

Revealing Dynamics: The Impact of Minimum Wage on Inequality Within Germany's Regions

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Minimum wage in Germany

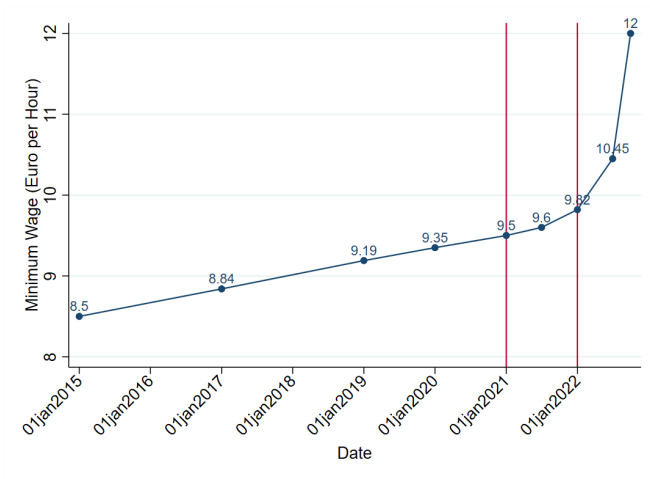
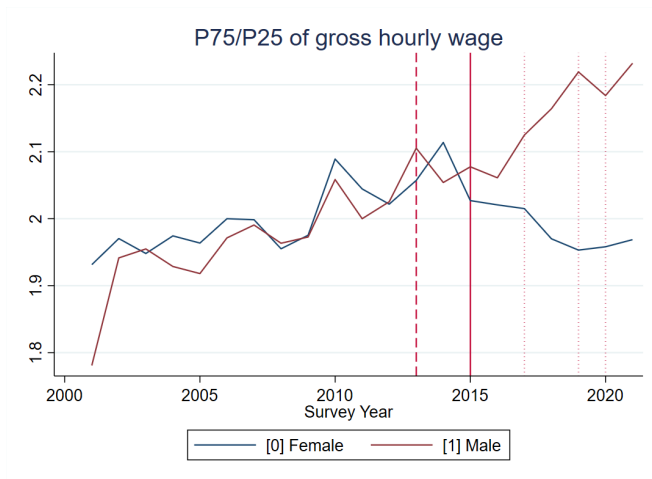


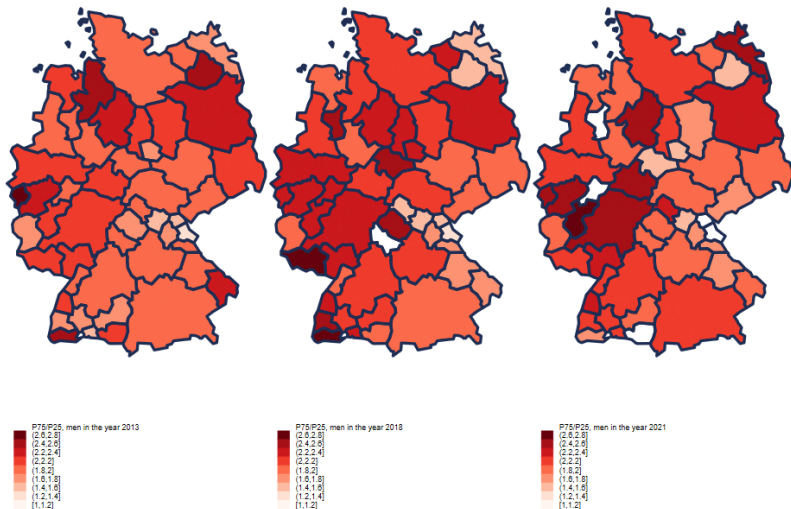
Figure: Development of the minimum hourly wage;

Source: based on data from Destatis

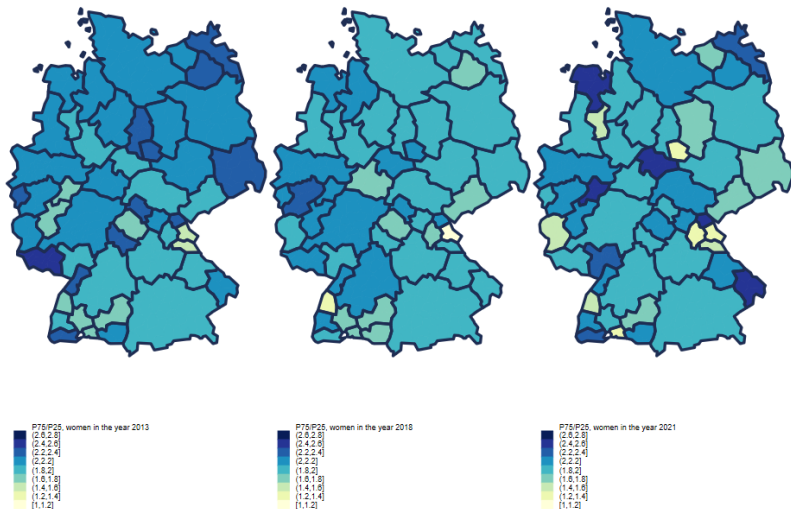
Wage inequality within sex



Wage inequality: P75/P25 men in 2013, 2018, and 2021



Wage inequality: P75/P25 women in 2013, 2018, and 2021



Contribution

Scarce evidence on **regional differences**, **gender wage differences**, and **inequality** aspects

Inequality: Backhaus and Müller (2023) found no effects on inequality reduction in HH income; Bossler and Schank (2023) found a significant reduction in wage inequality in terms of monthly wages

Gender wage gap studies: women's wages rose directly after the reform, while men's with a some delay (Burauel et al. 2017; Bachmann et al. 2022); different effects in the different parts of distribution (Caliendo and Wittbrodt 2022)

Regional effects: Ahlfeldt, Roth, and Seidel (2018) find spatial inequality convergence; Bonin et al. (2020) studied effects on regional (un-)employment

Data & Methods

Datasets

- German Socio-Economic Panel (SOEP), v.38 - up to the year 2021
- Indicators and maps of spatial and urban development (INKAR) - currently up to the year 2020/2021

Estimation strategy

Difference-in-Difference approach

- on the LLMA's level - DiD-R
- on the individual level - DiD-I

Note: SOEP allows to define both + different types of hours: contracted and actual

Unit of Analysis: Local Labour Market Areas

Functional vs Administrative LLMAs

Following Kropp and Schwengler (2016) (IAB):

- Maximizing commuting within regions
- Minimizing commuting between regions
- Stability of the NUTS3 attributions
- Results in **50 functional LLMAs**, homogeneous in terms of population

Treatment definition: Minimum wage “bite”

Current definition (per Caliendo et al. 2023):

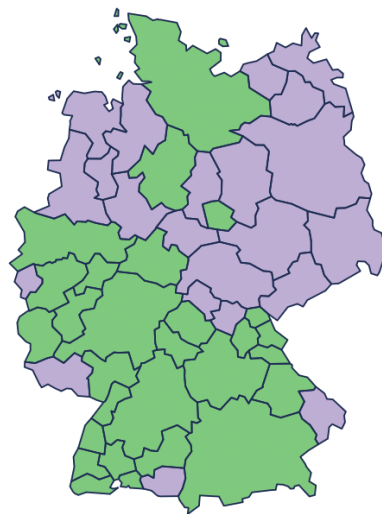
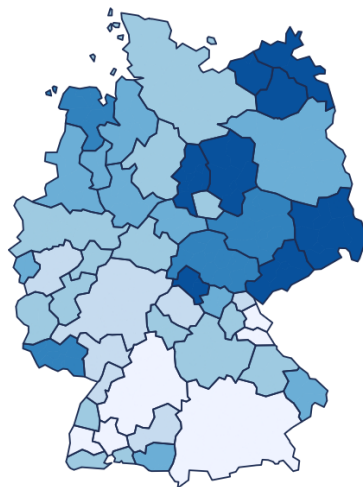
$$Bite_{rtg} = \frac{a_{rtg} - \bar{a}_{tg}}{\hat{\sigma}(a_{tg})}$$

where a_{rtg} is a share of respondents with gross hourly income below 8.5 Euro in a region r at time t over subgroup g

⇒ A region is considered treated, if the normalized bite is greater than 0.

Robustness checks: alternative definitions (Kaitz index as per DeStatis; three definitions used by Garloff (2019)); placebo regressions (Bite in 2012 × year 2014 dummy); stability of assignments.

Treatment definition: minimum wage “bite”



Regression Equations: DiD-R I

Total effect:

$$\ln(Y_{rgt}) = \beta_1(\text{Bite}_{rg}^{2013} \times \mathbb{1}\{t = 2015 - 2021\}) + \mu \mathbf{X}_{rgt} + \gamma_t + \gamma_r + \epsilon_{rgt}, t \in [2012, 2021]$$

\mathbf{Y}_{rt} - inequality measure for region r at time t

β_1 - treatment coefficient

\mathbf{X}_{rgt} - a set of time-varying control variables for demographic and labour market conditions in a region, such as average # of children below 16 years of age in a HH, average # of working adults in a HH, average years of education in a region, share of men, share of migrants, share of the full-time employees, share of small and large firms in a region; share of industries by NACE.

γ_t is time fixed effects; γ_r is regional fixed effects and ϵ_{rgt} is an error term

Regression Equations: DiD-R II

Short-mid-long(er) term effect:

$$\begin{aligned} \ln(Y_{rgt}) = & \beta^{2015} (\text{Bite}_{rg}^{2013} \times \mathbb{1}\{t = 2015\}) + \\ & + \beta^{2016-2018} (\text{Bite}_{rg}^{2013} \times \mathbb{1}\{t = 2016 - 2018\}) + \\ & + \beta^{2019-2021} (\text{Bite}_{rg}^{2013} \times \mathbb{1}\{t = 2019 - 2021\}) + \\ & + \mu \mathbf{X}_{rgt} + \gamma_t + \gamma_r + \epsilon_{rgt} \end{aligned}$$

Dynamic setup:

$$\ln(Y_{rgt}) = \sum_{y=2015}^{2021} \beta^y (\text{Bite}_{rg}^{2013} \times \mathbb{1}\{t = y\}) + \mu \mathbf{X}_{rgt} + \gamma_t + \gamma_r + \epsilon_{rgt}$$

Results: Overall, hourly wages

Table: Aggregated effects of the minimum wage introduction on within-region inequality on LLMA level

	P75/P25	P90/P10	P25/P10	Std. dev
Bite2013 # Post-treatment years	-0.029 (0.023)	-0.117*** (0.036)	-0.070** (0.029)	0.016 (0.023)
Observations	449	449	449	449
Parallel trends p-value	0.414	0.995	0.323	0.006
Granger causality p-value	0.416	0.981	0.319	0.006

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; Control variables are included as aggregated information on the LLMA level: general hh composition, labour market conditions, average respondents' characteristics

Graphical Parallel Trends

Results: Overall, monthly indicators

Table: *Aggregated effects of the minimum wage introduction on within-region inequality on LLMA level, monthly indicators*

	Individual Monthly Income			HH Monthly Income		
	P75/P25	P90/P10	Gini	P75/P25	P90/P10	Gini
Bite2013 # Post-treatment years	0.018 (0.033)	0.096* (0.053)	0.004 (0.007)	-0.020 (0.042)	-0.086 (0.074)	-0.009 (0.008)
Observations	449	449	449	449	449	449
Parallel trends p-value	0.322	0.790	0.744	0.472	0.448	0.476
Granger causality p-value	0.319	0.790	0.747	0.461	0.438	0.463

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; Control variables are included as aggregated information on the LLMA level: general hh composition, labour market conditions, average respondents' characteristics

Results: hourly wages disaggregated by sex

Table: Effects of the minimum wage introduction on within-region inequality on LLM level

	P75/P25	P90/P10	P25/P10	Std. dev
Panel A: LLMA effects, women				
Bite2013 (women) # Post-treatment years	-0.045* (0.023)	-0.059 (0.038)	-0.044 (0.032)	0.090*** (0.031)
Observations	400	400	400	400
Parallel trends p-value	0.048	0.393	0.441	0.025
Granger causality p-value	0.047	0.395	0.441	0.025
Panel B: LLMA effects, men				
Bite2013 (men) # Post-treatment years	-0.089*** (0.028)	-0.156** (0.072)	-0.018 (0.052)	-0.039 (0.029)
Observations	400	399	399	400
Parallel trends p-value	0.445	0.684	0.163	0.685
Granger causality p-value	0.419	0.709	0.166	0.708

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; Control variables are included as aggregated information on the LLMA level: general hh composition, labour market conditions, average respondents' characteristics. All variables are aggregated at the subgroup level

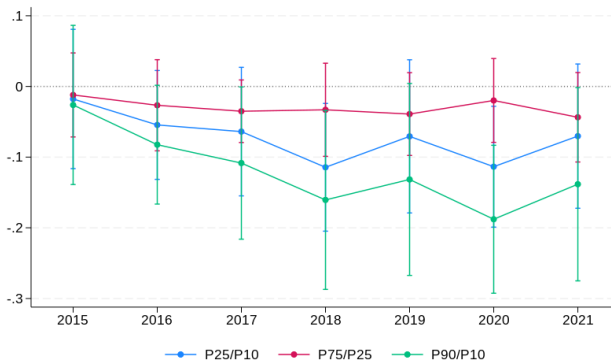
Results: monthly income disaggregated by sex

Table: Effects of the minimum wage introduction on within-region inequality on LLM level

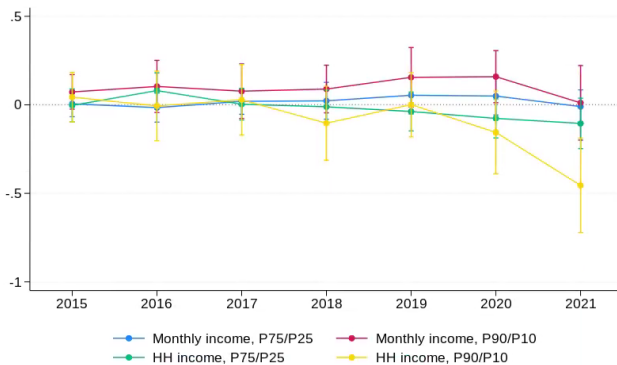
	Women			Men		
	P75/P25	P90/P10	Gini	P75/P25	P90/P10	Gini
Bite2013 # Post-treatment years	0.054 (0.049)	-0.002 (0.061)	0.014* (0.007)	-0.093** (0.036)	-0.032 (0.094)	-0.007 (0.009)
Observations	400	400	400	400	400	400
Parallel trends p-value	0.568	0.505	0.847	0.221	0.812	0.877
Granger causality p-value	0.576	0.501	0.839	0.214	0.806	0.875

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; Control variables are included as aggregated information on the LLM level: general hh composition, labour market conditions, average respondents' characteristics. All variables are aggregated at the subgroup level

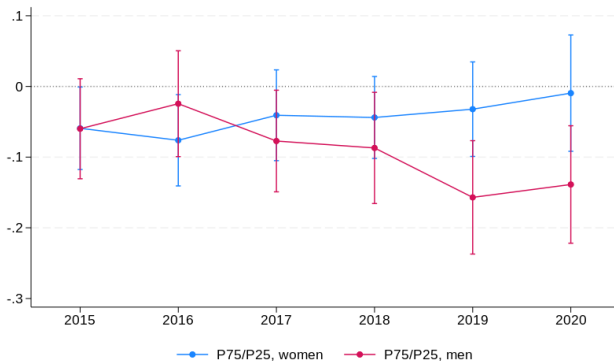
Time perspective: overall, gross hourly wages



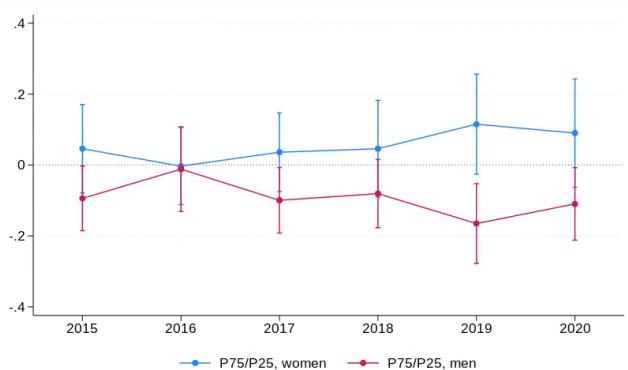
Time perspective: overall, monthly indicators



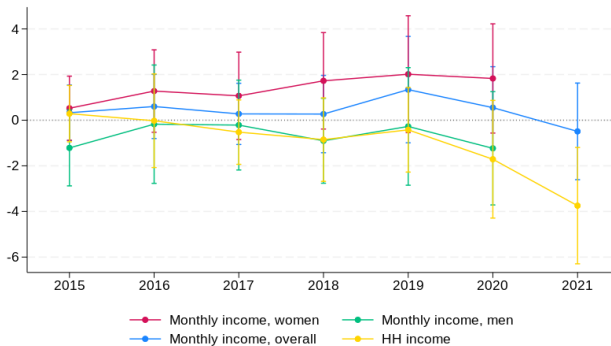
Time perspective: sex, gross hourly wages



Time perspective: sex, gross monthly wages



Time perspective: Gini Coefficients



Coefficients and CIs are rescaled by 100.

Individual level: summary

Treatment

- **DiD treatment:** $\mathbb{1}\{wage_i^{2013} \leq 8.5\} \times \mathbb{1}\{t = 2015 - 2021\}$ vs $\mathbb{1}\{wage_i^{2013} \leq 8.5\} \times \mathbb{1}\{t = 2015 - 2021\} \times \mathbb{1}\{wage_i^{2013} \leq 25pth\}$

Results summary

- **Additional increase in hourly wages** by about 7%, throughout the **whole distribution for men** and in **the lowest quartile for women**
- **Amplitude** of effect **increased with time for men**, but stayed the **same for women**
- Actual and contracted **hours reduction** only for **women**
- **Robustness check:** separate regressions by quantiles of wage distribution; placebo regressions (in progress)

Conclusion

With the help of the **DiD** on the **functional LLMA level** it has been established that

- **Overall, the policy has reduced inequality** between top and bottom deciles of the within-region wage distribution by 11%
- For **men** the hourly wage effects are present through **the whole wage distribution**, while for **women** these are concentrated in the **lowest quartile**
- Most of the effects are **driven** by the change of inequality for **men**, which aligns with the regional pattern of the inequity evolution
- **No effect** on inequality of monthly income







Interquartile rate hourly wage development, men

Thank you for attention!


Your questions are welcome!


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Parallel Trends Assumption: P75/P25 hourly wages

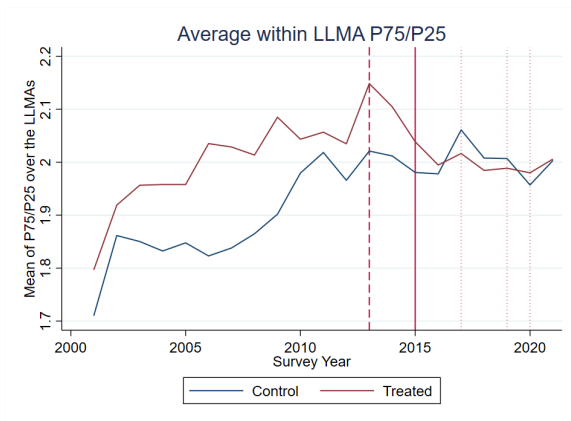


Figure: Developments of P75/P25 of hourly gross wages for treatment and control groups, regional level

Parallel Trends Assumption: P75/P25 hourly wages

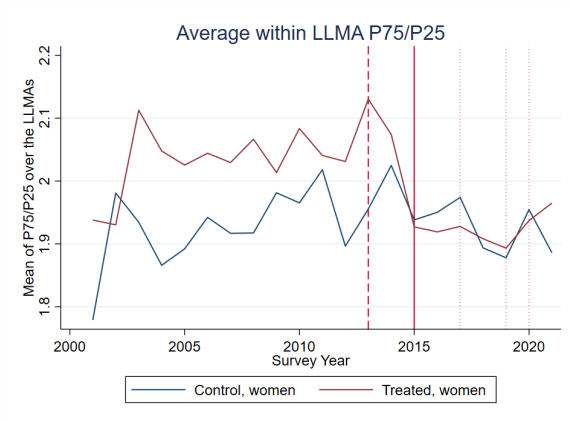


Figure: Developments of P75/P25 of hourly gross wages for treatment and control groups of women, regional level

Parallel Trends Assumption: P75/P25 hourly wages

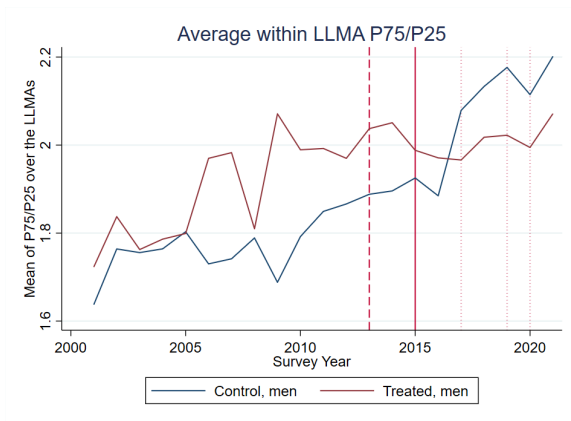
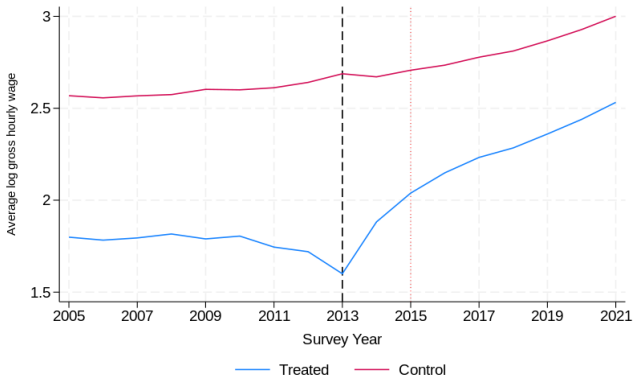


Figure: Developments of P75/P25 of hourly gross wages for treatment and control groups of men, regional level

Parallel Trends Assumption: individual hourly wage



Treated: respondents were paid less than 8.5 euro per hour in the year 2013
Control: respondents were paid more than 8.5 euro per hour in the year 2013

Figure: Developments of hourly gross wages for treatment and control groups, individual level