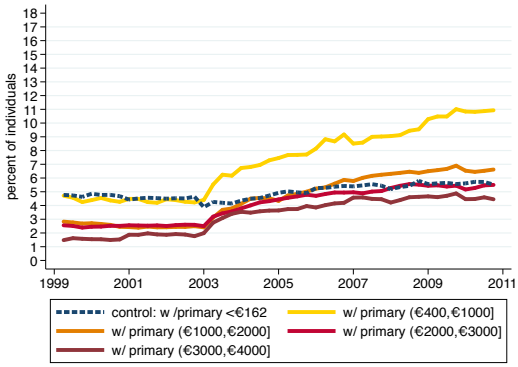
(c) 40 $<$ Age $\leq$ 50



(d) 50 $<$ Age $\leq$ 55



(e) Age $>$ 55



Notes: This figure plots the share of individuals who hold secondary jobs earning up to €400 by levels of primary earnings. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.