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INCREASING HOURS WORKED: MOONLIGHTING RESPONSES TO A LARGE TAX REFORM

Alisa Tazhitdinova

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ABSTRACT

Moonlighting is increasingly popular in OECD countries, with 5 to 10% of workers holding two or more jobs. However, little is known about the responsiveness of moonlighting to financial incentives due to the lack of identifying variation. This paper studies a unique reform in Germany that allowed workers to hold small secondary jobs tax-free, decreasing the marginal tax rate by between 19.5 to 66pp. I show that the reform resulted in a dramatic increase in moonlighting that was not offset by reductions in primary earnings, and that hours constraints is the key determinant of moonlighting.

Alisa Tazhitdinova
Department of Economics
University of California at Santa Barbara
North Hall
Santa Barbara, CA 93106
and NBER
tazhitda@ucsb.edu

Income tax cuts are a popular approach to increasing working hours of employed individuals. Recent empirical evidence, however, suggests that this margin often appears to be unresponsive even to large financial incentives.[1] A common explanation for such weak responses is hours constraints: many jobs only offer a fixed number of hours, and employers are often unwilling to negotiate changes to the standard hours offered.[2]

Of course, an alternative way for workers to raise their hours is to hold one or more jobs concurrently with their main job. Currently, multiple job holding, or moonlighting, rates in OECD countries range from 5% of the working population in the United States to over 10% in the UK, with disproportionately higher rates among low-income individuals. The recent proliferation of alternative work arrangements and flexible-contract job opportunities, many facilitated by digital platforms such as Uber and TaskRabbit, have the potential to raise these shares considerably.[3]

Little is known, however, about the responsiveness of moonlighting to financial incentives or how it varies across income groups: the vast majority of tax systems do not differentiate between primary and secondary employments, and simply apply the tax schedule to the sum of earnings. Therefore, changes in marginal income or payroll tax rates leave the relative wages of primary and secondary jobs unchanged, providing little scope for identification. This is unfortunate because differential tax treatment of primary and secondary jobs may have desirable distributional, incentive and revenue consequences. For example, moonlighting tax breaks may improve targeting if secondary jobs are predominantly held by low-income individuals. Furthermore, cutting a low-income worker's secondary tax rate could provide an equivalent incentive to cutting the worker's primary tax rate, while at the same time protecting the tax revenue collected on primary earnings.

Motivated by these gaps in knowledge, this paper provides the first plausibly

[1] For example, Chetty et al. (2013) study intensive margin responses to EITC subsidies; Tazhitdinova (2020) studies responses to a very large tax break in Germany; and Cahuc and Carcillo (2014) study detaxation of overtime pay in France.

[2] For example, see Kahn and Lang (1991); Dickens and Lundberg (1993); Chetty et al. (2011).

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

causal estimates of secondary job responses to financial incentives and offers new insights into the determinants of moonlighting by studying a unique reform in Germany. Since April 2003, part-time and full-time workers earning more than €400 per month have been allowed to hold a secondary job tax-free, if earnings from the secondary employment do not exceed €400 per month. Full income and social security taxes are due on secondary earnings of €401 or more, resulting in a large notch at €400.[4] This reform has thus exempted small secondary earnings from employee social security tax and income tax, with total savings ranging between 19.5% and 66%, depending on one's marginal tax bracket. Using administrative data on a 2% representative panel sample of wage earners in Germany, I find four results.

First, I show that the reform dramatically increased the number of low-paid secondary jobs. The secondary job holding rate rose sharply after the reform and continued to grow. Within the first 2 years, the share of individuals holding secondary employments increased from around 2.3% just prior to the reform to 5%. By 2010, nearly 7% of workers held secondary jobs. Approximately a quarter of these jobs represented at-the-threshold €400 jobs.

Second, I find that the observed increase in moonlighting represents a real increase in working hours and is not driven by shifting of primary working hours into secondary jobs. I show that primary earnings of individuals with *new* secondary jobs did not fall as a result of the reform. While some individuals report having both regular employment and a tax-free secondary job at the *same* establishment, such reports are rare and result in higher combined earnings relative to the previous year. The increased prevalence of €400-or-less jobs also did not come at the expense of higher-paid secondary jobs, although some conversion has occurred. Finally, the increased supply of secondary job workers did not result in fewer job opportunities for low-income individuals; instead, the number of small-earnings jobs increased accordingly.

Third, I show that women, foreign-born individuals, West-Germans, individuals with no vocational training and in lower-paid primary jobs are overrepresented among moonlighters. For example, individuals with primary earnings

[4] Employers pay social security taxes regardless of the size of workers' earnings, but the rates differ slightly (see Section 1.1).

between €400-€1000 per month are nearly 2.5 more likely to hold a secondary job than individuals with primary earnings of €3000-€4000. Furthermore, low-income individuals responded more strongly to the reform, despite enjoying a lower tax break.

Fourth, I find that most secondary jobs are held in low-wage service occupations and industries: cleaners represent over 20% of secondary jobs, while salespersons, waiters, drivers, warehousemen, watchmen, and office workers cover between 5% to 10% each. Importantly, these secondary job occupations do not vary with individuals' primary earnings: high-income individuals' secondary jobs are held in similar industries and occupations as low-income individuals. Small secondary jobs are held at firms that are similar to firms that employ low-income workers in general. Together, these two pieces of evidence suggest that secondary job workers are likely to be paid between €7-€10 per hour in their secondary jobs (Tazhitdinova (2020)).

To shed light on the economic determinants of moonlighting, I calibrate a parsimonious labor supply model with hours constraints which yields two insights. First, only individuals whose working hours are lower than their ideal hours by 25% or more could have been interested in moonlighting prior to the reform. Second, when the secondary tax rate is zero, secondary jobs become attractive to individuals with ideal primary hours, as long as they can obtain a secondary wage similar to their primary wage but not otherwise. However, even a small deviation from ideal primary hours makes tax-free low-wage secondary jobs attractive. Since most secondary jobs are of the low-wage type, and since individuals did not reduce primary earnings upon taking up a secondary job, the theoretical predictions imply that hours constraints are the primary cause of moonlighting. Approximately 30-60% of individuals hold secondary jobs for a year or less, suggesting that most individuals experience temporary constraints but a nontrivial share of workers experience long-term constraints.

To gage the economic importance of the estimated responses, I calculate the approximate fiscal costs and benefits of the reform. I find that the package of reforms "paid for itself," resulting in a net fiscal surplus due to increased collection of employer taxes. In 2005, each newly created secondary job generated a small revenue surplus of €25 or less, increasing to €25-€75 by 2010. However, this fiscal

outcome was in large part driven by increased employer tax rate and increased secondary earnings due to the threshold increase: if one holds mini-job earnings and tax rates constant at 2002 levels, the revenue gains are significantly smaller or negative. Importantly, if one calculates the fiscal outcomes based on the causal estimates described below, the reform resulted in revenue losses in 2005 and negligible revenue gains in 2010. While low-income workers are overrepresented among moonlighters, the majority of the tax break went to mid- and higher-income individuals. However, these tax breaks were well targeted in the sense that they were given to constrained individuals, as discussed earlier.

Finally, I complement the descriptive analysis with a causal estimation. Estimating the magnitude of the causal effect is challenging because the reform affected most individuals in Germany. I use several approaches. I start by accounting for aggregate changes that may affect the attractiveness or availability of small secondary jobs. Next, I use micro data and two plausible control groups to estimate the magnitude of response. Since none of these approaches present an ideal quasi-experiment, the estimated participation elasticities should be interpreted as "suggestive" of true magnitude of causal responses to the 2003 reform. All approaches yield similar results, suggesting that approximately half of the increase in moonlighting can be attributed to individual responses. Considering that most eligible workers saved between 19.5 to 66 percent on their combined social security and income taxes, these responses translate into elasticities of participation of 0.35-1.48 within 2 years of the reform, and 0.55-2.06 in the long run, depending on primary earnings. These elasticities are significantly larger than participation elasticities in primary employment, which are estimated in other settings to range between zero and 0.25 for men and between 0 and 0.35 for women (Blundell and Macurdy (1999); Blundell et al. (2011); McClelland and Mok (2012)).

The findings of this paper are subject to four caveats. First, the long term results are more sensitive to unrelated shocks, and thus are less reliable. Second, increased secondary job holding rates could be due to reclassification of under-the-table jobs into secondary mini-jobs. While I cannot rule out this channel, such conversions are not obviously attractive because employers must pay a 21-30% social security tax on mini-job earnings. Furthermore, about a quarter of

secondary jobs are held at firms with 50 employees or more, which are less prone to cheating. Third, the increased availability of small secondary jobs could be due to the splitting of full-time jobs. Such splitting is unlikely to be large because secondary jobs are concentrated in industries that predominantly hire part-time workers. Nevertheless, the precise origin of new secondary jobs is outside the scope of this paper. Fourth, the studied policy change was part of a larger package of Hartz reforms. It is unlikely that the other policy changes – that were primarily aimed at unemployed individuals – affected moonlighting directly: we observe no discontinuous increases in moonlighting except in April 2003. Nonetheless, these reforms may have had indirect effects; for example, by making small jobs more readily available. My estimates suggest that at least half of the observed increase in moonlighting was driven by labor supply rather than labor demand responses. To derive this bound I compare increases in the number of low-paid primary and secondary jobs, and find a much smaller increase in the number of €0-to-€400 primary jobs as compared to similar secondary jobs.

The results of this paper are policy-relevant for the following reasons. First, secondary tax breaks may result in a cost-effective approach to incentivizing longer working hours for low-income employed individuals. Cutting one's secondary tax rate provides an equivalent incentive as cutting one's primary tax rate but protects the tax revenue collected on primary earnings. This is the case because tax revenue depends not only on the elasticity of earnings and the magnitude of tax changes, but also on the income base the tax applies to. Moreover, lower moonlighting tax rates adhere to the Ramsey rule, ensuring that more elastic secondary earnings are taxed less than inelastic primary earnings. Finally, if secondary jobs are limited to low-wage employments, or if the magnitude of the tax break is limited, moonlighting jobs will only be attractive to low-income individuals or individuals who experience hours constraints, thus further improving the targeting of tax incentives. However, secondary tax breaks are not a viable policy for incentivizing the labor supply of lowest income individuals, simply because having a secondary job necessitates having a primary employment.

Second, the findings show that moonlighters are constrained in their choice of primary hours (Saez et al. (2012)), and that hours constraints are the primary cause of moonlighting (Shishko and Rostker (1976); Paxson and Sicherman

(1996)). Most individuals moonlight at low-skilled service jobs that are unlikely to be appealing to workers wishing to expand their skill sets (Lundborg (1995); Renna and Oaxaca (2006); Panos et al. (2014)). In this study, lack of information is unlikely to be the key friction restricting workers' hour choices, as many workers took advantage of moonlighting tax breaks, yet did not reduce their primary earnings. Instead, constraints may be driven by workers' inability to negotiate desirable hours with the employer or by career concerns.

Third, the results demonstrate that moonlighting responses cannot be easily inferred from studies of primary earnings responses. Instead, the large observed responses in this study are more consistent with recent experimental evidence that finds large intertemporal or compensated elasticities for individuals with highly flexible working hours (Angrist et al. (2017), Mas and Pallais (2019)).[5] In contrast, the secondary jobs studied in this paper are of the "traditional" part-time job type and are likely to offer less flexibility. Individuals who work in a popular secondary occupation as their primary job exhibit higher moonlighting rates (conditional on their earnings level), suggesting that job access is important. Therefore, if flexible work arrangements become more prevalent and decrease the fixed costs of finding appropriate secondary jobs, we may observe an increase in the take up of secondary employment (Jackson et al. (2017); Katz and Krueger (2019a); Katz and Krueger (2019b)).[6]

Finally, the results highlight the importance of reducing evasion channels when designing tax rules. The moonlighting reform in Germany led to genuine in-

[5] The only other study that estimates elasticity of secondary earnings to taxes is O'Connell (1979), which 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)). Among a number of recent studies of the 2003 reform (Gudgeon and Trenkle (2017); Tazhitdinova (2020); Galassi (2018); Carrillo-Tudela et al. (2018)), only Carrillo-Tudela et al. (2018) provides descriptive analysis of moonlighting. Caliendo and Wrohlich (2010) use variation in Socio-Economic Panel Study (SOEP) interview months to study the effect on secondary earnings and find a small increase in secondary employment among males. However, their identification approach does not allow observing responses beyond the first year of the reform, and the analysis is limited by the small sample sizes.

[6] In the studied setting, all moonlighters had regular jobs that provided them with basic social insurance benefits, including health insurance, alleviating the need for these benefits through secondary employment. It is unclear whether such jobs would be attractive to individuals not covered by social insurance schemes.

creases in working hours because cheating through job splitting was too costly. In contrast, detaxation of overtime hours in France in 2007 did not increase working hours because workers were able to easily manipulate hour declarations (Cahuc and Carcillo (2014)). Furthermore, moonlighting responses can be particularly large if the secondary job opportunities are from self-employment, making them harder to tax (Saez et al. (2012)). For example, in the U.S., even though most digital platform earnings are third-party reported via Forms 1099-K and 1099-Misc, these earnings can be offset with self-reported business expenses that are hard to verify (Carrillo et al. (2017); Slemrod et al. (2017); Tazhitdinova (2018)). Hence, lower effective tax rates combined with flexible working schedules could make secondary jobs particularly attractive.

1 Institutional Setting and Data

1.1 Institutional Setting

There are two broad categories of employment in Germany: regular jobs subject to income and social security taxes, and mini-jobs, also known as marginal jobs, that are exempt from income tax and the employee portion of social security taxes. From 1999 until April 2003, these mini-jobs were limited to jobs in which employees earned less than €325 per month and worked less than 15 hours per week. All other jobs were considered regular, so were subject to the 21% employee social security tax and to income taxes, with a marginal tax rate ranging from 0 to 53% depending on own and spousal earnings. If individuals held secondary jobs, the €325 threshold applied to the sum of earnings. Thus, for individuals with multiple employments, income and social security taxes were calculated based on the sum of primary and secondary earnings. Employer social security tax liability barely changed at the €325 threshold, decreasing from the 22% "mini-job tax" to the 21% regular employer social security tax.

The Hartz II reforms introduced on April 1, 2003 increased the mini-job threshold from €325 to €400 and abolished the hour constraint.[7] Crucially, the

[7] Tazhitdinova (2020) studies primary earnings responses to the mini-job threshold. The distribution of primary earnings and the effect of the threshold increase on primary earnings are shown in the Appendix Figure A.2.

reform made mini-jobs attractive to individuals with regular jobs, by allowing them to hold one secondary mini-job tax free. Therefore, a worker who earned more than €400 per month could now obtain a secondary mini-job and pay no income or social security taxes on his secondary earnings, as long as these earnings did not exceed €400. Secondary employments that earned over €400 per month were subject to the usual income and social security taxes on the full amount. However, the rules allowed workers to occasionally exceed the mini-job threshold. Employer tax on mini-job wages increased from 22% to 25% in 2003, and further to 30% in 2006. Employer social security tax, on the other hand, remained at 21% until 2006, at which point it decreased to 19.5%.

From the perspective of taxes, mini-jobs and regular jobs are similar for employers. However, several recent studies show that mini-job workers receive smaller fringe benefits – e.g. sick day pay, vacation pay, bonuses, etc. (Bachmann et al. (2012); Wippermann (2012); Tazhitdinova (2020)); for these reasons, mini-jobs may be attractive to firms. Finally, Germany did not have a universal minimum wage until 2015, and while industry-specific minimum wages cover some workers, they rarely apply to mini-job workers. For more details on the institutional setting and data, see Appendix A.

The policy change studied in this paper was part of a larger package of Hartz reforms implemented in 2003-2005.[8] These reforms were introduced with the goal of reducing unemployment and increasing the efficiency and flexibility of the German labor market. In addition to the changes described above, the reforms re-organized employment agencies and the services they provide, reduced unemployment insurance durations and benefits, relaxed dismissal rules, provided start-up subsidies for entrepreneurs and liberalized the temporary help sector. These changes were unlikely to affect the attractiveness of moonlighting because unemployed individuals were the main target of the reform. However, Hartz reforms may have changed the availability of small secondary jobs, e.g. because of laxer dismissal rules.

[8] For a comprehensive review of the Hartz reforms see Jacobi and Kluve (2006) and Ebbinghaus and Eichhorst (2006), a brief summary is available in Appendix A.1.

1.2 Data

I use the weakly anonymous Sample of Integrated Labor Market Biographies 1975-2010 (SIAB), which provides information on employment, job search and receipt of unemployment benefits for a 2% sample of *wage earners* in Germany (vom Berge et al. (2013)). I focus on the years 1999-2010 because the information on mini-job employment is only available beginning in second quarter of 1999. Employment histories consist of end-of-the-year notifications, along with employer notifications that are submitted when an employee is hired or terminated or when an employment is interrupted. Thus, if no changes are made to the employment relationship, only one notification is recorded per year. Otherwise, multiple notifications, precise to the day, are recorded. The data provides demographic and establishment variables such as gender, age, citizenship status, education, occupation, economic activity of the establishment, number of employees at the establishment, and the median wage. Unfortunately, marital status and number of children are known only for benefit recipients and those engaged in job search, while wage and working hours data is not available at all. Finally, the data does not provide information on self-employment, but this is largely irrelevant because the studied tax change applies to wage earners only.

I restrict the sample to individuals in regular and mini-jobs; jobs of other types, e.g. trainees, are dropped. I study job holding behavior at the quarterly level. For each quarter, the observation with the largest monthly earnings is recorded as the main job, and the second highest earnings employment is recorded as the second job. Therefore, by construction, primary jobs generate the highest earnings. To ensure that the identified secondary employment represents an actual secondary job rather than a temporary job overlap due to job-switching, I proceed as follows. For each quarter I identify the employment of the longest duration. I then delete any job records within that quarter that do not overlap with this employment by at least 15 days. For months of continuous employment, this procedure identifies the main job and the highest-paid secondary job held during that month. In months of job switches, employment spells of the longest duration are recorded. This procedure, therefore, could lead to omission of very short spells of multiple-job holding in between main jobs. The results, however, are not sensitive to the choice of the minimum overlap period, which

is not surprising considering an average individual works at a secondary job for approximately 8 months.

Section 3 provides in-depth descriptive analysis of secondary mini-job holders and the jobs they hold. Summary statistics and further data details are available in Appendix A.3.

2 Theoretical Framework

To better understand the incentives generated by the 2003 reform, consider a simple theoretical framework inspired by Shishko and Rostker (1976). Consider an individual maximizing utility function

$$U = c - \frac{A}{1+1/\varepsilon}\left(\frac{h_1+h_2}{A}\right)^{1+1/\varepsilon} \quad \text{s.t.} \quad c = (1-\tau_1)w_1h_1 + (1-\tau_2)w_2h_2, \quad (1)$$

with h_i and w_i denoting working hours and wages in job i, respectively. An unconstrained individual will always hold one job that pays the highest after-tax wage. Hence, if $(1-\tau_1)w_1 > (1-\tau_2)w_2$ then optimal working hours are $(h_1^*, h_2^*) = (Aw_1^{\varepsilon}(1-\tau_1)^{\varepsilon}, 0)$ and vice versa. Therefore, secondary jobs are only attractive to constrained individuals whose actual hours $\hat{h}_1$ are lower than the desired hours h_1^*.

Now consider a policy change that exempts small secondary jobs from tax rates, i.e. let $\tau_2 = 0$ as long as $w_2h_2 \leq K$ and $w_1h_1 \geq M$, where K and M are some government-chosen thresholds. When $(1-\tau_1)w_1 > w_2$, unconstrained individuals will continue to be uninterested in secondary jobs, while constrained individuals may obtain a new secondary job or increase their secondary earnings as long as the thresholds allow it.

Individuals with $(1-\tau_1)w_1 < w_2$ would ideally like to convert all primary earnings into tax-free secondary jobs but will not be able to do so because of the threshold restrictions. The optimal response of such individuals would then be to take advantage of the policy by substituting some primary earnings with secondary ones. In the simplest case – when the pre-reform earnings exceeded $M + K\frac{w_1}{w_2}$ – the ideal strategy is to hold a secondary job that pays K and reduce primary hours by K/w_2.

The empirical evidence in Section 3.2 will show, however, that such substitution may be undesirable or infeasible. For example, many primary jobs are salary positions that do not allow for hour flexibility or provide workers with important benefits that secondary jobs may not. Alternatively, reducing one's primary working hours may be too costly if this can negatively affect career growth, or if the tax rules change frequently. In this case, individuals may still obtain a secondary job while keeping their primary hours unchanged if doing so increases utility, i.e. if $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) > 0$. Using 2nd order Taylor expansion of $f(x) = x^{1+1/\varepsilon}$ around $x = \hat{h}_1$ we find

$$U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) = (1-\tau_2)w_2h_2 - \frac{A^{-1/\varepsilon}}{1+1/\varepsilon}\left[\left(\hat{h}_1 + h_2\right)^{1+1/\varepsilon} - \hat{h}_1^{1+1/\varepsilon}\right] \quad (2)$$

$$\approx (1-\tau_2)w_2h_2 - \frac{h_2}{\hat{h}_1}\left[1 + \frac{1}{2}\frac{1}{\varepsilon}\frac{h_2}{\hat{h}_1}\right] A\left(\frac{\hat{h}_1}{A}\right)^{1+1/\varepsilon}. \quad (3)$$

A simple calibration allows us to investigate the likelihood of condition $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) > 0$ being satisfied in the setting of the 2003 reform. I consider individuals with primary wages w_1 of between €1000 to €4000 per month and choose the ability parameter A, so that their ideal working hours are $h_1^* = 173$ hours per month (or 40 hours per week). I then assume that individuals' actual hours are $\hat{h}_1 = (1-\lambda)h_1^*$, so that λ measures the deviation from ideal primary hours.[9] I consider secondary jobs paying €400 per month, and assume that secondary wage w_2 is the lower of €9 per hour (a typical wage in mini-jobs, see Tazhitdinova (2020)) or an individual's primary wage.[10] Tax rates τ_1 are based on the 2002 tax schedule and individuals' optimal earnings $w_1h_1^*$. I then calculate the range of elasticities ε for which condition $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) > 0$ is satisfied.

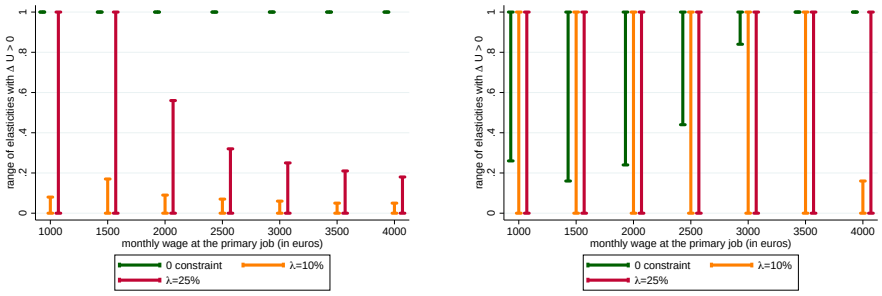
The results of this exercise are summarized in Figure 1 and provide two key insights. First, when secondary jobs are taxed at the same rate as primary jobs, €9-wage secondary jobs are not attractive unless working hours are too low, e.g.

[9] More details available in Appendix B. Note that for smaller elasticities of labor supply – i.e. whenever $\varepsilon < 1$ – the first derivative of $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0)$ with respect to λ is positive, implying that secondary jobs are more attractive to individuals with suboptimal primary hours.

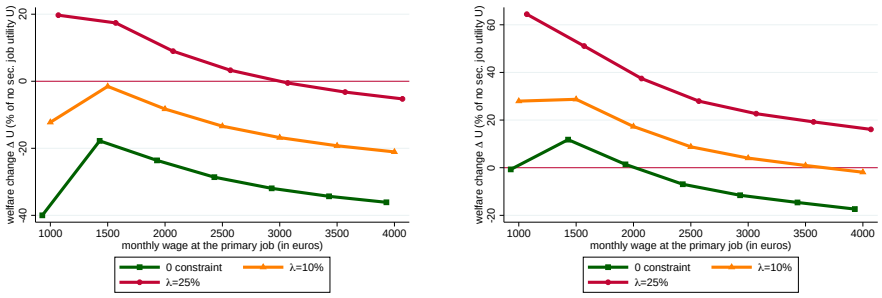
[10] Appendix Figure B.3 shows equivalent results but for secondary jobs with $w_2 = w_1$. Secondary job holding becomes attractive to slightly constrained individuals *if* they can obtain a wage similar to their primary job wage.

Figure 1: Calibration: Take Up and Welfare Effects of a €400 Secondary Job

(a) Take up: $\tau_2 = \tau_1$ (b) Take up: $\tau_2 = 0$



(c) Welfare: $\tau_2 = \tau_1$ & $\varepsilon = 0.25$ (d) Welfare: $\tau_2 = 0$ & $\varepsilon = 0.25$



Notes: Figures (a) and (b) show the range of elasticities ε for which $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) > 0$ (see equation (3)), while Figures (c) and (d) plot $(U(\hat{h}_1, h_2) - U(\hat{h}_1, 0))/U(\hat{h}_1, 0)$ in percent for an individual with elasticity $\varepsilon = 0.25$. Elasticity range restricted to $\varepsilon \in (0, 1)$. Parameter A is chosen such that each individual's optimal hours are 173 hours per month. The following parameters are used: $\lambda = 0, 0.10, 0.25$, $w_1 =$ €1000/173,...,€4000/173, $\hat{h}_1 = (1 - \lambda)173$, $w_2 = \min\{w_1, 9\}$, $h_2 =$ €400$/w_2$.

less than 75% of ideal hours. Therefore, only individuals who work substantially fewer than optimal hours at the primary job will hold secondary jobs prior to 2003, and these jobs are likely to offer a wage similar to their primary wage.

Second, when the secondary tax rate is zero, secondary jobs become attractive to individuals with ideal primary hours as long as they can obtain a secondary wage similar to their primary wage, even if primary earnings cannot be reduced concurrently. These individuals will not be interested in secondary jobs if the secondary wage is too low. However, even a small deviation from ideal primary hours makes low-wage secondary jobs attractive. When primary hours are lower than the ideal hours by 25% or more, all individuals find €9-per-hour secondary jobs attractive.

These results imply that we can gage the presence and magnitude of hours constraints by observing individuals' job choices. Highly constrained individuals will hold a secondary job before and after the reform. Individuals with smaller hour constraints will be willing to take up a low-wage secondary job after the reform. Individuals with primary hours equal to h_1^* but who cannot or do not want to reduce their primary hours will only be interested in secondary jobs with similar wage levels as their primary jobs. Finally, completely unconstrained individuals will reduce their primary hours upon take up of a secondary job.

Note that constraints need not be of permanent nature. For example, an individual who experiences a negative income shock may want to earn higher income temporarily. If such an individual is unable to increase his primary working hours, he may increase his earnings by moonlighting. The results in this section do not account for non-monetary benefits of moonlighting or potentially high fixed costs of obtaining a secondary employment. Naturally, the former will tend to increase moonlighting rates, while the latter will decrease them.

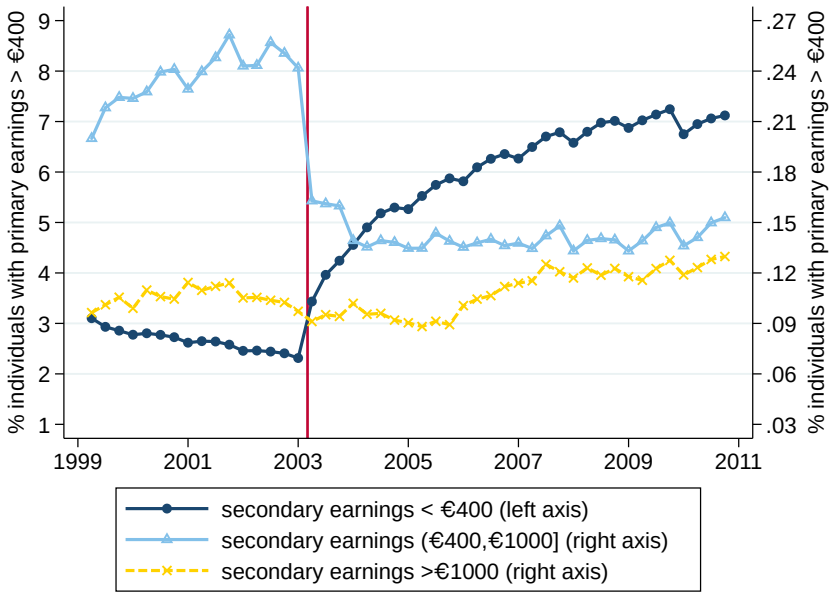
3 Descriptive Evidence

3.1 Take Up of Secondary Jobs

To explore how moonlighting rates changed from 1999 to 2010, Figure 2 shows the percent of individuals who held secondary jobs paying less than €400 per month, €400-€1000, or more than €1000 over time. Few individuals moonlighted in Germany prior to the reform – just over 2% held secondary jobs at the beginning of 2003, and the majority of these employments earned less than €400. Figure 2 shows that secondary jobs with earnings below €400 increased sharply after the reform and kept growing until about 2009. In the last year of data, 2010, roughly 7% of individuals held secondary jobs. Following the predictions of Section 2, the relatively low levels of moonlighting – despite large tax savings – suggest that either the available secondary jobs offer wages that are too low, or the fixed costs of moonlighting are too high.

Importantly, Figure 2 shows that the increase in the number of secondary mini-jobs cannot be explained by the reduction in the number of secondary jobs

Figure 2: Percent of Wage Earners Holding Secondary Jobs Over Time



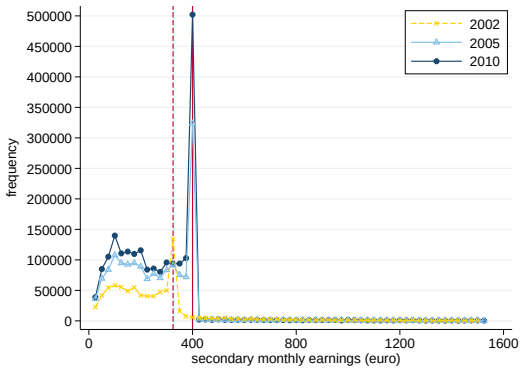
Notes: This figure shows the share of individuals who hold secondary jobs paying less than €400 per month, paying between €400 and €1000, or more than €1000 per month, among all wage earners with primary earnings of €400 or more. The vertical red line identifies the 2003 tax reform. *Source*: Sample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

that paid more than €400, as the number of €400+ secondary jobs was too small before the reform. Figure 2 shows that secondary employment in the mid-range, with earnings between €400 to €1000 per month, decreased rapidly after the reform and have stagnated ever since. The number of these jobs, however, stabilized quickly, within 2 years. We see a small increase in the number of high-paying secondary jobs (over €1000 per month) over time, but this increase is very small in comparison to the dramatic increase in the number of secondary mini-jobs and does not show a discontinuity at the time of the reform. Finally, Figure 2 shows that unemployment insurance benefit changes that were implemented in January 2005 and February 2006 did not lead to sharp changes in the number of secondary jobs (Price (2020)).

Figure 2 highlights the relatively slow adjustment process. Because mini-job rules are well-known in Germany, it is unlikely that the slow adjustment

Figure 3: Distributions of Secondary Jobs

(a) Full distribution



(b) Distribution above €400

Notes: These figures show the distribution of secondary job earnings in 2002, 2005 and 2010. The vertical red line identifies the €400 threshold, the dashed red line identifies the €325 pre-2003 mini-job threshold. Figure (b) simply zooms in on the €400+ region. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

was driven by lack of salience. Instead, it could be driven by firm constraints, consistent with the findings of Gudgeon and Trenkle (2017) who investigate firms' adjustment to the mini-job threshold shift from €325 to €400. Gudgeon and Trenkle (2017) show that it took firms more than 3 years to transform €325 jobs into €400 jobs.

Figure 3(a) shows the distributions of secondary earnings in 2002, 2005, and 2010. While approximately 25% of individuals hold €400 secondary jobs, the rest hold secondary jobs that pay less. Consistent with the notched nature of tax incentives, we see a steep drop off in the number of secondary jobs that pay €400 or more.[11] Zooming in on that part of the distribution in Figure 3(b), we see that jobs that pay over €400 were "converted" into €400-jobs; however, this conversion did not happen for larger jobs, e.g. jobs that pay €1000 or more.[12]

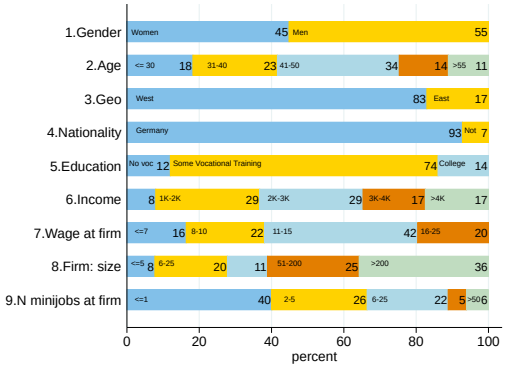
Figure 4 compares the demographic composition of secondary job holders in 2010 to that of the overall population. Women, West-Germans, foreign-born

[11] A similar bunching behavior can be seen in the distribution of primary jobs, shown in Appendix Figure A.2.

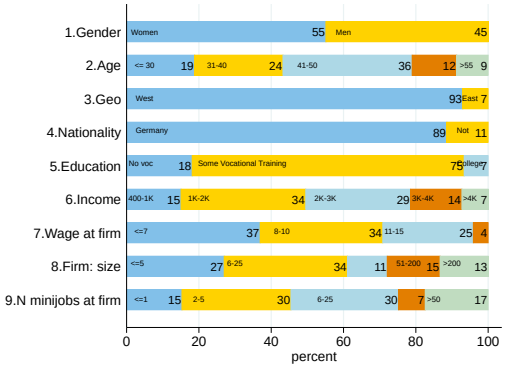
[12] Appendix Figure D.9 provides more evidence of such substitution behavior by studying moonlighting behavior of a balanced panel of individuals who held €400-€1000 jobs in January-March 2003.

Figure 4: Who Holds Secondary Jobs? Demographic Composition of Job Holders

(a) All Wage-Earners in 2010



(b) Secondary Job-Holders in 2010

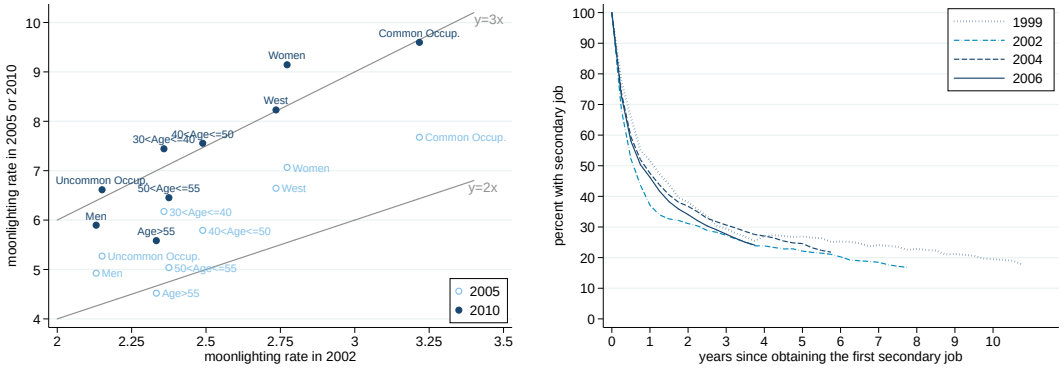


Notes: These figures provide demographic characteristics in 2010 of (a) all wage earners with primary monthly earnings greater than €400, or (b) secondary job holders with primary monthly earnings greater than €400 and secondary monthly earnings of €400 or less. The last three bars provide characteristics of the establishments at which the individuals hold their primary job in (a) or their secondary job in (b): median hourly wage of full time employees, number of employees at the establishment, and number of mini-job employees, all measured as of June 2010. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

individuals, individuals with no vocational training, and in lower-paid primary jobs are all more likely to hold secondary jobs. However, we see no difference in the propensity to moonlight due to age. The median full-time wage at these establishments is lower than at an average firm. Secondary jobs are more likely to be held at small firms with a larger number of mini-job workers. While 27% of secondary jobs held at very small firms – with 5 employees or less, 28% of jobs are held at firms with 51 employees or more. Comparing these decompositions with those from 2002 (shown in the Appendix Figure C.4), only two changes are notable. First, women became more over-represented in secondary jobs than before. Second, a much larger number of secondary jobs is held at firms with a large number of mini-job workers than in the past. Otherwise, the demographic composition of secondary job holders remained approximately the same. Appendix Figure C.4 also shows that small secondary jobs are held at firms that are very similar to firms that employ low-income workers in general. This suggests that secondary job workers are likely to be paid between €7-€10 per hour in their

Figure 5: Heterogeneity of Response and Durations

(a) Moonlighting Rates in 2002, 2005, 2010 (b) Jobs Started in 1999, 2002, 2004, 2006



Notes: Figure (a) compares moonlighting rates in 2002 against moonlighting rates in 2005 and 2010 for various demographic groups. Individuals are broken down into groups by demographic characteristics: men vs women, individuals living in West Germany vs East Germany, individuals whose primary occupation is among the top 5 most common secondary occupations, and finally, individuals of different age groups. Figure (b) shows what share of individuals continue to hold a secondary job so many years after first obtaining a secondary job in a given year. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

secondary jobs (Tazhitdinova (2020)).

Occupation and industry compositions of secondary jobs also remained approximately constant between 2002 and 2010. As shown in the Appendix Figure C.5, 70% of secondary jobs are held in several occupations: household cleaners, office workers, watchmen, warehousemen, waiters, drivers, salespersons. Among these, cleaners represent over 20% of all secondary jobs, while other occupations range between 5 and 10%. Importantly, while relative shares of these occupations change across primary income groups – e.g. cleaning is less common among highest primary income individuals who instead are more likely to moonlight as office workers – nonetheless, the same occupations cover the top 70% for all income groups. If we break down secondary jobs by firm's industry, approximately 25% of secondary jobs are help in service industries, and between 5 and 10% in retail, health, hotels and restaurants, renting and recreation.

Figure 5(a) explores how moonlighting rates differ across demographic groups in 2002, 2005 and 2010. Individuals are broken down into groups by demographic characteristics: men vs women, individuals living in West Germany vs East Ger-

many, individuals whose primary occupation is among the top 5 most common secondary occupations, and finally, individuals of different age groups. While we see substantial heterogeneity in moonlighting rates, the response to the reform appears to be relatively similar: moonlighting rates roughly doubled by 2005, and tripled by 2010.

Finally, Figure 5(b) shows how the likelihood of holding a small secondary job evolves over time for individuals who first obtained a secondary job in 1999, 2002, 2004 or in 2006. To construct this figure, I recorded the first year during the sample period (1999-2010) in which an individual reported having a secondary job that paid €400 or less. For all subsequent years, I calculate the proportion of individuals who still report holding a secondary job (with the same or different employer), thus allowing for breaks between secondary jobs. Figure 5(b) shows that most secondary jobs are held for a year or less. However, approximately 20% of moonlighters hold secondary jobs for extended periods of time.

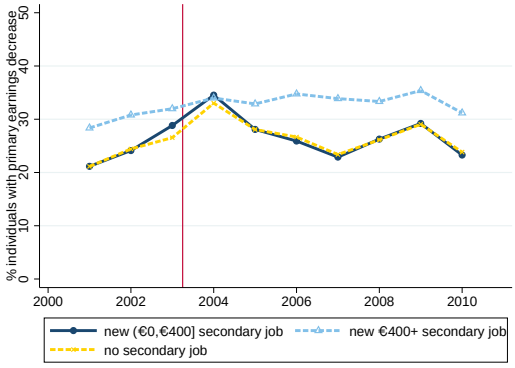
3.2 Earnings Substitution and Aggregate Responses

The results of the previous section show that the 2003 reform led to an increased number of small secondary jobs. In this section I investigate whether this increase was offset by reduced primary employment or resulted in a crowd out of small primary jobs.

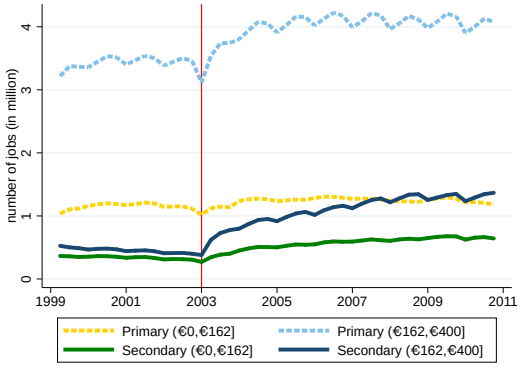
Since the 2003 tax reform reduced taxation of secondary jobs but left primary tax rates unchanged, the reform could lead to an arbitrage opportunity: some of the increase in moonlighting hours may be offset by lower working hours at the primary jobs. If this were the case, the observed increase in moonlighting would not constitute an increase in hours, but merely result in lost revenue. Such substitution is unlikely to happen in practice. First, employers are not directly incentivized to split primary jobs because the employer mini-job tax rate is slightly higher than the employer social security tax rate. Empirically, less than 1.5% of moonlighters held both a regular and a mini-job with the same employer. Among these secondary job holders, 61% experienced an increase in pay when they first started the new secondary job, and for only 6.5%, their earnings remained within €100 of their previous month's wage. Second, the lack of high-paying secondary jobs limits the scope of arbitrage. Tazhitdinova (2020)

Figure 6: Job Substitution: By Workers and Across Workers

(a) % Moonlighters with Decreased Primary Earnings



(b) Changes in Number of Primary Jobs



Notes: Figure (a) shows percent of individuals whose primary earnings decreased relative to a year ago for: (i) individuals with new €0-€400 secondary jobs (solid blue), (ii) new €400+ secondary jobs (dashed light blue), and (iii) no new secondary jobs (dashed yellow). Figure (b) shows the number of jobs taken as primary or secondary jobs by monthly earnings level for the full population (irrespective of age): under €162, between €162 and €400. The vertical red line identifies the 2003 tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

documents that most mini-job workers were paid an average of €9 per hour in 2006-2010. This hourly wage can be compared, for example, to an unmarried worker with primary earnings of €2000 per month, whose implied before-tax hourly wage is approximately €12 per hour and implied after-tax wage is €8, similar to average mini-job wages. This back-of-envelope comparison suggests that except for the lowest-earning workers, the reform did not present much of an arbitrage opportunity. Third, it is unlikely that most secondary job holders would be able to reduce their primary working hours because they are salaried or because doing so is costly. Finally, while regular jobs increase one's pension and unemployment insurance entitlements, secondary mini-jobs do not, making them an imperfect substitute.

To provide empirical evidence against substitution, I explore how primary earnings change upon take up of a secondary job, before and after the reform. Figure 6(a) shows the percent of individuals who experienced a decrease in primary earnings from the previous year separately for individuals who obtained a

new secondary mini-job (€0 to €400), who obtained a new high-paying secondary job (€400 or more), as well as for individuals with no secondary jobs. If individuals were shifting earnings from primary employment to secondary, we would observe an increase in the solid curve after the reform, and no similar increase for dashed curves. No such increase is apparent. Instead, Figure 6(a) shows a similar evolution of primary earnings changes for all three groups. Appendix D.2 tests this result formally and considers other measures of primary earnings changes.

The lack of primary earnings response implies that individuals experience some form of hours constraint, since as discussed in Section 2, a fully unconstrained individual would not obtain a secondary job without reducing his primary hours. Since the reform led to a noticeable increase in moonlighting, these hours constraints are likely to be small in magnitude, since if this were not the case, individuals would have held secondary jobs prior to the reform. The evidence in Figure 5 strongly suggests that most individuals experience temporary constraints: between 40-60% of secondary jobs are held for a year or less. However, a nontrivial number of individuals experience long-term constraints – approximately 25% moonlight intermittently for five years, and approximately 10% moonlight continuously for five years.

A secondary job tax break could also lead to two other forms of substitution. First, if labor demand cannot absorb the influx of secondary workers, this may lead to secondary workers "stealing" jobs from primary workers, resulting in decreased labor supply of individuals with low primary earnings. Figure 6(b) provides evidence against this: the number of primary jobs with earnings of less than €400 has not decreased as a result of the reform. An important caveat is that the 2003 reform may have led to extensive margin responses within the primary jobs market: since the mini-job threshold increased from €325 to €400, individuals who had previously chosen 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), not that of small jobs (under €162). Figure 6(b) shows a small increase in the number of primary jobs both below and above €162, suggesting no substitution between primary and secondary workers.

Second, the increased demand for small jobs may result in the splitting of larger full-time jobs into multiple mini-jobs. Unfortunately, Figure 6(b) cannot

provide convincing evidence against this possibility because, relative to the overall full-time workforce, the increase in the number of small secondary jobs is small.

3.3 Distributional Effects

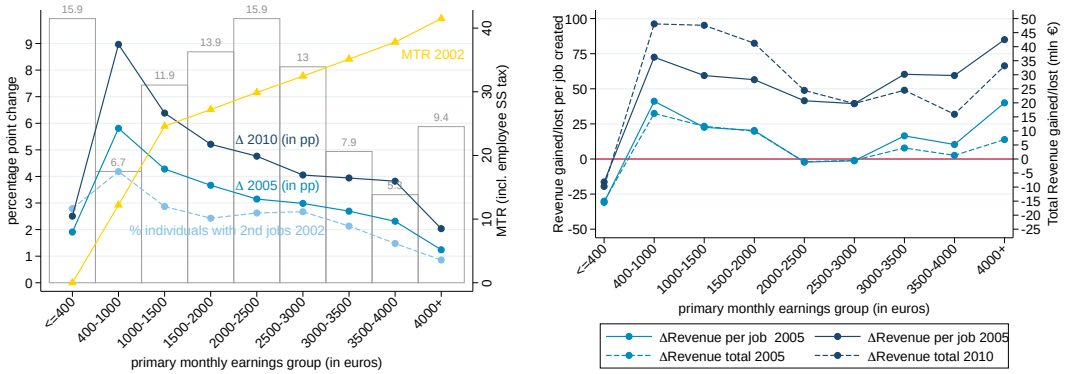
Figure 7 helps us to assess the distributional and fiscal impacts of the reform. I calculate the fiscal gain/cost of the 2003 tax reform as a simple difference between the tax revenue collected on all secondary jobs that paid €1000 or less in 2005/2010 and in 2002. For individuals with primary earnings of less than €400, I calculate the fiscal costs based on individuals whose combined earnings exceed the mini-job threshold, thus making them liable for income and social security taxes. Therefore, these calculations account for all changes that occurred during this period, including changes to income and social security tax rates, along with mini-job threshold increase, as well as their effects on the magnitude of secondary earnings, and substitution responses (the observed decrease in the number of €400+ jobs). Appendix E considers alternative approaches: holding pre-reform or post-reform tax-rate and threshold constant, or limiting the increase in secondary jobs to causal estimates of Section 4 (Figure 10(a)-(b)).

Figure 7(a) shows the secondary mini-job holding rates by primary income group in 2002, percentage point increase in secondary mini-job holding rates in 2005 and in 2010, as well as the corresponding marginal tax rate in 2002. In the background, the vertical bars show the relative shares of the population in each income bin. Figure 7(a) shows that while high-income individuals experienced the largest tax break, lower-income individuals were most likely to obtain a secondary job. However, since these individuals represent a relatively small share of the population, most tax benefits went to the middle-income groups – individuals with primary earnings of €1500-€3000 per month.

Figure 7(b) shows the implied fiscal gains/losses from the reform. The solid line shows the revenue change per job created (left scale), while the dashed line measures the total revenue change (right scale), scaled from a 2% sample. The results imply that in the two years after the reform, in 2005 the revenue collected increased for individuals with primary earnings of less than €2000, but decreased or remained the same for higher income groups. By 2010, the increase in secondary jobs was large enough that combined with increased employer mini-job

Figure 7: Who Benefited from the Reform? Distributional Effects

(a) Moonlighting Rates by Income Group (b) Implied Fiscal Costs of the Reform



Notes: Figure (a) shows the number of individuals with €0-€400 secondary jobs in 2002 in dashed light blue, the increase in the number of such secondary jobs from 2002 to 2005 in percentage points in light blue, and from 2002 to 2010 in dark blue. The yellow curve (right scale) shows the corresponding marginal tax rates in 2002. The vertical bars in the background show the relative shares of the population in each income bin in 2002. Figure (b) shows the fiscal gain (if positive) or fiscal cost (if negative) of the reform. The solid lines measure revenue change per job created, while the dashed lines measure the total cost, scaled from the data's 2% sample to reflect full population. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

tax rate (which increased from 22% in 2002 to 30% in 2010), the reform led to an overall revenue increase. However, this fiscal outcome was in large part driven by increased employer mini-job tax rate and increased secondary earnings due to threshold increase: if one holds mini-job earnings and tax rates constant at 2002 levels, the revenue gains are significantly smaller or negative. Importantly, if one calculates the fiscal outcomes based on causal estimates of Section 4, the reform resulted in revenue losses in 2005 and lower revenue gains in 2010. The observed U-shaped pattern is driven by two factors: a larger percent increase in secondary job holding rates among lower income individuals and higher average secondary earnings among high-income individuals: Appendix Figure E.10(b) shows that average secondary mini-job earnings increase from €250 to €300 as primary income increases.

Combining these results with the calibration predictions of Section 2 generates two insights. First, the package of reforms "paid for itself" and resulted in a small net revenue increase for all except lowest-income individuals. Since

secondary job holders receive a full tax break, the revenue increase is entirely due to increased employer mini-job tax revenue. Second, mid- and higher-income individuals experienced the largest tax breaks, both per person and as a total. However, these tax breaks were well targeted in the sense that they were given to constrained individuals, as discussed in Section 3.2. Combining the evidence from Figure 7(a) with calibration predictions of Figure 1 suggests that beneficiaries can be classified into two categories. The heavily constrained individuals – who held secondary jobs before the reform and whose working hours are likely to be smaller than their ideal hours by 25% or more – constitute approximately 2-3% of all individuals. These individuals benefited the most, and their utility can be approximated by the red-circle lines of Figure 1 (c) and (d). Lightly constrained individuals – those who did not hold a secondary job before the reform and whose working hours are likely to be constrained by less than 25% – represent 4-8% of the population – benefited less. Their utility can be approximated by the orange-triangle lines of Figure 1 (c) and (d). These results suggest that as long as secondary jobs are limited to low-wage employments or if the tax breaks are small in magnitude, moonlighting tax breaks will only generate responses among low-income and constrained individuals.

4 Measuring the Effect of Tax Reform on Take-Up of Secondary Jobs

The graphical evidence presented in Section 3.1 provides strong evidence of a causal response of secondary mini-jobs to the reform: the increase in secondary mini-jobs is immediate and sharp. However, estimating the magnitude of the causal effect is more challenging. In this section, I attempt to do so using two approaches. First, I use aggregate evidence to account for aggregate changes that may affect the attractiveness or availability of small secondary jobs. Second, I use micro data and two plausible control groups to estimate the magnitude of response. Since none of these approaches present an ideal quasi-experiment, the estimates should be interpreted as "suggestive" of the true magnitude of causal responses to the 2003 reform.

4.1 Aggregate Control Group Estimates

The main threat to identification is the possibility that the number of secondary mini-jobs increased for some other reasons unrelated to tax incentives. Two types of such aggregate shocks are plausible. First, a cultural shift or economic necessity may make moonlighting more attractive. For example, the Hartz IV reform reduced long-term unemployment benefits in 2005, which may induce spouses of unemployed workers to seek out secondary jobs. If this were the case, we should observe an increase in moonlighting rates across all levels of secondary earnings. This means that we can use the number of high-paying secondary jobs – the dashed blue series from Figure 2 – as a control group in order to account for aggregate shocks that affect the appeal of moonlighting in general.[13]

Second, mini-jobs may become more readily available because of a demand-driven shock, thus inadvertently increasing the number of secondary mini-jobs. For example, Hartz reforms relaxed dismissal rules and reduced taxation of the temporary help sector, which may have incentivized employers to offer more small jobs. If this were the case, we should see a roughly proportional increase in the number of mini-jobs taken as primary jobs or as secondary jobs. This means that we can use the number of primary mini-jobs – the sum of solid curves from Figure 6(b) – as a control group in order to account for aggregate shocks that affect the availability of less-than-€400 jobs.

Formally, I estimate

$$\log(Num\_Jobs_{jt}) = \beta_1 + \sum_{t=1999}^{2010} \beta_{2t}\delta_t + \sum_{t=1999}^{2010} \beta_{3t}(Treat_{jt} \times \delta_t) + \varepsilon_{it}, \quad (4)$$

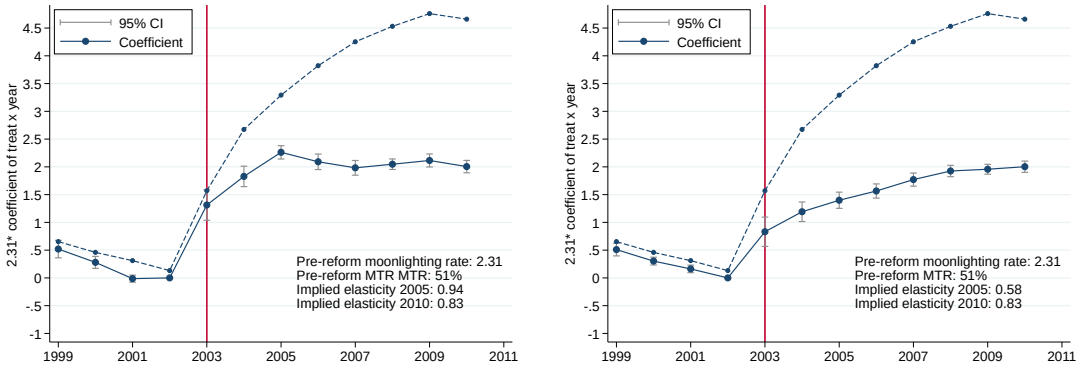
where t measures time in years and j identifies job type. To account for the first type of aggregate shocks, Num_Jobs_{jt} measures either the number of secondary mini-jobs (defined as secondary employments paying €400 or less) or the number of secondary high-paying jobs (paying €1000 or more). To account for the second type of aggregate shocks, Num_Jobs_{jt} either measures the number of secondary mini-jobs (defined as secondary employments paying €400 or less) or the number

[13] Note that medium-paying secondary jobs cannot be used as a control because the number of these employments decreased due to tax incentives. See Figures 2 and 3.

of primary mini-jobs (defined as primary employments paying €400 or less). In both cases, $Treat_{jt}$ equals to 1 for secondary jobs with earnings of €400 per month or less, and zero otherwise. Specification (4) is estimated on 92 quarterly observations. Observations from January-March 2003 are not included, so the 2003 point estimate measures the immediate effect of the reform. The results are shown in Figure 8.

Figure 8: Results: Take Up of Secondary Jobs

(a) Control group: Large Secondary Jobs (b) Control group: Primary Mini-Jobs



Notes: This figure plots estimates and 95% confidence intervals of coefficients β_{3t} of specification (4) multiplied by 2.31 – the pre-reform secondary mini-job holding rate in January-March 2003. In both figures, the treatment observations measure the number of secondary €0-€400 jobs. In figure (a), the control observations measures the number of individuals with large (i.e. €1000+) secondary jobs, while in figure (b) control observations measure the number of small (i.e €400 or less) primary jobs. The dashed line shows a simple difference between the secondary mini-job holding rate in a given year minus in Jan-March 2003. Year 2002 is omitted. Specification (4) is estimated on 92 quarterly observations. The vertical red line identifies the 2003 tax reform. Coefficients and standard errors are reported in Table F.6. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

The dashed line in Figure 8 shows the simple difference between the secondary mini-job holding rate in a given year and the pre-reform rate of 2.31% in Jan-March 2003, while the solid line shows estimates from (4) scaled by the pre-reform rate. Both approaches suggest that approximately half of the total increase in small secondary jobs can be attributed to the causal effect of the reform, implying an almost 100% increase in secondary mini-job holding by 2010. The results highlight the importance of accounting for aggregate shocks, but the estimates must be interpreted with caution. The increase in the number of small jobs and the increased popularity of moonlighting may have been caused by the reform

itself; in that case, the estimates shown in Figure 8 represent the lower bound on the true causal effect.

4.2 Micro Data Control Group Estimates

To estimate the effect of the reform on the take up of secondary jobs using microdata, I employ a difference-in-differences linear probability model (LPM) specification:

$$P(2nd\_Mini_{it} = 1) = \beta_1 + \sum_{t=1999}^{2010} \beta_{2t}\delta_t + \sum_{t=1999}^{2010} \beta_{3t}(Treat_{it} \times \delta_t) + \gamma X_{it} + \varepsilon_{it}, \quad (5)$$

where $2nd\_Mini_{it}$ is equal to 1 if the individual holds a secondary mini-job and zero otherwise, while δ_t is an indicator of a given time period. $Treat$ identifies one of the several treatment groups – individuals with primary earnings of €400 to €1000, €1000 to €3000, or over €3000. Controls X_{it} include demographic characteristics such as gender, age, state (länder), occupation, and individual fixed effects. The coefficients of interest β_{3t} measure an increase in the take up of secondary jobs as a result of the tax break. Standard errors are clustered by individual.

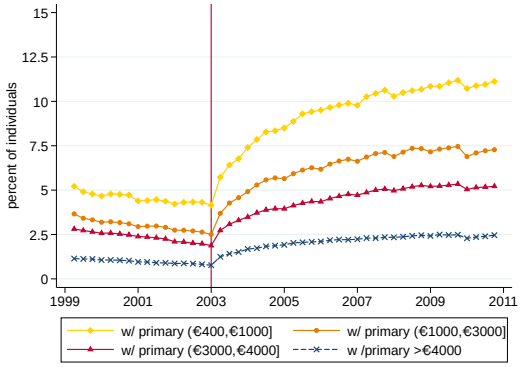
I choose the LPM over a nonlinear model such as a logit or a probit for several reasons. First, LPM is easy to interpret and the regression results can be directly compared to graphical evidence. Second and most importantly, LPM is more suitable for including individual fixed effects because nonlinear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

I use two approaches to assign individuals to treatment and control groups. First, I assign individuals to treatment and control groups based on their primary earnings in January-March 2003, the three months before the reform.[14] The

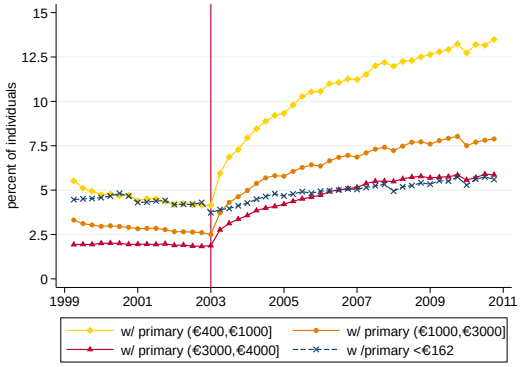
[14] The results are robust to assigning status based on the 2002 earnings level.

Figure 9: Secondary Job Holding Rates by Primary Earnings

(a) By Pre-Reform Earnings



(b) By Current Earnings



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

control group consists of individuals with primary earnings of €4000 or more, while the treatment groups consist of workers with primary earnings of €400 to €4000, broken down by primary income tranches. The identification relies on the intuition that high-wage individuals are less likely to be affected by the secondary job tax break because their primary wages are likely to be much higher than moonlighting wages, even after accounting for the tax break. Therefore, high-wage individuals' moonlighting decisions should be primarily driven by non-tax factors that we are trying to control for. Ideally, one would then assign treatment and control groups based on wage levels, but this information is not available and for this reason, I use earnings as a proxy for wages. Since high-income individuals are nonetheless treated, this approach yields a lower bound on the true magnitude of the response.

The second approach attempts to find a control group that is not treated. To do so, I choose individuals with very small primary earnings as a control group – less than €162 per month. By sample construction, these individuals' secondary jobs are bound by their primary earnings, and therefore their combined income is limited to €324. Hence, these individuals should not be affected by the 2003 mini-job threshold increase from €325 to €400, as their cumulative

earnings do not exceed €325. The downside of this approach is that the treatment and control groups must be assigned based on current rather than pre-reform earnings. The reason for this is that these individuals tend to increase their primary earnings relatively quickly: within 2 years, only 25% of individuals have earnings of €162 or less, and approximately 60% have earnings over €400 (see Appendix Figure F.11). This means that the pre-reform earnings of very low-income individuals cannot be used to predict individuals' future earnings, and one must rely on current earnings. On one hand, doing so is advantageous because the group assignment accurately reflects individuals' contemporaneous incentives. The downside, of course, is that the same individual might be assigned to a control group in some years, but to various treatment groups in other years. Treatment group switches do not affect the validity of the empirical approach, merely the interpretation of the results. On the other hand, the possibility of selection into treatment could invalidate my empirical approach; however, Appendix Figure F.11 shows no changes in relative income group switches as a result of the reform (see discussion in Appendix F).[15]

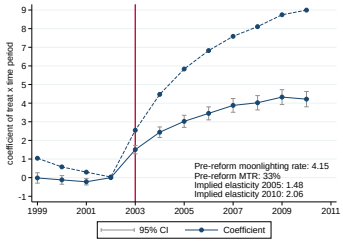
The treatment and control groups are not perfectly comparable and differ in many aspects. The necessary identifying assumption is that the likelihood of secondary employment evolved similarly for individuals in the treatment groups as for individuals in the control group. Figures 9(a) and (b) investigate the validity of this assumption and show that prior to the reform in April 2003, the percent of secondary job holders appears to follow a similar downward trend for all income groups. High-income individuals, however, are less likely to hold secondary jobs than individuals with small primary earnings, consistent with evidence from Figure 4.

Figure 10 presents the results of estimating (5) separately for individuals with primary earnings ranging between €400 and €1000, €1000 and €3000, and between €3000 and €4000. Estimates for all income groups combined are shown in Appendix Figure F.12. In all estimates, observations from January-

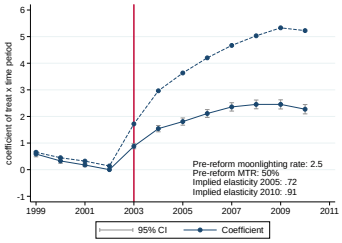
[15] Another possibility is that individuals with pre-reform income just above €400 may wish to reduce their earnings in order to qualify for a tax-free primary job. In that case, the €400-€1000 treatment group may be adversely selected. If this were the case, we should see a decreased mass in the distribution of primary earnings, just above the €400 threshold, after the reform. Appendix Figure A.2 does not show evidence of such missing mass. See also Tazhitdinova (2020) for more detailed treatment of primary earnings responses.

Figure 10: Results: Take Up of Secondary Jobs

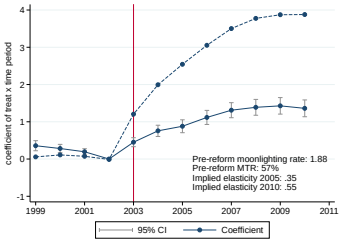
(a) Pre-reform Earnings: €400–€1000



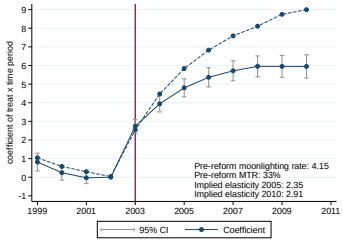
(b) Pre-reform Earnings: €1000–€3000



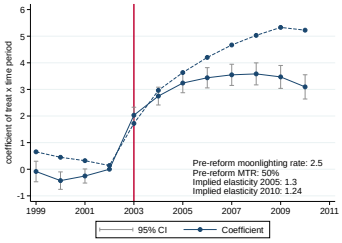
(c) Pre-reform Earnings: €3000–€4000



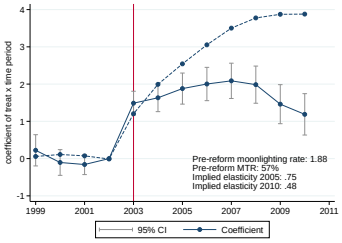
(d) Current Earnings: €400–€1000



(e) Current Earnings: €1000–€3000



(f) Current Earnings: €3000–€4000



Notes: This figure plots estimates and 95% confidence intervals of coefficients β_{3t} of specification (5). Figures (a) through (c) assign treatment and control groups based on earnings in January-March 2003, with €4000+ serving as the control group. Figures (e) through (f) assign treatment and control groups based on current quarter earnings with €0-€162 group serving as the control. Year 2002 is omitted. The vertical red line identifies the 2003 tax reform. Coefficients and standard errors are reported in Appendix Table F.5. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

March 2003 are not included, so the 2003 point estimate measures the immediate effect of the reform. Figure 10 confirms the general validity of the parallel trend assumption by showing no major pre-trends before the policy change in April 2003. Both specifications – whether based on pre-reform earnings or based on current earnings – show similar results: the reform resulted in an immediate increase in moonlighting, followed by a gradual increase over time. For individuals with primary earnings between €400 to €1000, moonlighting increased by 3-5 percentage points within the first 2 years, and by approximately 4-6 percentage points by 2010 from a pre-reform mean of 4.15%. For individuals with primary earnings of €1000 to €3000, the likelihood of secondary job holding increased by 2-3 percentage points in the first 2 years after the reform, and by 2-3 percentage

points by 2010, from the initial level of 2.5%. Finally, individuals with primary earnings between €3000 and €4000 also increased their moonlighting rates, by 1-1.8 percentage points in the first 2 years and by approximately 1.3 by 2010, from the initial rate of 1.88. In all specifications, higher-income individuals show a slightly weaker response than individuals with small primary earnings.

4.3 Discussion and Caveats

The estimated changes in the take up of secondary jobs can be used to estimate elasticities of participation in the secondary job market. I define elasticities as

$$\eta \equiv \frac{\%\Delta Participation}{\%\Delta(1-\tau)} = \frac{\%\Delta Participation}{\%\Delta(1-\tau_{SS}-\tau_{Income})}, \tag{6}$$

where $\tau_{SS} = 0.21$ and τ_{Income} identify social security and income taxes on the first dollar of secondary earnings. An appropriate measure of τ_{Income} would take spousal earnings into account; however, that information 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)). As women tend to have lower earnings than their spouses, this approximation may result in a small upward bias for women, and the opposite for men. Thus, it is difficult to accurately predict the direction of the bias, especially taking into consideration that moonlighters may be negatively selected. The average τ_{Income} is 12% for individuals with low primary earnings (€400-€1000), 29% for individuals with €1000-€3000 earnings, and 36% for individuals with primary earnings of €3000 to €4000.

Using 2005 and 2010 to calculate short-term and long-term elasticities, I estimate short-term elasticities of 1.48-2.35 and long-term elasticities of 2.06-2.91 for individuals with small primary earnings (€400-€1000). For individuals with primary earnings of €1000 to €3000, short-term elasticities range between 0.72 and 1.3, while long-term elasticities are 0.91-1.24. Finally, for higher-income individuals, short-run elasticities are 0.35-0.75 and long-run elasticities are 0.48-0.55. Most importantly, all elasticities are very similar in magnitude and are significantly larger than participation elasticities for the primary jobs estimated in other settings: between 0 and 0.25 for men and between 0 and 0.35 for women (Blun-

dell and Macurdy (1999); Blundell et al. (2011); McClelland and Mok (2012)). However, elasticities are of comparable magnitude to recent experimental evidence that finds large intertemporal or compensated elasticities for individuals with highly flexible working hours (Angrist et al. (2017), Mas and Pallais (2019), Chen et al. (2017)). The results thus imply that moonlighting is highly responsive to tax incentives.[16]

The estimated responses are subject to several caveats. First, the results should not be interpreted as caused by the tax break alone. Threshold and other tax rate changes contributed to the observed outcomes. Second, the elasticities are calculated under the assumption that all individuals who looked for a secondary job were able to obtain such a job, in other words, that labor demand elasticity is perfectly elastic. However, if labor demand is less than perfectly elastic, the estimated response represents a lower bound on the true structural elasticities of labor supply. Third, as discussed in Section 4.1, Hartz reforms might have resulted in labor demand increase of small jobs because of the relaxed regulation. The approach taken in Section 4.1 attempts to account for such aggregate shifts by using appropriate control groups. The approach in Section 4.2 accounts for the demand shifts as long as demand changes affected treatment and control groups similarly. Since secondary mini-jobs are relatively similar across income groups (recall discussion in Section 3.1), there is no evidence to suggest this was not the case. Overall, the results suggest that roughly 50% of the observed increase in moonlighting may be attributed to individuals' responses. The remaining increase in secondary employment may have happened as a result of demand shift or any other aggregate changes in the economy.

5 Conclusion

Leveraging a unique reform in Germany that eliminated social security and income taxes on €0-€400 secondary jobs, this paper estimates the effect of taxes

[16] Unfortunately, the estimated participation elasticities cannot be easily compared to elasticities of taxable income (ETI): the secondary job incentive was limited to €400, and thus constrained the maximum taxable income change to €400 regardless of pre-reform income. Therefore, any estimates of ETI are flawed because individuals would have obtained larger secondary jobs in absence of the threshold, as evidenced by the large bunching in Figure 3.

on multiple job holding. The results show that moonlighting is highly responsive to taxes, with implied participation elasticities that are several times larger than participation elasticities for primary employment. Secondary jobs are disproportionately taken up by women, foreign-born individuals, individuals with no vocational training and in lower-paid primary jobs. These moonlighting jobs are mostly held in low-wage service occupations and industries, irrespective of primary earnings level. A calibration exercise reveals that hours constraints are the primary cause of moonlighting: low-wage secondary jobs are unlikely to be attractive to individuals unless their primary earnings are too low. For most individuals, these hours constraints are likely to be of temporary nature since they hold secondary jobs for a year or less.

The results thus suggest that moonlighting tax-breaks could be effective at incentivizing longer working hours as they offer two key advantages. First, they are cost-effective, as they only reduce the tax on highly elastic secondary earnings and preserve the tax revenue on inelastic primary earnings. Second, the incentive structure implicitly targets constrained lower-income individuals. However, these advantages must be weighted against disadvantages. For example, moonlighting tax breaks cannot be used to incentivize individuals to join the workforce in the first place, and they may inadvertently incentivize firms to split full-time jobs into multiple part-time jobs.

While the studied secondary jobs are of the "traditional" part-time type and thus are less flexible than typical "gig" jobs, they are similar in that they do not provide social insurance benefits. Therefore, moonlighting responses are likely to be stronger if the tax breaks are applied to more flexible and easily accessible "gig" jobs. However, the targeting of secondary tax breaks may be less efficient and may result in arbitrage opportunities if some of these gig jobs are of the high-wage type. For example, digital platforms such as TaskRabbit offer some high-wage opportunities that the traditional part-time labor market does not.

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APPENDIX FOR ONLINE PUBLICATION

A Institutional Details and Data

A.1 Summary of Hartz Reforms

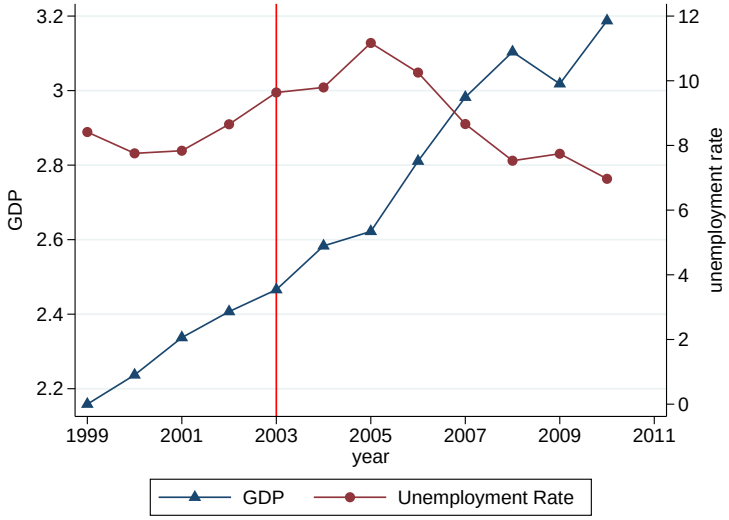
In this paper I evaluate labor supply responses to a tax rule change that was part of a larger package of reforms known as the *Hartz reforms*, summarized in detail in Jacobi and Kluve (2006) and Ebbinghaus and Eichhorst (2006). These reforms were implemented in four phases – Hartz I and II in 2003, Hartz III in 2004, and Hartz IV in 2005 – and had three goals in mind.

The first goal was to increase the effectiveness of labor market services by re-organizing and improving the effectiveness of employment agencies. For example, the Hartz I and II reforms introduced voucher systems that allowed individuals to work with private placement services in cases where public placement service failed to place individuals within 6 months of unemployment, or be re-trained by private providers. The Hartz III reforms re-organized the structure of public employment agencies, and extended the advising and counseling services they provide.

The second goal was to reduce unemployment and non-employment by changing the benefit system and by increasing work incentives. As can be seen in Figure A.1 below, the unemployment rate was relatively high. The Hartz I and II reforms introduced "sanction" elements for unemployment insurance recipients, which made it a requirement for unemployed individuals to actively seek employment and be obligated to accept any offer of suitable work. The Hartz III reforms reduced unemployment insurance benefits duration while the Hartz IV reforms decreased their amounts. Significant for this paper, the Hartz I and II reforms expanded the mini-job sector by increasing the mini-job threshold from €325 to €400 and by allowing secondary jobs to qualify for mini-job tax breaks.

The third goal was to increase the flexibility of the labor markets by deregulating the temporary work sector and relaxing dismissal/contract rules. The Hartz III reforms abolished restrictions on the maximum duration of temporary employment, and increased exemption threshold from dismissal protection from

Figure A.1: GDP and Unemployment Rate in Germany



Notes: GDP in trillion 2019 USD, and unemployment rate in percent, both from OECD.org.

5 employees or less to 10. It is worth noting that this change was unlikely to have a large effect on secondary jobs for two reasons. First, as evidenced in Figure 4, a quarter of secondary workers were employed by small firms who were exempt from the dismissal rules both before and after the reform. Second, the dismissal protections set in after a probationary period of six months.

To summarize, with the exception of the rule change studied in this paper, the majority of the Hartz reforms affected unemployed or non-employed individuals, which should have resulted in a labor supply increase in the primary job sector. The Hartz reforms may have further affected secondary job holding rates via changes in equilibrium wages or by changing the availability of small jobs.

A.2 Tax Rules

The mini-job tax rules are summarized in Table A.1, while the applicable income tax rates are available in Table A.2. As summarized in Table A.1, the tax rules generate a large notch at the €325/€400 threshold for individuals with small incomes in all years. Figure A.2 shows the distributions of primary earnings in 2002, 2005 and 2010. Each distribution shows pronounced bunching at the mini-

Table A.1: Tax Rules by Monthly Earnings in Primary and Secondary Jobs

	Before April 2003	After April 2003
Primary + Secondary $\leq$ €325	no tax	no tax
€325 $<$ Primary + Secondary $\leq$ €400	Primary: 21% tax Secondary: 21% tax	no tax
Primary $>$ €400, no Secondary	Primary: 21-74% tax	Primary: 19.5-66% tax
Primary $>$ €400, Secondary $\leq$€400	Primary: 21-74% tax Secondary: 21-74% tax	Primary: 19.5-66% tax Secondary: no tax
Primary $<$ €400, Primary + Secondary $>$ €400	Primary: 21-74% tax Secondary: 21-74% tax	Primary: 19.5-66% tax Secondary: 19.5-66% tax
Primary $>$ €400, Secondary $>$ €400	Primary: 21-74% tax Secondary: 21-74% tax	Primary: 19.5-66% tax Secondary: 19.5-66% tax

Notes: This table summarizes individual tax rules in Germany. Primary job is defined as the job with the highest earnings. The income tax rate depends on marital status and one's primary or total earnings, depending on whether secondary earnings are taxed. In all cases, employers must pay a social security or mini-job tax that ranges between 19.5% and 30%.

job threshold. Behavioral responses of primary workers are analyzed in Gudgeon and Trenkle (2017) and Tazhitdinova (2020). Furthermore, for individuals with small earnings, the reform substituted the social security notch at the €400 mini-job threshold with a kink. In other words, a worker with primary earnings of €450 per month would pay social security tax on €50 only. The income tax liability would still be based on the full €450. This change did not apply to secondary employments (see Gudgeon and Trenkle (2017); Tazhitdinova (2020); Galassi (2018); Carrillo-Tudela et al. (2018)).

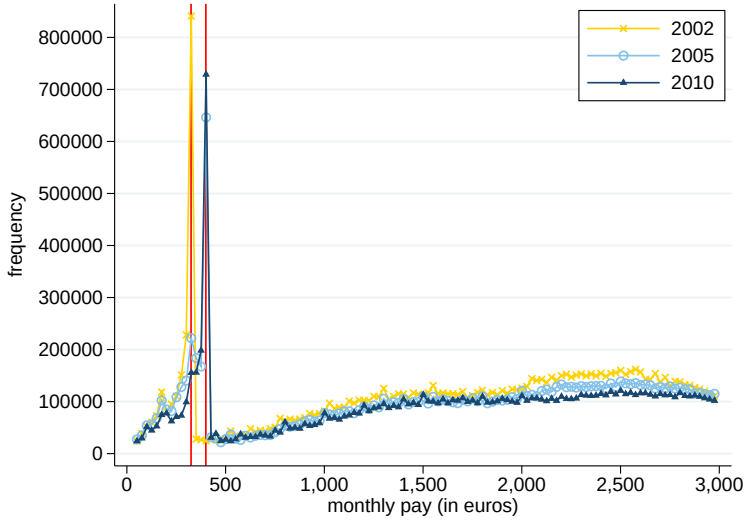
For individuals with at least one regular job – i.e. a job that pays over €400 per month – the mini-job threshold generated a large notch for secondary earnings starting in 2003. However, because of the prevalence of small €325 jobs in the labor market, some bunching at the €325 threshold is visible in the 2002 distribution of secondary jobs in Figure 3. This bunching has been termed 'aggregate bunching' and represents firms' rather than workers' responses to tax incentives.

Table A.2: Mini-job, Social Security and Personal Income Tax Rates

	Mini-job Taxes		Regular SS Taxes		Income Tax Rates						
Year	Employee	Employer	Employee	Employer	Tax-free	First Linear Progressive Zone		Second Linear Progressive Zone		Higher Income Zone	
	Tax	Tax	Tax	Tax	Allowance	income bracket	MTR	income bracket	MTR	income bracket	MTR
1999	0	22	21	21	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	0	22	21	21	6,902	6,903 to 8,945	22.9 to 25	8,946 to 58,643	25 to 51	from 58,644	51
2001	0	22	21	21	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	0	22	21	21	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	0	25	21	21	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	0	25	21	21	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	0	25	21	21	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	0	30	19.5	19.5	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	0	30	19.5	19.5	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	0	30	19.5	19.5	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	0	30	19.5	19.5	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	0	30	19.5	19.5	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 and social security taxes, 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 subjected to the same schedule. Incomes within the linear progressive zones are subject to linearly increasing marginal 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/

Figure A.2: Distribution of Primary Earnings



Notes: This figure shows the distribution of primary earnings in Germany in 2002, 2005 and 2010. The vertical red lines mark the mini-job threshold: €325 prior to April 2003 and €400 thereafter. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

A.3 Data

I use the weakly anonymous Sample of Integrated Labor Market Biographies 1975-2010 (SIAB), which provides information on employment, job search and receipt of unemployment benefits for a 2% sample of *wage earners* in Germany from 1975 until 2010. The 2% sample is comprised of all individuals who were subject to Social Security (i.e. regular employees), received unemployment benefits according to Social Code books II and III (since 1975), have been marginally employed (i.e. mini-job workers since 1999), 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.

To aggregate the data into the quarterly format I proceed as follows. For each quarter, the observation with the largest monthly earnings is recorded as the

main job, and the second highest earnings employment is recorded as the second job. Therefore, by construction, primary jobs generate the highest earnings. A very small number of individuals hold more than two concurrent employments; for these individuals, only the two highest-paid jobs are recorded. Earnings from the same establishment and the same employment category (i.e. regular or mini-job) are combined in the case of multiple concurrent records. If several jobs have the same duration, I use the spell with the highest income as the "main" spell. 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. Summary statistics are available in Table A.3.

Table A.3: Summary Statistics

		Men				Women			
		1999	2002	2005	2010	1999	2002	2005	2010
All Individuals	Number of Observations (quarterly data)	919,599	1,198,722	1,159,609	1,198,823	821,713	1,109,224	1,093,799	1,147,145
	Number Individuals	326,051	327,345	316,446	325,703	295,277	305,077	300,076	314,373
	Average Age	40	41	41	42	40	41	42	43
	Percent East Germany	18	17	16	16	18	17	16	16
	Average Monthly Pay (1st job)	2,415	2,536	2,608	2,747	1,477	1,559	1,569	1,707
	Median Monthly Pay (1st job)	2,379	2,515	2,542	2,643	1,383	1,448	1,415	1,506
With $\geq$2 jobs	Percent with Secondary Jobs	2.62	2.26	4.46	5.24	3.57	3.01	6.16	7.73
	Number of Observations with Secondary Jobs	25,245	28,873	54,867	67,010	31,184	35,610	71,741	94,774
	Number of 2nd Jobs Individuals	8,539	7,406	14,108	17,082	10,534	9,178	18,491	24,302
	Average Monthly Pay (1st job)	2,244	2,351	2,402	2,542	1,299	1,332	1,381	1,478
	Median Monthly Pay (1st job)	2,298	2,440	2,430	2,509	1,215	1,234	1,259	1,310
	Average Monthly Pay (2nd job)	278	290	281	290	238	253	248	262

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.

B Calibration

The calibration exercise is based on the following assumptions and choices. First, I suppose each individual maximizes

$$U = c - \frac{A}{1+1/\varepsilon}\left(\frac{h_1+h_2}{A}\right)^{1+1/\varepsilon} \quad \text{s.t.} \quad c = (1-\tau_1)w_1h_1 + (1-\tau_2)w_2h_2, \quad (7)$$

with h_i and w_i denoting working hours and wages in job i, respectively. It can be shown that an unconstrained individual would like to hold one job that pays the highest after-tax wage, with working hours $(h_1^*, h_2^*) = (Aw_1^{\varepsilon}(1-\tau_1)^{\varepsilon}, 0)$ whenever $(1-\tau_1)w_1 > (1-\tau_2)w_2$.

I assume that individuals ideally want to work 173 hours per month, which is equivalent to 40 hours per week. In other words, I set $h_1^* = 173$. I then assume that they actually work $\hat{h}_1 = (1-\lambda)h_1^*$ and consider $\lambda = 0, 0.1, 0.25$. I vary individuals' total earnings $h_1^*w_1$ from €1000 to €4000 per month, in €500 increments. This pins down their primary wage as $w_1 = Earnings/173$. Ability parameter A is then chosen so that their ideal working hours are $h_1^* = 173$, i.e. $A = 173/(w_1^{\varepsilon}(1-\tau_1)^{\varepsilon})$. Tax rates τ_1 are based on the 2002 tax schedule and individuals' optimal earnings $w_1h_1^*$.

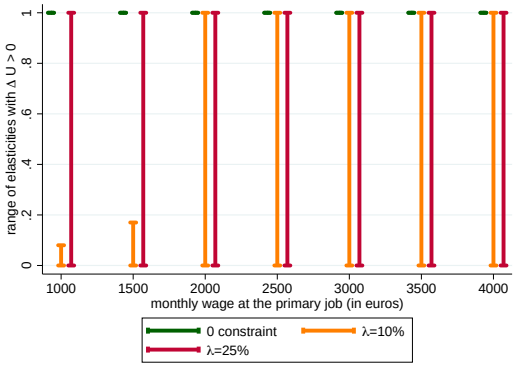
To construct Figures (a) and (b) I solve for the range of elasticities ε that result in $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) > 0$, where

$$U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) \approx (1-\tau_2)w_2h_2 - \frac{h_2}{\hat{h}_1}\left[1 + \frac{1}{2}\frac{1}{\varepsilon}\frac{h_2}{\hat{h}_1}\right] A\left(\frac{\hat{h}_1}{A}\right)^{1+1/\varepsilon}.$$

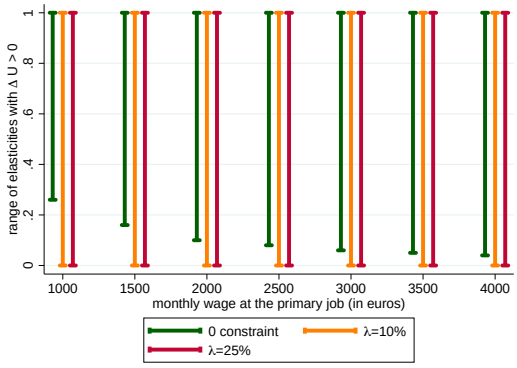
In both Figure 1 and B.3, $w_2h_2 =$ €400. However, in Figure 1 I assume that secondary wage w_2 is the lower of €9 per hour (a typical wage in mini-jobs, see Tazhitdinova (2020)) or individual's primary wage, i.e $w_2 = \min(€9, w_1)$. In Figure B.3, I assume that $w_2 = w_1$. Figures (c) and (d) plot $(U(\hat{h}_1, h_2) - U(\hat{h}_1, 0))/U(\hat{h}_1, 0) * 100\%$ for an individual with elasticity $\varepsilon = 0.25$.

Figure B.3: Calibration: Take up and Welfare Effects of a €400 Secondary Job

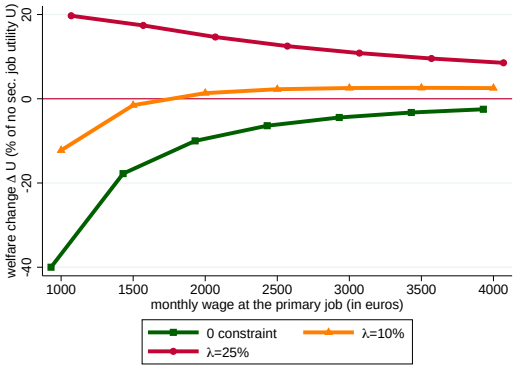
(a) Moonlighting: $\tau_2 = \tau_1$



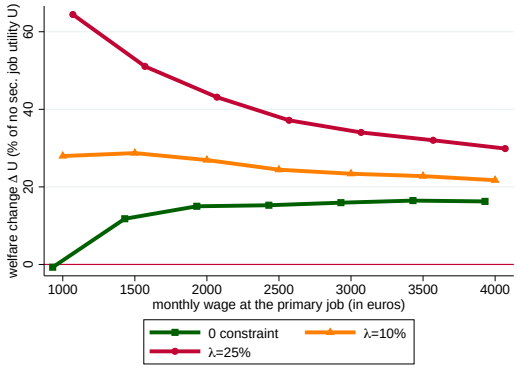
(b) Moonlighting: $\tau_2 = 0$



(c) Implied Welfare: $\tau_2 = \tau_1$



(d) Implied Welfare: $\tau_2 = 0$



Notes: Figures (a) and (b) show the range of elasticities ε for which $U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) > 0$ (see equation (3)), while Figures (c) and (d) plot $(U(\hat{h}_1, h_2) - U(\hat{h}_1, 0))/U(\hat{h}_1, 0)$ in percent for an individual with elasticity $\varepsilon = 0.25$. Elasticity range ε is limited to (0,1). Parameter A is chosen such that each individual's optimal hours are 173 hours per month. The following parameters are used: $\lambda = 0, 0.10, 0.25$, $w_1 = €1000/173, ..., €4000/173$, $\hat{h}_1 = (1 - \lambda)173$, $w_2 = w_1$, $h_2 = €400/w_2$.

C Additional Demographic Information

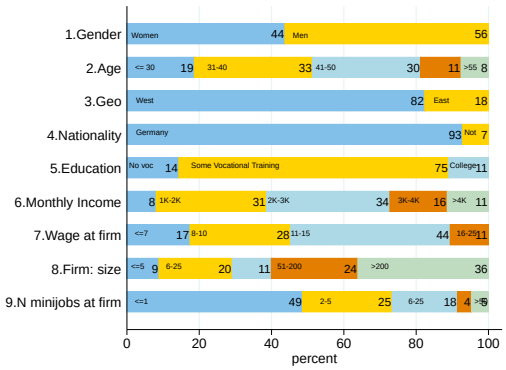
Figures C.4(a) and (b) show the demographic characteristics of secondary job holders and all wage earners with primary earnings of €400+ in 2002. Figures C.4(c) and (d) show the demographic characteristics of primary job holders with primary earnings of €400 or less in 2002 and 2010.

Figure C.5(a) shows the most common secondary occupations in 2002 and 2010 and their respective shares of total secondary jobs in that year. Altogether, these occupations cover approximately 70% of all secondary jobs. Over time, all common secondary occupations except for office workers and salespersons became less common. Interestingly, this pattern is not specific to any particular income group (not shown). However, the relative shares of each occupation vary across income groups. Figure C.5(b) repeats this exercise for industries. Overall, we see that secondary jobs have not changed much as a result of the 2003 reform: most of these jobs are in service industries and low-wage service occupations.

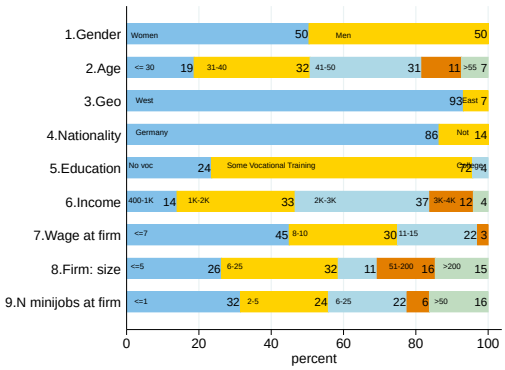
Figure C.6(a) shows Venn diagrams of the five most common occupations for secondary jobs in 2005 among 31-54-year-olds, by earnings level. Among small secondary jobs, low-skill occupations prevail: doormen and custodians, waiters, house cleaners, warehouse and transport workers, and office workers represent the majority of employment. High-paying secondary jobs, on the other hand, consist of higher-skilled jobs, such as teachers, nurses and assistants, entrepreneurs and consultants, social workers, and office workers. Interestingly, low-paid secondary job occupations do not appear to vary greatly with the primary earnings level – Figure C.6(b) shows most common occupations among secondary mini-jobs by individuals' primary earnings, documenting that low-skill occupations are most common regardless of primary earnings level. Corroborating this finding, Figure C.7 shows the percent of individuals whose main job occupation matches their second job occupation. As one would expect from Figure C.6, individuals with low primary earnings are more likely to have matching occupations than individuals with higher primary earnings and low-paying secondary jobs. For all income levels, among individuals with primary and secondary jobs of a similar level of earnings, 40% have the same occupation. As the earnings differential increases, this share decreases to 20%. Both probability of a match and most popular secondary job occupations remain very stable across the years.

Figure C.4: Who Holds Secondary Jobs? Demographic Composition of Job Holders

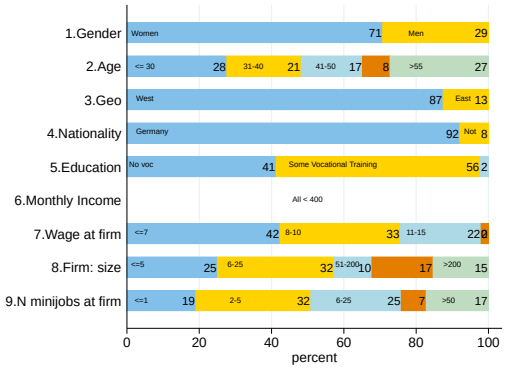
(a) All Wage-Earners in 2002



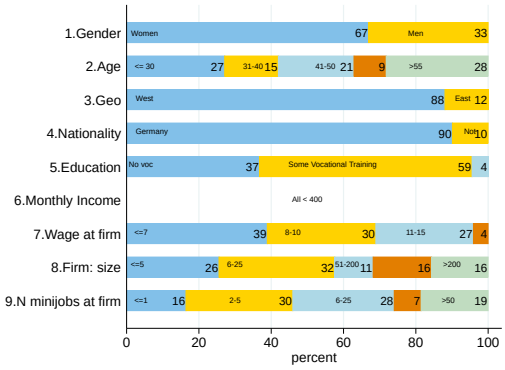
(b) Secondary Job-Holders in 2002



(c) €0-€400 Primary Earners in 2002



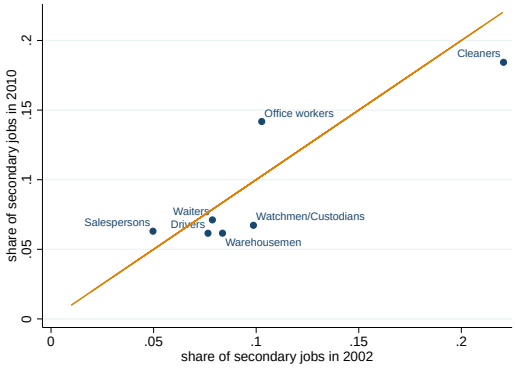
(d) €0-€400 Primary Earners in 2010



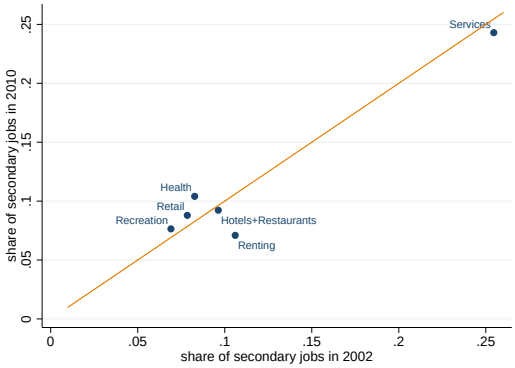
Notes: These figures provide demographic characteristics in 2002 of (a) all wage earners with primary monthly earnings greater than €400, or (b) secondary job holders with primary monthly earnings greater than €400 and secondary monthly earnings of €400 or less, or (c) all primary earners with primary monthly earnings of €400 or less, and in 2010 (d) of all primary earners with primary monthly earnings of €400 or less. The last three bars provide characteristics of the establishments at which the individuals hold their primary job in (a), (c) and (d) or their secondary job in (b): median hourly wage of full time employees, number of employees at the establishment, and number of mini-job employees, all measured as of June 2002 or 2010. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure C.5: Most Common Secondary Job Occupations and Industries

(a) Occupations



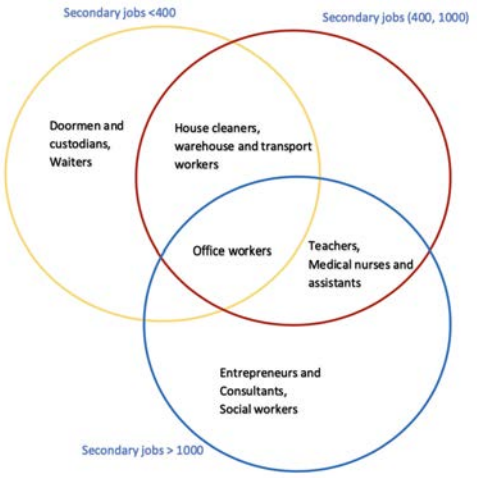
(b) Industries



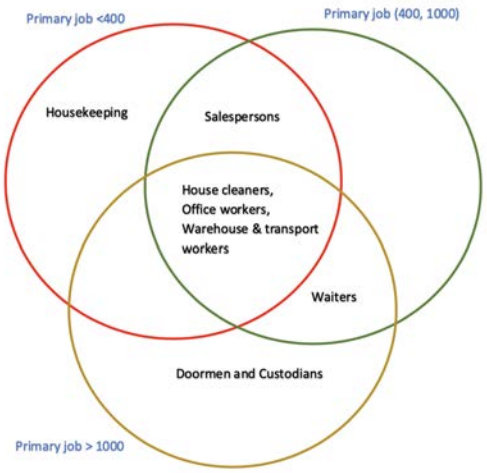
Notes: These figures show the most common occupations and industries of secondary jobs and their respective labor market shares in 2002 and 2010. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure C.6: Top 5 Most Common Secondary Job Occupations

(a) by secondary earnings

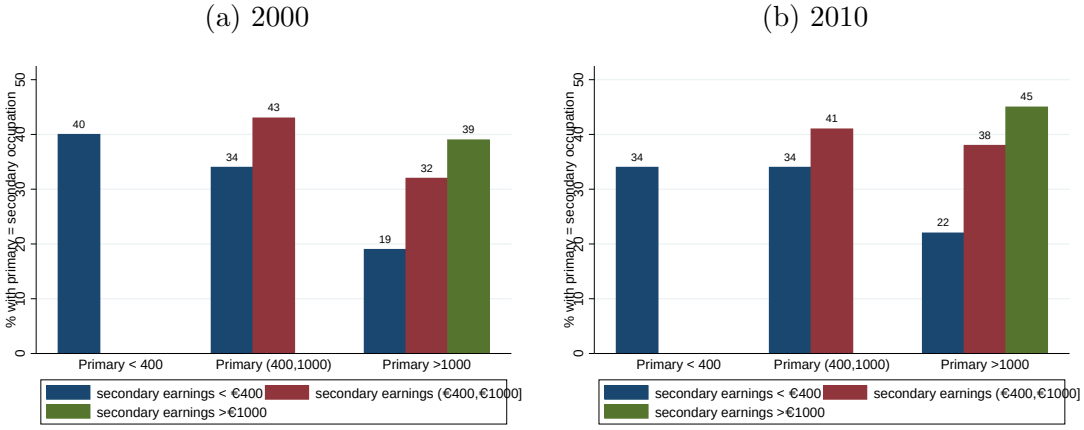


(b) ≤€400, by primary earnings



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

Figure C.7: Occupations Matches in Primary and Secondary Employments



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.

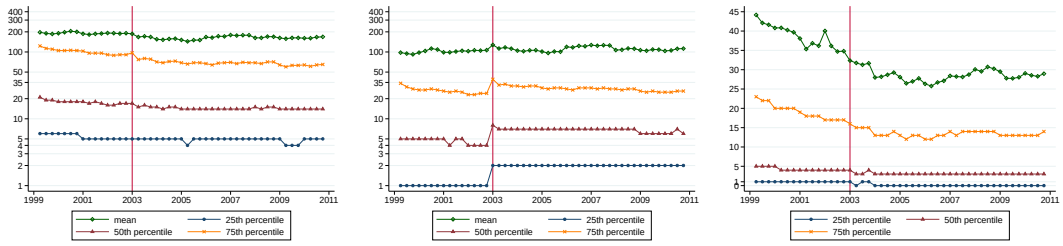
Finally, Figure C.8 attempts to shed light on whether moonlighting increased because of the legalization of previously held under-the-table jobs or from the conversion of contract arrangements into mini-jobs. While such conversions may be desirable for the employees, they are not obviously beneficial for the employers, because firms must pay a 25-30% tax on these jobs. If the secondary job holding rates increased because of such conversions, the average size of firms that employ secondary workers should increase after the reform. Instead, Figure C.8 shows a small decrease in firm size as a result of the reform. The number of mini-job workers (who hold these jobs as primary or secondary) increased while the number of full-time employees decreased. Overall, Figure C.8 does not provide empirical support for the evasion channel, but also does not rule it out completely.

The results of Figure C.8(b) are unfortunately subject to one important caveat: the data is provided by the firms, who define mini-job workers based on the official threshold definition. Practically, this means that workers who held €400 jobs before April 2003 were counted as regular part-time workers, but as mini-job workers after the reform. In other words, if these firms did not change the number of workers but were employing workers with earnings between €325 and €400, then Figure C.8(b) would still show an increase in the number of mini-

job workers. This means that the observed increase in mini-job workers in Figure C.8(b) is somewhat exaggerated.

Figure C.8: Size of Firms that Employ Secondary Workers

(a) N of Employees (b) N of Mini-Job Workers (c) N of Full-Time Workers



Notes: This figure shows the number of employees working at firms that employ secondary workers over time (logarithmic scale). Number of employees is the sum of full-time employees (c), part-time employees (omitted), and mini-job workers (b). The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

D Substitution

D.1 What Happened to €400-€1000 secondary jobs?

Figure 3 shows a decrease in the number of €400-€1000 secondary jobs. In this section, I explore what happened to these workers and to the firms that hired them.

In Figure D.9(a), I explore what happens to individuals who held €400-€1000 secondary jobs in January-March 2003 in the following years. Specifically, I investigate whether these individuals kept the secondary job after the reform, and if yes, how much it paid and whether it was with the same employer. I use a balanced panel of individuals, since otherwise the series suffer from selection due to differential attrition, and are very hard to interpret. Figure D.9(a) shows that a large share of individuals with €400-€1000 secondary jobs converted these jobs into smaller mini-jobs, often with the same employer. However, a nontrivial number continued holding €400+ jobs.

In Figure D.9(b), I explore what happened to the establishments that these individuals worked at. Specifically, I investigate the number of employees – total,

full time, and mini-job workers – that these establishments report to the social security agency as of June 30 each year.[17] Focusing on the employers, we see a clear increase in the number of mini-job workers (from 76 on average to around 100), no change in the number of full-time employees, and no change or a small increase in the number of total employees. The results based on averages suggest that the reform did not lead to a larger number of workers, and that full-time jobs were not cut into smaller mini-jobs, but that €400+ part-time jobs were most likely converted into small mini-jobs.

The results of Figure D.9(b), unfortunately, are subject to one important caveat: the data is provided by the firms, who define mini-job workers based on the official threshold definition. Practically, this means that workers who held €400 employments before April 2003 were counted as regular part-time workers, but as mini-job workers after the reform. In other words, if these firms did not change their policies but were employing workers with earnings between €325 and €400, then Figure D.9(b) would still show an increase in the number of mini-job workers. This means that firm-provided employment information can only be used as a suggestive evidence.

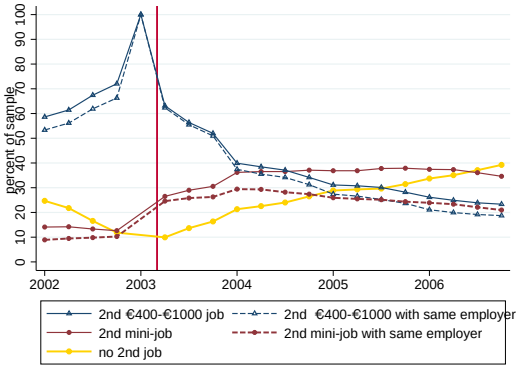
D.2 Are Primary Earnings Substituted with Secondary?

To test primary earnings substitution formally, I apply a difference-in-differences approach to two distinct comparison groups, as in Figure 6(a). First, I compare changes in primary earnings for individuals who obtained new €0-€400 secondary jobs to changes in primary earnings of individuals with new secondary jobs paying more than €400. 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. Second, I compare changes in primary earnings for individuals who have obtained new secondary mini-jobs ($\leq$€400) to changes in primary earnings of individuals who did not obtain a new secondary job. Because this second specification relies on almost all

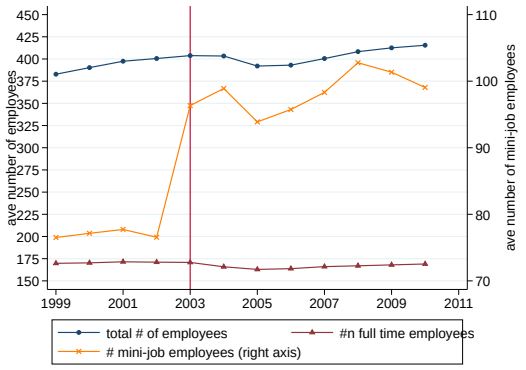
[17] The downside of the data is that it represents a panel of individuals rather than firms. Practically, that means that I cannot observe all individuals working at a given firm. Hence, comprehensively looking at firms that have employed secondary job holders prior to the reform with monthly pay between €400 and €1000 is not feasible.

Figure D.9: What happens to pre-reform €400-€1000 job holders and their firms?

(a) Individuals



(b) Firms



Notes: (a) Shows secondary job holding rates for a balanced panel of individuals who held a €400-€1000 secondary job in January-March 2003. (b) Shows the number of employees (total, full-time and mini-job) for a balanced panel of firms who were employing at least one €400-€1000 secondary job worker in January-March 2003.

individuals reaching computational limits, I estimate it on a random 75% sample of the data.

Formally, I estimate

$$Outcome_{it} = \beta_1 + \sum_{t=1999}^{2010} \beta_{2t}\delta_t + \sum_{t=1999}^{2010} \beta_{3t}(Treat_{it} \times \delta_t) + \gamma X_{it} + \varepsilon_{it}, \qquad (8)$$

$Treat_{it}$ is equal to one for individuals with new secondary jobs paying less than €400 per month, and zero otherwise. $Outcome_{it}$ considers several behaviors. Define $\Delta PrimaryEarnings_{it} = PrimaryEarnings_{it} - PrimaryEarnings_{i(t-12)}$. First, $Outcome_{it} = P(\Delta Primary\_Earnings_{it} < 0)$. In this case, specification (8) compares the likelihoods of having an earnings decrease. Next, I set $Outcome_{it} = P(\Delta Primary\_Earnings_{it} \in [-350, -450]))$. In other words, I investigate whether the likelihood of primary earnings decreases of approximately €400 became more prevalent among new secondary mini-job holders after the reform. Finally, I consider $Outcome_{it} = \Delta PrimaryEarnings_{it}$, so $Outcome_{it}$ 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, the coefficients

β_{3t} will be positive and statistically significant for $t >= 2003$ in the first two specifications, and negative and statistically significant in the third specification. For the identification approach to be valid, earnings changes should follow a similar trend for individuals with low-paying new secondary jobs, as well as for individuals with high-paying secondary jobs. This parallel trend assumption can be verified in Table D.4 and appears to hold approximately.

Table D.4: Are Primary Earnings Reduced?

			Outcome variable:					
Decrease			**Decrease ∈(-€450,-€350)**			**Δ primary earnings**		
year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.
Control group 1 – individuals with new secondary jobs paying €400+ per month.								
2000	4.22	(2.56)	2000	-1.00	(0.9)	2000	7.74	(27.25)
2001	-0.87	(2.33)	2001	-0.54	(0.79)	2001	-2.23	(22.33)
2003	3.83	(2.39)	2003	-0.99	(0.95)	2003	-38.51	(25.45)
2004	4.11	(2.78)	2004	0.07	(1.01)	2004	33.28	(31.08)
2005	2.95	(2.84)	2005	-1.07	(1.06)	2005	-4.88	(31.84)
2006	-0.98	(2.77)	2006	0.34	(1.09)	2006	-20.08	(32.72)
2007	0.78	(2.59)	2007	-0.24	(1.01)	2007	-22.94	(31.74)
2008	3.76	(2.58)	2008	-1.65	(1.08)	2008	-23.64	(30.13)
2009	8.09	(2.86)	2009	-1.38	(1.05)	2009	-46.60	(32.48)
2010	1.32	(3.01)	2010	-0.49	(1.05)	2010	-14.30	(37.56)
Number of Observations: 412,784								
Control group 2 – individuals with no secondary jobs								
2000	-1.96	(0.72)	2000	0.05	(0.2)	2000	-15.79	(7.69)
2001	-0.01	(0.69)	2001	-0.15	(0.19)	2001	-8.39	(6.63)
2003	0.23	(0.63)	2003	-0.11	(0.18)	2003	-19.84	(5.88)
2004	-0.57	(0.62)	2004	-0.06	(0.17)	2004	-6.34	(5.9)
2005	-0.68	(0.63)	2005	0.00	(0.18)	2005	-20.49	(6.09)
2006	-0.46	(0.62)	2006	-0.17	(0.17)	2006	-31.29	(6.08)
2007	-0.10	(0.61)	2007	-0.14	(0.17)	2007	-28.70	(6.11)
2008	0.21	(0.62)	2008	0.06	(0.17)	2008	-29.64	(6.18)
2009	0.69	(0.62)	2009	0.19	(0.19)	2009	-20.02	(6.25)
2010	1.04	(0.62)	2010	0.14	(0.18)	2010	-27.98	(6.47)
Number of Observations: 14,788,503								
Pre-reform average: 23.4%			Pre-reform average: 1.3%			Pre-reform average: €359		

Notes: Treatment group – individuals with new secondary jobs paying less than €400 per month. Control group 1 – individuals with new secondary jobs paying more than €400 per month. Control group 2 – individuals with no secondary jobs. The table lists the pre-reform average of the outcome variable for the treatment group. Standard errors clustered by individual. For more details see Section D.2.

E Calculating the Fiscal Costs

The calculations shown in Figure 7(b) (which is equivalent to Figure E.10(d) below) account for all fiscal changes due to the 2003 reform. Let $\bar{w}^t_{w_2\leq 400}$ (or $\bar{w}^t_{w_2>400}$) represent average secondary wages in year $t = 2005, 2010$ of individuals with secondary jobs paying less or equal to €400 per month (or between €400 and €1000). Similarly, let $N^t_{w_2\leq 400}$ (or $N^t_{w_2>400}$) denote the number of individuals with secondary jobs paying less or equal to €400 per month (or between €400 and €1000). Let τ^t_{RSS}, τ^t_{ESS} and $\bar{\tau}^t_{Income}$ denote employer social security tax in year t, employee social security tax in year t, and individuals' average marginal income tax rate, respectively. To construct Figure E.10(d) for each income group, I calculate the total change in tax revenue as the sum of the following three elements:

1. Tax revenue collected on all ≤€400 secondary jobs in a given after-reform year t (calculated as $N^t_{w_2\leq 400}\cdot\bar{w}^t_{w_2\leq 400}\cdot\tau^t_{RSS}$);
2. Minus tax revenue collected on all ≤€400 secondary jobs that existed in 2002 (calculated as $N^{2002}_{w_2\leq 400}\cdot\bar{w}^{2002}_{w_2\leq 400}\cdot(\tau^{2002}_{RSS}+\tau^{2002}_{ESS}+\bar{\tau}^{2002}_{Income})$;
3. Minus tax revenue change on all €400-€1000 secondary jobs (calculated as $N^t_{w_2>400}\cdot\bar{w}^t_{w_2>400}\cdot(\tau^t_{RSS}+\tau^t_{ESS}+\bar{\tau}^t_{Income})-N^{2002}_{w_2>400}\cdot\bar{w}^{2002}_{w_2>400}\cdot(\tau^{2002}_{RSS}+\tau^{2002}_{ESS}+\bar{\tau}^{2002}_{Income})$.

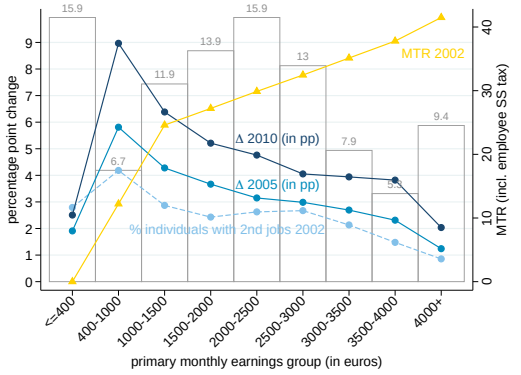
For individuals with primary earnings of less than €400, I calculate the fiscal costs based on individuals whose combined earnings exceed the mini-job threshold, thus making them liable for income and social security taxes.

Figure E.10(c) is constructed similarly, except $\tau^t_{RSS} = 0$ for all t, thus it does not account for changes in employer tax revenues. Figure E.10(e) is constructed similarly, except $N^t_{w_2\geq 400} = 0$ and therefore the calculations do not account for the revenue loss due to the reduced number of €400-€1000 jobs. Figure E.10(f) is constructed similarly, except $N^t_{w_2\leq 400}$ is measured based on estimates of Figure 10(a)-(c). Figure E.10(g) sets $\tau^t_{RSS} = \tau^{2002}_{RSS}$, $\tau^t_{ESS} = \tau^{2002}_{ESS}$, $\tau^t_{Income} = \tau^{2002}_{Income}$, $\bar{w}^t_{w_2\leq 400} = \bar{w}^{2002}_{w_2\leq 400}$ and $\bar{w}^t_{w_2>400} = \bar{w}^{2002}_{w_2>400}$. Finally, Figure E.10(h) sets $\tau^{2002}_{RSS} = \tau^{2010}_{RSS}$, $\tau^{2002}_{ESS} = \tau^{2010}_{ESS}$, $\tau^{2002}_{Income} = \tau^{2010}_{Income}$, $\bar{w}^{2002}_{w_2\leq 400} = \bar{w}^{2010}_{w_2\leq 400}$ and $\bar{w}^{2002}_{w_2>400} = \bar{w}^{2010}_{w_2>400}$.

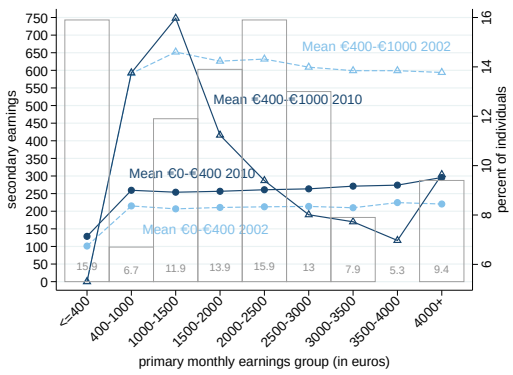
Note that the solid lines measure revenue per job created, while the dashed lines measure total revenue changes.

Figure E.10: Who Benefited from the Reform? Distributional Effects

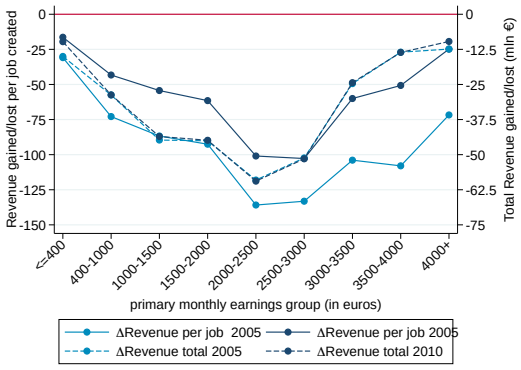
(a) Moonlighting Rates by Income Group



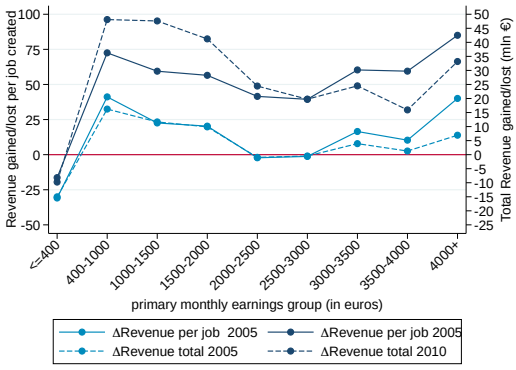
(b) Secondary Mini-job Earnings



(c) Employee Taxes Only



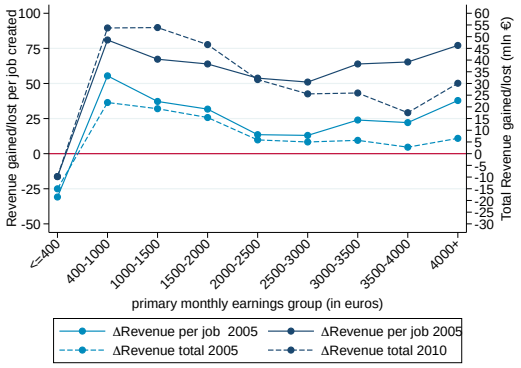
(d) Full Fiscal Costs



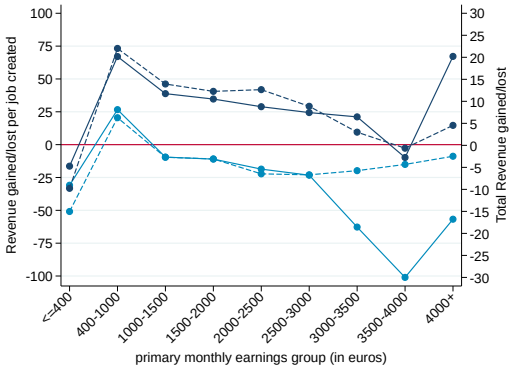
Notes: Figure (a) shows the number of individuals with €0-€400 secondary jobs in 2002 in dashed light blue, the increase in the number of such secondary jobs from 2002 to 2005 in percentage points in light blue, and from 2002 to 2010 in dark blue. The yellow curve (right scale) shows the corresponding marginal tax rates in 2002. The vertical bars in the background show the relative shares of the population in each income bin in 2002. Figure (b) shows average mini-job (€0-€400) and midi-jobs (€400-€1000) by income group. Figure (c) shows the fiscal costs of the reform not account for fiscal externalities due to increased employer revenue. Figure (d) shows the total fiscal gain (if positive) or fiscal cost (if negative) of the reform. The solid lines measure revenue change per job created, while the dashed lines measure the total cost, scaled from the data's 2% sample to reflect full population. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure E.10: Continued: Who Benefited from the Reform?

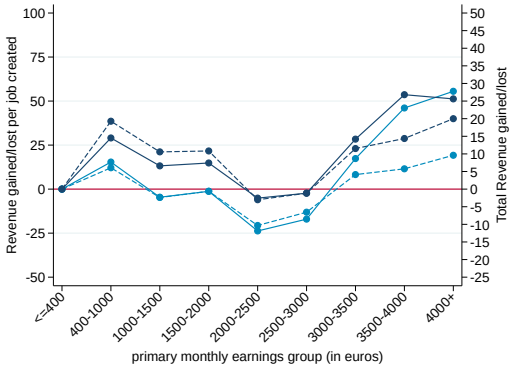
(e) Full Costs on ≤400 Jobs Only



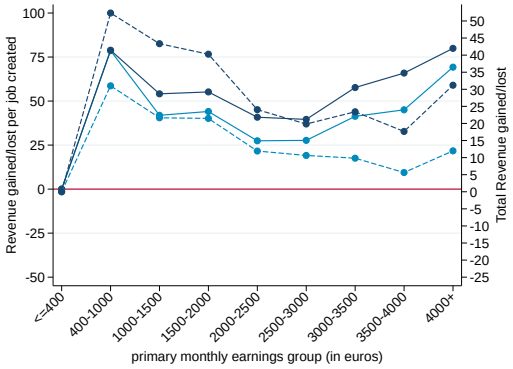
(f) Full Causal Fiscal Costs



(g) Holding 2003 Rules Constant



(h) Holding 2010 Rules Constant

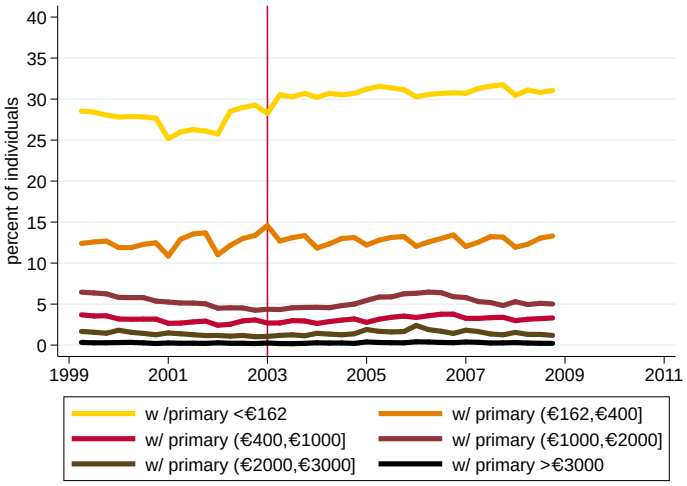


Notes: Figure (e) shows the fiscal gain (if positive) or fiscal cost (if negative) of the reform, but disregarding revenue changes due to €400+ jobs. Figure (f) calculates fiscal gains/costs but using causal estimates from Figure 10(a)-(c). Figure (g) holds tax rates and average mini-job earnings at the 2002 level. Figure (h) holds tax rates and average mini-job earnings at the 2010 level. The solid lines measure revenue change per job created, while the dashed lines measure the total cost, scaled from the data's 2% sample to reflect full population. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

F Results: Take-Up of Secondary Jobs

The main threat to using current income to define treatment and control groups is the possibility that individuals will self-select into a different primary income group in order to take advantage of the secondary job holding rules. Figure F.11 explores this possibility for individuals who have earned less than €162 in some year. Specifically, the identification approach will result in biased estimates if individuals with very small earnings (less than €162) try to take advantage of the 2003 reform by increasing their earnings above €400 in order to qualify for the secondary job tax break. Figure F.11 plots the share of individuals who hold primary employment with earnings of less than €162, between €162 and €400, etc, 2 years after earning €162 or less. The results show that the likelihood of moving into higher income groups remained the same after the reform, thus providing evidence against such selection.

Figure F.11: Income Group Switches



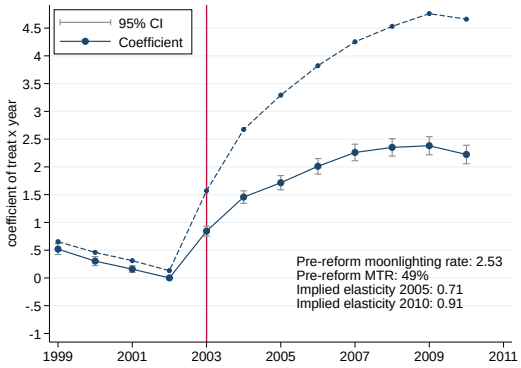
Notes: This figure plots the share of individuals who hold primary employment with earnings of less than €162, between €162 and €400, etc, 2 years after earning €162 or less. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010,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

Figure F.12 shows the results of estimating specification (4) on the full sample, i.e. the treatment group consists of individuals with earnings between €400 and €4000 in January-March 2003 in Figure F.12(a) and with earnings greater

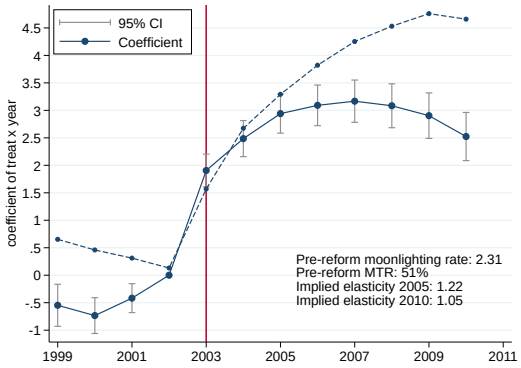
than €400 in Figure F.12(b).

Figure F.12: Results: Take Up of Secondary Jobs

(a) Control group: Primary >€4000



(b) Control group: Primary <€162



Notes: This figure plots estimates and 95% confidence intervals of coefficients β_{3t} of specification (5). The pre-reform rates differ because the treatment groups differ. The treatment group in Figure (a) includes individuals with primary earnings of €400 to €4000 in Jan-Mar 2003. The treatment group in Figure (b) includes individuals with contemporaneous primary earnings of €400+. The dashed line shows a simple difference between the secondary mini-job holding rate in a given year minus in Jan-March 2003. Year 2002 is omitted. The vertical red line identifies the 2003 tax reform. Coefficients and standard errors are reported in Table F.5. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table F.5: Results: Take Up of Secondary Jobs (for Figures F.12 and 10)

Altogether: €400-€4000			**€400-€1000**			**€1000-€3000**			**€3000-€4000**		
year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.
Control group 1 – individuals with primary earnings of €4000+ in Jan-Mar 2003.											
1999	0.52	(0.05)	1999	-0.02	(0.14)	1999	0.59	(0.05)	1999	0.36	(0.07)
2000	0.3	(0.04)	2000	-0.12	(0.12)	2000	0.33	(0.04)	2000	0.28	(0.06)
2001	0.16	(0.03)	2001	-0.22	(0.09)	2001	0.17	(0.03)	2001	0.19	(0.04)
2003	0.84	(0.05)	2003	1.5	(0.12)	2003	0.88	(0.05)	2003	0.45	(0.06)
2004	1.46	(0.06)	2004	2.44	(0.15)	2004	1.54	(0.06)	2004	0.76	(0.08)
2005	1.71	(0.07)	2005	3.02	(0.17)	2005	1.81	(0.07)	2005	0.88	(0.09)
2006	2.01	(0.07)	2006	3.45	(0.18)	2006	2.11	(0.08)	2006	1.12	(0.1)
2007	2.26	(0.08)	2007	3.88	(0.19)	2007	2.36	(0.08)	2007	1.31	(0.1)
2008	2.35	(0.08)	2008	4.02	(0.2)	2008	2.45	(0.08)	2008	1.39	(0.11)
2009	2.38	(0.08)	2009	4.33	(0.2)	2009	2.45	(0.09)	2009	1.43	(0.11)
2010	2.22	(0.08)	2010	4.21	(0.21)	2010	2.27	(0.09)	2010	1.36	(0.12)
Number of Observations: 18,230,678			Number of Observations: 3,599,200			Number of Observations: 13,998,585			Number of Observations: 5,378,015		
Altogether: €400+			**€400-€1000**			**€1000-€3000**			**€3000-€4000**		
year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.
Control group 2 – individuals with primary earnings of (€0,€162).											
1999	-0.55	(0.2)	1999	0.82	(0.24)	1999	-0.09	(0.2)	1999	0.22	(0.21)
2000	-0.73	(0.17)	2000	0.24	(0.2)	2000	-0.43	(0.17)	2000	-0.1	(0.18)
2001	-0.42	(0.13)	2001	-0.03	(0.16)	2001	-0.25	(0.14)	2001	-0.16	(0.14)
2003	1.91	(0.15)	2003	2.74	(0.19)	2003	2.03	(0.15)	2003	1.49	(0.16)
2004	2.49	(0.17)	2004	3.94	(0.22)	2004	2.75	(0.17)	2004	1.63	(0.19)
2005	2.94	(0.18)	2005	4.8	(0.25)	2005	3.24	(0.19)	2005	1.88	(0.21)
2006	3.09	(0.19)	2006	5.36	(0.26)	2006	3.44	(0.19)	2006	2	(0.23)
2007	3.17	(0.2)	2007	5.71	(0.27)	2007	3.55	(0.2)	2007	2.09	(0.24)
2008	3.08	(0.2)	2008	5.95	(0.29)	2008	3.58	(0.21)	2008	1.98	(0.25)
2009	2.9	(0.21)	2009	5.95	(0.3)	2009	3.47	(0.22)	2009	1.46	(0.27)
2010	2.52	(0.22)	2010	5.95	(0.32)	2010	3.09	(0.23)	2010	1.19	(0.28)
Number of Observations: 23,007,700			Number of Observations: 2,881,005			Number of Observations: 14,861,756			Number of Observations: 4,578,490		

Notes: This table lists estimates and 95% confidence intervals of coefficients β_{3t} of specification (5). The header for each column group lists the primary earnings range of the treatment group. Control group 1 results: treatment and control groups are based on earnings in January-March 2003, with €4000+ serving as the control group. Control group 2 results: assign treatment and control groups are based on current quarter earnings with the €0-€162 group serving as the control. Year 2002 is omitted. The vertical red line identifies the 2003 tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table F.6: Results: Take Up of Secondary Jobs (for Figure 8)

Control group: Large Secondary Jobs			Control group: Primary Mini-Jobs		
year	coefficient	s.e.	year	b	se
1999	0.52	0.08	1999	0.51	0.06
2000	0.28	0.06	2000	0.3	0.04
2001	-0.01	0.03	2001	0.16	0.03
2003	1.31	0.14	2003	0.83	0.14
2004	1.83	0.09	2004	1.19	0.09
2005	2.26	0.06	2005	1.4	0.07
2006	2.09	0.07	2006	1.57	0.07
2007	1.98	0.07	2007	1.77	0.06
2008	2.05	0.05	2008	1.93	0.05
2009	2.11	0.06	2009	1.96	0.05
2010	2.00	0.06	2010	2.00	0.05
Number of Observations: 92			Number of Observations: 92		

Notes: This table lists estimates and 95% confidence intervals of coefficients β_{3t} of specification (4). The header for each column group lists the the control group: either the number of individuals with large (i.e. €1000+) secondary jobs, or the number of small (i.e €400 or less) primary jobs. In both cases, the treatment observations measure the number of secondary €0-€400 jobs. Year 2002 is omitted. Specification (4) is estimated on 92 quarterly observations. The vertical red line identifies the 2003 tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.