Online Appendix
"Increasing Hours Worked: Moonlighting Responses to a Large Tax Reform" by Alisa Tazhitdinova

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

Figure A.1: GDP and Unemployment Rate in Germany
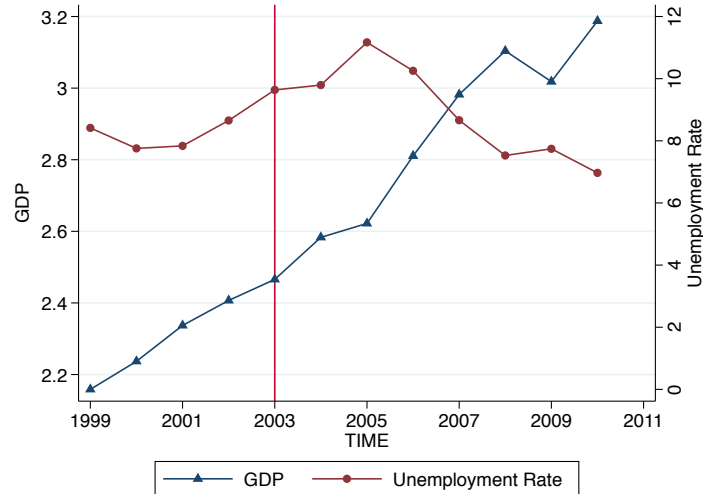
Notes: GDP in trillion 2019 USD, and unemployment rate in percent, both from OECD.org.

Hartz III reforms abolished restrictions on the maximum duration of temporary employment, and increased exemption threshold from dismissal protection from 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

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

	Before April 2003	After April 2003
Primary + Secondary ≤ €325	no tax	no tax
€325 < Primary + Secondary ≤ €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 ≤€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%.

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-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. (forthcoming)).

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 | | | | | | |
| | Employee | Employer | Employee | Employer | | First Linear Progressive Zone | | Second Linear Progressive Zone | | Higher Income Zone | |
Year	Tax	Tax	Tax	Tax	Tax-free 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
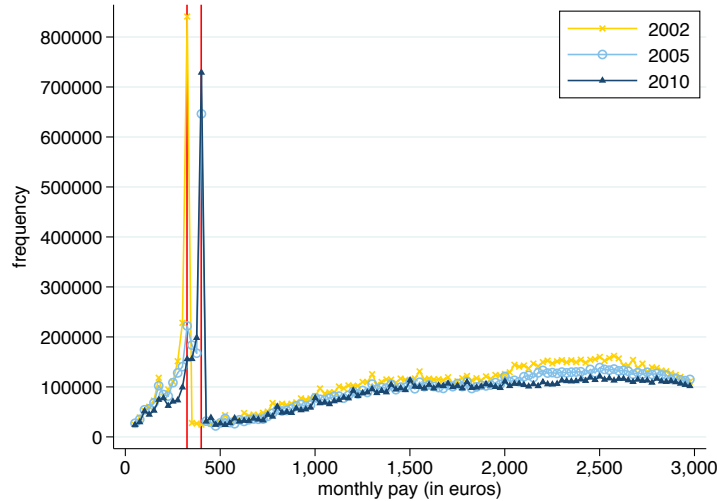
Notes: This figure shows the distribution of primary earnings in Germany in 2002, 2005 and 2010. The vertical red lines mark the mini-job threshold: €325 prior to April 2003 and €400 thereafter. *Source*: Tazhitdinova (2020).

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 ≥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.

46

B Calibration

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

$$U = c - \frac{A}{1+1/\varepsilon}\left(\frac{h_1 + h_2}{A}\right)^{1+1/\varepsilon} \quad \text{s.t.} \quad c = (1-\tau_1)w_1 h_1 + (1-\tau_2)w_2 h_2, \quad (7)$$

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 $(1-\tau_1)w_1 > (1-\tau_2)w_2$.
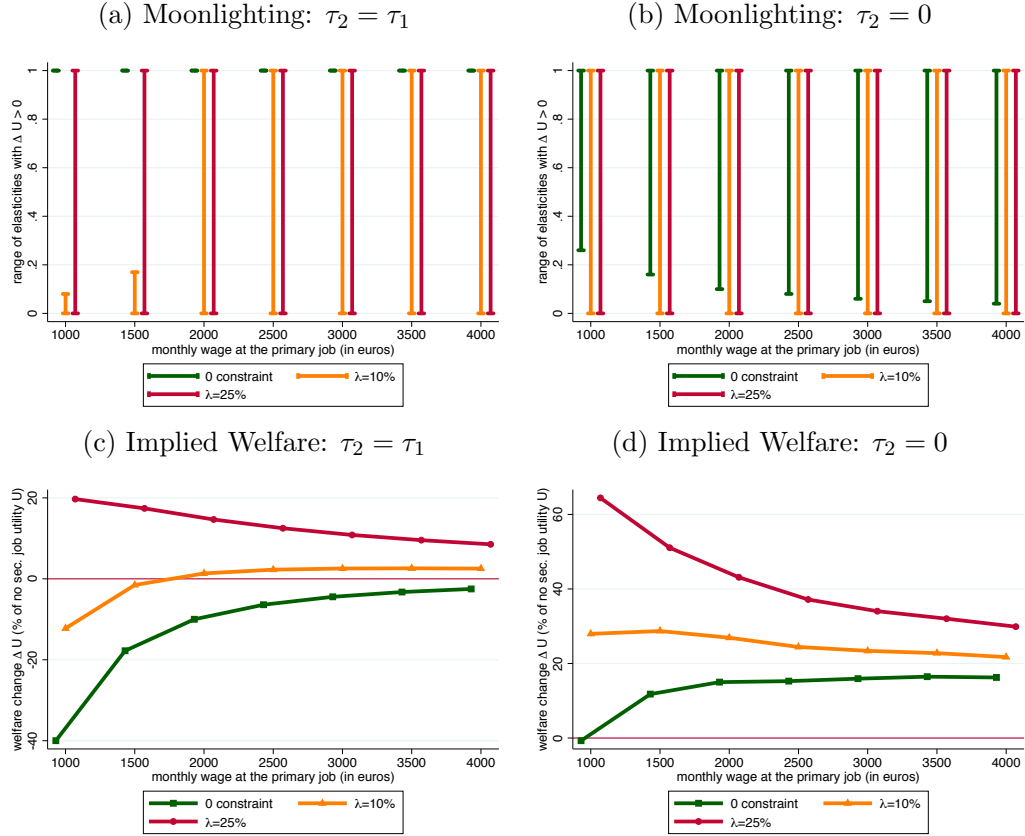
I assume that individuals ideally want to work 173 hours per month, which is equivalent to 40 hours per week. In other words, I set $h_1^* = 173$. I then assume that they actually work $\hat{h}_1 = (1-\lambda)h_1^*$ and consider $\lambda = 0, 0.1, 0.25$. I vary individuals' total earnings $h_1^* w_1$ 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 $w_1 h_1^*$.

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

$$U(\hat{h}_1, h_2) - U(\hat{h}_1, 0) \approx (1-\tau_2)w_2 h_2 - \frac{h_2}{\hat{h}_1}\left[1 + \frac{1}{2}\frac{1}{\varepsilon}\frac{h_2}{\hat{h}_1}\right] A\left(\frac{\hat{h}_1}{A}\right)^{1+1/\varepsilon}.$$

In both Figure 1 and B.3, $w_2 h_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.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
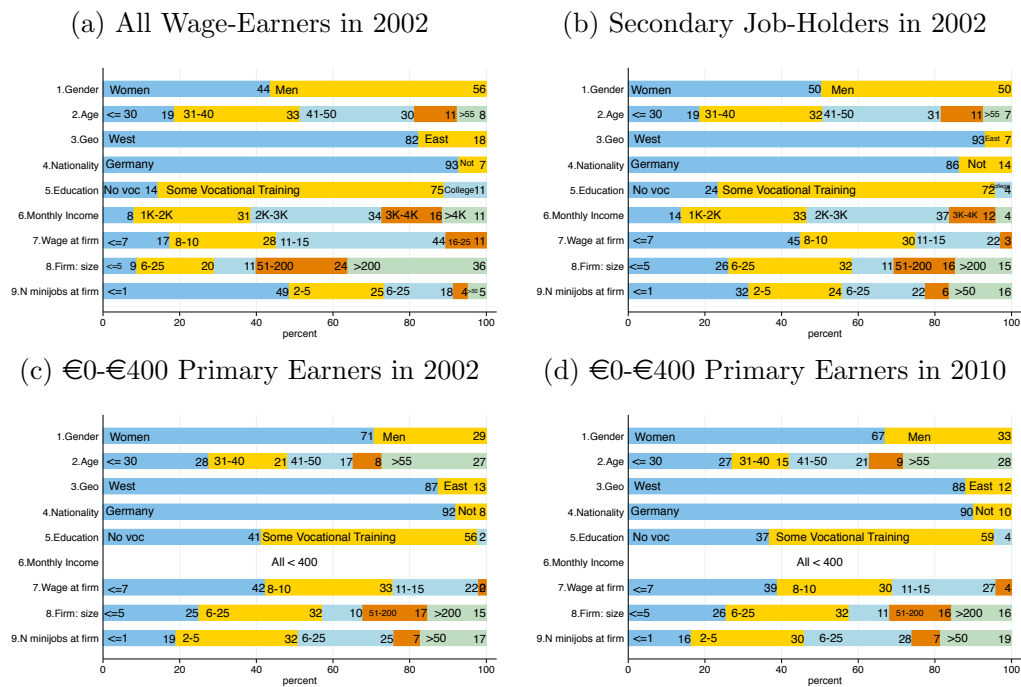
Notes: These figures provide demographic characteristics in 2002 of (a) all wage earners with primary monthly earnings greater than €400, or (b) secondary job holders with primary monthly earnings greater than €400 and secondary monthly earnings of €400 or less, or (c) all primary earners with primary 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(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 slightly less common. Interestingly, this pattern is not specific to any particular income group. Regardless of individuals' primary income earnings level, most €0-€400 jobs are in low-skill occupations: watchmen, custodians, waiters, cleaners, warehouse and transport workers, drivers, salespersons, office workers. Of course, the relative shares of each occupation vary across income groups. Note that higher-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. For individuals with primary earnings of €400 or less, the primary and secondary occupations match in approximately 40% cases, this match rate decreases for individuals with higher levels of primary incomes. 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.5: Most Common Secondary Job Occupations and Industries

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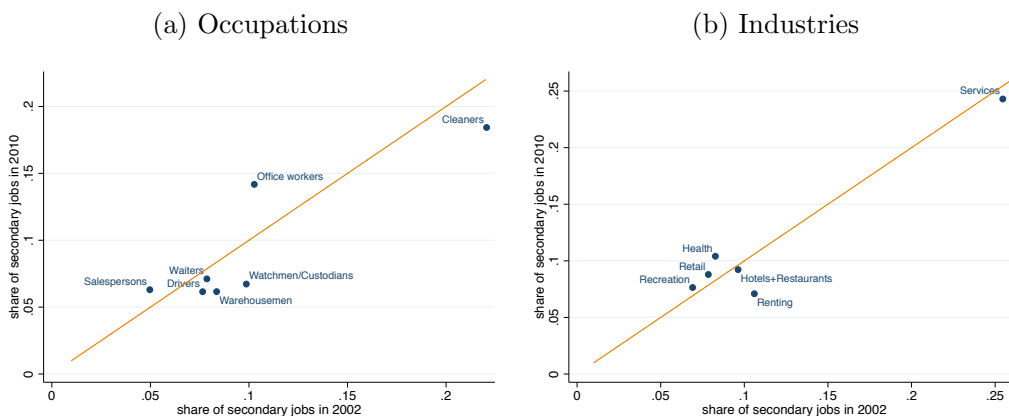
Notes: These figures show the most common occupations and industries of secondary jobs and their respective labor market shares in 2002 and 2010. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Finally, Figure C.6 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.6 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.6 does not provide empirical support for the evasion channel, but also does not rule it out completely.

The results of Figure C.6(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.6(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.6(b) is somewhat exaggerated.

Figure C.6: Size of Firms that Employ Secondary Workers

(a) N of Employees (b) N of Mini-Job Workers (c) N of Full-Time Workers
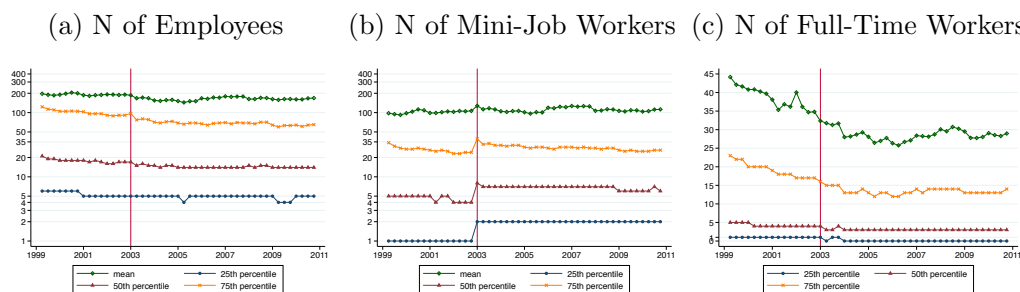
Notes: This figure shows the number of employees working at firms that employ secondary workers over time (logarithmic scale). Number of employees is the sum of full-time employees (c), part-time employees (omitted), and mini-job workers (b). The vertical red line identifies the tax reform. *Source*: 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.7(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.7(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.7(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.[19] 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.7(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

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[19] 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.

change their policies but were employing workers with earnings between €325 and €400, then Figure D.7(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.

Figure D.7: What happens to pre-reform €400-€1000 job holders and their firms?

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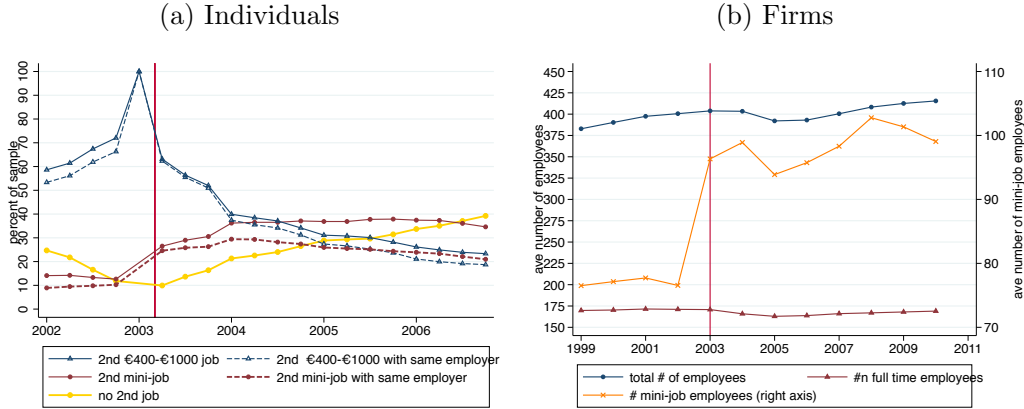
Notes: (a) Shows secondary job holding rates for a balanced panel of individuals who held a €400-€1000 secondary job in January-March 2003. (b) Shows the number of employees (total, full-time and mini-job) for a balanced panel of firms who were employing at least one €400-€1000 secondary job worker in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

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 (≤€400) to changes in primary earnings of individuals who did not obtain a new secondary job. Because this second specification relies on almost all individuals, it reaches data center's computational limits, so I estimate it on a random 75% sample of the data.

Formally, I estimate

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

$Treat_{it}$ is equal to one for individuals with new secondary jobs paying less than €400 per month, and zero otherwise; δ_t are year-t dummies. $Outcome_{it}$ considers several behaviors. Define $\Delta PrimaryEarnings_{it} = PrimaryEarnings_{it} - PrimaryEarnings_{i(t-1)}$, i.e. change in earnings from one year ago.

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. Overall, Table D.4 does not provide evidence of a statistically and economically significant decrease in primary earnings among new secondary mini-job holders.

Table D.4: Are Primary Earnings Reduced?

| | Outcome variable: | | | | | | | |
| | Decrease | | | Decrease $\in$(-€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.8(c) 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 earnings in year $t = 2002, 2005, 2010$ 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.8(c) 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. Plus 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 primary and secondary earnings exceed the mini-job threshold, thus making them liable for income and social security taxes.

Figure E.8(d) is constructed similarly to figure (c), but calculates $N^{2005}_{w_2 \leq 400}$ and $N^{2010}_{w_2 \leq 400}$ by scaling $N^{2002}_{w_2 \leq 400}$ up using estimates of Table F.7. Therefore, these calculations disregard changes in the number of people in the workforce. All other revenue components are measured as in Figure (c).

Figure E.8(e) is constructed similarly to figure (c), but calculating $N^{2005}_{w_2 \leq 400}$ and $N^{2010}_{w_2 \leq 400}$ based on population in 2005 and 2010 and estimates of Table F.7. Therefore, these calculations account for changes in the number of people in the workforce. All other revenue components are measured as in Figure (c).

Figure E.8(f) is constructed similarly to figure (c), except $\tau^t_{RSS} = 0$ for all t, thus it does not account for changes in employer tax revenues.

Figure E.8(g) is constructed similarly to figure (c), 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.8(h) sets $\tau_{RSS}^t = \tau_{RSS}^{2002}$, $\tau_{ESS}^t = \tau_{ESS}^{2002}$, $\tau_{Income}^t = \tau_{Income}^{2002}$, $\bar{w}_{w2\leq400}^t = \bar{w}_{w2\leq400}^{2002}$ and $\bar{w}_{w2>400}^t = \bar{w}_{w2>400}^{2002}$.

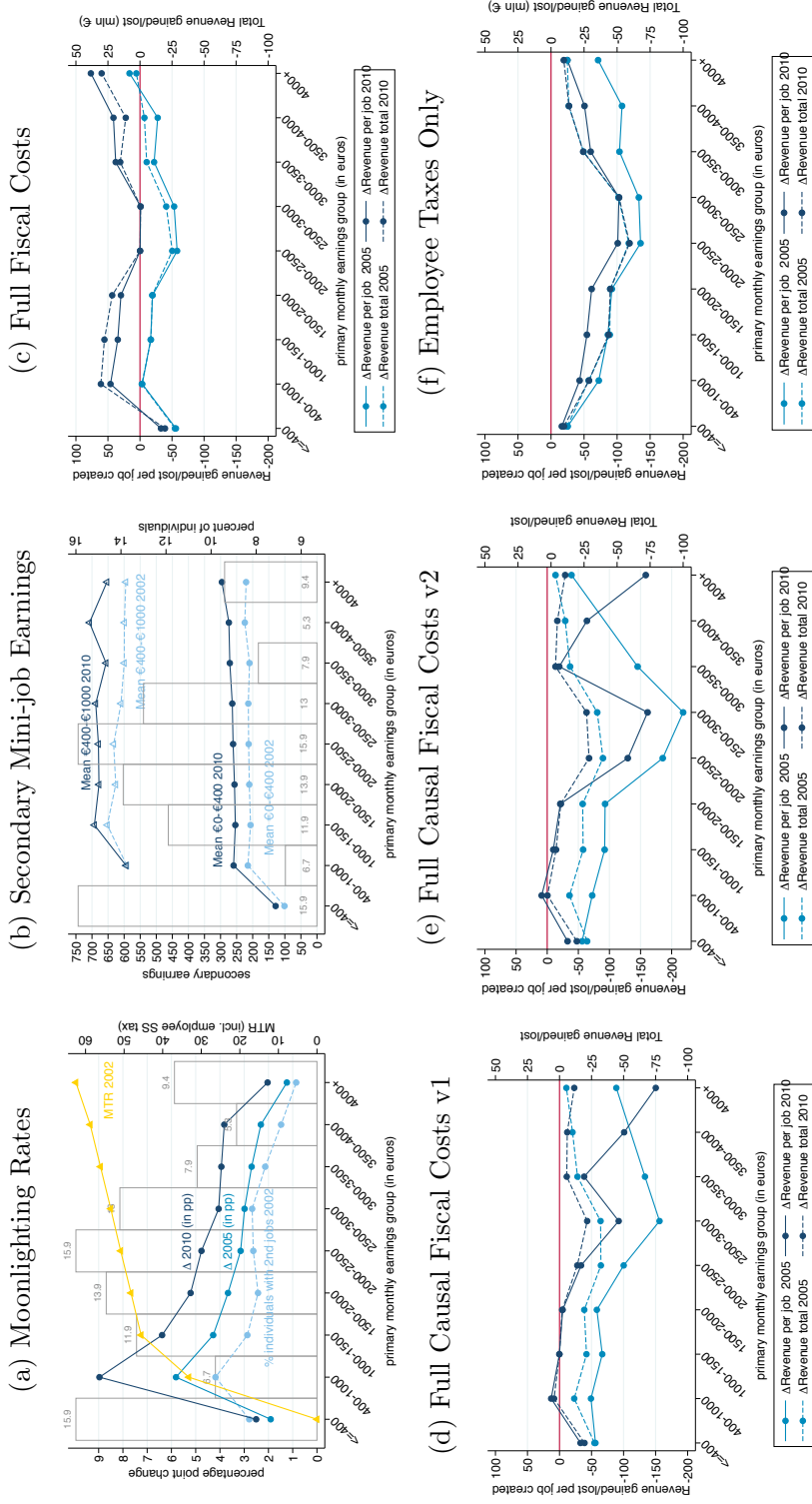Finally, Figure E.8(i) sets $\tau_{RSS}^t = \tau_{RSS}^{2010}$, $\tau_{ESS}^t = \tau_{ESS}^{2010}$, $\tau_{Income}^t = \tau_{Income}^{2010}$, $\bar{w}_{w2\leq400}^t = \bar{w}_{w2\leq400}^{2010}$ and $\bar{w}_{w2>400}^t = \bar{w}_{w2>400}^{2010}$.

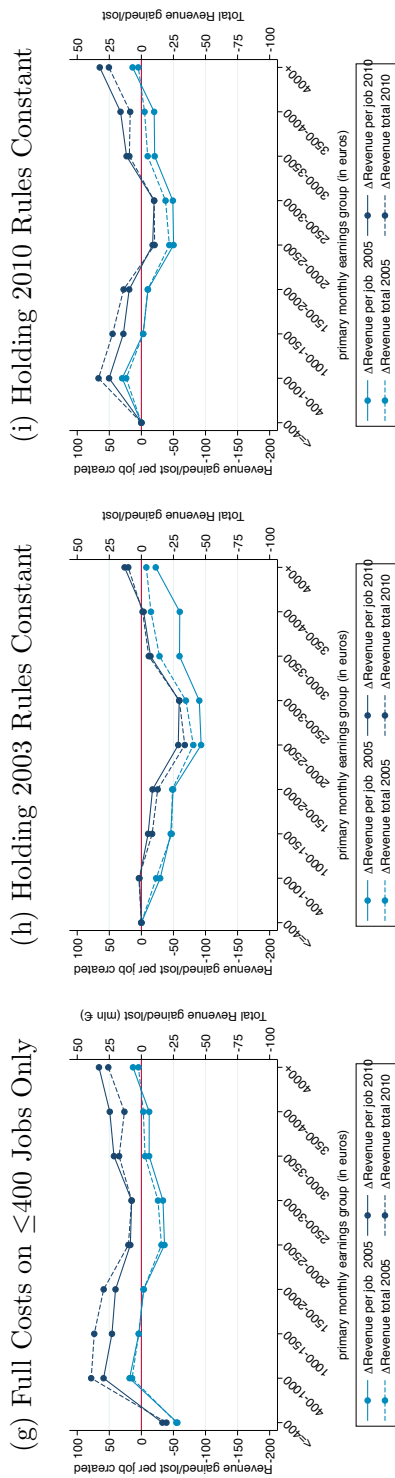Note that the solid lines measure revenue per job created (left axis), while the dashed lines measure total revenue changes (right axis).

Figure E.8: Who Benefited from the Reform? Distributional Effects

(a) Moonlighting Rates

(b) Secondary Mini-job Earnings

(c) Full Fiscal Costs

(d) Full Causal Fiscal Costs v1

(e) Full Causal Fiscal Costs v2

(f) Employee Taxes Only

Notes: see next page.

Figure E.8: Continued: Who Benefited from the Reform?

(g) Full Costs on ≤400 Jobs Only

(h) Holding 2003 Rules Constant

(i) Holding 2010 Rules Constant

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 earnings in secondary mini-jobs (€0-€400) and midi-jobs (€400-€1000) by income group. Figure (c) shows the total fiscal gain (if positive) or fiscal cost (if negative) of the reform. Figure (d) calculates fiscal gains/costs but using causal estimates from Table F.7 and holding population at 2002 level. The figure does not show the value of 2005 per job revenue for income group 3500-4000, which is -375. Figure (e) calculates fiscal gains/costs but using causal estimates from Table F.7 but allowing for population changes. The figure does not show the value of 2005 per job revenue for income group 3500-4000, which is -585. Figure (f) shows the fiscal costs of the reform not accounting for fiscal externalities due to increased employer revenue. The solid lines in (c)-(f) 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. Figure (g) shows the fiscal gain (if positive) or fiscal cost (if negative) of the reform, but disregarding revenue changes due to €400+ jobs. Figure (h) holds tax rates and average mini-job earnings at the 2002 level. Figure (i) holds tax rates and average mini-job earnings at the 2010 level. In figures (c)-(i), 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 in Section 4.2 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.9 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.9 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.9: Income Group Switches
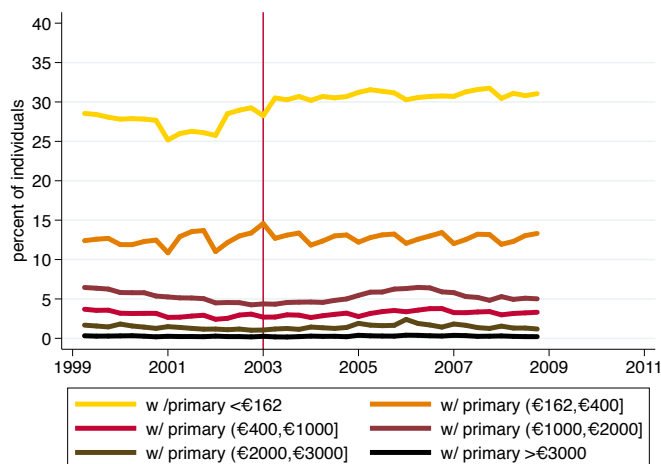
Notes: This figure plots the share of individuals who hold primary employment with earnings of less than €162, between €162 and €400, etc, 2 years after earning €162 or less. The vertical red line identifies the tax reform. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Figure F.10 shows the results of estimating specification (5) 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.10(a) and with earnings greater

than €400 in Figure F.10(b).

Figure F.10: Results: Take Up of Secondary Jobs

(a) Control group: Primary >€4000

(b) Control group: Primary <€162
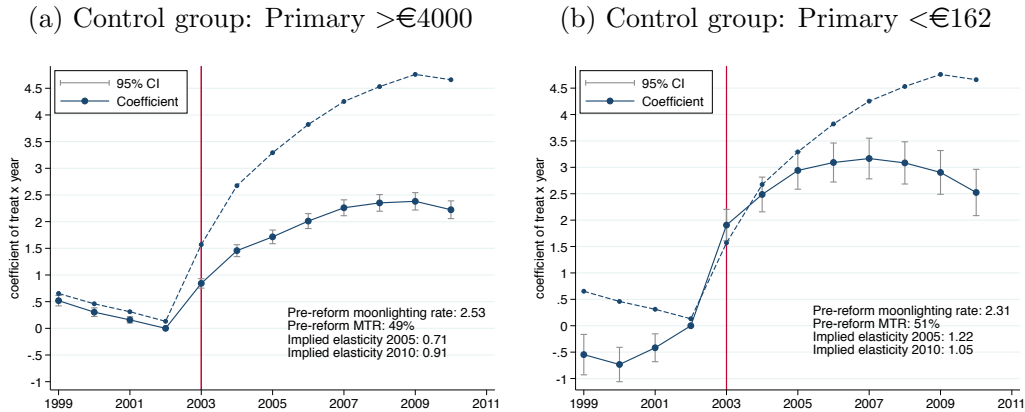
Notes: This figure plots estimates and 95% confidence intervals of coefficients β_{3t} of specification (5), measured in p.p. The pre-reform rates differ because the treatment groups differ. The treatment group in Figure (a) includes individuals with primary earnings of €400 to €4000 in Jan-Mar 2003. 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.

61

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

Control group 1 – individuals with primary earnings of €4000+ in Jan-Mar 2003.

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.
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		

Control group 2 – individuals with primary earnings of (€0,€162).

Altogether: €400+			€400-€1000			€1000-€3000			€3000-€4000		
year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.	year	coefficient	s.e.
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: 23,007,699			Number of Observations: 2,881,005			Number of Observations: 14,861,756			Number of Observations: 4,578,490		

Notes: This table lists estimates and standard errors of coefficients β_{3t} of specification (5), measured in p.p. 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: treatment and control groups are based on current quarter earnings with the €0-€162 group serving as the control. Year 2002 is omitted. *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.	scaled coefficient	scaled s.e.	year	coefficient	s.e.	scaled coefficient	scaled s.e.
1999	0.22	0.04	0.52	0.08	1999	0.22	0.03	0.51	0.06
2000	0.12	0.02	0.28	0.06	2000	0.13	0.02	0.30	0.04
2001	-0.01	0.01	-0.01	0.03	2001	0.07	0.02	0.16	0.03
2003	0.57	0.06	1.31	0.14	2003	0.36	0.06	0.83	0.14
2004	0.79	0.04	1.83	0.09	2004	0.52	0.04	1.19	0.09
2005	0.98	0.03	2.26	0.06	2005	0.61	0.03	1.40	0.07
2006	0.91	0.03	2.09	0.07	2006	0.68	0.03	1.57	0.07
2007	0.86	0.03	1.98	0.07	2007	0.77	0.03	1.77	0.06
2008	0.89	0.02	2.05	0.05	2008	0.83	0.02	1.93	0.05
2009	0.92	0.03	2.11	0.06	2009	0.85	0.02	1.96	0.05
2010	0.87	0.02	2.00	0.06	2010	0.87	0.02	2.00	0.05
Number of Observations: 92					Number of Observations: 92				

Notes: This table lists estimates and standard errors of coefficients β_{3t} of specification (4). Since regression coefficients measure percent changes, the table also shows the scaled coefficients shown in Figure 8 that measure percentage point changes. 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. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.

Table F.7: Results: Take Up of Secondary Jobs (for Figure E.8(d))

	Primary Income Group							
	400-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	3500-4000	4000+
1999	-0.02	0.42	0.69	0.67	0.41	0.43	0.23	0.19
	(0.14)	(0.09)	(0.08)	(0.08)	(0.08)	(0.09)	(0.09)	(0.21)
2000	-0.12	0.13	0.38	0.37	0.28	0.33	0.20	-0.09
	(0.12)	(0.08)	(0.07)	(0.06)	(0.06)	(0.07)	(0.08)	(0.17)
2001	-0.22	0.06	0.24	0.16	0.17	0.22	0.14	-0.22
	(0.09)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.14)
2003	1.5	1.11	1.09	0.86	0.57	0.59	0.23	0.94
	(0.12)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.16)
2004	2.44	1.87	1.8	1.5	1.16	0.95	0.45	0.64
	(0.15)	(0.10)	(0.09)	(0.08)	(0.08)	(0.09)	(0.10)	(0.19)
2005	3.02	2.29	2.07	1.75	1.37	1.15	0.44	0.56
	0.17	(0.11)	(0.1)	(0.09)	(0.10)	(0.11)	(0.12)	(0.21)
2006	3.45	2.62	2.42	2.12	1.57	1.34	0.77	0.42
	(0.18)	(0.12)	(0.11)	(0.10)	(0.10)	(0.12)	(0.13)	(0.22)
2007	3.88	2.95	2.63	2.39	1.81	1.56	0.92	0.24
	(0.19)	(0.13)	(0.12)	(0.11)	(0.11)	(0.12)	(0.14)	(0.24)
2008	4.02	3.07	2.8	2.46	1.88	1.68	0.92	0.11
	(0.2)	(0.13)	(0.12)	(0.11)	(0.12)	(0.13)	(0.14)	(0.25)
2009	4.33	3.21	2.91	2.44	1.71	1.71	0.98	-0.42
	(0.2)	(0.14)	(0.13)	(0.12)	(0.12)	(0.14)	(0.15)	(0.26)
2010	4.21	3.18	2.63	2.24	1.56	1.61	0.97	-0.71
	(0.21)	(0.14)	(0.13)	(0.12)	(0.12)	(0.14)	(0.15)	(0.28)
N of Obs.	3,599,200	4,700,035	5,231,394	5,815,532	5,369,307	4,241,632	3,508,944	4,029,417

Notes: This table lists estimates and standard errors of coefficients β_{3t} of specification (5), measured in p.p. The header for each column group lists the primary earnings range of the treatment group. For treatment groups with income levels under €4000 (i.e. all except the last column), the results are based on approach that uses €4000+ as the control group. For income group with earnings above €4000 (i.e. the last column), the results are based on the approach that uses individuals with current quarter earnings between €0 and €162 as the control. Year 2002 is omitted. *Source*: Sample of Integrated Labour Market Biographies (SIAB) 1975 - 2010, Nuremberg 2013.