

# **Employment Effects of the New German Minimum Wage: Evidence from Establishment-Level Microdata**

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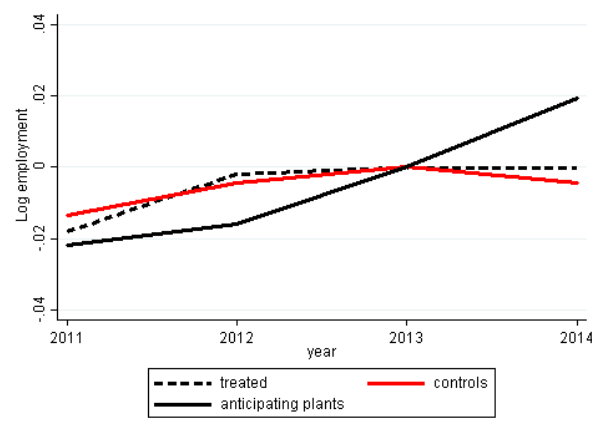
## **Online Appendices**

### **Appendix A**

In this Appendix, we add the initially excluded group of anticipating establishments to our sample: This group comprises establishments that adjusted wages before the minimum wage was introduced. They are excluded from the main results since their true treatment status is not revealed from the data because they adjusted wages in the course of the debate on the minimum wage introduction before the treatment information was collected.

As in the main text, we first illustrate the pretreatment employment trends for the added group of anticipating establishments to check the plausibility of the parallel trends assumption. Figure A.1 shows that the pretreatment trend is much more positive compared with the trend for the treated and control establishments presented in the text. Our conclusion concerning the deviation of trends is twofold. First, it demonstrates that this group of anticipating establishments is on a very positive employment path, suggesting that the respective employers could already afford increasing wages during the time frame of the debate on a potential minimum wage introduction. Second, it demonstrates that adding this group of establishments to our main analysis is problematic because these establishments already behaved differently before the minimum wage introduction. Hence, the parallel trends assumption is very likely to be violated for this group of establishments.

**Figure A.1. Pretreatment Trends of Anticipating Plants**



*Data source:* IAB Establishment Panel 2011–2014, analysis sample.

*Notes:* Aggregated time series of log employment by treatment status adding anticipating plants as a separate group. Each plant's time series is centered on the respective group's value of 2013.

Despite the violation of the parallel trends assumption, Table A.1 presents results from a regression model that adds a separate treatment effect for the group of anticipating plants. The results show virtually unchanged treatment effects for the treatment group of non-anticipating plants compared with Table 2. However, the effects of the group that adjusted wages in anticipation of the minimum wage introduction differ. Although the treatment effect on wages is somewhat larger, we do not observe a statistically significant effect on employment. We want to emphasize that these effects should not be interpreted as causal effects given that the parallel trends assumption is likely to be violated.

Although these results do not change our conclusions for the treatment group of interest, they limit the results to plants that were affected by the minimum wage but did not adjust wages after the minimum wage was announced. Hence, the treatment effect has to be related to the population represented by our unambiguous treatment group. We address this limitation when we provide a back-of-the-envelope calculation of the overall employment effect in our conclusions.

**Table A.1. Robustness Check Adding Anticipating Establishments**

	(1) <i>Log wages per worker</i>	(2) <i>Log employment</i>
Treated firm $\times$ post treatment	0.036*** (0.009)	-0.017** (0.008)
Anticipating firms $\times$ post treatment	0.060*** (0.011)	0.003 (0.012)
Observations	55,886	68,803
Establishments	13,480	15,083

*Data source:* IAB Establishment Panel 2011–2016, analysis sample.

*Notes:* Coefficients are treatment effects on the treated in which the effects are derived from a difference-in-differences specification with establishment-level fixed effects, including a separate treatment interaction for anticipating plants. Treated firms are those that had at least one employee paid below €8.50/hr in 2014. For additional notes, see Table 2.

Asterisks indicate significance level: \*\*\*1%, \*\*5%, and \*10%.

## Appendix B

Here, we replicate our estimation using data from the IAB QUEST survey, which is an alternative (but much smaller) survey of establishments in Germany conducted by the Institute of Employment Research (IAB) in the beginning of 2016. We linked the survey data to the German administrative social security, providing a longitudinal panel-data dimension in the employment variable (dependent variable), while the extent to which establishments were affected by the minimum wage introduction (independent variable) was again included in the survey. In fact, these data include the same questions concerning the treatment assignment and hence allow us to apply the same estimation strategy. However, this alternative data set also comes at the price of three major disadvantages. First, it bears a much smaller sample size, implying little power to identify precise treatment effects. Second, the treatment assignment was surveyed retrospectively in the first half of 2016, which implies some scope for inaccurate reporting. Third, the data do not include wage information, restricting our estimation to employment effects. The results in Table B.1 show effects on employment that are very similar compared with our baseline

estimates, corroborating our major findings. Because of the relatively low precision, these treatment effects fall short of conventional significance levels.

**Table B.1. Cross Sample Validity of the Employment Effect Using the QUEST Survey**

	(1) <i>Extensive margin effects (0/1) on log employment</i>	(2) <i>Intensive margin effects [0,1] on log employment</i>
Treated firm $\times$ post treatment	−0.023 (0.017)	−0.078 (0.061)
Treated firm $\times$ 2014 dummy	−0.003 (0.012)	−0.022 (0.027)
Observations	4,192	4,192
Establishments	1,408	1,408

*Data source:* IAB QUEST Survey 2013–2015.

*Notes:* Coefficients are treatment effects on the treated in which the effects are derived from a difference-in-differences specification with establishment-level fixed effects. Treated firms are those that had at least one employee paid below €8.50/hr in 2014. For additional notes, see Table 2.

## Appendix C

Next, we replicate the baseline estimation, using the synthetic control method. It reweights the control group and thereby creates a so-called synthetic control group that resembles the trend of the treatment group. This procedure ensures that the parallel trends assumption is fulfilled.

The synthetic control method, which we apply here, is based on the entropy-balancing algorithm proposed by Hainmueller (2012) and implemented in Stata by Hainmueller and Xu (2013). It calculates weights such that the chosen covariates are balanced between the groups of treated and control establishments. In our application, covariates comprise pretreatment outcomes both in levels and in changes, ensuring that the trends between treated and control establishments are balanced. The resulting weights are used in our baseline estimation, which is a difference-in-differences approach that includes establishment and year fixed effects. Hence, the

approach yields a treatment effect on the treated establishments, wherein the counterfactual is a weighted control group using entropy-balancing weights.

**Table C.1. Effects from a Synthetic Control Method Using Entropy-Balancing Weights**

	<i>Balancing of pretreatment levels</i>		<i>Balancing of pretreatment changes</i>	
	(1)	(2)	(3)	(4)
	<i>Log wages per worker</i>	<i>Log employment</i>	<i>Log wages per worker</i>	<i>Log employment</i>
Treated firm $\times$ post treatment	0.015 (0.011)	−0.014* (0.008)	0.039*** (0.010)	−0.016* (0.008)
Observations	42,195	61,111	39,438	55,494
Establishments	9,250	13,398	7,816	10,833

*Data source:* IAB Establishment Panel 2011–2016, analysis sample.

*Notes:* Coefficients are treatment effects on the treated in which the effects result from a weighted difference-in-differences specification with establishment-level fixed effects. Treated firms are those that had at least one employee paid below €8.50/hr in 2014. Weights are retrieved from an entropy balancing, using pretreatment outcome levels in columns (1) and (2) and pretreatment outcome changes in columns (3) and (4). For additional notes, see Table 2 in the main text.

Asterisks indicate significance level: \*\*\*1%, \*\*5%, and \*10%.

The results in column (1) of Table C.1 show that the synthetic control method does not yield a significantly positive wage effect when balancing on the pretreatment levels. This outcome is very plausible since the weighting procedure aligns average wage levels between treated and control establishments before the minimum wage was introduced. This approach diminishes the potential for a wage effect since wages are already forced to be similar ahead of the treatment. The treatment effects are robust, however, when we balance the trends based on changes of the pretreatment outcome variables in columns (3) and (4). Although this reduces the sample size because it requires panel continuation in consecutive years, it does not equalize wage and employment levels. Hence, it leaves enough treatment-relevant variation to identify treatment effects as presented in the main body of the article.

## References

- Hainmueller, Jens. 2012. Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis* 20: 25–46.
- Hainmueller, Jens, and Yiqing Xu. 2013. ebalance: A Stata package for entropy balancing. *Journal of Statistical Software* 54(7): 1–18.