**Evaluating the Minimum-Wage Exemption of the Long-Term Unemployed in Germany**

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**Online Appendix**

**A. Extended Institutional Background**

*History of the German National Minimum Wage*

In Germany, a strong safety net and high collective bargaining coverage ensured that introducing a national minimum wage was not considered a policy choice of primary importance for a long time. This assessment was changed by two major developments: First, the erosion of collective bargaining coverage resulted in a decline of the fraction of workers covered by the implicit wage floors included in the agreements (Dustmann, Fitzenberger, Schönberg, and Spitz-Oener 2014). Second, the Hartz reforms of 2005 strengthened the incentives for job seekers to take up jobs in the low-wage sector (Möller 2014). Under this new law, unemployment insurance benefits amount to 60 to 67% of previous earnings. Eligibility and expiry depend on age and past employment duration in covered jobs during the past five years. In the most typical case of an unemployed person with previous employment duration exceeding two years, benefits expire after 12 months. After that period, the unemployed job seekers receive means-tested welfare benefits for subsistence, which are calculated at the level of the benefit unit.

Pioneered by the introduction of a minimum wage in Germany’s main construction sector in 1997, several industry-specific minimum wages were implemented with the collaboration of employer associations, labor unions, and the government to counter the falling fraction of workers
and firms covered by the collective bargaining agreements. These sectors were waste removal, coal mining, roofing, electrical installation, commercial cleaning, painters and varnishers, nursing care, security services, industrial laundries, temporary work, and education and training services. None of these measures, however, could prevent the well-documented rise in wage inequality that began in the 1980s (Dustmann, Ludsteck, and Schönberg 2009; Antonczyk, Fitzenberger, and Sommerfeld 2010; Card, Heining, and Kline 2013).

These developments led to a growing interest in a national minimum wage among many policymakers. This interest was backed by results from the empirical evaluation of sectoral minimum wages, which rarely found negative employment effects (Möller 2012). The pros and cons of minimum wages were also vigorously discussed among German academics (Ifo 2008).

The minimum-wage exemption of the long-term unemployed is regulated by section 22 (4) MiLoG.¹ As defined in section 18 of Book III of Germany’s Social Code, an individual is officially classified as long-term unemployed as soon as she is registered as unemployed for more than one year. An unemployment period, according to this definition, is not interrupted by employment measures in accordance with section 45 of Book III, periods of sickness leave, and other types of non-employment not exceeding six weeks. Time spent in measures of active labor market policy and care dependency, among others, is not considered in the determination of the long-term unemployment status.

Once hired, the formerly long-term unemployed normally loses her long-term unemployment status. In case of employment with less than 15 hours a week, however, she is still classified as long-term unemployed. In principle, the exemption can then be applied again to future employment relationships.

¹ MiLoG is the abbreviation for the German Minimum Wage Law.
Other Exemptions

Apart from the long-term unemployed, additional groups are exempted from the minimum wage: workers younger than 18 years without completed vocational training, apprentices, and some types of internships and voluntary work. In addition, some sector-specific minimum wages below the national minimum were allowed for a transition period. On January 1, 2015, these sectors included the hairdressing industry, personnel leasing, the meat industry, agriculture and forestry with gardening, and the textile industry. In our survey, 8% of all long-term unemployed who started a job in April 2014, and 11% among those who started at less than 8.50 EUR/hour, were employed in one of these exempted sectors. All sector-specific exemptions ended January 1, 2017, at the latest.

Extended Background on the Survey

We conducted our survey as part of the project “Mindestlohnbegleitforschung - Überprüfung der Ausnahmeregelung für Langzeitarbeitslose,” which was funded by the German Ministry for Labour and Social Affairs (vom Berge et al. 2016). The first wave’s interviews took place retrospectively during spring 2015. Wave 2 interviews took place between October 2015 and December 2015, and wave 3 interviews took place between November 2015 and January 2016. The telephone interviews (Computer Aided Telephone Interviews, CATI) were carried out by the Soko-Institute (Sozial- und Kommunikationswissenschaftliches Institut), located in Bielefeld, Germany.

The unadjusted response rate of the survey was 26.5% and the rejection rate was 21.8%. The response rate was lowered by the sampling design that refrained from further interviews once the target number of 450 interviews per bin was reached. We arrive at a corrected response rate of more than 40% once we take this into account.
Table A.1 verifies that the actual survey responses are not particularly selective. It contrasts characteristics of the responding population with characteristics of a random sample from the target population. In each wave, survey respondents are somewhat positively selected; they are more likely female, older, and less likely to be marginally employed than the target population. However, these differences are not particularly pronounced. The fraction of long-term unemployed among the respondents is also about the same as in the target population. We are therefore confident that our survey sufficiently resembles the population of unemployed job starters.

**Table A.1. Selectivity of Survey Respondents**

| Outcome          | (1) Target | (2) Response | (3) Target | (4) Response | (5) Target | (6) Response | (7) Target | (8) Response |
|------------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| **Female**       | 0.454      | 0.496        | 0.454      | 0.490        | 0.438      | 0.456        |            |              |
|                  | (0.007)    | (0.007)      | (0.007)    | (0.007)      | (0.007)    | (0.007)      |            |              |
| **Age**          | 40.4       | 41.9         | 40.5       | 42.4         | 39.6       | 41.6         |            |              |
|                  | (0.169)    | (0.173)      | (0.172)    | (0.174)      | (0.174)    | (0.177)      |            |              |
| **Marginal**     | 0.355      | 0.318        | 0.317      | 0.285        | 0.296      | 0.255        |            |              |
| employment       | (0.007)    | (0.006)      | (0.006)    | (0.006)      | (0.006)    | (0.006)      |            |              |
| **Long-term**    | 0.600      | 0.600        | 0.600      | 0.600        | 0.600      | 0.594        |            |              |
| unemployed       | (0.007)    | (0.007)      | (0.007)    | (0.007)      | (0.007)    | (0.007)      |            |              |
| **Observations** | 4,500      | 4,596        | 4,500      | 4,578        | 4,500      | 4,543        |            |              |

Notes: The table contrasts characteristics of a random sample from the target population of unemployed people transitioning to covered employment, or marginal employment, in April 2014 (wave 1), April 2015 (wave 2), or July 2015 (wave 3) with characteristics of the actual survey respondents. Robust standard errors are in parentheses. Own calculations based on our survey data and on Unemployment Statistics and Employment Statistics, respectively.
B. Testing for Selective Sorting and Attrition

Test of a Discontinuity in the Density of the Running Variable

Table B.1 presents the results of the McCrary (2008) test for discontinuous breaks in the density of the running variable. Columns (2) and (3) show estimates based on the full sample for hires in 2014 and 2015, respectively. Column (4) focuses on hires in 2015 but excludes those hires taking place after exactly one year in unemployment. We also bootstrap the difference of the McCrary (2008) statistics between 2015 and 2014 in column (5).

In 2015, taking all unemployment durations into account, 84.7% more employment transitions fell into the bin to the right of the threshold as compared to the bin to the left of the threshold. The corresponding number for 2014 is 81.5%. These significant estimates are solely driven by the selectivity of hires after exactly one year: The discontinuities are estimated to be small in magnitude and no longer statistically significant when we exclude those hires in column (4). Furthermore, the discontinuities in the full sample are approximately the same size in 2014 and 2015, as can be seen from their differences, which are again estimated close to zero and statistically insignificant (see column (5)). Consequently, after accounting for selectivity we see no evidence for any effects of the exemption on the hiring chances of the long-term unemployed.
Table B.1. Discontinuities in the Density of the Running Variable

|                | (1)      | (2)      | (3)      | (4)      | (5) minus(2) |
|----------------|----------|----------|----------|----------|--------------|
|                | 2014     | 2015     | 2015     |          |              |
| McCrary statistic | 0.815   | 0.847    | 0.028    | 0.032    |
| (0.013)        | (0.013)  | (0.015)  | (0.020)  |
| Cases directly at threshold excluded | No       | No       | Yes      | No        |
| Observations   | 334,013  | 312,359  | 300,363  | 646,372  |

Notes: The table shows estimates of a discontinuity at the long-term unemployment threshold in the density of the running variable (i.e., the unemployment duration prior to job start). Regressions of the density comprise the population of unemployed, according to Federal Employment Agency’s definition, entering covered employment, or marginal employment after 243 to 486 days of unemployment in the respective years and are conducted with the estimator by McCrary (2008), with standard errors in parentheses. Column (4) excludes unemployment periods ending after 364, 365, and 366 days. Column (5) shows the difference of the estimates of the McCrary statistic in (3) and (2), together with bootstrap standard errors based on 500 replications. Own calculations based on Unemployment Statistics and Employment Statistics.

Test of Discontinuities at the Threshold in Observable Worker and Firm Characteristics

In addition, we test for discontinuities in observable worker and firm characteristics at the long-term unemployment threshold. Table B.2 presents these results for predetermined individual characteristics (average age, education, gender, nationality, and place of residence in East Germany) in both our survey and the administrative data. Figure B.1 considers characteristics of the new job or employer (the probability of marginal employment, workplace in East Germany, firm size, and the share of part-time employees at the firm).

The only discontinuities we find are attributable to workers who start a job after exactly one year. These workers are on average somewhat older and more educated than those who start at other durations close to the threshold. Reassuringly, our results are fully robust to accounting for this selectivity.
Table B.2. Regression Discontinuity at the Long-term Unemployment Threshold in Observable Characteristics – by Data Source in 2015

| Outcome          | Survey data | Administrative data | Survey data | Administrative data |
|------------------|-------------|---------------------|-------------|---------------------|
|                  | (1)         | (2)                 | (3)         | (4)                 | (5)                 |
|                  | All obs.    | Obs. at threshold excluded | All obs.    | Obs. at threshold excluded |
| Age              | 2.92        | 1.62                | 3.60        | -0.05               |
|                  | (0.897)     | (1.044)             | (0.068)     | (0.083)             |
| No voc. training | -0.047      | -0.020              | -0.072      | 0.014               |
|                  | (0.028)     | (0.035)             | (0.002)     | (0.003)             |
| Female           | -0.005      | -0.023              | -0.000      | -0.006              |
|                  | (0.039)     | (0.045)             | (0.002)     | (0.003)             |
| German           | 0.013       | -0.029              | 0.025       | -0.018              |
|                  | (0.024)     | (0.032)             | (0.002)     | (0.002)             |
| Residence in West| -0.021      | -0.009              | -0.029      | -0.008              |
|                  | (0.035)     | (0.040)             | (0.002)     | (0.003)             |
| Observations     | 6,387       | 6,208               | 1,234,874   | 1,185,119           |

Notes: The table shows Calonico et al. (2014) bias-corrected estimates of a discontinuity at the long-term unemployment threshold in observable characteristics of the unemployed within a window of 243 to 486 days of unemployment. Robust standard errors are in parentheses. The survey data comprises respondents transitioning from unemployment to covered employment, or marginal employment, in April 2015 (wave 2) or July 2015 (wave 3). The administrative data comprises all unemployment periods according to Federal Employment Agency’s definition in 2015. Columns (3) and (5) exclude unemployment periods ending after 364, 365, and 366 days. Own calculations based on our survey data and on Unemployment Statistics and Employment Statistics, respectively.
Figure B.1. Regression Discontinuity at the Long-Term Unemployment Threshold in Observable Characteristics of the New Employer – Job Starters in 2015

Notes: The figure comprises the population of unemployed, according to Federal Employment Agency’s definition, entering covered employment, or marginal employment, in 2015. It shows unconditional bin-means together with 99% confidence bands and a local linear fit to the left and right of the long-term unemployment threshold. (a) shows the fraction of marginal employees at the establishment and is based on 319,777 observations. (b) shows the fraction of establishments located in East Germany and is based on 318,773 observations. (c) shows the fraction of establishments with more than 50 employees in the month prior to hiring and is based on 319,777 observations. (d) shows the fraction of part-time employees at the establishment and is based on 318,559 observations. Unemployment periods ending after 364, 365, and 366 days are excluded. Own calculations based on Unemployment Statistics and Employment Statistics.
C. Employment and Wage Effects for Subgroups Most Strongly Affected by the Minimum Wage

Although the minimum wage exhibits a certain bite across the German economy overall, some sectors are much more affected than others. We therefore repeat our analysis of the employment and wage effects of the long-term unemployment exemption in sectors that are particularly strongly affected. Figure C.1 presents results of our regression discontinuity (RD) analysis of effects on the hiring rate in four subgroups: 1) establishments located in East Germany, 2) industries not exempted from the minimum wage due to sectoral agreements at the time of the minimum wage introduction (i.e., excluding the hairdressing industry, personnel leasing, the meat industry, agriculture and forestry [including gardening], and the textile industry), 3) the low-wage sector (i.e., manufacture of bakery and farinaceous products, retail [excluding automotive parts], taxi operation, hotels, private security services, gastronomy/catering, call centers, gambling and betting services, beauty parlors, and households with employees), and 4) for workers marginally employed in non-exempted sectors. In none of these tests, however, do we find significant discontinuities at the threshold.

Furthermore, Figure C.2 repeats the RD analysis of the fraction of entry wages below minimum in 2015 for establishments in (i) East Germany, (ii) not bound by collective agreements, (iii) not exempted from the minimum wage due to sectoral agreements, (iv) in the low-wage sector, (v) for marginally employed workers in sectors not exempted from the minimum wage, or (vi) for high-turnover industries. Unfortunately, the corresponding estimates are often imprecise due to small sample sizes. However, they are perfectly in line with the results derived from the full sample.
Figure C.1. Change in Distribution of Unemployment Duration Cumulated Prior Job Start, 2015 versus 2014 – by Subgroups

(a) 2015 minus 2014, workplace in East
(b) 2015 minus 2014, sectors not MW exempted
(c) 2015 minus 2014, low-wage sectors not MW exempted
(d) 2015 minus 2014, marginal employment in sectors not MW exempted

Notes: The figure comprises the population of unemployed, according to Federal Employment Agency’s definition, entering covered employment, or marginal employment, in 2015 or 2014. It shows differences in the kernel density estimates of unemployment durations cumulated prior to job start between 2015 and 2014, together with a local linear fit to the left and right of the long-term unemployment threshold. (a) restricts the sample to establishments located in East Germany. (b) restricts the sample to establishments in industries not exempted from the minimum wage (MW) in January 2015. (c) restricts the sample to establishments in industries identified as low-wage sectors and not exempted from the minimum wage in January 2015. (d) restricts the sample to marginally employed workers in industries not exempted from the minimum wage in January 2015. Observations directly at the threshold are included. Own calculations based on Unemployment Statistics and Employment Statistics.
Figure C.2. Regression Discontinuity at the Long-term Unemployment Threshold in Fraction of Wages below Minimum – Job Starters in 2015 – by Subgroups

Notes: The figure comprises survey participants transitioning from unemployment to covered employment, or marginal employment, in April 2015 (wave 2) or July 2015 (wave 3). It shows unconditional bin-means together with 95% confidence bands and a local linear fit to the left and right of the long-term unemployment threshold. (a) restricts the sample to establishments located in East Germany. (b) restricts the sample to wages not subject to collective agreements as reported by the survey participant. (c)
restricts the sample to establishments in industries not exempted from the minimum wage (MW) in January 2015. (d) restricts the sample to establishments in industries identified as low-wage sectors and not exempted from the minimum wage in January 2015. (e) restricts the sample to marginally employed workers in industries not exempted from the minimum wage in January 2015. (f) restricts the sample to firms in sectors with a turnover rate above median. Observations directly at the threshold are included. Own calculations based on our survey data.

D. Difference-in-Differences Estimates of the Wage Effect of the Exemption

One disadvantage of the RD approach is that employers and workers need to be sufficiently precise in their estimation of the correct duration of unemployment. If there is a sizeable amount of miscalculation, the effect at the threshold might be blurred. Moreover, there is a monetary incentive for employers to delay the hiring of short-term unemployed job seekers if they are already close to the threshold. This condition would lead to some bunching in the distribution of hires around the threshold and an upward bias in our estimate of the exemption’s effect on the hiring rate (note that we do not find any significant effects on hiring, though).

We therefore use the following classic difference-in-differences (DiD) approach to take the focus away from the threshold and obtain an alternative estimate that is arguably more robust to these problems:

\[ y_{it} | d_{it} \in [d^{lb}; d^{ub}]; t \in [2014, 2015] = \bar{y} + \alpha \mathbb{1}(d_{it} \geq \bar{d}) + \gamma \mathbb{1}(t \geq 2015) + \beta \mathbb{1}(d_{it} \geq \bar{d}) \times \mathbb{1}(t \geq 2015) + \delta x_{it} + \epsilon_{it}. \]

That is, we estimate a regression of \( y \) (the fraction affected) pooling all years and eventually restricting the sample by individual unemployment duration located between some lower bound value \( d^{lb} \) and some upper bound value \( d^{ub} \) to make the sample more homogenous. The regressions include as regressors a dummy for long-term unemployment, \( \mathbb{1}(d_{it} \geq \bar{d}) \), a dummy for post-treatment period, \( \mathbb{1}(t \geq 2015) \), the interaction term between these two dummy
variables, a vector of observable worker characteristics \( \mathbf{x} \), an error term \( e \), and an intercept \( \bar{y} \). The parameters of the model are denoted by \( \alpha, \beta, \gamma, \) and \( \delta \). Ordinary least square (OLS) estimates of \( \beta \) then measure the effect of the exemption by contrasting the mean outcome of the long-term versus the short-term unemployed before relative to after the minimum wage introduction.

Table D.1 summarizes the results: Between 2014 and 2015 the likelihood of earning less than the minimum wage declines by 9.6 percentage points, or 0.8 percentage points more for the long-term than for the short-term unemployed, depending on whether we include all the long-term unemployed or only those with unemployment durations not exceeding 486 days. The estimated effects change only little with the inclusion of controls for the survey wave, gender, nationality, vocational training, age, age squared and fixed effects for the district of residence in the month before the worker was hired. Most important, these estimates indicate that the wages of the long-term unemployed did not increase by less than did those of the short-term unemployed. Also recall from panel (c) of Figure 2 in the main text that the employment prospects of unemployed job seekers did not change much in 2015 relative to 2014, irrespective of the previous duration in unemployment. Our finding of no significant effects of the exemption therefore holds for unemployment durations further away from the threshold, too.
**Table D.1. Changes in Likelihood of Earning an Entry Wage below Minimum – by Unemployment Duration**

| Days unemployed | (1) | (2) | (3) | (4) | (5) |
|-----------------|-----|-----|-----|-----|-----|
| Key regressors  | [242 and above] | [242–486] | [242–486] | [242–486] | [242–486] |
| [a] Hired in 2015 | -0.187 | -0.162 | -0.187 | -0.163 |
|                  | (0.015) | (0.016) | (0.015) | (0.015) |
| [b] Hired as LTU | 0.137 | 0.118 | 0.029 | 0.034 |
|                  | (0.023) | (0.020) | (0.022) | (0.019) |
| [a] × [b] interaction | -0.096 | -0.082 | -0.008 | -0.005 |
|                  | (0.025) | (0.023) | (0.021) | (0.020) |

*Other regressors included in regression:*

| Constant | Yes | Yes | Yes | Yes |
| Wave     | No  | Yes | No  | Yes |
| Female   | No  | Yes | No  | Yes |
| German   | No  | Yes | No  | Yes |
| No voc. training | No | Yes | No | Yes |
| Age, age | No  | Yes | No  | Yes |
| squared  |      |     |     |     |
| Region of residence in month before job start | No | Yes | No | Yes |
| Observations | 11,776 | 11,776 | 9,710 | 9,710 |

*Notes:* The table comprises survey respondents transitioning from unemployment to covered employment, or marginal employment, in April 2014 (wave 1), April 2015 (wave 2), or July 2015 (wave 3). It shows ordinary least squares estimates with a dummy variable indicating an hourly entry wage below 8.50 EUR as dependent variable, weighted and with robust standard errors clustered at the duration of unemployment in parentheses. LTU stands for “long-term unemployed.” Own calculations based on our survey data.
E. The Effect of the Exemption on Employment Stability

Given that we do not observe any impact of the exemption on the hiring chances of the long-term unemployed, we do not expect to see an impact on the separation rate of formerly long-term unemployed workers after six months. After six months, merely 58 to 60% of the former long-term unemployed hired in the first quarter of 2014 or 2015, respectively, are still employed (see Table E.1). Reassuringly, the survival rates in those jobs do not indicate any unusual increase in separation rates after six months on the job when the minimum wage also binds for former long-term unemployed.

Table E.1. Survival in Employment – by Year of Job Start

| Days employed | Survival rate 2014 | Survival rate 2015 |
|---------------|--------------------|--------------------|
| 28            | 0.915              | 0.924              |
| 59            | 0.806              | 0.823              |
| 90            | 0.734              | 0.754              |
| 121           | 0.680              | 0.700              |
| 152           | 0.632              | 0.654              |
| 183           | 0.584              | 0.607              |
| 214           | 0.543              | 0.569              |
| 245           | 0.511              | 0.537              |
| 276           | 0.482              | 0.508              |
| 307           | 0.450              | 0.483              |
| Observations  | 87,159             | 93,064             |

Notes: The table comprises the population of long-term unemployed, according to Federal Employment Agency’s definition, entering a job in the first quarter of either 2014 or 2015, respectively. The end of the employment period defines failure. Own calculations based on Unemployment Statistics and Employment Statistics.
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