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Moonlighting and the Minimum Wage

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Abstract

In this paper, we investigate the effects of the introduction of a nationwide minimum wage in Germany on main jobs, secondary jobs and their interaction by exploiting large-scale administrative data and variation in exposure to the minimum wage across jobs. While we find that the national minimum wage raised earnings but did not lower employment for both job types at an individual level, we document differential effects on working time adjustments: For main jobs, it increased the likelihood of upgrading marginal to regular jobs. For secondary jobs, it rather led to working hours reductions in order to maintain tax advantages. We also provide evidence that individuals holding more than one job (moonlighters) who experienced a minimum-wage-induced decline of working hours on their main job partially transferred hours to their secondary job instead.

Zusammenfassung

In diesem Beitrag untersuchen wir die Auswirkungen der Einführung eines flächendeckenden Mindestlohns in Deutschland auf Haupt- und Nebentätigkeiten und deren Wechselwirkung, indem wir umfangreiche administrative Daten und Variation in der Betroffenheit vom Mindestlohn über Tätigkeiten hinweg nutzen. Während wir bestätigen, dass der nationale Mindestlohn für beide Beschäftigungsarten die Verdienste auf individueller Ebene erhöht, aber die Beschäftigung nicht verringert hat, stellen wir fest, dass er unterschiedliche Auswirkungen auf die Anpassung der Arbeitszeit hatte: Bei Haupttätigkeiten erhöhte er die Wahrscheinlichkeit, dass geringfügige in reguläre Beschäftigung umgewandelt wurde. Bei Nebentätigkeiten führte er eher zu Arbeitszeitverkürzungen, um Steuervorteile zu erhalten. Darüber hinaus liefern wir Evidenz, dass Personen mit einer Nebenbeschäftigung, die einen mindestlohnbedingten Rückgang der Stundenzahl ihrer Haupttätigkeit erlebten, stattdessen diese Arbeitsstunden zumindest teilweise auf ihre Nebentätigkeit übertragen haben.

JEL classification

J23 - Labor Demand, J38 - Public Policy, J88 - Public Policy

Keywords

German national minimum wage, Secondary job holding, Difference-in-differences

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1 Introduction

Numerous contributions to the literature on minimum wages study the effects of this policy instrument on wages and employment. In doing so, almost all of this work takes a perspective centered on separate jobs. Specifically, when individual workers can be observed, most papers focus on the 'main' job of a worker – either due to data limitations or to simplify theoretical considerations and empirical approaches. However, 'Moonlighting' – i.e. having a secondary job next to a main job – is quite prevalent and on the rise, with shares ranging between 2.5 and 8.5 percent in European countries.[1] The perspective usually taken in the literature therefore ignores the realities of labor supply for a significant share of the working population and limits our ability to understand the effects of a minimum wage on an individual's overall work composition and labor income. It particularly overlooks the possibility that people with several jobs might be affected by and react to a minimum wage differently than single-job holders. The job-centered perspective thus prevents us from studying the effects of minimum wages on the allocation of working time across multiple jobs as well as the decision to moonlight at all.

In this article, we deliberately choose a worker-centered perspective and exploit high-quality administrative data to study the effects of the introduction of the German national minimum wage in 2015 on main jobs, secondary jobs, and their interaction. Our data enable us to estimate the effects of the policy on the job mix of affected workers by applying an individual-level difference-in-differences analysis, comparing trends in outcomes between workers earning less than the minimum wage (the treatment group) and considerably more (the control group, which should be largely unaffected) before the minimum wage introduction (Cengiz et al., 2019; Dustmann et al., 2022). To the best of our knowledge, our paper provides the first study of moonlighting in a minimum-wage context in Germany, and the first one using large-scale administrative data for any country, allowing for much more detailed analyses than previously possible. Our results therefore offer new and unique insights into how labor supply and demand interact in a multi-job setting.

In a first step of our empirical analysis, we document that gaining additional income is an important motive for moonlighting in Germany. Secondary jobs are also particularly strongly affected by the minimum wage. From a theoretical point of view, it appears plausible that a wage shock induced by the minimum wage influences main and secondary jobs differently and affects how workers allocate their working time across multiple jobs. We develop a simple yet insightful theoretical framework to support intuition regarding the potential adjustment mechanisms; see section 4 and Appendix 1: Model.

In a second step, we estimate the causal effects of the minimum wage on earnings, employment, and working time status (full-time vs part-time vs marginal employment) in both main and secondary jobs separately. For both main and secondary jobs, we find positive effects on earnings but no negative effects on employment probabilities. However, we find that main jobs react differently than secondary jobs when it comes to working time adjustments. Concerning

[1] As reported by Klinger and Weber (2020), based on data from the EU Labour Force Survey in 2018. Bailey and Spletzer (2021) find a share of 7.8 percent for the US in that year, while we report a share of 7.3 percent for Germany in this paper. The latter number is up from 6.0 percent in 2007, which highlights the increasing importance of moonlighting in Germany.

marginal employment as main job, we find that the minimum wage increases the likelihood to switch from marginal to regular employment in order to realize higher earnings at the new hourly wage level. Concerning marginal employment as secondary job, we find no such effect. Instead, we find that the minimum wage leads moonlighters to reduce hours worked on secondary jobs in order to maintain tax advantages.[2] Last but not least, concerning regular employment as main job, we find negative effects of the minimum wage on working hours for both moonlighters and non-moonlighters.

In a final step, we investigate how outcomes of secondary jobs react to minimum-wage-induced wage increases on the main jobs. Interestingly, a minimum wage treatment of the main job reduces not only the working time on the main job but also increases secondary earnings, even if the secondary job was already payed above the minimum wage before its introduction. At a binding minimum wage, this increase in secondary earnings points to affected moonlighters partially transferring working hours to their secondary jobs in response to a minimum-wage-induced decline of hours on their main jobs. We develop a rescaling procedure to quantify this 'hours-reallocation' effect and estimate (as a lower bound) that at least 9.4 percent of working hours reduced on the main job are transferred to the secondary job, on average. However, we find no evidence that the decision to moonlight itself is affected significantly by the minimum wage.

Our paper contributes to two strands of the literature in labor economics. First, regarding the literature on minimum wages, there has long been a focus on the effects of minimum wages on employment, with the last iteration of the (often controversial) discussion in the US exemplified by Neumark and Wascher (2017) and Allegretto et al. (2017). In Germany, early studies of the new national minimum wage found mostly little to no negative employment effects (Ahlfeldt et al., 2018; Caliendo et al., 2018; Garloff, 2019; Bossler and Gerner, 2020).[3] However, there is also a growing literature looking beyond and trying to dissect the mechanisms behind (the absence of negative) employment effects of minimum wages. This includes studies of working hours adjustments (e.g. Neumark et al., 2004, for the US; Stewart and Swaffield, 2008, for the UK; Biewen et al., 2022, for Germany), wage distributions and spillovers (Cengiz et al., 2019, for the US; Bossler and Schank, 2022, for Germany), price adjustments (Aaronson et al., 2018; Harasztosi and Lindner, 2019; Ashenfelter and Jurajda, 2022, for the US; Link, 2019, for Germany), the role of monopsony power (Azar et al., 2023; Popp, 2023) and non-compliance (Ashenfelter and Smith, 1979) as well as employer-reallocation effects of minimum wages (Dustmann et al., 2022, for Germany). In our paper, we study employment adjustments in a multiple-jobs setting. In particular, we explore another reallocation channel that has been barely studied at all – that minimum wages may not only lead to reallocation within or between firms, but also to shifts in labor supply between different jobs that the same worker holds. The only other paper we are aware of that studies this relationship is Robinson and Wadsworth (2007), who find no effect of

[2] In Germany, marginal employment ('geringfügig entlohnte Beschäftigung') is exempt from employee social security contributions and income taxes, but only up to a monthly earnings threshold (450 EUR in 2014, the year before the minimum wage introduction). A minimum wage thus limits the number of monthly working hours for marginal jobs, in our case to (450 EUR/month / 8.50 EUR/hour ≈) 53 hours/month. Affected workers earning close to the threshold already before the minimum wage introduction thus either have to switch from their marginal job to regular employment or have to reduce working hours in order to maintain their marginal employment status.

[3] Earlier studies on minimum wages in Germany dealt with the effects of sectoral minimum wages, e.g. König and Möller (2009) or vom Berge and Frings (2020).

the UK minimum wage on the incidence of secondary job holding. The authors also find some tentative hints on working hours adjustments, but are hampered by relatively small sample sizes in analyzing shifts between jobs in more depth. In our study, in contrast, we can utilize high quality administrative data covering a large sample of jobs in Germany, allowing for a far more detailed analysis.

Second, our paper is also connected to the moonlighting literature. After the initial impulse of Shishko and Rostker (1976), a number of papers have addressed the question how incidence, working hours, and earnings of both main and secondary jobs react to wage changes (e.g. Smith-Conway and Kimmel, 1998; Panos et al., 2014; Choe et al, 2018; Klinger and Weber, 2020, for Germany). However, the moonlighting literature typically faces severe identification problems, due to a lack of exogenous variation in wages, and is often either confined to descriptive analyses or has to impose quite strong identifying assumptions. In our study, in contrast, we can exploit a large and exogenous wage shock to shed new light on labor supply responses involving moonlighting. Additionally, we can utilize the special feature of the German labor market that permits lower taxes for marginal jobs as long as earnings do not exceed – during the time of the minimum wage introduction – 450 EUR/month (see Collischon et al., 2020, for a recent study of the German 'Minijob' program). In combination with a minimum wage set at 8.50 EUR/hour this earnings threshold implied an exogenous restriction of working time to 53 hours/month (provided that marginal jobs were not switched to regular employment). These exogenous restrictions on wages and hours allow us to draw conclusions about how wages, employment, and working hours respond to wage increases not only within but also across jobs.

We proceed as follows: In section 2, we provide information on the institutional background, describe our data, and characterize both moonlighters and secondary jobs. In section 3, we outline our estimation strategy and present results. In section 4, we view our results through the lens of a simple theoretical model of moonlighting and the minimum wage to discuss adjustment mechanisms. Finally, we draw conclusions in section 5.

2 Background and Data

2.1 Institutional Background

On January 1, 2015, a nationwide minimum wage of 8.50 EUR/hour came into effect in Germany. Its introduction took place against the backdrop of high wage inequality, a declining share of workers covered by collective bargaining agreements and robust economic growth. The minimum wage had a wide coverage and was binding for a large fraction of the workforce. Roughly 4 million jobs, or 11 percent of jobs, were directly affected as they earned less than the minimum at the time of its introduction (Destatis, 2016). Female, immigrant, low-skill, young, and part-time workers as well as small establishments located in East Germany in the transportation, accommodation and food services sectors were overrepresented among the affected. Only a relatively small group of workers was exempted from the policy, including specific sectors (making up only about 5 percent of total employment), e.g. hairdressing or the

meat industry, workers younger than 18, voluntary workers, trainees, interns, or the long-term unemployed; see Dustmann et al. (2022) for details.

2.2 Data and Sample Selection

Our empirical strategy is to contrast changes in job-level outcomes by the hourly wage level prevailing before the minimum wage introduction (see section 3.1 for details). The most suitable data available in Germany for this task are the administrative labor market data of the Institute for Employment Research (IAB), Nuremberg. Specifically, for this study, we draw on the Sample of Integrated Labour Market Biographies (SIAB) data set; see Frodermann et al. (2021) and vom Berge et al. (2021).

The employment information we use originates from employers reporting to the social security institutions and is thus generally highly precise and reliable. Employers are obligated to report the start and end dates for all jobs at least once a year, together with the sum of gross earnings accumulated for each job over the respective reporting period. Further information comprises age, gender, nationality, and education.[4] The SIAB also includes unique person and establishment identifiers. These make it possible not only to identify which jobs belong to which person but also to merge information on employers, like industry, location, size, workforce composition, and within-establishment earnings distribution.

Concerning working time, the standard version of the SIAB only includes the working time status of each job, i.e. whether it is full-time, part-time, or marginal employment. Luckily, for the period 2011 to 2014, it is possible to merge information on the number of contractual working hours at the job level from the Employee History (Beschäftigtenhistorik, BeH) of the IAB. Similar to the case of earnings, these reports originate from employers and include the sum of working hours accumulated over the respective reporting period. Due to the possibility for employers to report hours according to different reporting schemes (e.g. contractual vs actual), we apply the correction procedure described in vom Berge et. al (2023) and drop some observations with implausibly low or high weekly working hours reports (below 30 and above 50 for full-time, below 3 and above 38 for part-time and above 18 for marginal jobs). After this adjustment, we uniformly measure contractual hours.[5] We further verify that the distribution of weekly hours in our data closely matches the distribution from the German Structural Earnings Survey[6], the most comprehensive source of working hours information in Germany, after correction. We are thus confident that our corrected weekly working hours variable is reliable and well suited for treatment assignment.

In addition to employment, the administrative data also integrates worker-level information on unemployment and nonemployment periods originating from the operative processes of the Federal Employment Agency. The SIAB comprises a 2 percent random sample of these integrated labor market biographies from the full population.

The administrative data are very detailed. This makes some sample restrictions unavoidable to keep the analysis feasible. For our main analysis, we select all employment reports that cover

[4] Education is not mandatory to report and thus subject to some missing values and misreporting. We therefore cleaned the education variable with the proven imputation procedure of Fitzenberger et al. (2005) and Ludsteck and Thomsen (2016).

[5] The corrected hours are available as an addon for SIAB 7521, see Schmucker et al. (2023).

[6] See Statistisches Bundesamt (2016) for details.

June 30 of each year from 2011 to 2015. We identify a job as the combination of person-identifier, establishment-identifier and working time status. If a person holds multiple jobs at one point in time, we rank jobs by annual earnings and define the highest paying job as the main job and the second highest paying job as the secondary job. With around 95 percent, the vast majority of secondary jobs are marginal jobs. Holding more than two jobs at the same time is also quite rare (almost 97 percent of moonlighters have no more than two jobs during our observation period). We therefore keep all main jobs as well as secondary marginal jobs with the highest earnings rank and drop all other cases from the analysis sample (when we generate variables, like a switch of a secondary job from marginal to part-time, however, we consider all relevant information).

2.3 Moonlighting and the Minimum Wage

Half a year before the introduction of the minimum wage, 7.3 percent of individuals in our sample had more than one job. In Table 1, we characterize these moonlighters and compare them to non-moonlighters. In terms of sociodemographic characteristics, non-German citizens and women are overrepresented. Moonlighting is also relatively more frequent in Western than in Eastern Germany. Differences in age, however, appear to play only a minor role. Furthermore, moonlighters are on average less educated than non-moonlighters: Among individuals with only one job, roughly 17 percent have completed academic education; among those with two jobs, this share is 11 percent.

Table 1: Which Individuals are Engaged in Secondary Employment?
Individual characteristics in 2014, average values

	(1) Non-Moonlighters	(2) Moonlighters
East Germany	0.18	0.09
Non-German citizen	0.08	0.12
Women	0.47	0.58
By age		
Share less than 24	0.06	0.04
Share 24-44	0.48	0.47
Share 45-59	0.45	0.47
By education		
Share low skilled	0.07	0.08
Share medium skilled	0.74	0.79
Share high skilled	0.17	0.11
By working time status of main job		
Full-time	0.62	0.54
Part-time	0.21	0.35
Marginal	0.16	0.10
All jobs combined		
Average total monthly earnings	2,456	2,366
Share of earnings from sec. job	-	0.16
Average total weekly hours	31.5	36.0
Share of hours from sec. job	-	0.21
Number of individuals	583,928	45,776

Notes: In the table, we compare individuals holding only one job (non-moonlighters) with individuals holding two jobs (moonlighters) on June 30, 2014, six months before the introduction of the minimum wage of 8.50 EUR/hour. The 'Low skilled' are individuals without university entrance qualification and without vocational education while the 'High skilled' have completed academic education.

Source: Weakly anonymous Version of the Sample of Integrated Labour Market Biographies (SIAB) – Version 7519 v1, own calculations. © IAB

In the case of moonlighting, a full-time job combined with a marginal job is the most frequent combination, carried out by roughly each second moonlighter (recall that we excluded non-marginal secondary jobs as these are rare). In about each third case, a regular part-time job is supplemented with a marginal job and the remaining 10 percent of moonlighters carry out two marginal jobs. Strikingly, despite of two jobs and overall longer working hours, the average total monthly earnings of moonlighters are even somewhat lower than those of non-moonlighters. One reason for these lower earnings is that the secondary jobs contribute only a relatively small share of 16 percent to total earnings while moonlighters invest 21 percent of their total worktime into secondary employment, on average.

In Table 2, we contrast secondary and main jobs, irrespective of moonlighting status. For a better comparability, we further differentiate between main regular and main marginal jobs. As one might expect, regular jobs are higher paying, show longer tenure, require more often analytical and cognitive and less often manual non-routine tasks than marginal jobs, and the employing establishments are also larger, on average (column (1) vs column (2) or (3), respectively).[7]

[7] We measure tenure as the number of years since the particular job held on June 30, 2014, has been recorded in the data for the first time. For defining tasks, we use the concept of Dengler et al. (2014).

Almost each third marginal job is a secondary job. Comparing secondary with main marginal jobs, however, does not reveal particularly large differences (column (3) vs (2) of Table 2). On the one hand, secondary jobs demand somewhat more often manual and routine tasks and less often analytical or interactive tasks. The employing establishments also tend to be somewhat smaller and weekly working hours are lower, on average. On the other hand, secondary jobs are slightly more stable and hourly wages are higher as compared to main marginal jobs. Still, exposure to the minimum wage is substantial for both types of marginal jobs: 42 percent of secondary and 51 percent of main marginal jobs pay less than 8.50 EUR/hour in 2014, as opposed to 6 percent of regular jobs.

Finally, it is interesting to take a look at the professions of moonlighters. The five most frequent occupations (at the 4-digit level) performed as secondary job are i) Occupations in cleaning services without specialization (16.1 percent), ii) Office clerks and secretaries without specialization (11.5 percent), iii) Gastronomy occupations without specialization (7.8 percent), iv) Occupations in building services engineering without specialization (4.4 percent) and v) Sales occupations in retail trade without product specialization (4.1 percent). It is also not uncommon that moonlighters pursue the same type of occupation on their main job, too. Using the measure of Dengler et al. (2014), we find a correlation between the task content of first and secondary jobs' occupations of about 0.4. This descriptive evidence thus suggests that gaining additional income is an important motive for moonlighting in Germany.[8]

[8] The moonlighting literature frequently discusses the motives for taking up a secondary job, with the two main motives typically being secondary employment as an additional income source (i.e. due to hours constraints on the main job) or for enhancing the job portfolio (i.e. due to utility-enhancing non-pecuniary aspects of heterogenous jobs); cf. Smith-Conway and Kimmel (1998).

Table 2: Secondary jobs and how main jobs differ from secondary jobs

Job characteristics in 2014, average values

	(1) Main regular (full-time or part-time)	(2) Main marginal	(3) Secondary marginal
Average tenure in years	5.54	3.06	3.24
Average monthly earnings	2,825	291	267
Average weekly hours	35.3	8.72	7.73
Average hourly wage	19.7	8.85	9.41
Hourly wage <8.50 EUR	0.06	0.51	0.42
By task content			
Analytical non-routine	0.25	0.18	0.16
Interactive non-routine	0.13	0.14	0.11
Cognitive routine	0.28	0.24	0.25
Manual routine	0.11	0.09	0.10
Manual non-routine	0.21	0.33	0.36
By establishment size			
1-4 employees	0.05	0.21	0.26
5-19 employees	0.17	0.31	0.31
20-49 employees	0.14	0.15	0.15
50+ employees	0.61	0.31	0.26
Number of jobs	530,993	98,711	43,552

Notes: In the table, we compare characteristics of jobs performed as main or secondary employment on June 30, 2014, six months before the introduction of the minimum wage of 8.50 EUR/hour, irrespective of moonlighting status. Tenure is measured as the number of years since the particular job has been recorded in the data for the first time. Tasks are defined following Dengler et al. (2014).

Source: Weakly anonymous Version of the Sample of Integrated Labour Market Biographies (SIAB) – Version 7519 v1, own calculations. © IAB

3 Effects of the Minimum Wage on Earnings, Employment and Working Time

We begin this section by outlining our strategy for identifying the causal effects of the minimum wage introduction. For the first set of results, we estimate effects for main and secondary jobs separately. Afterwards, we analyze how secondary job outcomes react to minimum-wage-induced wage increases on the main job and if the minimum wage impacts the decision to moonlight itself.

3.1 Method

For our study, we apply the 'individual approach' of Dustmann et al. (2022) that compares changes in outcomes before versus after the minimum wage introduction of individuals who have a priori earned less (the treatment group) or considerably more (the control group) than the minimum of 8.50 EUR/hour. We implement this approach by regressing the first difference of outcome y, such as log earnings change, change in employment probabilities or changes in

working time status between years $t-1$ and t, on the position in the hourly wage distribution that an individual occupies in $t-1$:

$$y_{it}^{r} - y_{it-1}^{r} = \Delta y_{it}^{r} = \sum_{k} 1[b_{k-1} < w_{it-1}^{r} \leq b_{k}]\gamma_{kt}^{r} + e_{it}^{r}. \quad (1)$$

The position in the pre-policy wage distribution is defined by the hourly wage w of individual i in $t-1$ falling into wage bin k, as indicated by the indicator function $1[.]$.[9] Outcomes and hourly wages can either refer to the main job ($r = m$) or the secondary job ($r = s$), respectively. The coefficients γ_{kt} then measure the average bin-specific absolute change in the outcome in each year $t = 2012, \ldots, 2015$. e is an idiosyncratic error term.

In addition to the causal effect of the minimum wage, coefficients γ, as defined in equation (1), might pick up confounding factors, such as mean reversion or macroeconomic time effects. To eliminate these confounding factors, we estimate a reparametrized version of the model:

$$\Delta y_{it}^{r} = \sum_{k} \left(1[b_{k-1} < w_{it-1}^{r} \leq b_{k}]_{pre}\gamma_{k\_pre}^{r} + 1[b_{k-1} < w_{it-1}^{r} \leq b_{k}]_{t}\delta_{kt}^{r} \right) + \beta^{r} X_{it-1}^{r} + \tilde{e}_{it}^{r}. \quad (2)$$

The coefficients γ_{k_pre} now capture the absolute change in the outcome averaged over the pre-policy period 2012 to 2014 in each wage bin (conditional on controls X). The coefficients $\delta_{kt} = \gamma_{kt} - \gamma_{k\_pre}$ measure the deviations of the bin-specific changes in the outcome in each year $t = 2012, \ldots, 2015$ from this average change. Estimates of δ_{kt} thus factor out any mean reversion and macro effects that remain constant over time within wage bins. Furthermore, we can eliminate confounding factors that vary over time but in the same way across bins, by taking deviations from the effects in the higher wage bins, i.e. the difference-in-differences (did): $\delta_{kt \mid k<8.50}^{did} = \delta_{kt \mid k<8.50} - \delta_{kt \mid 12.50 \leq k<20.50}$ and $\delta_{kt \mid 8.50 \leq k<12.50}^{did} = \delta_{kt \mid 8.50 \leq k<12.50} - \delta_{kt \mid 12.50 \leq k<20.50}$ (we do not use initial wages between 8.50 and 12.50 EUR/hour as reference for constructing the difference-in-differences estimates because we want to allow for potential spill-over effects of the minimum wage). As we will show, the estimates of δ_{kt} in the years before the minimum wage introduction are close to zero for all wage bins. The estimates of δ_{kt} in the higher wage bins also generally remain close to zero after the minimum wage introduction. The effects that we estimate thus emerge exactly when the minimum wage is introduced and primarily for workers who are directly affected by it. We argue that these patterns allow for a causal interpretation of our findings (see Dustmann et al., 2022, for further evidence of the validity of this identification strategy).

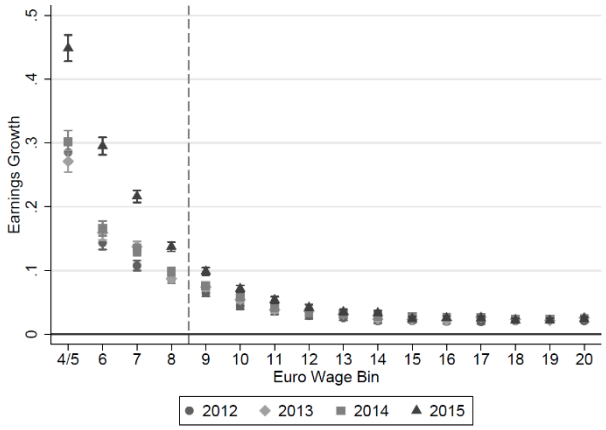
Finally, in the benchmark models, we include indicator variables for gender, age (yearly precision), nationality (German/non-German), working time status (interacted with year), education (five categories), industry (3-digit level), and region of workplace (402 districts), as control variables, measured in $t-1$, with coefficient vector β.

[9] For the figures, we use 15 one-Euro bins and one bin for hourly wages in $t-1$ between 3.50 and 5.50 EUR. For the tables, we classify individuals into three broader bins, with thresholds b_0=3.50, b_1=8.50, b_2=12.50, and b_3=20.50.

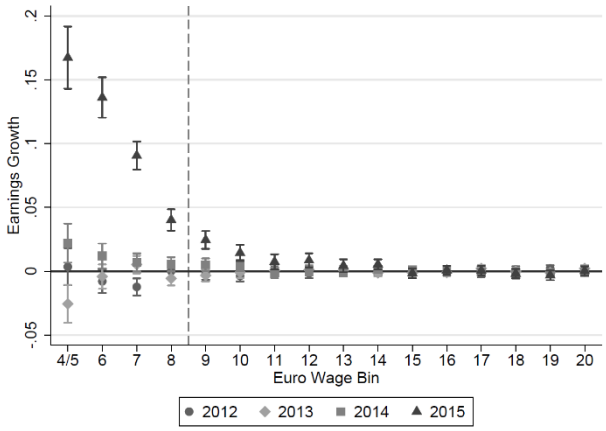
3.2 Effects of a treatment of one job on the same job's outcomes

We begin our analysis by reproducing Dustmann et al. (2022)'s estimates of the earnings and employment effects of the minimum wage for main jobs with the SIAB data. In Figure 1, panel (A), we show estimates of coefficients γ (regression equation (1)) for log earnings change as outcome, i.e. the absolute earnings growth. In panel (B), we present estimates of the difference-in-differences coefficients δ^{did} as defined in the previous subsection. We present analogous results for the likelihood of staying in employment as outcome in Figure 2.

Figure 1: Earnings Effects of the Minimum wage: Main Jobs



(A) One-Year Daily Earnings Growth by Initial Hourly Wage Bin



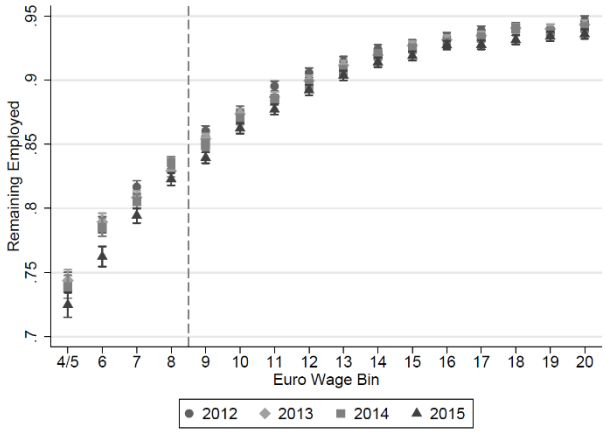
(B) One-Year Daily Earnings Growth by Initial Hourly Wage Bin, Difference-in-Differences

Notes: In Panel A, we plot one-year growth in main job earnings of individuals who were employed in $t-1$ and t against their initial main job wage bin, separately for the periods 2011 versus 2012 to 2014 versus 2015. Estimates refer to γ_{kt}^{m} in equation (1) in the text. In Panel B, we plot one-year excess growth in main job earnings by initial main job wage bin in the periods 2011 versus 2012 to 2014 versus 2015 relative to the average over the pre-policy period 2012 to 2014 and relative to deviations for initial wages exceeding 12.50 EUR/hour, controlling for individual characteristics in $t-1$ (age, education, gender, nationality, working time status interacted with year, district fixed effects, and industry fixed effects). Estimates refer to coefficients δ_{kt}^{did} in the text. The dashed vertical line indicates the minimum wage of 8.50 EUR/hour introduced in 2015. We also show the 95 percent confidence intervals based on heteroskedasticity-robust standard errors.

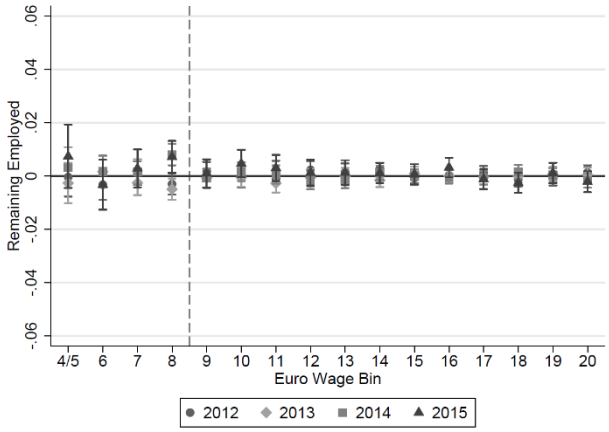
Source: Weakly anonymous Version of the Sample of Integrated Labour Market Biographies (SIAB) – Version 7519 v1, own calculations and illustration. © IAB

Panels (A) of both figures reveal substantial mean reversion: Earnings growth rates decrease and employment probabilities increase for higher levels of initial wages. The figures further suggest that mean reversion is stable over time, which is why we account for it by taking deviations from the pre-policy period's average. Additionally, the figures show no economically significant changes at higher wage bins, particularly in those bins exceeding 12.50 EUR/hour, even after the minimum wage introduction, which suggests the absence of macroeconomic time effects during our study period as potential confounding factor. After the minimum wage introduction in 2015, however, earnings of individuals directly affected by the policy experience substantial excess growth, relative to both the pre-policy period and wage bins above 12.50 EUR/hour. At the same time, employment probabilities remain stable. These results thus support the findings of Dustmann et al. (2022) that the minimum wage pushed up earnings without lowering employment for existing jobs.

Figure 2: Employment Effects of the Minimum Wage: Main Jobs



(A) Employment Probability in Year t by Initial Hourly Wage Bin



(B) Employment Probability in Year t by Initial Hourly Wage Bin, Difference-in-Differences

Notes: In Panel A, we plot the probability that a worker employed in period $t-1$ remains employed in period t against his or her initial main job wage bin, separately for the periods 2011 versus 2012 to 2014 versus 2015. Estimates refer to γ_{kt}^{m} in equation (1) in the text. In Panel B, we plot this probability by initial main job wage bin in the periods 2011 versus 2012 to 2014 versus 2015 relative to the average over the pre-policy period 2012 to 2014 and relative to deviations for initial wages exceeding 12.50 EUR/hour, controlling for individual characteristics in $t-1$ (age, education, gender, nationality, working time status interacted with year, district fixed effects, and industry fixed effects). Estimates refer to coefficients δ_{kt}^{did} in the text. The dashed vertical line indicates the minimum wage of 8.50 EUR/hour introduced in 2015. We also show the 95 percent confidence intervals based on heteroskedasticity-robust standard errors.

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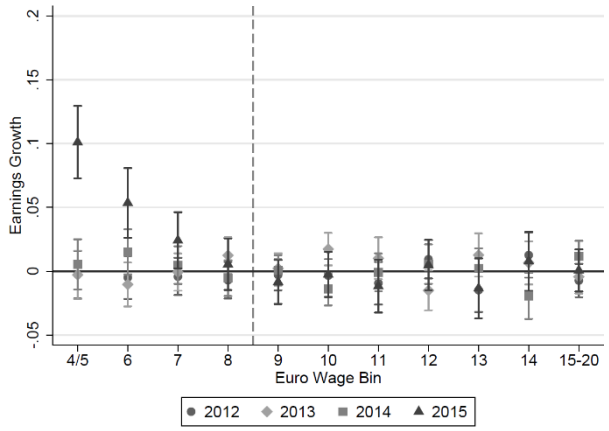
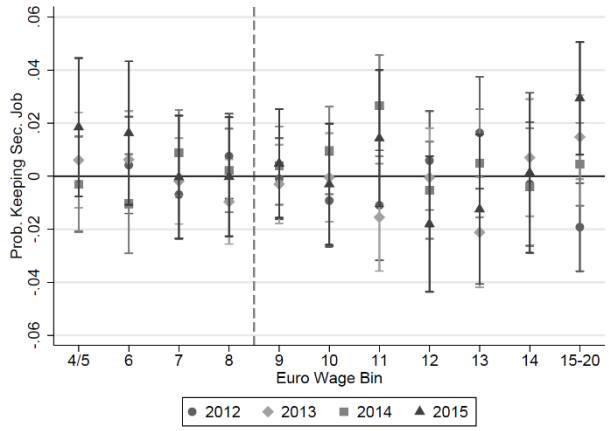
We summarize the difference-in-differences estimates for outcomes of main jobs in the first two columns of Table 3. The treatment group consists of individuals with initial hourly wages below 8.50 EUR, the spill-over group of those between 8.50 and 12.50 EUR, and the control group of those between 12.50 and 20.50 EUR. The estimates in column (1) show an excess growth in average earnings for treated individuals of about 8 percent after the minimum wage introduction. Most other estimates are close to zero. Only the 2015 estimate for the spill-over group and the 2014 estimate for the treatment group are somewhat elevated yet small in magnitude, pointing to some but weak spill-over and anticipation effects, respectively. The estimates of employment in column (2), in turn, are all close to zero, both before and after the

minimum wage introduction. If anything, we find a positive effect on employment which is economically insignificant, however. These findings also hold when we restrict the sample to main marginal jobs; see columns (3) and (4) of Table 3.

Figure 3: Earnings and Employment Effects of the Minimum Wage: Secondary Jobs – Difference-in-Differences



(A) One-Year Daily Earnings Growth by Initial Hourly Wage Bin



(B) Probability of Keeping Secondary Job in Year t by Initial Hourly Wage Bin

Notes: In Panel A, we plot one-year excess growth in secondary job earnings of individuals who were employed in a secondary job in $t-1$ and t against their initial secondary job wage bin, separately for the periods 2011 versus 2012 to 2014 versus 2015 and relative to the average over the pre-policy period 2012 to 2014 as well as relative to deviations for initial wages exceeding 12.50 EUR/hour. In Panel B, we plot the probability that a worker who was employed in a secondary job in period $t-1$ remains employed in a secondary job in period t against his or her initial secondary job wage bin in the periods 2011 versus 2012 to 2014 versus 2015 relative to the average over the pre-policy period 2012 to 2014 as well as relative to deviations for initial wages exceeding 12.50 EUR/hour. Individual characteristics in $t-1$ (age, education, gender, nationality, secondary job working time status interacted with year, secondary job district fixed effects, and secondary job industry fixed effects) are controlled for. Estimates refer to coefficients δ_{kt}^{did} in the text. The dashed vertical line indicates the minimum wage of 8.50 EUR/hour introduced in 2015. We also show the 95 percent confidence intervals based on heteroskedasticity-robust standard errors.

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In Figure 3 and Table 3, columns (5) and (6), we repeat the analysis of earnings and employment for secondary instead of main jobs. Concerning employment, again, we do not find any evidence

for significant effects of the minimum wage on the likelihood of keeping a secondary job (panel (B) of Figure 3 or column (6) of Table 3). The effect of 3.8 percent on secondary job earnings growth, however, is estimated significantly positive. Yet, it is only about half as large in magnitude than the effect on main job earnings (of 8 percent); see column (5) of Table 3. From panel (A) of Figure 3, it becomes clear that the earnings effect is even close to zero and insignificant for individuals with initial wages in the 7.50 to 8.50 EUR wage bin.

Table 3: The Effects of the Minimum Wage on Earnings and Employment: Difference-in-Differences

Difference in the deviation of a given outcome variable from the pre-policy period's average between workers with a certain initial hourly wage level, in (log) percentage points

	(1)	(2)	(3)	(4)	(5)	(6)
	Main		Main marginal		Secondary	
	Earnings	Employment	Earnings	Employment	Earnings	Employment
Treatment versus control group: [3.5,8.5) versus [12.5,20.5) wage bin in $t-1$						
Post-policy period						
2015 vs *pre*	0.0797	0.0037	0.0791	0.0052	0.0376	0.0017
	(0.0032)	(0.0022)	(0.0096)	(0.0056)	(0.0076)	(0.0086)
Pre-policy period (Placebo)						
2014 vs *pre*	0.0081	0.0048	0.0051	0.0044	-0.0007	0.0006
	(0.0021)	(0.0015)	(0.0067)	(0.0039)	(0.0053)	(0.0061)
2013 vs *pre*	-0.0041	-0.0026	-0.0083	-0.0056	0.0037	-0.0038
	(0.0021)	(0.0015)	(0.0068)	(0.0039)	(0.0055)	(0.0062)
2012 vs *pre*	-0.0040	-0.0021	0.0033	0.0012	-0.0030	0.0033
	(0.0020)	(0.0014)	(0.0070)	(0.0040)	(0.0054)	(0.0063)
Spill-over versus control group: [8.5,12.5) versus [12.5,20.5) wage bin in $t-1$						
Post-policy period						
2015 vs *pre*	0.0123	0.0022	0.0095	0.0045	-0.0074	-0.0017
	(0.0020)	(0.0016)	(0.0096)	(0.0058)	(0.0068)	(0.0086)
Pre-policy period (Placebo)						
2014 vs *pre*	0.0027	0.0007	0.0013	0.0036	-0.0079	0.0093
	(0.0014)	(0.0011)	(0.0069)	(0.0041)	(0.0049)	(0.0063)
2013 vs *pre*	-0.0012	-0.0013	-0.0046	-0.0032	0.0108	-0.0074
	(0.0014)	(0.0011)	(0.0070)	(0.0041)	(0.0052)	(0.0064)
2012 vs *pre*	-0.0015	0.0006	0.0033	-0.0004	-0.0028	-0.0019
	(0.0014)	(0.0011)	(0.0072)	(0.0042)	(0.0052)	(0.0066)
Observations	1.149.062	1.289.566	198.100	248.496	79.673	113.777

Notes: In the table, we show difference-in-differences estimates that take the deviations of the one-year earnings growth as well as the likelihood to stay employed (all individuals are employed at baseline) from the average over the pre-policy period 2012 to 2014 (*pre*) of workers who earn less ('Treatment group', upper half of the table) or close to ('Spill-over group', lower half of the table) the minimum wage at baseline and compare them to the deviations of workers who earn more than 12.50 EUR/hour ('Control group') at baseline. Estimates for the pre-policy years 2012 to 2014 serve as placebo tests. We consider all main jobs in columns (1) and (2), main marginal jobs in columns (3) and (4), and secondary jobs (which comprise only marginal jobs) in columns (5) and (6). Estimates refer to coefficients δ_{kt}^{did} in the text. All regressions control for individual characteristics at baseline (age, education, gender, nationality, working time status interacted with year, district fixed effects, and industry fixed effects). Heteroskedasticity-robust standard errors are in parentheses.

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Although we do not find effects at the extensive margin of employment, we document effects of the minimum wage on working time status in Table 4. The first two columns of the table show

difference-in-differences estimates of the likelihood to switch from a full-time to a part-time job between $t-1$ and t. As we are interested in intensive margin labor demand adjustments on main jobs, we restrict the estimation of this particular outcome to individuals who do not change their job composition otherwise during both periods (i.e. do not change employer on their main jobs and, in case of moonlighting, neither employer nor working time status on their secondary jobs). For non-moonlighters, the estimates in column (1) show an increase in the likelihood to switch from a full-time to a part-time job of 1.3 percentage points (with a likelihood to switch of 2.0 percent among the treatment group at baseline, this effect amounts to an increase of 65 percent). The corresponding effect for moonlighters, shown in column (2), is estimated at roughly 2.1 percentage points (or 70 percent at a baseline likelihood of 3.0 percent).

Additionally, we find that the minimum wage induces workers to switch from marginal to regular jobs. This effect, however, is only present for main jobs, where we see an increase in this probability by 1.7 percentage points (or 17 percent, at a baseline likelihood of 10 percent) in column (3) of Table 4. For secondary jobs, there is no such significant positive effect (baseline likelihood of 0.7 percent), as the likelihood to switch from a marginal to a regular job is even slightly reduced. We further explore the mechanisms underlying these results in section 4 and appendix 2.

To sum up, in line with the existing literature, we find that the minimum wage has considerable effects on earnings without negative effects on employment probabilities of already existing jobs. However, it increases both the likelihood to switch from full-time to part-time and from marginal to regular jobs.

Table 4: The Effects of the Minimum Wage on Working Time Status: Difference-in-Differences

Difference in the deviation of a given outcome variable from the pre-policy period's average between workers with a certain initial hourly wage level, in percentage points

	(1) Full-time to part-time switch – stable non-moonlighters	(2) Full-time to part-time switch – stable moonlighters	(3) Main marginal to regular switch	(4) Secondary marginal to regular switch
Treatment versus control group: [3.5,8.5) versus [12.5,20.5) wage bin in $t-1$				
Post-policy period				
2015 vs *pre*	0.0128	0.0205	0.0174	-0.0042
	(0.0023)	(0.0119)	(0.0044)	(0.0020)
Pre-policy period (Placebo)				
2014 vs *pre*	-0.0032	-0.0001	-0.0014	0.0000
	(0.0012)	(0.0063)	(0.0031)	(0.0013)
2013 vs *pre*	-0.0035	-0.0013	-0.0012	-0.0018
	(0.0011)	(0.0060)	(0.0031)	(0.0014)
2012 vs *pre*	0.0066	0.0014	0.0026	0.0019
	(0.0012)	(0.0059)	(0.0032)	(0.0013)
Spill-over versus control group: [8.5,12.5) versus [12.5,20.5) wage bin in $t-1$				
Post-policy period				
2015 vs *pre*	-0.0001	0.0028	0.0032	-0.0037
	(0.0008)	(0.0039)	(0.0046)	(0.0021)
Pre-policy period (Placebo)				
2014 vs *pre*	-0.0004	-0.0028	-0.0015	-0.0001
	(0.0005)	(0.0021)	(0.0033)	(0.0013)
2013 vs *pre*	-0.0008	0.0002	-0.0017	-0.0018
	(0.0005)	(0.0022)	(0.0033)	(0.0014)
2012 vs *pre*	0.0011	0.0026	0.0031	0.0019
	(0.0005)	(0.0023)	(0.0034)	(0.0014)
Observations	530,756	30,529	248,496	113,777

Notes: In the table, we show difference-in-differences estimates of the likelihood to switch from a full-time job to part-time in the first two columns and from a marginal job to regular in the last two columns. Estimates for the pre-policy years 2012 to 2014 serve as placebo tests. We consider non-moonlighters staying at the same employer in column (1), moonlighters with a stable job composition in column (2), main marginal jobs in column (3), and secondary jobs (which comprise only marginal jobs) in column (4). Estimates refer to coefficients δ_{kt}^{did} in the text. All regressions control for individual characteristics at baseline (age, education, gender, nationality, district fixed effects, and industry fixed effects). Heteroskedasticity-robust standard errors are in parentheses.

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3.3 Effects of a main job treatment on secondary job outcomes

In the previous subsection, we have investigated how a minimum wage treatment of one job affects the outcome of the same job. Now we turn to analyzing how a minimum wage treatment of the main job affects secondary job outcomes. The first outcome we consider is the likelihood that individuals who moonlight before the policy continue moonlighting afterwards. Theoretically, higher earnings from the main job might induce moonlighters to give up their secondary job if they no longer rely on the additional income, for instance. We present the corresponding difference-in-differences estimates in column (1) of Table 5 and find no significant

effect, however. Apparently, even an increase of main job earnings by 8 percent, as caused by the minimum wage, does not lead individuals to give up secondary employment, on average.

Table 5: The Effects of a Minimum Wage Treatment of the Main Job on Secondary Job Outcomes: Difference-in-Differences

Difference in the deviation of a given outcome variable from the pre-policy period's average between workers with a certain initial hourly wage level, in (log) percentage points

	(1) Continue moonlighting	(2) Secondary earnings	(3) Secondary earnings – Stable moonlighters	(4) Secondary earnings – Stable moonlighters – Unconstrained	(5) Secondary earnings – Stable moonlighters – Sec. job above MW
Treatment versus control group: [3.5,8.5) versus [12.5,20.5) main job wage bin in $t-1$					
Post-policy period					
2015 vs *pre*	0.0010	0.0398	0.0345	0.0458	0.0223
	(0.0104)	(0.0108)	(0.0087)	(0.0185)	(0.0115)
Pre-policy period (Placebo)					
2014 vs *pre*	-0.0046	0.0031	-0.0003	0.0060	0.0018
	(0.0069)	(0.0069)	(0.0053)	(0.0117)	(0.0086)
2013 vs *pre*	0.0055	0.0092	0.0029	0.0047	-0.0074
	(0.0069)	(0.0068)	(0.0054)	(0.0116)	(0.0084)
2012 vs *pre*	-0.0010	-0.0123	-0.0026	-0.0107	0.0057
	(0.0068)	(0.0069)	(0.0053)	(0.0117)	(0.0082)
Spill-over versus control group: [8.5,12.5) versus [12.5,20.5) main job wage bin in $t-1$					
Post-policy period					
2015 vs *pre*	-0.0106	0.0074	0.0110	0.0044	0.0063
	(0.0083)	(0.0080)	(0.0065)	(0.0169)	(0.0085)
Pre-policy period (Placebo)					
2014 vs *pre*	0.0032	0.0055	0.0070	0.0122	0.0023
	(0.0058)	(0.0056)	(0.0047)	(0.0111)	(0.0061)
2013 vs *pre*	-0.0025	-0.0078	-0.0053	-0.0105	-0.0077
	(0.0058)	(0.0057)	(0.0048)	(0.0117)	(0.0064)
2012 vs *pre*	-0.0007	0.0024	-0.0017	-0.0017	0.0054
	(0.0059)	(0.0059)	(0.0048)	(0.0108)	(0.0062)
Observations	78,095	67,656	54,786	13,402	21,307

Notes: In the table, we show difference-in-differences estimates of the likelihood that individuals with two jobs before the minimum wage introduction keep both their main and secondary jobs afterwards in column (1) and of one-year secondary earnings growth in columns (2) to (5). Estimates for the pre-policy years 2012 to 2014 serve as placebo tests. We consider all moonlighters in column (2), moonlighters with a stable job composition in column (3), those who additionally worked in secondary jobs where receiving the minimum wage in 2015 and keeping working hours at the level of 2014 would not lead monthly earnings to exceed the marginal compensation threshold ("unconstrained") in column (4), or whose secondary wage initially exceeded 8.50EUR/hour in column (5). Estimates refer to coefficients δ_{kt}^{did} in the text. All regressions control for individual characteristics referring to the secondary job at baseline (age, education, gender, nationality, district fixed effects, and industry fixed effects). Heteroskedasticity-robust standard errors are in parentheses.

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Additionally, we present results from regressing secondary earnings growth on initial main job hourly wage bins. The difference-in-differences estimate shows an increase of secondary earnings by almost 4 percent if the main job is treated by the minimum wage (column (2) of Table 5). We can think of various reasons for this effect. For instance, there might be a direct

minimum wage effect on secondary earnings through the secondary wage (such an effect would be absorbed by the estimate to the extent that the likelihood of receiving a wage below minimum is correlated across jobs) or effects on the job composition, like reallocation towards more productive employers. Another plausible mechanism is the job-switching channel. Recall that the minimum wage increases the likelihood to switch from a main full-time to a part-time job (columns (1) and (2) of Table 4). Individuals might respond to such a decline in working hours on the main job by increasing hours on their secondary job in turn. We are particularly interested in this channel because it provides unique insights into how individuals allocate working time across multiple jobs in response to an exogenous wage shock.

Investigating this *hours-reallocation* effect is challenging without having access to the number of working hours post policy. Considering changes in working time status is not helpful in this regard because moonlighters rarely switch their secondary jobs to part-time (Table 4). What we can observe, however, are both the number of working hours (and hence hourly wages) pre policy and changes in earnings and job composition post policy. This information allows us to pin down a lower bound estimate of the hours-reallocation effect.

To do so, we begin by re-estimating the regression of secondary earnings growth on initial main job wage bin for the sample of moonlighters who do not change employer or job composition during the observation period. This sample restriction shuts down any potential employer-reallocation channel. The estimated effect declines somewhat (to 3.5 percent) but remains highly significant. Furthermore, if hours-reallocation were present, we would expect to observe the effect primarily for secondary jobs without constrained working hours (i.e. marginal jobs where monthly earnings would not exceed the marginal compensation threshold if the hourly wage increases to the minimum wage and working hours stay at the initial level, so that the marginal employment status can be kept without having to decrease hours). In line with this prediction, the effect is now estimated at almost 4.6 percent for unconstrained, stable secondary jobs (columns (4) of Table 5).

In a final sampling step, we focus on moonlighters with a stable job composition and secondary jobs that initially payed above the minimum wage. The advantage of this specification is that we can rule out any direct effect of the minimum wage through the secondary job, yielding an estimate of around 2.2 percent (column (5) of Table 5). The drawback is that the individuals in this sample receive relatively high hourly wages already before the minimum wage introduction, which limits the scope for earnings effects relative to a representative sample (due to mean reversion). The estimate derived from this restricted sample should therefore be interpreted as a lower bound.

From the estimates we have presented so far, it is hard to infer the magnitude of the hours-reallocation effect. To quantify it, we develop a 5-step rescaling procedure, which works as follows:

First, we construct a measure that approximates the reduction in working hours on the main job. The idea is that shifting the hourly wage up to the minimum implies a certain increase in monthly earnings. If earnings of affected jobs increase by less than this amount, we infer that this lack of

earnings increase is due to a reduction in working hours.[10] Specifically, for workers with hourly wages initially below 8.50 EUR, we calculate the earnings change that we would expect if the wage was set to the new minimum and working hours were held constant. If the actually observed change in earnings is below (above) this hypothetical value, we assume a proportional reduction (increase) in working hours, respectively. For the post-policy year 2015 and workers with hourly wages initially above 8.50 EUR, we extrapolate the hourly-wage bin specific average change in working hours in the previous years. For the pre-policy years, we simply use the actual working hours information.

Second, we run a difference-in-differences regression as before, but with the inferred measure of hours reduction as outcome (in log-differences). This provides us not only with an (upper-bound) estimate of the minimum wage effect on (the reduction of) hours worked on the main job but also generalizes the estimate of its effect on switching a full-time to a part-time job (Table 4).

Third, we run a difference-in-differences regression of secondary earnings growth on initial main job wage bin for the sample used in the second step.

Fourth, we divide the estimate of secondary earnings from the third step by the estimate of hours reduction from the second step. Note that this fourth step is equivalent to the second stage of a two-stage least squares procedure, with the hours reduction measure as endogenous variable, secondary earnings as outcome, and the main job minimum wage treatment as instrument.[11] As is well known, dividing the reduced-form (the minimum wage effect on secondary earnings) by the first-stage (the minimum wage effect on main job working hours reduction) yields the second-stage effect (the local average treatment effect (LATE) of a minimum-wage-induced reduction in main job working hours on secondary earnings for those individuals who reduce hours worked on the main job in response to the minimum wage hike – the complier group). If there is no other direct channel through which the minimum wage treatment of the main job affects secondary earnings but through reducing hours worked on the main job, the increase in secondary earnings is directly proportional to the transfer of working hours from the main to the secondary job.

As a final fifth step, we adjust the second-stage effect for the average hours difference in main and secondary jobs in 2014 to account for the differences in working time status between the two job types.

We summarize the results of our rescaling procedure in Table 6, again for a sample of moonlighters who do not change their employers and job composition as well as whose secondary jobs are already payed above minimum before the policy, to rule out endogenous job mobility and a direct minimum wage treatment of secondary jobs. As shown in column (1), a minimum wage treatment of the main job reduces hours worked on the main job by 6.1 percent, on average. At the same time, it also increases secondary earnings by on average 2.5 percent (column (2)). We then arrive at an estimate of the hours-reallocation effect, rescaled by the difference in initial mean weekly working hours between secondary and main jobs, of

[10] The key assumption behind this approach is full compliance with the minimum wage law. At the end of this section, we use a simulation exercise to show that the existence of non-compliance will lead us to underestimate the hours-reallocation effect, so that the estimates presented here are still informative.

[11] Another prominent example for using the minimum wage as instrument is quantifying the employment effect of a minimum wage by relating it to its wage effect.

(2.49/6.1*7.17/31.05=) 9.4 percent. According to this estimate, moonlighters who experience a reduction of working hours on the main job due to the minimum wage transfer on average 9.4 percent of these working hours to the secondary job, ceteris paribus.[12] As a more intuitive example, consider the case of a moonlighter whose main job switches from full-time to part-time in response to the minimum wage. According to the working hours data, such a switch usually implies a reduction of weekly working time by 6.4 hours. The average moonlighter affected by this event then increases the time worked on her or his secondary job by 36 minutes.

[12] Reassuringly, we arrive at a very similar estimate when we run a difference-in-differences regression of the implied change in working hours on the secondary job (derived from the observed change in secondary earnings under the assumption that the hourly wage rate would remain constant) on our proxy-measure of the reduction in working hours on the main job. The coefficient of the interaction term between the post-policy period and the proxy-measure is estimated as 0.0947 (0.0281). The main weakness of this methodology is that is does not restrict itself to correlation mediated through the affectedness by the minimum wage. Still, the close resemblance between the results increases our confidence in the hours-reallocation effect we find.

Table 6: The Effects of a Minimum Wage Treatment of the Main Job on Main Job Working Hours and on Secondary Job Earnings: Hours-Reallocation

Difference in the deviation of a given outcome variable from the pre-policy period's average between workers with a certain initial hourly wage level, in log percentage points

Regression of:	(1) Main job hours reduction	(2) Secondary earnings	(3) Hours-reallocation effect rescaled: (2) / (1) x (mean hours secondary jobs) / (mean hours main jobs)
Treatment versus control group: [3.5,8.5) versus [12.5,20.5) main job wage bin in $t-1$			
Post-policy period			
2015 vs *pre*	0.0610	0.0249	0.0942
	(0.0109)	(0.0117)	[0.0097; 0.1964]
Pre-policy period (Placebo)			
2014 vs *pre*	-0.0104	0.0011	
	(0.0058)	(0.0091)	
2013 vs *pre*	-0.0071	-0.0113	
	(0.0063)	(0.0095)	
2012 vs *pre*	0.0175	0.0102	
	(0.0071)	(0.0087)	
Spill-over versus control group: [8.5,12.5) versus [12.5,20.5) main job wage bin in $t-1$			
Post-policy period			
2015 vs *pre*	-0.0051	0.0055	
	(0.0033)	(0.0088)	
Pre-policy period (Placebo)			
2014 vs *pre*	-0.0044	0.0031	
	(0.0038)	(0.0065)	
2013 vs *pre*	-0.0016	-0.0084	
	(0.0044)	(0.0069)	
2012 vs *pre*	0.0060	0.0053	
	(0.0047)	(0.0066)	
Observations	19,948	19,948	19,948

Notes: In the table, we show difference-in-differences estimates of an inferred measure of hours reduction on the main job in column (1) and of one-year secondary earnings growth in column (2) on a minimum wage treatment of the main job. Estimates for the pre-policy years 2012 to 2014 serve as placebo tests. The estimation sample consists of moonlighters with a stable job composition and whose secondary wage initially exceeded 8.50 EUR/hour. Estimates refer to coefficients δ_{kt}^{did} in the text. All regressions control for individual characteristics referring to the secondary job at baseline (age, education, gender, nationality, district fixed effects, and industry fixed effects), except for working time status interacted with year, which refers to the main job. In column (3), we use the estimates from the first two columns to estimate the fraction of working hours on the main job that has been reduced due to the minimum wage and transferred to the secondary job in turn; see the text for details. In the first two columns, we report heteroskedasticity-robust standard errors in parentheses. In column (3), we report the lower and upper bounds of a bias-corrected 95 percent confidence interval based on bootstrapping the whole rescaling procedure with 1,000 replications in brackets.

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Note that this estimate is a lower bound for at least three reasons: i) mean reversion, which implies comparatively small relative earnings increases for high-wage earners; ii) the marginal compensation threshold, which discourages moonlighters from switching secondary jobs to regular employment (see Appendix 2); iii) the assumption of full compliance with the minimum wage law that we imposed when constructing the measure of hours reduction.

Concerning the latter point, compliance has been found to be quite high in general (cf. Biewen et al., 2022). However, particularly in the first year after the minimum wage introduction, there is

also some evidence for non-compliance. For instance, Caliendo et al. (2019) report a non-compliance rate of about 3.5 percent according to German administrative data and of roughly 7 percent according to survey data.[13] We simulated how our estimates of the hours-reallocation effect change when we impose a certain degree of non-compliance, by setting an appropriate share of cases in the hours reduction measure to zero at random if the hourly wage was initially below 8.50 EUR. According to this simulation exercise, a non-compliance rate of 3.5 percent would reduce the first-stage effect estimate from 6.1 to 5.3 percent, which in turn increases the second-stage effect estimate to (2.49/5.3*7.17/31.05=) 10.8 percent. A non-compliance rate of 7.5 percent would reduce the first-stage to 4.5 percent and the second-stage to (2.49/4.5*7.17/31.05=) 12.8 percent.[14]

To sum up, while we find no evidence that the minimum wage prevents people from moonlighting, we find that a minimum wage treatment of one job affects the outcome of another job that the same worker holds. Specifically, the minimum wage reduces not only the hours worked on the main job, on average, it also induces affected moonlighters to transfer a certain fraction of these hours to their secondary job. We estimate that on average at least 9.4 percent of hours are transferred. Without an institutional setting that limits the scope for increasing hours worked on secondary jobs, this fraction would have likely been even larger.

4 Discussion

In this section, we discuss the adjustment mechanisms behind our key results. For this purpose, we also view them through the lens of a simple theoretical model of labor supply and demand that we outline in Appendix 1: Model in more detail. The intuition captured by the model is that preferences for working hours may not be aligned between workers and firms when they match. As a result, at the optimal wage-hours package posted by the firm, the firm might actually prefer the worker to work more and the worker might wish to work less hours, or vice versa. We discuss the following effects:

Switching to part-time jobs: In section 3.2, we find that the minimum wage increased the likelihood to switch from full-time to part-time, therefore reducing working hours. One natural explanation for this pattern would be a labor-supply reaction where the income effect dominates the substitution effect for workers affected by the minimum wage hike. However, this explanation appears unlikely to account for the majority of the observed effect as we study the low-wage labor market, where workers are arguably particularly dependent on the additional income. Indeed, in section 3.3 we find workers to reallocate working hours to the secondary job in response to a minimum-wage induced reduction of working hours on the main job.

An alternative mechanism put forward by our model runs through adjustments on the labor-demand side. Rising labor costs caused by a minimum wage induce some employers to reduce the optimal posted working hours for a job, particularly when the minimum wage hike is large.

[13] Note that it is generally tricky to separate non-compliance from measurement error, especially if survey respondents suffer from false memory, e.g. for hours worked. The 7 percent figure therefore is likely an upper bound for true non-compliance.

[14] More details on this simulation exercise are available from the authors upon request.

We find this latter mechanism more plausible in light of our empirical results and therefore argue that the 'downgrading' effect we find is rather driven by labor demand than by labor supply.

Switching to regular jobs: In section 3.2, we also find that the minimum wage lead to an increased switching of main jobs from marginal to regular employment. This reaction is exactly what our model predicts once we introduce a tax reduction for jobs with only few working hours (i.e. marginal jobs): Without a minimum wage, such a regulation can lead firms to offer marginal jobs to workers with a preference for working few hours, even when the firms would prefer more hours. As discussed in section 1, the introduction of a binding minimum wage limits the hours that can be worked under the marginal employment status. This restriction, in turn, makes it more profitable for firms to offer regular jobs with more hours. It will be utility enhancing for workers to accept such a regular instead of an 'hours-constrained' marginal job as soon as the earnings gain overcompensates for the additional tax burden. The switching pattern we observe for main marginal jobs can thus be explained by a combination of labor supply and demand decisions, taking the specific institutional particularities into account.

Main versus secondary job switching: In contrast to main marginal jobs, we find no significant effect on switching to regular employment for secondary jobs (Table 4, column (3) versus (4)), and the effect on secondary earnings is also far weaker (Table 3, column (3) versus (5)). These patterns can again be explained by the interplay between the marginal compensation threshold, an individual's job composition and the minimum wage. We analyze this mechanism explicitly in appendix 2, where we select all jobs that initially payed below the minimum wage and split them into four groups: main marginal or secondary jobs that are either working-hours constrained or not. A marginal job is considered 'hours constrained' if monthly earnings would exceed the marginal compensation threshold when the hourly wage increases to the minimum wage and working hours stay at the initial level, so that the marginal employment status can only be kept if working hours are reduced.

The results reveal that the weak (and in certain constellations even negative) effect on secondary earnings is driven by hours constrained jobs. For these jobs, the effect of the minimum wage on hourly wages does not translate into significantly higher earnings. At the same time, these jobs show neither an increased likelihood to be switched to regular employment nor negative employment effects, which suggests that affected individuals must have reduced their working time in order to keep their marginal employment status. That moonlighters show no 'upgrading' effects is plausible as the tax burden from switching the secondary job to regular employment is very high in their case, because the earnings from the main job will also be relevant for determining the tax level. In that sense, the implicit hours restriction imposed by the marginal compensation threshold is much more binding for moonlighters than for non-moonlighters.

Main marginal jobs, in turn, show clear switching effects, even when they are not hours constrained. Non-moonlighters with marginal jobs therefore appear to extend working hours to realize higher earnings at the new minimum. The earnings effect is also much larger for unconstrained main marginal than for unconstrained- secondary jobs, which again points to rising working hours among workers with only one marginal job.

Reallocating working hours to secondary jobs: Another important question is why moonlighters react to the minimum wage by reallocating working hours to their secondary job. To explore this question from a theoretical point of view, we extend our model by a secondary

job market. In such a setting, a minimum wage that reduces hours worked on the main job leaves more room for workers to extend hours worked on the secondary job. Taking both jobs together, a worker can reach a higher utility level by transferring working hours. The 'hours-reallocation effect' is thus explained by the model as a supply-side reaction of workers induced by the firms' reduction of main job working hours. Given these observed patterns and adjustment mechanisms predicted by our model, it is also not particularly surprising that the minimum wage did not induce moonlighters to give up their secondary jobs.

Individual-level versus aggregate effects: Finally, previous studies have found no or only small changes in average working hours caused by the minimum wage; see e.g. Burauel et al. (2020) or Biewen et al. (2022). At first glance, this finding might seem to contradict our result of significant effects on working time. However, a plausible explanation is that the minimum wage changed not only individual hours worked but also the composition of full-time, part-time and marginal workers. When full-time workers switch to part-time, the average hours of the remaining full-time workers will not change much as there is little variation in working hours among full-timers. Working hours of the former full-timers, however, will still be relatively high compared to the pre-policy average hours worked by part-timers. The opposite is true for workers who switched from marginal to part-time. These opposing composition effects will thus tend to cancel each other out so that the average working hours of part-time workers will tend to remain relatively constant post policy, too. Finally, those who remain in marginal employment will have the fewest working hours, which again will tend to reduce average hours of workers in the marginal group post policy. At the same time, we have shown that marginal workers who do not switch to part-time still tend to increase hours in response to the minimum wage until they reach the marginal compensation threshold (see Appendix 2). Again, there are counteracting effects that tend to leave average hours of marginal workers unchanged. Consequently, for analyzing the working time effects of a minimum wage, a detailed analysis at the individual level that takes not only institutional particularities but also workers' job composition into account is decisive.

5 Conclusion

Our results paint a complex picture of the working time effects of the minimum wage introduction in Germany in 2015, revealing both positive and negative effects. Viewing these through the lens of a theoretical model of labor supply and demand suggests four key mechanisms: First, the minimum wage introduction has led some employers to reduce working hours (e.g. to transform low-paying full-time jobs into part-time). Second, some affected low-wage workers – primarily those with only one job – responded to the minimum wage hike by increasing hours worked (e.g. by switching from marginal jobs with already relatively long hours before the policy to regular employment), while others – especially those with multiple jobs (moonlighters) – have reduced hours in order to stick to marginal employment and thus to avoid higher taxes. Third, moonlighters who experienced negative hours effects on their main job tented to increase hours worked on their secondary job instead. Fourth, an increase of main job earnings by 8 percent, as caused by the minimum wage, does not lead individuals to give up secondary employment, on average. We therefore conclude: i) Considering only one job per

person and not taking institutional particularities into account falls short of getting the full picture of how employment reacts to wage shocks; ii) Studying effects at the individual level is important because one cannot conclude from the (lack of change) in the hours distribution that there are no minimum wage effects on working time; iii) The German policy scheme for marginal employment ('Minijobs') encourages employers to offer (and employees to accept) jobs at lower weekly working hours than without that policy; iv) A minimum wage appears not to be a proper policy for reducing moonlighting, which is sometimes claimed to be an important goal of a minimum wage.[15]

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[15] In the German policy discussion leading up to the introduction of the minimum wage, it was regularly claimed that a minimum wage, by guaranteeing a living wage, would make it unnecessary to have a secondary job to make ends meet (e.g. Ministerium für Arbeit und Sozialordnung, Familie, Frauen und Senioren Baden-Württemberg, 2011; DGB Südwestsachsen, 2013).

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6 Appendix 1: Model

In this appendix, we outline a simple and intuitive model to help us frame our discussion and put our results in place. While we acknowledge that efforts have been made to model the interaction of minimum wages with employment and working hours in more complex theoretical settings (e.g. Bhaskar, Manning and To, 2002, or Berger, Herkenhoff and Mongey, 2022, for employment; Strobl and Walsh, 2011, for working hours), we deliberately choose a more bare-bone, textbook-style model of labor supply and labor demand to keep the discussion from getting too mathematically involved and focus on illustrating our main points. We start by presenting a labor market where each worker can only hold one job, and discuss the effect of a minimum wage in this simple framework. We then introduce a tax exemption for jobs with only few working hours and an additional opportunity to participate in a secondary job market.

6.1 Labor supply and labor demand

Assume that, without loss of generality, workers are homogenous and optimize utility $\mathrm{U}(Y, L)$ with income Y and leisure L ($U_Y > 0;\ U_L > 0$). Income Y is the product of hourly wage w and working hours H, with working hours and leisure fulfilling $H + L = T$ for total available hours. When not working, workers receive reservation income Y_r. A graphical representation of this basic setup is depicted in Figure 4 (panel (A)), where I_R represents the 'reservation' utility indifference curve. Workers decline any job that offers lower utility, with w_l as the lowest acceptable wage. An employer who wants the worker to deviate from this schedule, either working more or less hours, has to pay a premium $w - w_l > 0$.

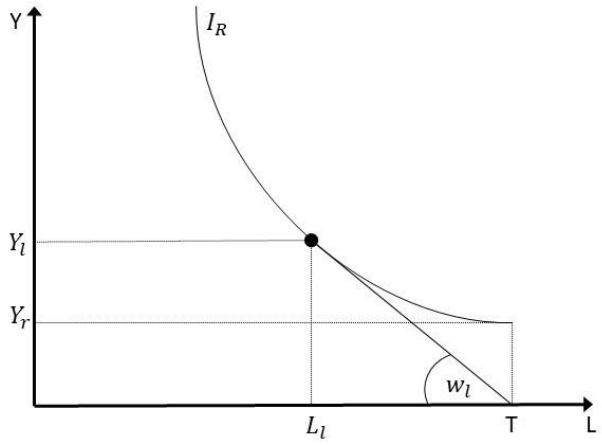
Firms are heterogeneous in their production technologies, and therefore differ in their optimal use of working hours. Each firm j is randomly matched with exactly one worker and gains full information about the worker's preferences in the process. The firm then maximizes profits

$$\pi_j = f_j(H_j) - w_j H_j$$

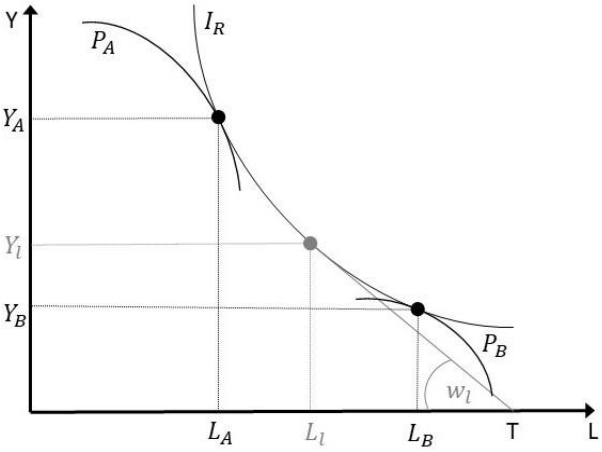
by picking a combination of hourly wage and working hours ($f_H > 0$). Figure 4 (panel (B)) illustrates this optimal choice for two firms A and B, with each firms' lowest isoprofit curve P_A and P_B tangential to I_R. Firm A's production technology requires relatively many hours, so that the firm picks $H_A = T - L_A$. Firm B, on the other hand, requires relatively few hours and picks H_B. Since worker and firm preferences for working hours are not aligned in this example, firm B would actually prefer the worker to work less hours at the solution (w_B, L_B, Y_B), while the worker would prefer working longer hours (conversely for firm A).

In a frictionless, competitive labor market, both firms and workers could of course easily find a better match for their preferred working hours schedule (at least if workers were heterogenous, too). Here, we assume that both are stuck with this initial match. While this simplifying assumption is rather extreme, it captures the essence of the idea that in segmented, thin labor markets characterized by a significant amount of search frictions, both workers and firms might find it hard to improve on an existing match.

Figure 4: Labor supply and labor demand



(A) Worker choice between work and leisure; reservation utility



(B) Firm choice of optimal hourly wage and working hours

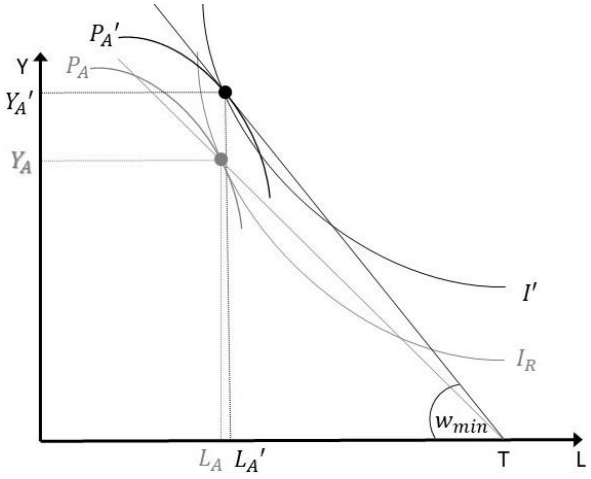
Notes: Panel (A) illustrates the worker choice between work and leisure, where reservation income (and utility) Y_r results in the worker refusing to work for wages below w_l. Panel (B) illustrates how the optimal posted wage of the firm (which depends on the firm's production technology) can lead to workers accepting working hours that differ from their preferred schedule. From the worker's point of view, they may be higher (case A) or lower (case B) than optimal (case in Panel (A)).

Source: Own illustration. © IAB

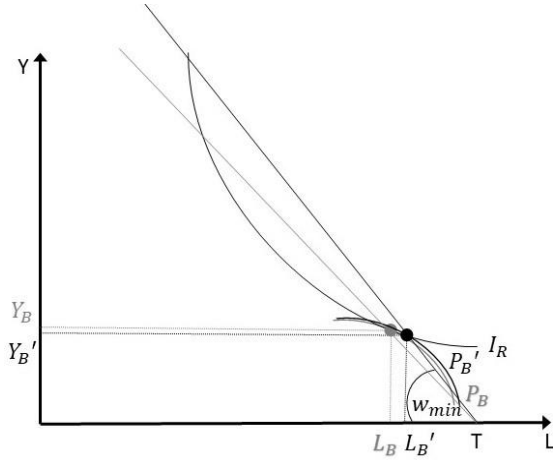
6.2 Effect of a minimum wage

Next, we turn to the effect of introducing a (binding) minimum wage in our simple wage-posting framework. Figure 5 illustrates the case. Clearly, the new minimum wage w_{min} will force firms to shift to a lower isoprofit curve (P'_A; P'_B). The effect on worker utility and working hours will, however, depend on the initial working hours/wage combination and the extent of the minimum wage hike.

Figure 5: Effect of a minimum wage: basic setting



(A) Job has more working hours than preferred by worker



(B) Job has fewer working hours than preferred by worker

Notes: The figure illustrates how working hours react to the introduction of a binding minimum wage. The working hours offer posted by the firm will usually (but not always) decline, and worker utility will increase if the minimum wage hike is strong enough. Firm profits will always decline. Panel (A) depicts the case where the job initially has more working hours than preferred by the worker. Panel (B) shows the case where the job initially has fewer working hours than preferred by the worker.

Source: Own illustration. © IAB

To see this, let's focus first on the case of firm A, where the job initially has more working hours than preferred by the worker (Panel (A)). Here, a small enough wage increase over the initial level of w_A will let the optimal hours/wage allocation posted by the firm move along the reservation utility indifference curve I_R (to the left and up). The worker will therefore accept, at constant utility, an increase in working hours for the higher hourly wage, moving her or him further away from the preferred split between work and leisure. However, once the firm's isoprofit curve becomes tangential to the minimum wage budget line at the optimal posted working hours offer (i.e. $\partial \pi_j(H_j; w_{min})/\partial H_j = 0$), the worker's reservation utility stops being a binding constraint for the firm (the minimum wage now becomes the only binding constraint). From here on, a higher minimum wage leads to a reduction in equilibrium working hours (as labor becomes more expensive) and an increase in worker utility. Panel (A) depicts a case (in black) where the

minimum wage is high enough for the optimal working hours offer of firm A (H_A') to be actually lower than in the unrestricted case (depicted in grey), and worker utility shifts to I'.

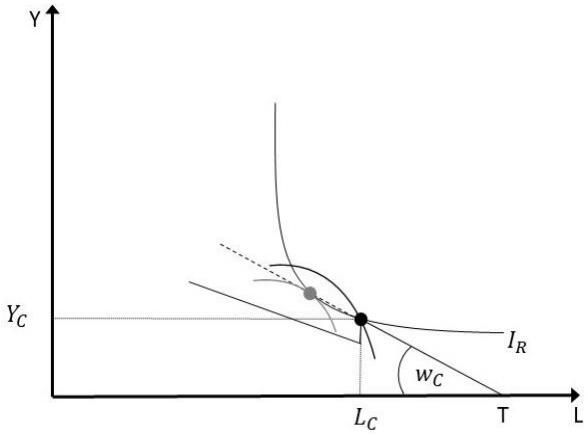
When a worker is offered less than the preferred number of working hours in the unrestricted case (Panel (B)), a binding minimum wage will always reduce working hours. Again, worker utility will stay constant for small minimum wage hikes and only increase once the minimum wage becomes the only binding constraint in the firm's optimization problem.

6.3 Marginal jobs and the minimum wage

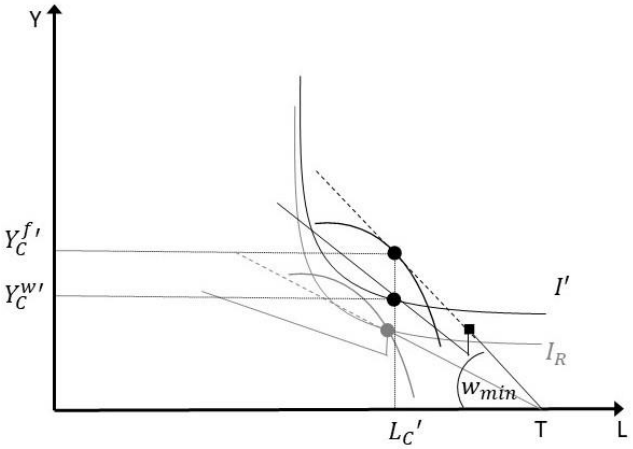
We now extend our basic setting to cover the special case when the main job offer is a marginal employment relationship according to the German 'Minijob' scheme. In Figure 6, we assume that the worker has a strong preference for few working hours (exemplified by I_R becoming very steep quickly), and model the preferential tax treatment as a kink in the budget line at the marginal compensation threshold Y_C for workers (for simplicity, we assume that there is no kink in the payment schedule for firms). In the initial setting (Panel (A)), the firm offers the worker a combination of hourly wage w_C and working hours H_C that results in earnings of exactly Y_C (depicted in black), i.e. a marginal job despite the firm's preference for more working hours (without the preferential tax treatment, the firm would choose the solution depicted in grey at the dashed budget line).[16] With the introduction of the minimum wage (Panel (B)), keeping the marginal employment relationship would now allow for much fewer working hours, which is no longer optimal for neither firm nor worker (case depicted as small black square). Consequently, the firm now offers a regular job without preferential tax treatment (depicted in black), which drives a wedge between worker net earnings $Y_C^{w\prime}$ and firm gross labor compensation $Y_C^{f\prime}$. In the new optimum, the worker may work more or less hours than in the marginal job without a minimum wage.

[16] This is an intermediate case. If the firm's production technology requires few working hours, it will also prefer a marginal employment relationship. If it requires many working hours, the firm will offer a higher wage to compensate the worker for working in a regular job.

Figure 6: Effect of a minimum wage: marginal job



(A) Working hours choice for a marginal job with preferential tax treatment



(B) Effect of a minimum wage on the chosen job type

Notes: Panel (A) shows how a firm may offer a marginal job with a preferential tax-treatment ('Minijob') despite the firm's preference for more working hours. Panel (B) illustrates how working hours react to the minimum wage when the main job is a marginal job. Here, the minimum wage may induce the firm to 'upgrade' the job offer, i.e. switch to a regular job.

Source: Own illustration. © IAB

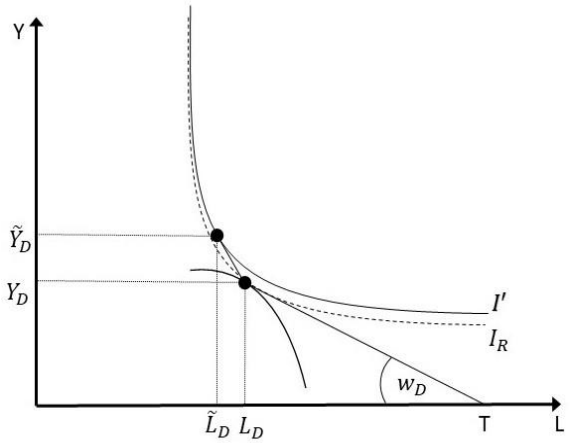
6.4 Secondary jobs and the minimum wage

In a final step, we want to turn to the effect of a minimum wage once we add a secondary job to the worker's optimization problem. To keep things as simple as possible, assume there is a secondary labor market where workers can work for a fixed hourly wage of w_S. They can freely choose to work up to H_S^{max} hours, with $Y_S^{max} = w_S \times H_S^{max} < Y_R$. This means these secondary jobs are, by assumption, not as attractive as main jobs per se, and only used to bolster up income. Also, we abstract from any disutility of taking up a secondary job.

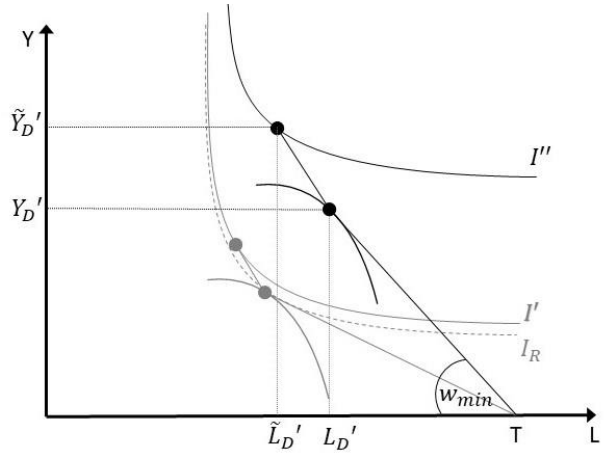
Figure 7 illustrates the effect of a minimum wage on the worker's decision problem. The worker is assumed to have a relatively strict working hours ceiling in $U(Y, L)$, possibly caused by family commitments, strong preferences for hobbies that require a certain amount of leisure time, or labor protection laws. In the pre-minimum-wage solution (Panel (A)), the worker is engaged in the main job at relatively many working hours H_D, leaving only limited time for a secondary job.

Still, at w_S, the worker chooses to add a couple of working hours H_S in the secondary job, thus switching from the reservation utility level to I'.[17, 18] However, the worker does not reach H_S^{max} due to the strong curvature of the indifference curve. After the minimum wage introduction (depicted in black in Panel (B)), the worker's main employer decides to reduce working hours to $L_D{}'$, which now leaves more room to extend working hours on the secondary job. Combining both jobs, the worker can now reach the higher utility level I''.

Figure 7: Effect of a minimum wage: secondary job



(A) Secondary job take-up



(B) Effect of a minimum wage on working hours choice in the secondary job

Notes: The figure illustrates how working hours in a secondary job may react to a binding minimum wage in the main job. Workers will generally choose a secondary job if they are working-hours-constrained on the main job or can earn a higher hourly wage on the secondary job (which might not be suitable for a main job due to strong limits on working hours). The latter case is shown in Panel (A). If firms reduce working hours on main jobs as a consequence of the minimum wage, this allows workers to shift more working time to the secondary job (Panel (B)).

Source: Own illustration. © IAB

[17] $H_S = L_D - \tilde{L}_D$.

[18] In Figure 7 (Panel (A)), a secondary job paying a wage below the main job is not attractive. However, as can be readily inferred from case B in Figure 4 (panel (B)), this would be the case if the worker is hours-constrained in the main job.

7 Appendix 2: Main versus secondary job switching

In contrast to main jobs, we find no significant effect on switching from marginal to regular employment for secondary jobs (Table 4, column (3) versus (4)), and the effect on secondary earnings is also far weaker (Table 3, column (3) versus (5)). For interpreting the weaker minimum wage effects on earnings and lack of switching for secondary jobs, it is important to consider the interplay between the marginal compensation threshold of 450 EUR/month and an individual's job composition. As discussed in section 1, individuals who receive the minimum wage must not work longer than 53 hours/month under the marginal employment status. To analyze this mechanism explicitly, we select all jobs that initially payed below the minimum wage and split them into four groups: main marginal or secondary jobs that are either working hours constrained or not. A marginal job is considered 'hours constrained' if the minimum wage hike would lead monthly earnings to pass the threshold at stable working hours. In Table 7, we then show how the earnings growth (Panel A) or the probability to switch to regular employment (Panel B) in 2015 deviate from their pre-policy averages within each hourly wage bin in 2014.[19]

Three important patterns arise from Table 7: First, the weakness of the earnings effect found for all secondary jobs is driven by jobs that are hours constrained (column (3) versus (4) of panel A). Secondary jobs that are not hours constrained experience significant earnings increases, in turn.

Second, from column (3) we see that the effect of the minimum wage on hourly wages does not translate into higher earnings of secondary jobs that are hours constrained. At the same time, there are no effects on switching to regular employment for this job type (panel B) and also no negative employment effects (Table 3, column (6)). These patterns imply that affected individuals must have reduced their working time in order to keep their marginal employment status. This is plausible as the tax burden from transforming a secondary job to regular employment is very high in the case of moonlighting, because the earnings from the main job will also be relevant for determining the tax level. Hours constrained secondary jobs with initial wages close to the minimum wage even experience some decline in earnings relative to the average pre-policy period change. Only those with initially very low wages, and consequently relative long working hours already before the policy, show an increased propensity to switch.

Third, main marginal jobs show clear effects on switching to regular employment, even when they are not hours constrained. Non-moonlighters with marginal jobs therefore appear to extend working hours to realize higher earnings at the new minimum. This effect becomes clear when comparing unconstrained main and secondary jobs (columns (2) versus (4)). The implicit hours restriction imposed by the marginal compensation threshold limits minimum-wage-induced earnings increases far more for moonlighters than for non-moonlighters. Rising working hours can thus explain why the earnings effect is much larger for unconstrained main marginal than for unconstrained secondary jobs.

[19] For this exercise, we show single differences because the 'Control group' of high-wage earners is excluded from the estimation sample by construction when we consider working hours being constrained or not.

Table 7: The Effects of the Minimum Wage on Earnings and Switching to Regular Employment for Marginal Jobs Paid Below the Minimum Wage – Depending on Working Hours Being Constrained or Not: Single Differences

Deviation of a given outcome variable from the pre-policy period's average, in (log) percentage points

	(1)	(2)	(3)	(4)
	Main marginal		Secondary	
	Constrained	Unconstrained	Constrained	Unconstrained
2015 versus $\overline{2012 to 2014}$ by wage bin in 2014				
Panel A: Earnings growth				
[3.5,5.5)	0.1132	0.2155	0.0662	0.1240
	(0.0183)	(0.0194)	(0.0204)	(0.0161)
[5.5,6.5)	0.0889	0.2038	0.0069	0.0813
	(0.0117)	(0.0204)	(0.0167)	(0.0168)
[6.5,7.5)	0.0479	0.1175	-0.0201	0.0524
	(0.0094)	(0.0143)	(0.0122)	(0.0125)
[7.5,8.5)	0.0135	0.0565	-0.0270	0.0260
	(0.0110)	(0.0109)	(0.0128)	(0.0101)
Observations	41,208	67,452	9,870	25,757
Panel B: Switch to regular				
[3.5,5.5)	0.0328	0.0305	0.0101	-0.0026
	(0.0085)	(0.0059)	(0.0051)	(0.0017)
[5.5,6.5)	0.0465	0.0301	0.0066	0.0007
	(0.0073)	(0.0065)	(0.0047)	(0.0026)
[6.5,7.5)	0.0426	0.0171	0.0010	0.0017
	(0.0062)	(0.0050)	(0.0030)	(0.0020)
[7.5,8.5)	0.0343	0.0047	-0.0019	-0.0028
	(0.0076)	(0.0044)	(0.0033)	(0.0015)
Observations	50,411	89,486	14,036	40,310

Notes: In the table, we show single-difference estimates that take the deviations of the one-year earnings growth (panel A) as well as the likelihood to switch from marginal to regular employment (panel B) from the average over the pre-policy period of workers who earn less than the minimum wage at baseline. We consider main marginal jobs that are working hours constrained in column (1), unconstrained main marginal jobs in column (2), constrained secondary jobs in column (3), and unconstrained secondary jobs in column (4). We define a job as 'hours constrained' if an increase to the minimum wage at stable hours would lead monthly earnings to pass the marginal compensation threshold of 450 EUR and thus force either a switch to regular employment or a reduction of working hours to keep the marginal employment status. All regressions control for individual characteristics at baseline (age, education, gender, nationality, working time status interacted with year, district fixed effects, and industry fixed effects). Heteroskedasticity-robust standard errors are in parentheses.

Source: Weakly anonymous Version of the Sample of Integrated Labour Market Biographies (SIAB) – Version 7519 v1, own calculations © IAB

Taken together, the effect on switching to regular employment is restricted to marginal employment as a main job, where affected individuals can realize even higher earnings at the new minimum wage by also increasing their working time (at the cost of losing the marginal jobs' tax advantage). The implicit hours restriction imposed by the marginal compensation threshold, however, is much more binding for moonlighters and discourages them to transform their secondary jobs. These workers rather tend to reduce working hours and even accept some earnings decline in response to the minimum wage.

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