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The regional effects of Germany's national minimum wage☆

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HIGHLIGHTS

- Analyses the spatially differential effects of a nationally uniform minimum wage.
- Uses a micro data set covering the universe of employed and unemployed individuals in Germany from 2011 to 2016.
- Uses a difference-in-differences based identification strategy that controls for heterogeneity in pre-treatment outcome trends.
- Finds that policy led to spatial wage convergence, in particular in the left tail of the distribution, without reducing relative employment in low-wage regions within the first two years.

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ABSTRACT

We show that the minimum wage introduced in Germany in 2015 led to spatial wage convergence, in particular in the left tail of the distribution, without reducing relative employment in low-wage regions within the first two years.

1. Introduction

While there is a vast and controversial literature about the implications of minimum wages for employment and the distribution of wages, little is known about the spatial implications of such a policy. With productivity and, hence, wage differences across locations, the introduction of a national minimum wage affects regions to different extents. While the policy bites hard in poor places, there is only a small fraction of workers earning less than the minimum in rich places (Machin et al., 2003).

We follow this idea when exploring the wage, employment, and migration effects of the federal minimum wage that was introduced in Germany in 2015. Since then, German employers have to pay at least €8.50 per hour corresponding to 48% of the median salary of full-time workers. This level is high compared to the US (36%) and because no similar regulation preceded the statutory wage floor, it represented a potentially significant shock to regions in the left tail of the regional wage distribution.[1]

To identify the differential effects across locations, we exploit the variation in the fraction of workers who earned less than the minimum in 2014 across German counties. We compare counties subject to different intensities of treatment in a difference-in-differences (DD) strategy that accounts for heterogeneity in pre-treatment outcome trends. In doing so, we exploit a micro data

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[1] The level is comparable to many other developed economies, see https://stats.oecd.org.

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set covering the universe of employment and unemployment in Germany from 2011 to 2016.

We show that the minimum wage policy raised the wages of low-wage workers without affecting employment. Unemployment even shrinks in regions with a high minimum-wage bite in 2015 relative to low-bite locations owed to a temporary reduction in in-migration, but these effects already vanish in 2016. The policy's primary effect thus far has been to transfer producer surplus to workers in low-wage regions, indicating that low-wage employees were paid below their marginal value product (Machin et al., 1993; Machin and Manning, 2004). Hence, the competitive labour market model has to be rejected.

This paper contributes to the literature on the labour market implications of minimum wages that largely builds on experience in the US. Our evidence is novel in that it is based on the largest European economy, focuses on the *regional* implications of a national minimum wage, and covers the effects on regional migration.[2]

2. Data

The empirical analysis is based on the Employment Histories (BeH) and the Integrated Employment Biographies (IEB) provided by the Institute of Employment Research (IAB) which contain individual-level data on the universe of labour market participants in Germany. Despite their comprehensiveness, the data do not include information about the number of hours worked. We therefore impute average working hours separately for full-time and part-time workers from an auxiliary regression that accounts for sector of employment, federal state of employment, and various socio-demographic attributes and uses a 1% sample from the 2012 census (for details, see section 5 of the online appendix). We find that full-time employees work approximately 40 hours per week while the number is lower for regularly employed (21 hours) and for marginally employed part-time workers (10 hours). Combining working hours with average daily earnings delivers hourly wages from which we compute the 2014 (the year prior to the policy change) share of workers (at the workplace) below the minimum wage for each of the 401 German counties (NUTS3 regions). Since labour markets are integrated across county borders, we define the minimum-wage bite as the average of the shares of below-minimum-wage workers at all counties, weighted by the bilateral commuting flows from the year 2010. Table 1 provides an overview of the key variables.

3. Empirical strategy

To evaluate the effects of the minimum wage policy on an outcome $y_{c,g,t}$ in county c in region g at time t, we use a difference-in-difference specification with a continuous treatment variable (Ahlfeldt et al., 2017). It allows for treatment effects on both the level and the trend of an outcome (Ahlfeldt and Feddersen, 2018) and controls for county-specific time trends. In particular, we have

$$y_{c,g,t} = \beta_1 T_c \times I\,(t \geq 2015) + \beta_2 T_c \times I\,(t \geq 2015) \times (t - 2015) + \mu_c + \vartheta_{g,t} + (\eta_c \times t) + \epsilon_{c,g,t}, \quad (1)$$

where T_c is the treatment variable (the minimum wage bite) that interacts with time through an indicator variable $I(.)$ that takes the value of one if the observation refers to years 2015 or 2016, and zero otherwise. Further, the inclusion of the second term allows us to identify time-specific treatment effects. μ_c are county effects, $\vartheta_{g,t}$ denote region (East Germany, West Germany) effects interacted with year effects and $\epsilon_{c,g,t}$ is a random error. We also control for county-specific effects that interact linearly with time t, $(\eta_c \times t)$, to absorb unobserved spatio-temporal heterogeneity that could induce a non-parallel-trends problem. The time-specific treatment effect we estimate is $\frac{\partial y_{c,g,t,I=1}}{\partial T_c} - \frac{\partial y_{c,g,t,I=0}}{\partial T_c} = \hat{\beta}_1 + \hat{\beta}_2(t - 2015)$, where hats indicate estimated values.

To depict the temporal pattern of the treatment effect without imposing parametric constraints, we use an intervention-study design of the following form:

$$y_{c,g,t} = \sum_{Z \neq 2014} \beta_Z T_c \times I\,(t = Z) + \mu_c + \vartheta_{g,t} + \epsilon_{c,g,t}. \quad (2)$$

The estimated time-varying effects $\hat{\beta}_Z$ capture the effect of the treatment on the outcome $\frac{\partial y_{c,g,t=Z}}{\partial T_c} - \frac{\partial y_{c,g,t=2014}}{\partial T_c}$ and the effects of a time-trend that interacts with unobserved county-specific effects, η_c in (1). To control for a confounding effect if $cov(\eta_c, T_c) \neq 0$, we compute the treatment effect at time $t = Z$ as the difference between $\hat{\beta}_Z$ and a linear extrapolation of the trend in $\hat{\beta}_Z$ during the pre-treatment period. The counterfactual is then the same as in specification (1). The treatment effects for $Z > 2014$ are identical in both specifications in this setting with two post-intervention periods.[3] We report clustered standard errors (by county) as they turn out to be more conservative than a panel-derivative of Conley's (1999) standard errors.[4] We acknowledge that T_c incorporates hours worked, which are measured with error at the individual level. Within each county, however, we aggregate over a large number of workers (≈150k on average), thus the county-level mean and variance of the error is likely near zero.

A precisely estimated zero effect of the minimum wage bite on employment will have important policy implications. However, given that there is suggestive evidence for some employers paying less than €8.50 per hour after 2015 (e.g. Mindestlohnkommission, 2016), a zero-employment effect could be driven by non-compliance if the (unobserved) compliance rate and the minimum wage bite were spatially correlated. To rule out that an economically and statistically insignificant employment effect is driven by non-compliance, we show that the bite has a significantly positive effect on wages, i.e. there is at least imperfect compliance. Further, we compute the minimum wage bite using wage and employment data from 2014 (before the policy was implemented) to ensure that the compliance rate is not a component of the bite measure. We develop the above argument formally in section 4 of the appendix.

4. Results

In line with the spatial distribution of the minimum wage bite (see Figure A1 in the online appendix), the minimum wage appears to have had a stronger bite in the economically still weaker eastern states. At the 10th percentile of the distribution within counties, hourly wages increased from 2014 to 2016 by about €1.25 in the eastern states, compared to less than €1 in the western states. We note that we hold the (imputed) hours worked constant, so hourly wages in our data cannot increase due to reductions in working hours.

In Fig. 1, we use our baseline empirical specification (2) to more formally evaluate the effects of the minimum wage. Panel A shows that the minimum wage policy helped low-wage workers (10th percentile) to increase their wage relatively more in counties with a higher bite. The treatment effect (gap between the 2016 dot and the dashed line) implies that an increase in

[2] See Brown (1999) and Neumark and Wascher (2008) for reviews and Dube et al. (2010), Baek and Park (2016) and Caliendo et al. (2017) for more recent evidence.

[3] Notice that we do not add $(\eta_c \times t)$ to specification (2) because this means we have to drop another $\beta_Z T_c \times I\,(.)$ interaction term and the point estimates are no longer the same.

[4] We use the Stata module Conley spatial HAC for models with fixed effects by Thimo Fetzer with cutoffs of 100 km and one year to address a correlation of errors cross space and time.