MOTIVATION: INCREASING INEQUALITY

• Historically, strong safety net and high collective bargaining coverage in Germany (Dustmann et al., 2014)

• Collective bargaining agreements served as implicit wage floors

• Coverage declined from 82% in 1996 to about 55% in 2015

• Dramatic increase in wage inequality from the mid '90s (Dustmann et al., 2009; Antonczyk et al., 2010; Kügler et al., 2019)
  – the 90th percentile increased by nearly 20%
  – median wages rose by only 8%
  – the 10th percentile stagnated

• In response, Germany introduced hourly minimum wage (MW) of €8.50 in January 2015
MACROECONOMIC CONDITIONS

![Graph 1: Nominal GDP (2010=100%)](image1)

- Year: 2011 to 2016
- Nominal GDP increases from approximately 95 to 125.

![Graph 2: Unemployment Rate (%)](image2)

- Year: 2011 to 2016
- Unemployment rate decreases from approximately 6% to 3%.
RESEARCH QUESTIONS

• Impact of the introduction of MW on employment and wages

• First analysis of reallocation effects of MW:
  → Do ‘bad’ firms exit the market?
  → Do workers reallocate to ‘better’ firms?
EMPIRICAL STRATEGY: VARIOUS DID ESTIMATIONS

Main strategy (Individual level)
- Similarly to Currie/Fallick (1996), we follow workers who earned wages below the MW prior to the introduction
- However, rather than using survey data we use employer-employee administrative data
- We carefully deal with differential labor market trajectories along the wage distribution by using pre-MW introduction years

Complementary strategy (Local labor market level)
- Similarly to e.g. Card (1992), we exploit the variation in the bite of MW across local labor markets
MAIN FINDINGS

• Positive and significant effect on wages, no indication for significant dis-employment effects

• MW leads to **reallocation of workers** to
  - firms paying higher wages and with higher AKM fixed firm effects
  - firms with higher full-time share/lower marginal employment share
  - larger firms
  - firms with higher share of skilled worker
  - firms with lower turnover
  - firms with more productive workforce

• At highly exposed locations, MW leads to
  - a decrease in the number of firms
  - an increase in average firm size
  - an increase in average AKM firm FEIs and in average productivity of firms
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DATA

• IAB employer-employee history administrative data
  – information on individual gross earnings and hours worked
  – working hours reported to German accident insurances separately for each single employment relationship (available between 2011-2014)

• Covers 2011-2016

• Sample restrictions, we exclude:
  – those younger than 18 and apprentices; not affected by the MW introduction
  – those older than 59; as their labor force participation is mainly driven by retirement incentives
INDIVIDUAL APPROACH: IMPACT ACROSS THE WAGE DISTRIBUTION

• Effect of the minimum wage by previous wage (Abowd et al. 2000; Currie/Fallick 1996; Clemens/Wither 2019)

• We assign workers to a EUR wage bin $w$ based on hourly wage in $t-2$

$$\Delta^2 y_{it} = \sum_w \gamma_{wt} D_{w_{i(t-2)}} + \beta X_{i,t-2} + e_{it}$$

- $D_{w_{i(t-2)}}$ equal to 1 if worker $i$ falls into wage bin $w$
- $X_{it-2}$: age, gender, full-time status, industry, education, ...
- $\Delta^2 y_{it} = \log(\text{wage})_{it} - \log(\text{wage})_{it-2}$ or $\Delta^2 y_{it} = \text{Emp}_{it} - \text{Emp}_{it-2}$
INDIVIDUAL APPROACH: (PROXIED) HOURLY WAGES

![Graph showing hourly wage growth vs. Euro wage bin for 2013.](image-url)
INDIVIDUAL APPROACH: (PROXIED) HOURLY WAGES
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![Graph showing hourly wage growth vs Euro wage bin for different years (2013, 2014, 2015, 2016).]
INDIVIDUAL APPROACH: EFFECTS RELATIVE TO 2013 VS 2011

• Estimated Regression:

\[ \Delta^2 y_{it} = \sum_w \delta_{wt} D_{wi(t-2)} \times YEAR_t + \sum_w \gamma_{w2013} D_{wi(2011)} + \beta X_{i,t-2} + e_{it} \]

• \( \delta_{wt} \) corresponds to: \( \gamma_{wt} - \gamma_{w2013} \)

• For \( t = 2015, 2016 \): effects of the minimum wage policy

• For \( t = 2014 \): placebo period → coefficients should be close to zero
INDIVIDUAL APPROACH: WAGE EFFECTS RELATIVE TO 2013 VS 2011
INDIVIDUAL APPROACH: WAGE EFFECTS RELATIVE TO 2013 VS 2011
GENERALIZED DIFFERENCE-IN-DIFFERENCES

<table>
<thead>
<tr>
<th>Wage bin in t-2</th>
<th>Bottom vs Top</th>
<th>Middle vs Top</th>
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<tbody>
<tr>
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</tr>
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Panel (b): Employment (1 if employed)

| 2016 vs 2014 | 0.007 | 0.001 |
| (0.0005) | (0.0003) |
| 2014 vs 2012 (Placebo) | 0.002 | -0.001 |
| (0.0004) | (0.0003) |

- Changes relative to
  - 2013 vs 2011
  - Top
- **Bottom**: less than 8.50 Euro per hour (treatment group)
- **Middle**: between 8.50 Euro and 12.50 Euro per hour (partially treated group)
- **Top**: more than 12.50 Euro per hour (control group)
INDIVIDUAL APPROACH: EMPLOYMENT
INDIVIDUAL APPROACH: EMPLOYMENT EFFECTS RELATIVE TO 2013 VS 2011
## GENERALIZED DIFFERENCE-IN-DIFFERENCES

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- **Top**: more than 12.50 Euro per hour (control group)
WORKER REALLOCATION

• We measure change in firm quality:
\[ \Delta^2 y_{it} = q_{j(i,t),i}^{t-2} - q_{j(i,t-2),i}^{t-2} \]

• where \( q_{j(i,t),i}^{t-2} \) is the time \( t-2 \) characteristics of firm \( j \) where worker \( i \) is employed in year \( t \)

→ Any changes in firm quality induced by the minimum wage reflect compositional changes only

• For firm stayers: \( q_{j(i,t),i}^{t-2} - q_{j(i,t-2),i}^{t-2} = 0 \)

• Estimated Regression:
\[ q_{j(i,t),i}^{t-2} - q_{j(i,t-2),i}^{t-2} = \sum_w \delta_{wt} D_{w_{i(t-2)}} \times YEAR_t + \sum_w \gamma_{w2013} D_{w_{i(2011)}} + \beta X_{i,t-2} + e_{it} \]
MOVEMENT TO FIRMS WITH HIGHER DAILY WAGE

![Graph showing change in firm's average daily wage across Euro Wage Bins for different years (2014, 2015, 2016).]
MOVEMENT TO FIRMS PAYING A HIGHER WAGE PREMIUM

Change in the Firm’s Wage Premium

Euro Wage Bin

-0.005 0 0.005 0.01 0.015

-0.005

6.5 7.5 8.5 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15 15.5 16 16.5 17 17.5 18 18.5 19 19.5

2016 2015 2014
MOVEMENT TO FIRMS WITH A MORE SKILLED WORKFORCE
MOVEMENT TO FIRMS WITH MORE FULL-TIME AND LESS MARGINAL WORKERS
MOVEMENT TO FIRMS WITH LOWER WORKER TURNOVER
MOVEMENT TO LARGER FIRMS

![Graph showing change in firm size by Euro wage bin over years 2014 to 2016.](image)

Legend:
- 2014
- 2015
- 2016
MOVEMENT TO FIRMS WITH HIGHER AKM FIXED FIRM EFFECTS
MOVEMENT TO FIRMS WITH MORE PRODUCTIVE WORKERS

Reallocation and the Minimum Wage // Seite 30
COMPLEMENTARY EVIDENCE ON REALLOCATION AT REGIONAL LEVEL
REGIONAL APPROACH

• Exposure to the minimum wage at time $t$ at location $g$:
  $$GAP_{gt} = \frac{\sum_{i \in g} h_{it} \min\{0, MW - w_{it}\}}{\sum_{i \in g} h_{it} w_{it}}$$

→ calculates the percentage increase in wages that is needed to comply with the minimum wage law for an average worker

• Average over 3 pre-introduction years:
  $$\overline{GAP_g} = \frac{1}{3} \sum_{t=2011}^{2013} GAP_{gt}$$
REGIONAL VARIATION IN EXPOSURE TO MW
REGIONAL APPROACH: DIFFERENCE-IN-DIFFERENCES EVENT STUDY

• We estimate the following equation:

\[ Y_{rt} = \alpha_r + \zeta_t + \sum_{\tau=2011, \tau \neq 2014}^{2016} \gamma_{\tau} \overline{GAP}_{\tau} \times YEAR_{\tau} + \epsilon_{rt} \]
REGIONAL APPROACH: DISTRICTS’ AVERAGES WAGES

[Graph showing the region's proxied hourly wage over years 2011 to 2016, with estimated effect and trend based on 2011-2013.]
REGIONAL APPROACH: DISTRICTS’ AVERAGES WAGES – DETRENDED
REGIONAL APPROACH: DISTRICTS’ EMPLOYMENT – DETRENDED
REGIONAL APPROACH: FIRM SIZE – DETRENDED
REGIONAL APPROACH: NUMBER OF SMALL FIRMS – DETRENDED
REGIONAL APPROACH: NUMBER OF SMALL FIRMS EXITING – DETRENDED
REGIONAL APPROACH: AKM FIXED FIRM EFFECT – DETRENDED
REGIONAL APPROACH: PRODUCTIVITY OF FIRMS – DETRENDED
CONCLUSION

Introduction of minimum wage:
• increased wages (at the bottom)
• did not lead to dis-employment effects
• lead to a reallocation of workers to better firms
• improved firm composition
THANK YOU

matthias.umkehrer@iab.de
APPENDIX
BITE OF THE MINIMUM WAGE

• Germany:

<table>
<thead>
<tr>
<th>Fraction earning less than 8.50 EUR/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>All</td>
</tr>
<tr>
<td>West</td>
</tr>
<tr>
<td>East</td>
</tr>
</tbody>
</table>

• International Comparison of the Ratio of MW to Median Wage (OECD)

<table>
<thead>
<tr>
<th></th>
<th>German</th>
<th>Spain</th>
<th>France</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>0.48</td>
<td>0.37</td>
<td>0.61</td>
<td>0.49</td>
<td>0.36</td>
</tr>
</tbody>
</table>
MAGNITUDE OF THE REALLOCATION EFFECTS

• Effect of the MW on daily wages is 10.7%
• Average daily wage increased by 2.5%

25% of the daily wage increase can be attributed to reallocation

• The firm’s daily wage can increase:
  – Moving to firms which offer better jobs (full-time instead of marginal)
  – Moving to firms that increase hourly wages

• Effect of the MW on hourly wages is 6.1%
• Wage premium increases by 0.5%

8.2% of the hourly wage increase can be attributed to reallocation
MAGNITUDE OF THE REALLOCATION EFFECTS

• Effect of the MW on daily wages is 10.7%
• Average daily wage increased by 2.5%

The firm’s daily wage can increase:
  – Moving to firms which offer better jobs (full-time instead of marginal)
  – Moving to firms which pay higher wage per hour

• Effect of the MW on hourly wages is 6.1%
• Wage premium increases by 0.5%

25% of the daily wage increase can be attributed to reallocation

8.2% of the hourly wage increase can be attributed to reallocation
WHY MAY REALLOCATION EFFECTS ARISE?

→ common feature of models that deviate from competitive benchmark

1) Search frictions: e.g. Acemoglu (2001)

2) Monopsony power: Manning (2003); Bhaskar et al. (2002); more recently: Berger et al. (2019)

3) Product market frictions: consumers switch like in Luca/Luca (2018) and in Mayneris et al. (2014)

4) Friction to access technology: Williamson’s (1968) ‘Wage Rates as Barriers to Entry Model’
DISCUSSION – WHAT DRIVES REALLOCATION?

Search frictions

• Acemoglu (2001): low paying (‘bad’ jobs) and high paying (‘good’ jobs) can coexist in DMP search model

• MW will destroy ‘bad’ jobs and create ‘good’ (capital intensive) ones

• Test this by proxying capital intensity with:
  – AKM FEs
  – the share of high-skilled workers

• MW leads to reallocation in terms of both measures
DISCUSSION – WHAT DRIVES REALLOCATION?

Monopsony power

• Monopsonistic/Oligopsonistic competition models also predict reallocation

• Card et al. (2018) argue that monopsony power emerges if workers have idiosyncratic, non-pecuniary preferences to work at a particular firm
  → Leading candidate: commuting time from home

• We find evidence for an increase in commuting distance
DISCUSSION – WHAT DRIVES REALLOCATION?

Product market frictions

• Friction on the output market can also lead to reallocation (Luca/Luca, 2018; Mayneris et al., 2014)

Labor cost ↑ → least efficient firms exit → consumers reallocate → labor demand also reallocates given increasing demand for goods at given firm

• Consumer driven reallocation is likely to be stronger in the non-tradable sector
• We find that reallocation is larger in the non-tradable sector
## ADJUSTMENT OF WORKING HOURS

<table>
<thead>
<tr>
<th></th>
<th>2011 unadjusted</th>
<th>2011 adjusted</th>
<th>2014 unadjusted</th>
<th>2014 adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>26,7</td>
<td>30,3</td>
<td>26,5</td>
<td>30,1</td>
</tr>
<tr>
<td>Full-time</td>
<td>34,8</td>
<td>39,8</td>
<td>34,8</td>
<td>39,7</td>
</tr>
<tr>
<td>Part-time</td>
<td>22</td>
<td>24,9</td>
<td>21,8</td>
<td>24,6</td>
</tr>
<tr>
<td>Marginally employed</td>
<td>8,4</td>
<td>9,2</td>
<td>8,3</td>
<td>9,1</td>
</tr>
</tbody>
</table>
## WORKING HOURS - COMPARISON WITH SES

<table>
<thead>
<tr>
<th></th>
<th>BEH, adjusted</th>
<th>SES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full-time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>38,8</td>
<td>39,1</td>
</tr>
<tr>
<td>Men</td>
<td>38,9</td>
<td>39,1</td>
</tr>
<tr>
<td>Women</td>
<td>38,5</td>
<td>39</td>
</tr>
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<td></td>
</tr>
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