Increasing Hours Worked: Moonlighting Responses to a Large Tax Reform

Alisa Tazhitdinova*

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 20-62pp. Using a difference-in-diferences 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.

JEL Classification: H24, J22
Keywords: multiple job holding, moonlighting, payroll tax, income tax

*Department of Economics, UC Santa Barbara. Contact: tazhitda@ucsb.edu. I am grateful to Alan Auerbach, Youssef Benzarti, Hilary Hoynes, Peter Kuhn, Emmanuel Saez, Nathan Seegert, Joel Slemrod, Arthur Sweetman, Eleanor Wilking, and seminar participants at the University of Victoria, Wilfrid Laurier University and 2017 NTA meetings for helpful comments. A special thank you to the team at the Institute for Employment Research (IAB) for assistance with the SIAB data.

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, 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 treat primary and secondary employments identically, with the tax schedule applying 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.[3] The reform exempted secondary

[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)).

[3] Full income and social security taxes are due on secondary earnings of €401 or more.

earnings from both income and employee social security taxes, at a minimum offering a 20% tax break on secondary income. 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 number of moonlighters with small 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 eligible workers saved between 20 to 62 percentage points of combined social security and income taxes, these responses translate into elasticities of participation between 0.63 and 2.72. 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.[4] For identification, I employ a difference-in-differences approach and compare changes in multiple-job holding rates among high-income individuals, who were affected by the reform, to multiple job holding rates of low-income individuals, who were not affected by the reform. As an additional robustness check, 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), the tax treatment of the latter was not changed by the reform. Both 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 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. Fi-

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

nally, 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.[5] The fact that most individuals did not reduce earnings in their primary jobs is the key evidence of hour constraints at the primary employment.[6] Moreover, a large share of secondary employment took form of below-the-threshold rather than at-the-threshold 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 20 to 62 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 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

[5] 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.

[6] 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.

working hours (Angrist et al. (2017), Mas and Pallais (2017)).[7] 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 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 marginal jobs, or mini-jobs, that are exempt from income tax and employee portion of social security taxes. From 1999 until April 2003 marginal employment included jobs in which employees earned less than €325 per month and worked less than 15 hours per week. Importantly, if individuals held several jobs, the threshold applied to the sum of earnings.[8]

[7] 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)).

[8] Tazhitdinova (2018a) studies responses to the mini-job threshold by low-income individuals.

Thus for individuals with a regular job, secondary earnings were added to the primary earnings and thus were subject to the usual marginal income tax rate and regular social security taxes.

The Hartz II reforms introduced on April 1, 2003 increased the mini-job threshold from €325 to €400 and made mini-jobs attractive both to individuals who hold mini-job as the main source of income and to individuals with a regular job.[9] First, the 2003 reform 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 a secondary job tax-free if the secondary earnings do not exceed €400. Second, the reform abolished the hour constraint and smoothed the social security notch at the mini-job threshold by substituting it with a kink – the reduced tax liability phased out upon reaching €800, at which point both employees and employers are subject to regular social security taxes. The smoothed social security liability, however, did not apply to secondary mini-jobs.

Table B.1 summarizes applicable tax rates and rules from 1999 until 2010, while Figure 1 illustrates the budget constraints. Panel A shows the budget constraint for secondary income for an individual with a regular job. It shows that secondary earnings of any magnitude were subject to income and social security taxes prior to 2003. Starting from 2003 on, secondary earnings generate tax liability only when they exceed the €400 threshold, generating a large notch at €400. Panel B shows the budget constraint for individuals with low primary earnings. In both cases individuals' income and social security liability increased above the mini-job threshold, however, the magnitude of the notch is smaller after the 2003 reform.

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

[9] 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).

of unemployment benefits for a 2% sample of the *wage earners* – 1,639,325 individuals – in Germany from 1975 until 2010.[10] 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 is known only for benefit recipients and those engaged in job search.

I restrict the sample 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 31 through 54. For each month I identify employment spell of the longest duration. I then delete any job spells within that month that do not overlap with this employment spell by at least 15 days.[11] For months of continuous employment this procedure identifies the main job and secondary jobs held during that month. In months of job switches, employment spells of longest duration are recorded. This procedure, therefore, could lead to omission of very short spells of multiple-job holding in between main jobs.

For each month, the observation with the largest monthly earnings is recorded as the main job and the following two employments are recorded as the second

[10] 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.

[11] 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.

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 notifications.

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. At the same time, the number of third jobs increased by 1.5 times by 2004 and nearly doubled by 2010. The vast majority of these secondary employments are mini-jobs with average earnings around €260 to €300. 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 increased after the reform, the overall levels remained low, with less than 7% of individuals holding secondary jobs.

Figure 3 reports five most common occupations among secondary jobs for individuals with varying levels of primary earnings in 2005.[12] Figure 4 shows the share of individuals for who the occupation in the main job matches their occupation in the secondary job. These figures show that occupations such as house cleaners, office workers, warehouse workers are common across all years and types of workers. Individuals with low primary earnings are more likely to have matching occupations. 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. How-

[12] See also Table B.2 for other years.

ever, 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

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

If the working hours are unconstrained, an individual will hold one job that 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.[13] The optimal working hours are $(h_1^*, h_2^*) = \left(\bar{h}_1, \max\{0, w_2^{\varepsilon}(1-\tau_2)^{\varepsilon} - \bar{h}_1\}\right)$. The total income earned will be equal to the total earnings an individual would be willing to achieve if he only worked at the second job. This implies that individual will not hold a second job if the after-tax secondary wage is too low and the primary job hours are sufficiently high. The combined earnings will be lower than if the individual could work optimally, unless the after-tax wages are equal in primary and secondary jobs.[14]

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

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

If the the secondary job wage is too low even in absence of taxes, i.e. $(1 -$

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

[14] 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.

$\tau_1)w_1 \geq w_2$, 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 threshold M and the secondary 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.[15] 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 in the secondary market and decreased hours worked in the primary job. The actual hours will depend on individual

[15] 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.

preferences and hour constraints. The theoretical model thus generates three 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 secondary wage is lower than the after-tax primary wage will not hold 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.

Prediction 2: The distribution of secondary jobs will 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. The reform thus will lead to substitution of moderately-paying secondary jobs for at-the-threshold secondary jobs.

Prediction 3: 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 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.

Finally, an additional prediction can be made regarding the aggregate changes in the distributions of working hours and labor force participation of low-income individuals.

Prediction 4: If labor demand cannot expand rapidly, the reform will lead to temporary reductions in the labor force participation or working hours of low-income workers: the influx of moonlighters could reduce the availability of low-paid jobs to individuals with small primary earnings.

3 Empirical Results

3.1 Predictions 1 and 2: Take-Up of Secondary Jobs

3.1.1 Graphical Evidence

To evaluate the validity of Prediction 1 from Section 2, I explore how the probability of moonlighting changes from 1999 until 2010 in Figure 2. The results confirm Prediction 1. Secondary employments with earnings below €400 increased immediately after the reform and kept growing until about 2009. 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 fast, 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. Despite large potential savings, most individuals prefer not to hold a secondary job: the moonlighting rates increased from less than 2.8% prior to the reform to 7%. The low rates of moonlighting suggest that available secondary jobs offer wages that are too low, even if tax-exempt.

Prediction 2 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. Figure 6 confirms this prediction and shows the distributions of secondary jobs before and after the reform. 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, 6, 8 and 12 months after the reform. Figure 6 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. Figure 6 also shows a decrease in the number of mid-range secondary jobs. The pre- and post- reform distributions appear to overlap around €1000 per month (Appendix Figure B.1 zooms on the distributions of secondary jobs paying €425 or more).

Figure 7 mimics Figure 6 but shows the distributions of *primary* earnings for

individuals who hold secondary jobs. Two observations are striking. First, the secondary jobs are held by individuals with various levels of primary incomes and are not limited to low-income individuals. Both before and after the reform we see a wide range of primary incomes among secondary job holders.[16] Second, as follows from Figure 7, the reform increased the number of secondary jobs across most levels of primary earnings. Since the magnitude of the tax break depends on one's marginal tax rate, high-income individuals experienced the strongest incentive to obtain a secondary job. Therefore, Figure 7 suggests that low-income individuals are most responsive to tax incentives. The observed behavior is likely to be driven by job availabilities: as Table B.2 documents, high-income individuals find it more difficult to obtain a secondary job with the same occupation, and hence similar level of earnings as their primary job.

3.1.2 Regression Estimates

I rely on a difference-in-differences approach to quantify the effect of the 2003 reform on the likelihood of moonlighting. Two approaches are used to select a control group. As a first strategy, I use individuals with small primary earnings (who were not affected by the reform) as a control group for individuals with high primary earnings (who were eligible for the tax break). As a second strategy, instead of focusing on individuals, I compare counts of secondary jobs over time and use high-paying secondary jobs (over €1000 per month) that did not qualify for the tax break as a control group for low-paying secondary jobs (€400 or less) that were eligible for the tax break.

The 2003 reform allows individuals with *regular* jobs (i.e. earning more than €400) to hold secondary employment tax-free as long as *secondary* earnings do not exceed €400. Individuals with primary earnings of less than €400 (€325 prior to April 2003) have always been allowed to have secondary jobs tax-free as long as the *cumulative* earnings remained below the €400 threshold (€325 threshold prior to April 2003).[17] Thus individuals with low primary earnings can be used as

[16] Figure 7 does not account for shares of individuals with various levels of primary earnings in the population. Because there is a relatively small number of low-income individuals (earning between €400 and €1000), the rates of moonlighting among these individuals are significantly higher than those for high-income individuals (earning more than €1000). See Figure 5.

[17] As described in Section 1.1, individuals with cumulative earnings below the mini-job

a control group since they have not experienced a direct change in tax incentives. However, the increase in the mini-job threshold generates a complication: as the mini-job threshold increased from €325 to €400, individuals with primary jobs around €325 had an incentive to either obtain a higher-paying main job or take up a secondary job to increase total earnings to €400. To avoid such confounding effects, as a control group I choose individuals with very small primary earnings – less than €162 per month. By sample construction, the incentives to hold a secondary job have not changed for these individuals because the mini-job threshold was never binding.[18] Therefore I can compare moonlighting behavior of individuals with very small primary earnings (up to €162) to moonlighting decisions of individuals with high primary earnings: with primary earnings of €162 to €400, €400 to €1000, and over €1000.

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 high incomes. Figure 5 investigates the validity of this assumption and shows the shares of moonlighters with secondary jobs of less than €400 over time. Prior to the reform in April 2003, the percent of secondary job holders appears to follow a similar downward trend for all four income groups. Individuals, of course, differ in the levels of multiple job holding: high-income individuals and individuals with at-the-threshold jobs are less likely to hold secondary jobs than individuals with very small primary earnings or mid-range earnings (€400 to €1000). Figure 5(a) 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.

To quantify the effect of the reform, I estimate two models: a linear probability model (LPM) and a logistic equation. The advantage of the LPM is the

threshold are exempt from income and employee-paid portion of social security taxes.

[18] As described in Section 1.2, employment with highest income is recorded as the primary job. Therefore, individuals with primary income of €162 can at most earn €162 in their secondary jobs, resulting in combined income of €324 or less, which is smaller than the pre-2003 mini-job threshold.

ease of interpretation and the ability to directly compare results to graphical evidence. The downside is that because the probabilities of multiple job holding are very low, the linearity assumption is likely to be violated. For this reason, I also estimate a logistic equation. Formally, I estimate the probability of holding a secondary mini-job by individual i at time t (measured in months):

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

and

$$P(2nd_Mini_{it} = 1) = \Lambda(\beta_0 + \beta_1 Treat_{it} + \beta_2 After_{it} + \beta_3 (Treat_{it} \times After_{it}) + \delta X_{it}). \quad (5)$$

Variable $After$ identifies the after-the-reform months. Variable $Treat$ identifies one of the two treatment groups – individuals with primary earnings of €400 to €1000, or over €1000.[19] Available controls X_{it} include demographic characteristics such as gender, age, state, occupation, as well as month and year fixed effects; most specifications additionally include 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.

Tables 4 and 5 show the results of estimating specifications (4) and (5) respectively. 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 results are consistent across specifications 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 2.03 to 3.21 percentage points in the first 2 years after the reform, and by 6.55 to 7.8 percentage points by 2010 (from initial

[19] Individuals with primary earnings of €162 to €400 are omitted because their behavior is driven by different tax incentives.

level of 4.31%). For individuals with primary earnings of more than €1000, the likelihood of secondary job holding increased by 0.26 to 0.53 percentage points in the first 2 years after the reform, and by 2.43 to 3.18 percentage points by 2010 (from initial level of 2.14%). In all cases, logit specification (5) shows stronger response than LPM (4).[20]

I now turn to the second empirical strategy. 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 Prediction 2 – shifting of mid-range secondary jobs 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, which appear to not be affected according to Figure B.1. Further, since by construction, high-paying secondary jobs can only be held by individuals with high primary incomes, I perform the analysis individuals with primary earnings of more than €1000. To control for changes in the labor force overall, I focus on percent rather than actual counts. Parallel trend assumption is verified in Figure B.2 which mimics Figure 2 and shows the evolution of the number of secondary employments by type for individuals with primary earnings of more than €1000. The identifying assumption is that the number of secondary mini-jobs evolves similarly to high-paying secondary jobs appears to be satisfied in Figures B.2 for secondary jobs with low earnings for years immediately prior to the reform – starting from 2001. For this reason, I restrict the sample to 2001-2010 and focus on the effect of the reform on secondary mini-jobs. However, for completeness the results are presented for the mid-range jobs as well. Formally, I estimate

$$\begin{aligned} Num_Second_Jobs_{jt} = \gamma_0 + \gamma_1 Treat_{jt} + \gamma_2 After_{jt} + \gamma_3\, t + \gamma_4\, (t \times After_{jt}) \\ + \gamma_5 (Treat_{jt} \times After_{jt}) + \gamma_6 (t \times Treat_{jt} \times After_{jt}) + \delta Y_{jt} + \varepsilon_{jt}, \quad (6) \end{aligned}$$

where $Num_Second_Jobs_{jt}$ measures the number of secondary jobs with income type j in month t as percent of the working population. Variable t measures time in months, with 0 identifying April 2003 – the month of the reform. Coefficient

[20] Corresponding elasticities are available in Table 7.

of interest γ_5 measures an immediate change in the percent of individuals holding secondary jobs, while γ_6 measures an average *monthly* change in secondary job holding. Controls include month fixed effects separately for the treatment and control groups.

Table 6 shows the results of estimating specification (6) on a sample of individuals with primary earnings of €1000 per month or more. The results of Table 6 are very consistent with findings of Tables 4 and 5 and suggest that the likelihood of small secondary jobs holding increased by 0.95 percentage points within 2 years after the reform and by 4.31 percentage points by 2010 (from pre-reform level of 2.14%).

The results of Tables 4, 5, and 6 can be used to estimate elasticities of participation in the secondary job market. I define elasticities as

$$\eta \equiv \frac{\%\Delta Participation}{\%\Delta(1-\tau)} = \frac{\%\Delta Participation}{\%\Delta(1-\tau_{SS}-\tau_{Income})}, \tag{7}$$

where τ_{SS} and τ_{Income} identify social security and income taxes on the first dollar of secondary earnings. Elasticities are calculated using social security rate $\tau_{SS} = 21\%$, initial secondary job participation rates of 4.31% for individuals with primary incomes of (€400, €1000) and 2.14% for individuals with primary incomes of more than €1000. 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 12% for individuals with low primary earnings (€400-€1000) and 32% for individuals with high primary earnings (over €1000).

Elasticity estimates are summarized in Table 7. The results imply short-term elasticities of 0.96 to 1.51 and long-term elasticities of 3.09 to 3.67 for individuals with small primary earnings (€400-€1000), resulting in average secondary job participation elasticities of 1.89 to 2.46. For individuals with larger primary earnings (over €1000), short-term elasticities range between 0.11 to 0.79, while long-term elasticities vary between 1.01 to 1.79, resulting in average participation elasticities of 0.63 to 1.38. 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.[21] The results thus imply that moonlighting is highly responsive to tax incentives.

3.2 Prediction 3: Reductions in Primary Earnings

3.2.1 Graphical Evidence

Prediction 3 from 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 with offsetting increases in secondary earnings. Figure 8 investigates the presence of such responses by comparing primary earnings and changes in primary earnings over time for individuals with *new* secondary jobs. For each month I identify individuals who hold a secondary job in that month but who have not held a secondary job precisely a year ago and whose primary monthly earnings exceeded €1000 both in that month and a year ago. Figures 8(a) and (b) show the evolution of the mean and median of monthly earnings at the *primary* employment for three groups of individuals: individuals with new secondary earnings of under €400, between €400 and €1000, and over €1000. Since the incentive to shift earnings exists only for individuals with secondary mini-jobs (under €400), we should observe a decrease in primary earnings for these workers, but not for others. Figure 8 shows no decrease in primary earnings around the reform time, on the opposite, the mean and median earnings of new secondary job holders might have slightly increased. Of course, this upward trend may be driven by the compositional changes of secondary job holders: the reform increased the take up of secondary jobs by high-income individuals which could lead to an increase in mean and median primary earnings. To mitigate such concerns, Figures 8(c) and (d) show *changes* in primary earnings from the previous year. In comparison to earnings levels, earnings changes appear to be more similar among these groups, and therefore less susceptible to changes in composition. If individuals were shifting earnings, we would observe a decrease in the average difference after the reform for individuals with secondary jobs of under €400. No such decrease is apparent. Interestingly, Figures 8(c) and (d) suggest that secondary jobs are not

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

primarily taken up when individuals experience a decrease in primary earnings.

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. Approximately 44,050 individuals held both a regular and a mini-job with the same employer.[22] However, 61% of these new secondary job holders experience an increase in pay when they first start the new secondary job, and only for 6.5% 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 untaxed secondary job.

3.2.2 Regression Estimates

To test the third prediction I use a difference-in-differences approach and compare how primary earnings change relative to the previous year for individuals with *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 can be verified in Figure 8(c). While there are some differences between the groups, there is no striking divergence.

Formally, I estimate

$$\Delta PrimaryEarnings_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 After_{it} + \beta_3 (Treat_{it} \times After_{it}) + \delta X_{it} + \varepsilon_{it}, \quad (8)$$

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. If individuals shift earnings from primary to secondary jobs,

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

the coefficient β_3 will be negative and statistically significant. Moreover, since prior to the reform average $\Delta PrimaryEarnings \approx$ was approximately €0, then if all individuals obtain secondary jobs with the purpose of reducing primary earnings, $\beta_3 \approx -400$.

Specification (8) 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 primary earnings decreases of around €400 became more prevalent among new secondary job holders after the reform. To do so I estimate the following equation:

$$P(\Delta Primary_Earnings_{it} \in [-350, -450]) \\ = \gamma_0 + \gamma_1 Treat_{it} + \gamma_2 After_{it} + \gamma_3 (Treat_{it} \times After_{it}) + \delta X_{it} + \varepsilon_{it}. \quad (9)$$

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 (8) and (9) with a control group of workers with new secondary jobs paying between €400 and €1000 are presented in Table 8. Similar results but using individuals with new secondary jobs paying more than €1000 are available in Appedix Table B.3. The results provide strong evidence that individuals chose not to reduce primary earnings when they obtained new secondary jobs. Table 8 shows no discernible decrease in primary earnings, nor increased likelihood of having an approximately €400 decrease in primary earnings.

3.3 Prediction 4: Labor Demand Adjustment

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 9 helps evaluate Prediction 4 of Section 2.

Figure 9(a) shows the unadjusted number of jobs – both primary and secondary – by monthly income level over time. Two important observations follow: first, there is a clear increase in the availability of small jobs – paying €400 or less per month. Second, the observed increase in low-income employments does not appear to be offset by reductions in higher-paying jobs. Because the number of jobs vary greatly by job type, Figure 9(a) does not allow for visual comparison of trends. Figure 9(b) allows for such comparison by normalizing the number of jobs available in March 2003 (one month prior to the reform) to 100. Figure 9(b) shows that prior to the reform, low-earnings jobs (€400 or less) followed similar trend as mid-earnings jobs (€400 to €2000), however, the number of low-earnings jobs increased dramatically after the reform, while the number of mid-earnings jobs continued to decrease.

Importantly, Figures 9(a) and (b) do not differentiate between primary and secondary jobs. While the number of low-earnings jobs have increased, the increase may not have been sufficiently large to accommodate the influx of moonlighters. Figure 9(c) breaks down the number of small jobs by type – primary and secondary jobs. Further, Figure 9(c) 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 9(c) 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 9(c) 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.

4 Determinants of Moonlighting

In this section I use the findings from Section 3 to shed light on the decision to hold multiple employments.

The striking observation from Figure 2 is that while the rates of multiple job holding increased after the reform, the increase 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 would 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 secondary jobs are not available or that the available secondary jobs offer substantially lower wages than individuals' primary jobs (result 3 of Appendix A). This theoretical prediction is consistent with findings of Table B.2 that shows that the vast majority of secondary employments represent jobs in typically low-paying occupations, such as house cleaning, warehouse work and etc, even for individuals with large primary earnings. 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.

Individuals with lower primary incomes appear to be more responsive to tax incentives and are more likely to obtain a secondary job than individuals with high primary incomes. There are two potential explanations. First, these individuals might find it easier to obtain secondary employment, as suggested by higher matching shares in Table B.2. At the same time, these individuals might be having low primary earnings because of hour constraints, or they might be more inclined to obtain a secondary job in order to reach their consumption goals. In any case, the results suggest that financial incentives are strongly outweighed by the limited availability of high-paying secondary jobs, since the reform offered a substantially larger tax break to high income earners (53 percentage points) than to low income earners (33 percentage points), yet led to a larger response among the latter.

Table 8 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, 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 (Table B.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 Table B.2 is that 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).

5 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 0.54 to 1.51 and long-term participation elasticities of 1.01 to 3.67, 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.

Moreover, this paper shows that labor demand was able to absorb increased labor supply by moonlighters leading to no displacement of individuals for who low-paid jobs are the primary source of income.

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.

References

Abdukadir, G. (1992): "Liquidity Constraints As a Cause of Moonlighting," *Applied Economics*, 24, 1307–1310.

Angrist, J. D., S. Caldwell, and J. V. Hall (2017): "Uber vs. Taxi: A Drivers Eye View," Working Paper 23891, National Bureau of Economic Research.

Bell, D., R. A. Hart, and R. E. Wright (1997): "Multiple Job Holding As a "Hedge" Against Unemployment," CEPR Discussion Papers.

Blundell, R., A. Bozio, and G. Laroque (2011): "Labor Supply and the Extensive Margin," *The American Economic Review: Papers & Proceedings*, 101, 482–486.

Blundell, R. and T. Macurdy (1999): "Labor Supply: A Review of Alternative Approaches," in *Handbook of Labor Economics*, ed. by D. Card and O. Ashenfelter, Elsevier, vol. 3, Part A, 1559–1695.

Cahuc, P. and S. Carcillo (2014): "The Detaxation of Overtime Hours: Lessons from the French Experiment," *Journal of Labor Economics*, 32, 361–400.

Carrillo, P., D. Pomeranz, and M. Singhal (2017): "Dodging the taxman: Firm misreporting and limits to tax enforcement," *American Economic Journal: Applied Economics*, 9, 144–164.

Chetty, R., J. N. Friedman, and E. Saez (2013): "Using Differences in Knowledge Across Neighborhoods to Uncover the Impacts of the EITC on Earnings," *The American Economic Review*, 103, 2683–2721.

Doerrenberg, P., A. Peichl, and S. Siegloch (2017): "The Elasticity of Taxable Income in the Presence of Deduction Possibilities," *Journal of Public Economics*, 151, 41–55.

Ebbinghaus, B. and W. Eichhorst (2007): "Employment Regulation and Labor Market Policy in Germany, 1991-2005," SSRN Scholarly Paper ID 955839.

Farrell, D. and F. Greig (2016): "Paychecks, Paydays, and the Online Platform Economy: Big Data on Income Volatility," JPMorgan Chase & Co. Institute Working Paper.

Heineck, G. (2009): "The Determinants of Secondary Jobholding in Germany and the UK," *Zeitschrift fr ArbeitsmarktForschung*, 42, 107.

Jackson, E., A. Looney, and S. Ramnath (2017): "The Rise of Alternative Work Arrangements: Evidence and Implications for Tax Filing and Benefit Coverage," *Office of Tax Analysis Working Paper 114*.

Jacobi, L. and J. Kluve (2006): "Before and After the Hartz Reforms: The Performance of Active Labour Market Policy in Germany," SSRN Scholarly Paper.

Katz, L. F. and A. B. Krueger (2016): "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015," NBER Working Paper 22667 22667.

Kimmel, J. and L. M. Powell (1999): "Moonlighting Trends and Related Policy Issues in Canada and the United States," *Canadian Public Policy / Analyse de Politiques*, 25, 207–231.

Koustas, D. K. (2018): "Consumption Insurance and Multiple Jobs: Evidence from Rideshare Drivers," Mimeo.

Krishnan, P. (1990): "The Economics of Moonlighting: A Double Self-Selection Model," *The Review of Economics and Statistics*, 72, 361–367.

Lal, E. (2015): "Multiple Jobholding Over the Past Two Decades," *Monthly Labor Review*.

Lundborg, P. (1995): "Job Amenity and the Incidence of Double Work," *Journal of Economic Behavior & Organization*, 26, 273–287.

Mas, A. and A. Pallais (2017): "Labor Supply and the Value of Non-Work Time: Experimental Estimates from the Field," Working Paper 23906, National Bureau of Economic Research.

McClelland, R. and S. Mok (2012): "A Review of Recent Research on Labor Supply Elasticities," Congressional Budget Office.

O'Connell, J. F. (1979): "Multiple Job Holding and Marginal Tax Rates," *National Tax Journal*, 32, 73–76.

Panos, G. A., K. Pouliakas, and A. Zangelidis (2014): "Multiple Job Holding, Skill Diversification, and Mobility," *Industrial Relations: A Journal of Economy and Society*, 53, 223–272.

Paxson, C. H. and N. Sicherman (1996): "The Dynamics of Dual Job Holding and Job Mobility," *Journal of Labor Economics*, 14, 357–393.

Renna, F. and R. L. Oaxaca (2006): "The Economics of Dual Job Holding: A Job Portfolio Model of Labor Supply," SSRN Scholarly Paper ID 877897.

Saez, E., J. Slemrod, and S. H. Giertz (2012): "The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review," *Journal of Economic Literature*, 50, 3–50.

Shishko, R. and B. Rostker (1976): "The Economics of Multiple Job Holding," *The American Economic Review*, 66, 298–308.

Slemrod, J., B. Collins, J. L. Hoopes, D. Reck, and M. Sebastiani (2017): "Does credit-card information reporting improve small-business tax compliance?" *Journal of Public Economics*, 149, 1–19.

Tazhitdinova, A. (2018a): "Do Only Tax Incentives Matter? Labor Supply and Demand Responses to an Unusually Large and Salient Tax Break," Mimeo.

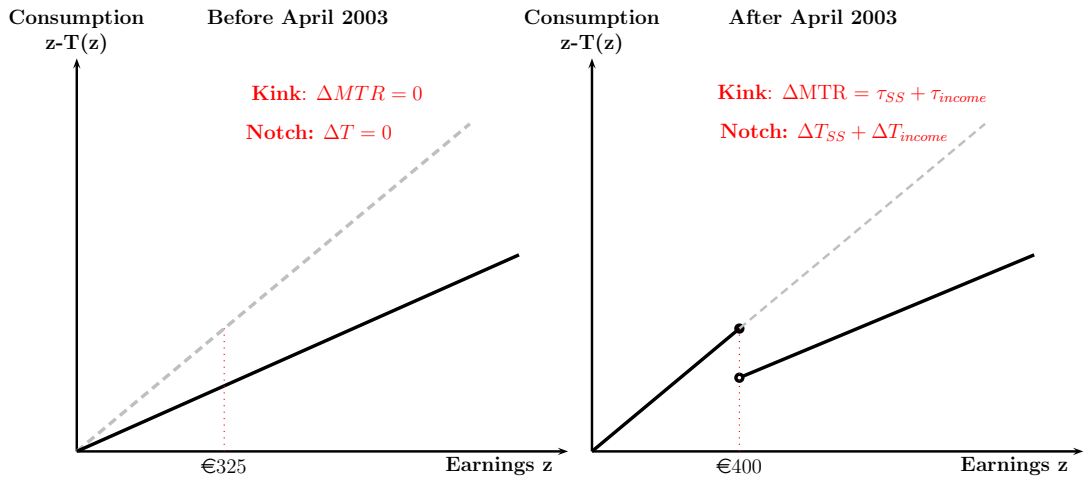
——— (2018b): "Reducing Evasion Through Self-Reporting: Evidence from Charitable Contributions," *Journal of Public Economics*, 165, 31–47.

vom Berge, P., M. Knig, and S. Seth (2013): "Sample of Integrated Labour Market Biographies (SIAB) 1975-2010. FDZ data report, 01/2013 (en)," FDZ data report, Nrnberg.

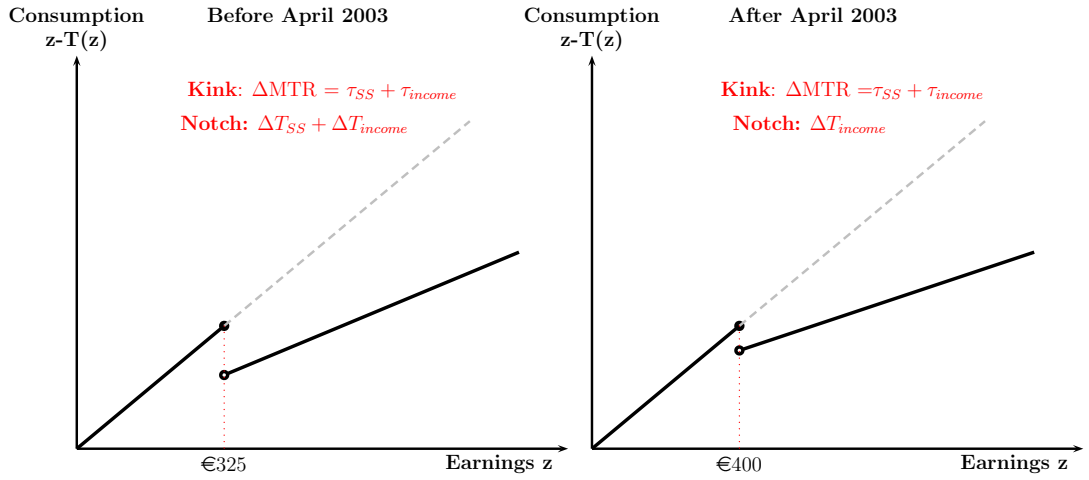
Weber, C. E. (2014): "Toward Obtaining a Consistent Estimate of the Elasticity of Taxable Income Using Difference-in-Differences," *Journal of Public Economics*, 117, 90–103.

Figure 1: Budget Constraints

Panel A: Mini-job as Secondary Employment



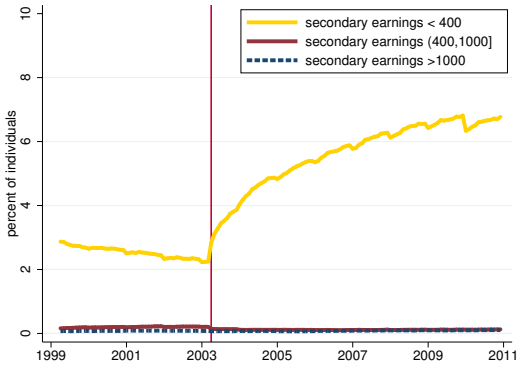
Panel B: Mini-job as Main Source of Income



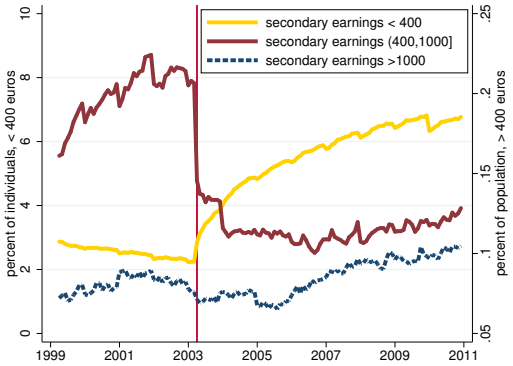
Notes: This figure shows budget constraints experiences by individuals in 1999-2003 and 2003-2010. Panel A shows the budget constraint for secondary earnings for an individual with a regular job. Panel B shows the budget constraint for an individual with primary earnings around the mini-job threshold.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

Figure 2: Secondary Job Holding Rates by Job Type

(a) same axis



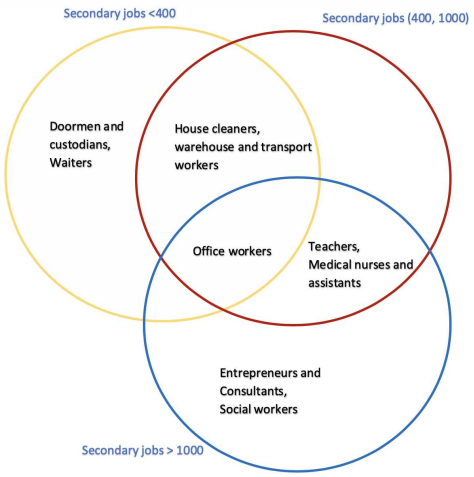
(b) different axis



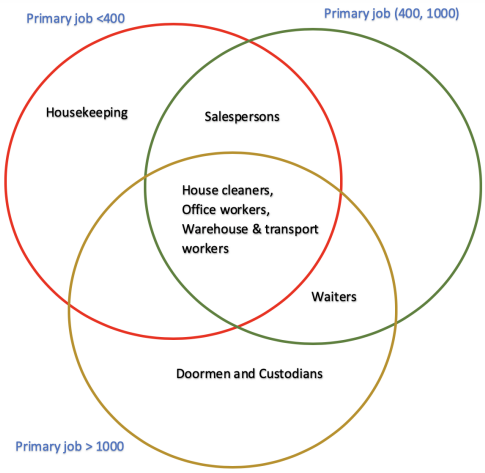
Notes: This figure shows the share of individuals with secondary jobs paying less than €400 per month, paying between €400 and €1000 , or more than €1000 per month. The vertical red line identifies the 2003 tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg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

Figure 3: Top 5 Secondary Job Occupations

(a) by secondary earnings



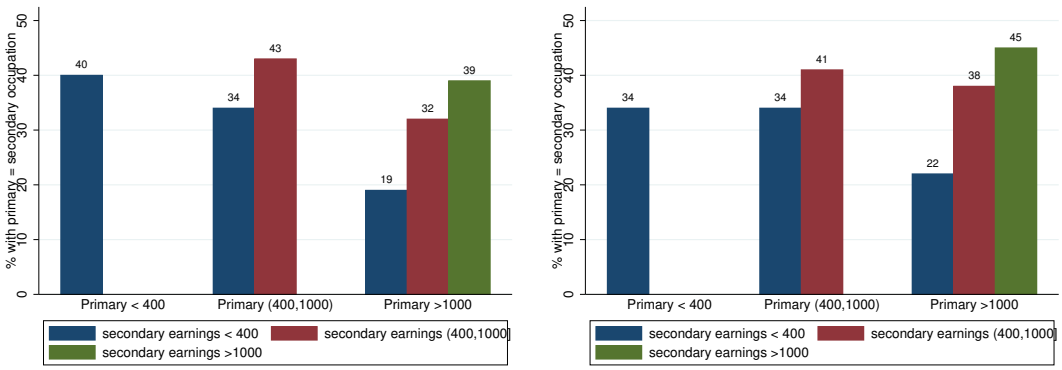
(b) ≤€400, by primary earnings



Notes: Figure (a) shows Venn diagrams of 5 most common occupations in secondary job by level of secondary job earnings. Figure (b) shows Venn diagrams of 5 most common occupations in secondary jobs that ≤€400 by levels of primary earnings: below €400, €400-€1000, and above €1000. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

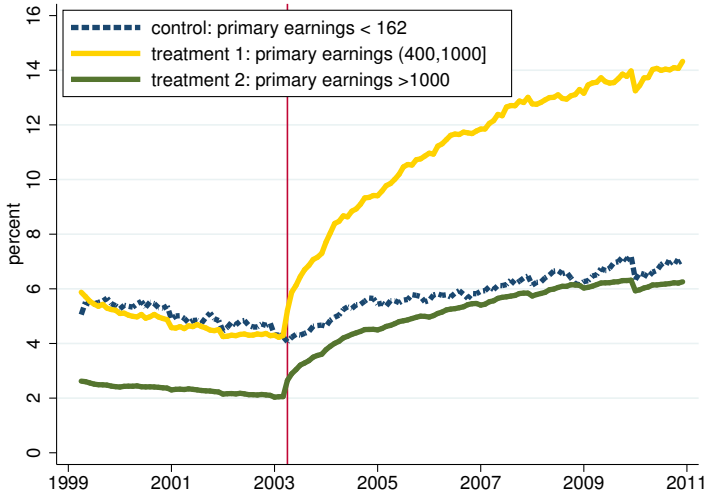
Figure 4: Occupations in Primary and Secondary Jobs

(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.

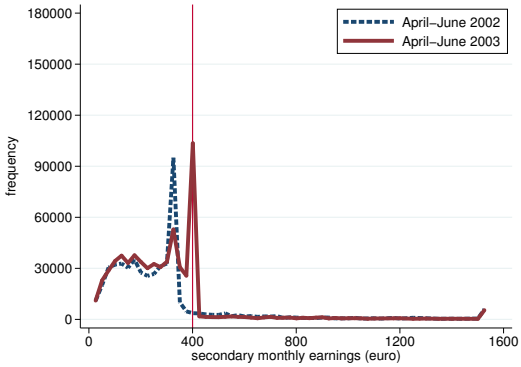
Figure 5: Secondary Employment Rates by Primary Income



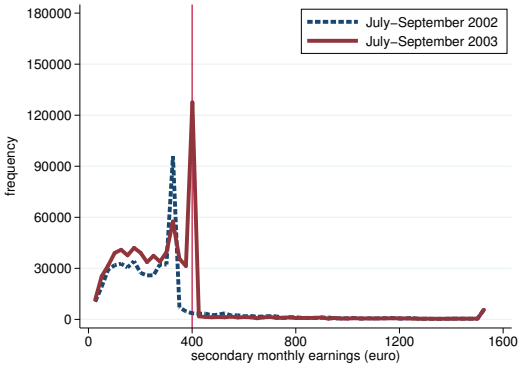
Notes: This figure plots the share of individuals who hold secondary jobs earning up to €400 by 4 levels of primary earnings: less than €162, between €162 and €400, between €400 and €1000, and more than €1000. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 6: Distributions of Secondary Earnings Before and After the Reform

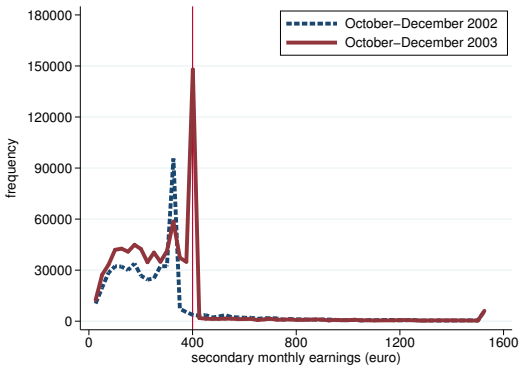
(a) April - June: 2002 and 2003



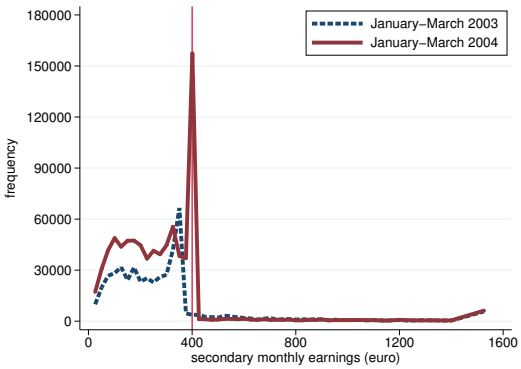
(b) July - September: 2002 and 2003



(c) October - December: 2002 and 2003



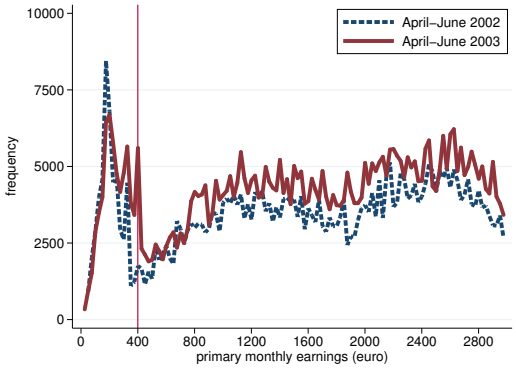
(d) January - March: 2003 and 2004



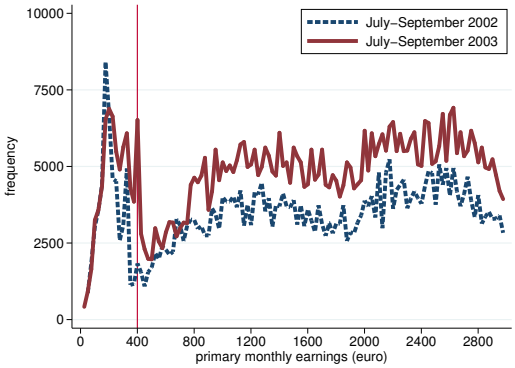
Notes: This figure shows the distributions of (positive) secondary monthly earnings. Each point shows the number of individuals in a €25 bin, scaled to represent the German population in that year from a 2% random sample. The vertical red line identifies the mini-job threshold. Pre-reform distributions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

Figure 7: Distributions of Primary Earnings of Individuals with Secondary Jobs Before and After the Reform

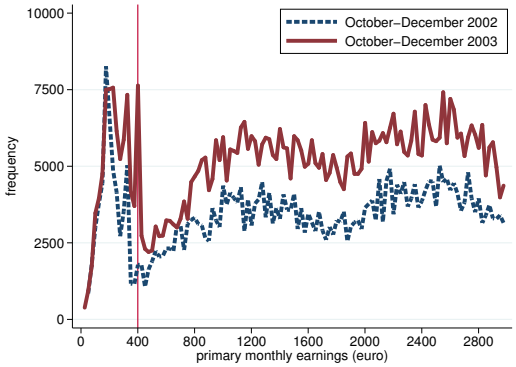
(a) April - June: 2002 and 2003



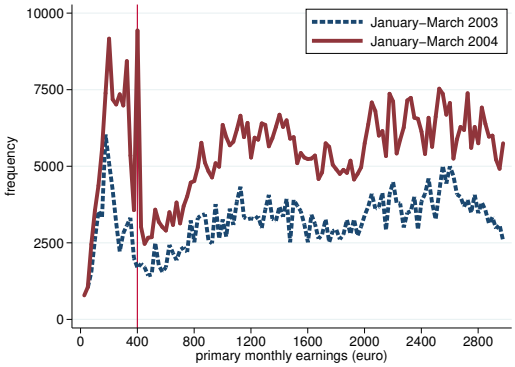
(b) July - September: 2002 and 2003



(c) October - December: 2002 and 2003



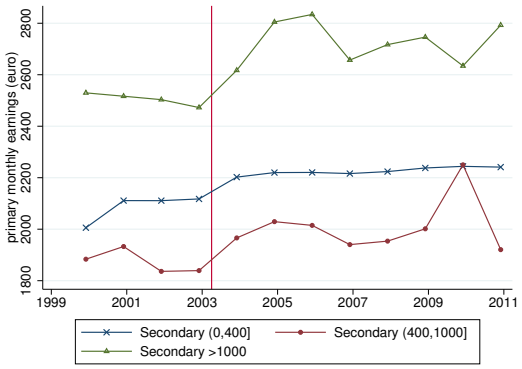
(d) January - March: 2003 and 2004



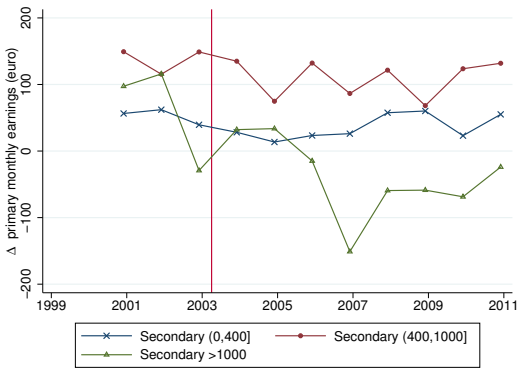
Notes: This figure shows the distributions of primary monthly earnings for individuals with secondary jobs. Each point shows the number of individuals in a €25 bin, scaled to represent the German population in that year from a 2% random sample. The vertical red line identifies the mini-job threshold. Pre-reform distributions shown as dashed lines. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure 8: Primary Earnings Changes Over Time

(a) Monthly Earnings (Mean)



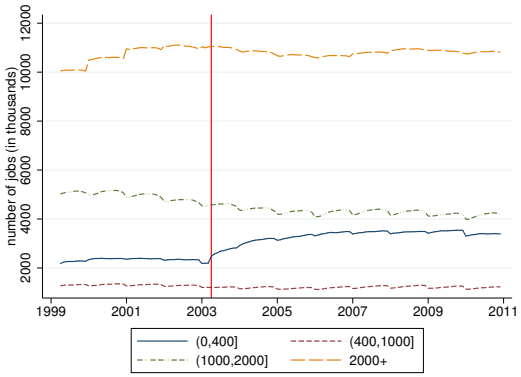
(b) Difference from Previous Year (Mean)



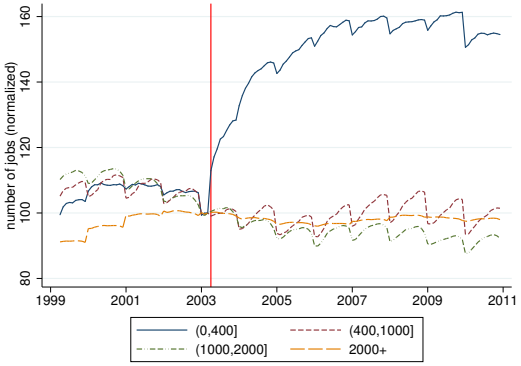
Notes: Figure (a) shows mean primary monthly earnings for individuals with new secondary jobs and primary earnings of at least €1000 in the target month and a year ago by 3 levels of secondary earnings: below €400, between €400 and €1000, and above €1000. Figure (c) shows mean changes in primary monthly 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 9: Availability of Jobs Over Time

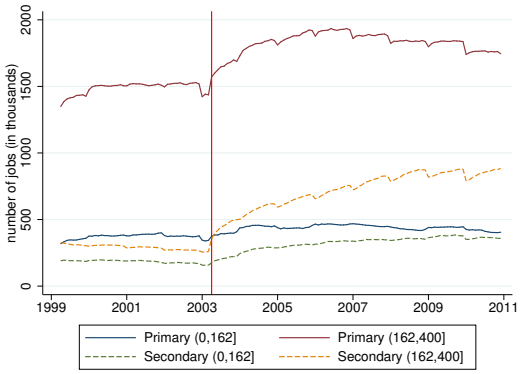
(a) Total Number of Jobs



(b) Total Number of Jobs (Normalized)



(c) Number of Primary and Secondary Jobs under €400



Notes: Figure (a) shows the number of jobs by monthly earnings. Figure (b) shows the number of jobs by monthly earnings, normalized to 100 in March 2003. Figure (c) 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 $\geq$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 $\geq$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: Extensive Margin: Changes in Secondary Employment (Monthly LPM)

Outcome:	Short Term		Long Term		All Years	
1 if holds secondary job (€0,€400]	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Treat × After	3.36***	2.03***	7.32***	6.55***	5.73***	4.02***
	(0.231)	(0.276)	(0.337)	(0.679)	(0.235)	(0.291)
Treat	-0.32	10.20***	-0.32	8.81***	-0.27	7.79***
	(0.217)	(0.458)	(0.217)	(0.571)	(0.196)	(0.310)
After	0.31	-0.26	2.03***	3.20***	0.91***	-1.70***
	(0.190)	(0.242)	(0.270)	(0.807)	(0.192)	(0.249)
N of Observations	1,577,489	1,571,944	1,550,091	1,545,051	4,579,718	4,564,802
Treatment Group: Individuals with Primary Earnings of (€1000,∞)						
Treat × After	1.30***	0.26	2.02***	2.43***	2.06***	1.52***
	(0.285)	(0.385)	(0.349)	(0.740)	(0.238)	(0.320)
Treat	-2.44***	10.43***	-2.44***	8.87***	-2.77***	7.31***
	(0.244)	(0.514)	(0.244)	(0.620)	(0.208)	(0.323)
After	0.47*	0.62	1.98***	1.97**	0.90***	-0.52
	(0.283)	(0.385)	(0.345)	(0.787)	(0.236)	(0.321)
N of Observations	1,564,778	1,557,062	1,517,985	1,510,842	4,429,098	4,407,541
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: Control group: individuals with primary monthly earnings of less than €162. 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. All years: April 1999 through December 2010. For more details see Section 3.1.2.

Table 3: Extensive Margin: Changes in Secondary Employment (Yearly LPM)

Outcome:	Short Term		Long Term		All Years	
1 if holds secondary job (€0,€400]	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Treat × After	3.36***	2.03***	7.32***	6.55***	6.72***	4.02***
	(0.231)	(0.276)	(0.337)	(0.679)	(0.255)	(0.291)
Treat	-0.32	10.20***	-0.32	8.81***	-0.25	7.79***
	(0.217)	(0.458)	(0.217)	(0.571)	(0.213)	(0.310)
After	0.31	-0.26	2.03***	3.20***	1.82***	-1.70***
	(0.190)	(0.242)	(0.270)	(0.807)	(0.192)	(0.249)
N of Observations	1,577,489	1,571,944	1,550,091	1,545,051	4,579,718	4,564,802
Treatment Group: Individuals with Primary Earnings of (€1000,∞)						
Treat × After	1.30***	0.26	2.02***	2.43***	2.06***	1.52***
	(0.285)	(0.385)	(0.349)	(0.740)	(0.238)	(0.320)
Treat	-2.44***	10.43***	-2.44***	8.87***	-2.77***	7.31***
	(0.244)	(0.514)	(0.244)	(0.620)	(0.208)	(0.323)
After	0.47*	0.62	1.98***	1.97**	0.90***	-0.52
	(0.283)	(0.385)	(0.345)	(0.787)	(0.236)	(0.321)
N of Observations	1,564,778	1,557,062	1,517,985	1,510,842	4,429,098	4,407,541
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: Control group: individuals with primary monthly earnings of less than €162. 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. All years: April 1999 through December 2010. For more details see Section 3.1.2.

Table 4: Extensive Margin: Changes in Secondary Employment (Yearly LPM, Fixed Treatment/Control Group)

Outcome:	Short Term		Long Term		All Years	
1 if holds secondary job (€0,€400]	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Treat × After	3.36***	2.03***	7.32***	6.55***	5.73***	4.02***
	(0.231)	(0.276)	(0.337)	(0.679)	(0.235)	(0.291)
Treat	-0.32	10.20***	-0.32	8.81***	-0.27	7.79***
	(0.217)	(0.458)	(0.217)	(0.571)	(0.196)	(0.310)
After	0.31	-0.26	2.03***	3.20***	0.91***	-1.70***
	(0.190)	(0.242)	(0.270)	(0.807)	(0.192)	(0.249)
N of Observations	1,577,489	1,571,944	1,550,091	1,545,051	4,579,718	4,564,802
Treatment Group: Individuals with Primary Earnings of (€1000,∞)						
Treat × After	1.30***	0.26	2.02***	2.43***	2.06***	1.52***
	(0.285)	(0.385)	(0.349)	(0.740)	(0.238)	(0.320)
Treat	-2.44***	10.43***	-2.44***	8.87***	-2.77***	7.31***
	(0.244)	(0.514)	(0.244)	(0.620)	(0.208)	(0.323)
After	0.47*	0.62	1.98***	1.97**	0.90***	-0.52
	(0.283)	(0.385)	(0.345)	(0.787)	(0.236)	(0.321)
N of Observations	1,564,778	1,557,062	1,517,985	1,510,842	4,429,098	4,407,541
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: Control group: individuals with primary monthly earnings of less than €162. 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. All years: April 1999 through December 2010. For more details see Section 3.1.2.

Table 5: Extensive Margin: Changes in Secondary Employment (Logit)

Outcome:	Short Term		Long Term		All Years	
1 if holds secondary job (€0,€400]	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
Treat × After	0.58***	0.62***	0.86***	0.94***	0.77***	0.80***
	(0.047)	(0.048)	(0.060)	(0.059)	(0.044)	(0.044)
Treat	-0.07	-0.03	-0.07	-0.07	-0.06	-0.004
	(0.049)	(0.050)	(0.049)	(0.049)	(0.042)	(0.042)
After	0.07	-0.20***	0.38***	0.34***	0.18***	-0.32***
	(0.041)	(0.044)	(0.051)	(0.052)	(0.038)	(0.041)
Predicted participation response	3.38***	3.21***	7.45***	7.80***	5.78***	5.22***
for treatment group	(0.227)	(0.204)	(0.376)	(0.360)	(0.248)	(0.216)
N of Observations	1,577,489	1,571,707	1,550,091	1,544,926	4,579,718	4,564,625
Treatment Group: Individuals with Primary Earnings of (€1000,∞)						
Treat × After	0.51***	0.53***	0.71***	0.77***	0.69***	0.71***
	(0.063)	(0.064)	(0.069)	(0.070)	(0.048)	(0.049)
Treat	-0.78***	-0.38***	-0.78***	-0.35***	-0.82***	-0.38***
	(0.057)	(0.059)	(0.057)	(0.059)	(0.044)	(0.046)
After	0.10*	-0.16**	0.38***	0.29***	0.17***	-0.27***
	(0.062)	(0.068)	(0.067)	(0.069)	(0.047)	(0.053)
Predicted participation response	1.54***	1.43***	3.03***	3.18***	2.54***	2.31***
for treatment group	(0.150)	(0.137)	(0.213)	(0.203)	(0.128)	(0.116)
N of Observations	1,564,778	1,557,044	1,517,985	1,510,834	4,429,098	4,407,513
Demographic Controls	no	yes	no	yes	no	yes
Year, Month FE	no	yes	no	yes	no	yes

Notes: Control group: individuals with primary monthly earnings of less than €162. 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. All years: April 1999 through December 2010. For more details see Section 3.1.2.

Table 6: Extensive Margin: Changes in Secondary Employment (Counts)

Outcome:	Short Term		Long Term		All Years		
Number of secondary jobs	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment Group: Secondary Mini-Jobs of (€0,€400] & 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)
Treatment Group: Secondary Jobs of (€400,€1000] & Primary jobs of >€1000							
Treat × After	-0.069***	-0.056***	-0.101***	-0.083***	-0.089***	-0.090***	-0.066***
	(0.003)	(0.004)	(0.002)	(0.013)	(0.003)	(0.002)	(0.003)
t × Treat × After		-0.015***		-0.004			-0.008***
		(0.004)		(0.003)			(0.002)
Time Trend and Interactions	no	yes	no	yes	no	no	yes
Treat × Month FE	no	yes	no	yes	no	yes	yes
N	104	104	102	102	240	240	240

Notes: Number of secondary jobs measured as percent of the population. Control group: number of secondary jobs with monthly earnings of more than €1000 and primary earnings greater than €1000. 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. For more details see Section 3.1.2.

Table 7: Participation Elasticities Summary

	Short Term		Long Term		All Years	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment Group: Individuals with Primary Earnings of (€400,€1000]						
LPM (Table 4)	1.58	0.96	3.45	3.09	2.70	1.89
	(0.109)	(0.13)	(0.159)	(0.32)	(0.111)	(0.137)
Logit (Table 5)	1.59	1.51	3.51	3.67	2.72	2.46
	(0.107)	(0.096)	(0.177)	(0.17)	(0.117)	(0.102)
Treatment Group: Individuals with Primary Earnings of (€1000,∞)						
LPM (Table 4)	0.54	0.11	0.84	1.01	0.85	0.63
	(0.118)	(0.16)	(0.145)	(0.307)	(0.099)	(0.133)
Logit (Table 5)	0.64	0.59	1.26	1.32	1.05	0.96
	(0.062)	(0.057)	(0.088)	(0.088)	(0.053)	(0.048)
Counts (Table 6)	0.79		1.79		1.38	
	(0.055)		(0.013)		(0.045)	
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: 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, 12% and 32% respectively. Initial secondary job participation rates are 4.31% for individuals with primary incomes of (€400, €1000) and 2.14% for individuals with primary incomes of more than €1000.

Table 8: Changes in Primary Earnings

	Short Term		Long Term		All Years	
	(1)	(2)	(3)	(4)	(5)	(6)
Outcome: Change in Primary Earnings						
Treat × After	-20.11	14.09	-25.80	-34.29	2.11	14.05
	(30.43)	(24.52)	(39.10)	(50.71)	(21.65)	(24.32)
Treat	11.68	16.30	-0.34	32.52	19.15	41.09**
	(19.24)	(19.53)	(19.02)	(27.04)	(15.32)	(17.06)
After	-0.47	-13.26	-9.28	-59.26	-30.64	-16.48
	(30.27)	(23.49)	(38.92)	(65.92)	(21.55)	(23.65)
N of Observations	164,959	164,605	146,044	145,832	492,284	491,343
Outcome: 1 if Change in Primary Earnings $\in [-350, -450]$						
Treat × After	1.93	-0.54	1.60	-3.53	-0.11	-0.15
	(1.470)	(1.448)	(1.567)	(2.945)	(1.059)	(1.183)
Treat	-2.81***	0.03	-2.81***	-0.45	-2.68***	-1.85**
	(0.973)	(1.083)	(0.973)	(1.547)	(0.756)	(0.814)
After	-1.71	1.25	-1.00	10.95**	0.47	0.73
	(1.456)	(1.402)	(1.552)	(4.280)	(1.049)	(1.163)
N of Observations	164,959	164,605	146,044	145,832	492,284	491,343
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 between €400 and €1000 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.

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* $(1-\tau_2)w_2 < (1-\tau_1)w_1 < w_2$

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/`

Table B.2: Top 5 Occupations in Secondary Jobs by Primary Earnings

		2000		2005		2010	
		Occupations	Match	Occupations	Match	Occupations	Match
≤€400	2nd job: <€400	House cleaners, Warehouse and transport workers, Office workers, Salespersons, Doormen and custodians	40%	House cleaners, Housekeeping, Office workers, Warehouse and transport workers, Salespersons	34%	House cleaners, Housekeeping, Warehouse and transport workers, Office workers, Salespersons	34%
(€400, €1000]	2nd job: <€400	House cleaners, Office workers, Warehouse and transport workers, Salespersons, Waiters	34%	House cleaners, Office workers, Salespersons, Waiters, Warehouse and transport workers	33%	House cleaners, Office workers, Salespersons, Housekeeping, Waiters	34%
	2nd job: (€400, €1000]	House cleaners, Office workers, Medical nurses and assistants, Warehouse and transport workers, Doormen and custodians	43%	House cleaners, Office workers, Medical nurses and assistants, Warehouse and transport workers, Teachers	37%	House cleaners, Office workers, Teachers, Housekeeping, Salespersons	41%
>€1000	2nd job: <€400	House cleaners, Office workers, Doormen and custodians, Warehouse and transport workers, Motor vehicle controllers and drivers	19%	House cleaners, Office workers, Doormen and custodians, Warehouse and transport workers, Waiters	20%	House cleaners, Office workers, Doormen and custodians, Warehouse and transport workers, Waiters	22%
	2nd job: (€400, €1000]	House cleaners, Office workers, Warehouse and transport workers, Teachers, Doormen and custodians	32%	Office workers, House cleaners, Teachers, Warehouse and transport workers, Medical nurses and assistants	36%	Office workers, Teachers, House cleaners, Social workers, Medical nurses and assistants	38%
	2nd job: >€1000	Office workers, Teachers, Entrepreneurs and consultants, Medical nurses and assistants, Salespersons	39%	Teachers, Office workers, Entrepreneurs and consultants, Social workers, Medical nurses and assistants	38%	Office workers, Teachers, Entrepreneurs and consultants, Physicians and dentists, Social workers	45%

Notes: This table shows 5 most common occupations in secondary jobs for three levels of primary earnings: below €400, €400-€1000, and above €1000. % Match records the number of observations for which occupation in the primary job matches the occupation in the secondary job.

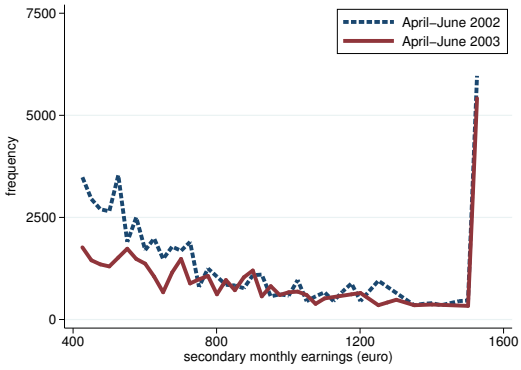
Table B.3: Changes in Primary Earnings

	Short Term		Long Term		All Years	
	(1)	(2)	(3)	(4)	(5)	(6)
Outcome: Change in Primary Earnings						
Treat × After	-12.49	30.03	-57.96	-96.41	24.41	32.30
	(42.43)	(47.57)	(75.52)	(88.92)	(39.00)	(44.67)
Treat	-99.88***	-127.61	-99.41**	-164.95**	-94.69***	-106.34**
	(37.54)	(81.10)	(45.41)	(68.19)	(32.22)	(41.79)
After	-8.53	-29.60	27.53	-6.92	-51.86	-34.41
	(42.19)	(46.63)	(78.08)	(98.79)	(39.02)	(43.68)
N of Observations	163,809	163,447	145,208	144,987	492,112	491,169
Outcome: 1 if Change in Primary Earnings$\in [-350, -450]$						
Treat × After	0.32	0.73	-2.56	-0.81	-1.21	-0.94
	(1.265)	(2.109)	(1.635)	(3.247)	(0.948)	(1.838)
Treat	-1.39	0.61	-1.39	0.64	-1.54**	-0.09
	(0.951)	(2.828)	(0.951)	(1.367)	(0.728)	(1.786)
After	-0.10	0.03	3.16*	9.11**	1.57	1.62
	(1.248)	(2.063)	(1.620)	(4.415)	(0.937)	(1.796)
N of Observations	163,809	163,447	145,208	144,987	492,112	491,169
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

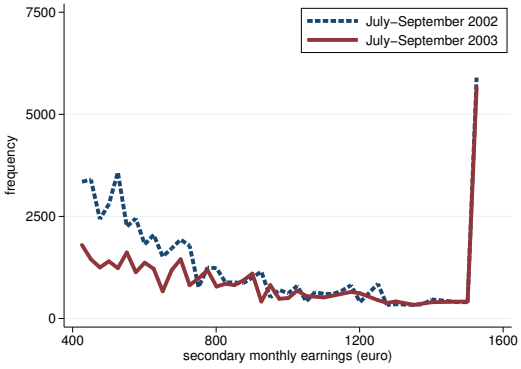
Notes: Treatment group – individuals with new secondary jobs paying less than €400 per month. Control group – individuals with new secondary jobs paying more than €1000 per month. Sample selection – individuals with new secondary jobs and primary earnings of at least €1000 in the target month and a year 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.

Figure B.1: Distributions of Secondary Earnings Before and After the Reform

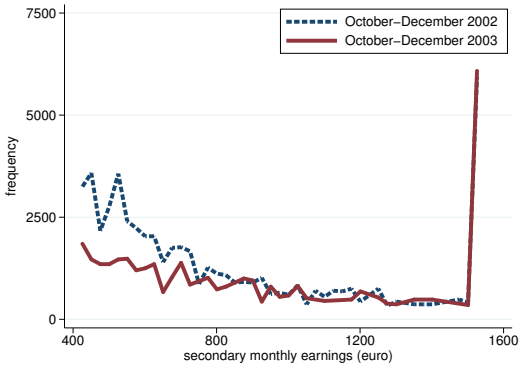
(a) April - June: 2002 and 2003



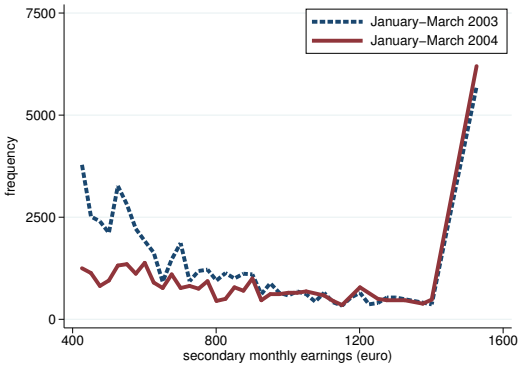
(b) July - September: 2002 and 2003



(c) October - December: 2002 and 2003

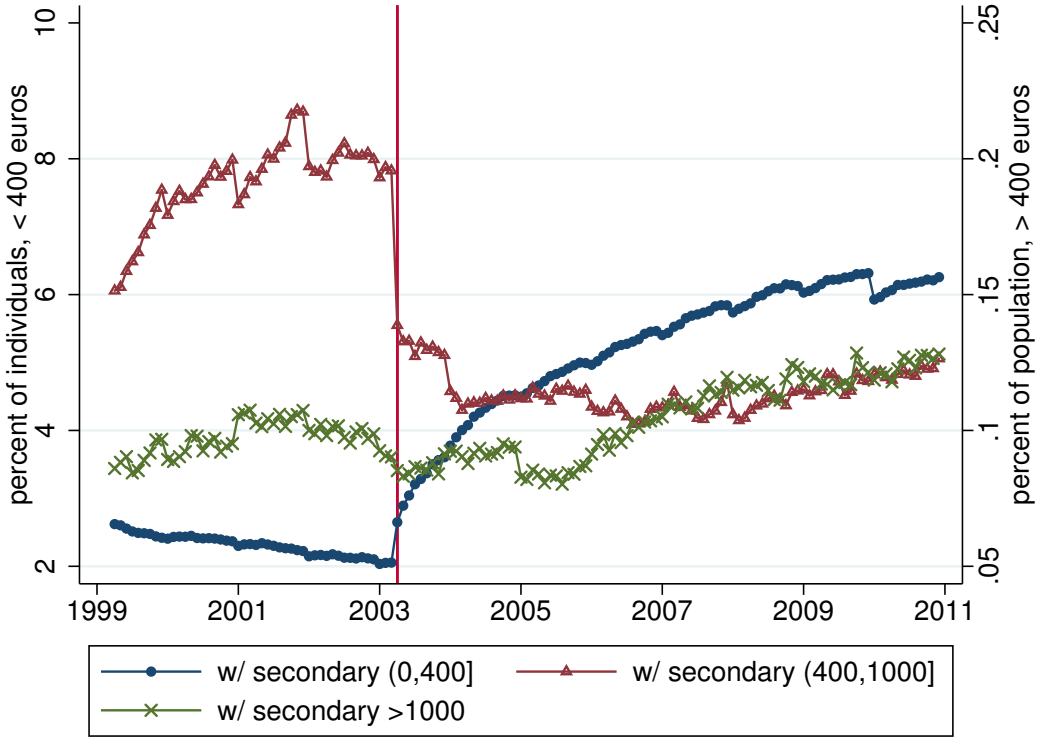


(d) January - March: 2003 and 2004



Notes: This figure shows the distributions of 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 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 B.2: Share of Individuals with Secondary Employments Over Time – High Income Individuals



Notes: This figure shows the share of individuals with primary earnings of more than €1000 and with secondary jobs paying less than €400 per month (left axis), paying between €400 and €1000 (right axis), or more than €1000 per month (right axis). *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.