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## Great expectations: Reservation wages and the minimum wage reform

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# Great Expectations: Reservation Wages and the Minimum Wage Reform

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## Abstract

We use the German Socio-Economic Panel to show that introducing a high-impact statutory minimum wage causes an increase in reservation wages of approximately 4 percent at the low end of the distribution. The shifts in reservation wages and observed wages due to the minimum wage reform are comparable in their magnitude. Additional results show that German citizens adjust their reservation wages more than immigrants. Moreover, suggestive evidence points to a compensation mechanism in which immigrants trade wage growth against job security.

Keywords: minimum wage; reservation wage; labor supply

JEL classification: J22, J3

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# 1 Introduction

Neoclassical, monopsonistic, and search theoretical models all predict negative labor demand reactions to the introduction of a high-impact, binding minimum wage. On the supply side, however, the same minimum wage could increase the number of people whose reservation wage<sup>1</sup> falls below the available market wage, thus increasing the probability of filling vacancies in low-wage sectors. This supply-side effect, however, will only mitigate potential employment losses if reservation wages are static. If reservation wages also react to minimum wages, non-workers do not necessarily adjust their search intensity.

Empirically, the link between minimum wages and reservation wages has largely been neglected due to lack of information about individual acceptance thresholds. Detailed survey information from the Socio-Economic Panel (SOEP), in combination with a natural experiment from the introduction of a statutory minimum wage in Germany, provide a unique opportunity to causally document this unexplored relationship. We show that the introduction of a high-impact minimum wage induces a substantial increase in reservation wages among non-workers at the low end of the distribution. Specifically, the minimum wage causes an increase of 4.2 percent at the 10th percentile of the reservation wage distribution. Likewise, it induces a 3.9 percent growth at the 25th percentile. Higher percentiles do not exhibit any change.

Theoretically, the relationship between reservation and minimum wages belongs to common model assumptions (Flinn, 2006). Within the neoclassical framework, binding minimum wages can increase reservation wages through inflation expectations. In the frictional setting of a sequential search model with an infinite horizon, the reservation wage can be expressed as a function of the expected future value of employment. This value depends centrally on the arrival rate of job offers and the observed wage distribution.<sup>2</sup> A minimum wage may affect this optimal reservation

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<sup>1</sup>Defined by the threshold at which a potential worker is willing to accept a job offer.

<sup>2</sup>The optimal search strategy for the standard search model can be expressed as follows:  $w^{res} = b + \frac{\alpha}{\rho} \int_{w^{res}}^{\bar{w}} [1 - F(w)] dF(w)$  where  $b$  denotes transfers received when not working,  $\rho$  is a time discounting factor,  $\alpha$  captures the job arrival rate, and  $F(w)$  is the observed wage distribution. More complicated models may include extensions, such as job destruction and job-to-job transitions, but these would not change the relevant predictions for minimum wages that motivate this paper.

strategy in two ways: through a negative impact on the job offer rate or through the rightward (positive) shift of the wage offer distribution. According to this model, a rightward shift of the wage distribution should increase the reservation wage, while a decrease in the job offer rate should decrease the reservation wage.<sup>3</sup> Whether the minimum wage, however, actually affects these two variables and to what extent they serve as drivers of increases in reservation wages remains an empirical exercise to explore. Our analysis uses this framework as guidance to explain the effects we find.

Although the empirical literature is scarce, the authors are aware of one lab-based experiment study (Falk et al., 2006) that finds positive and significant effects of minimum wages on reservation wages. They demonstrate that minimum wages set a new standard for fair pay and create entitlement effects that persist even after the removal of a wage floor.

The contribution of this paper is twofold. First, we show that reservation wages adjust upward in reaction to minimum wage increases and document the absence of supply-side positive employment effects in the short run. Secondly, we provide evidence useful to search theoretical models that reservation wages are not static in the short run.

## 2 Data

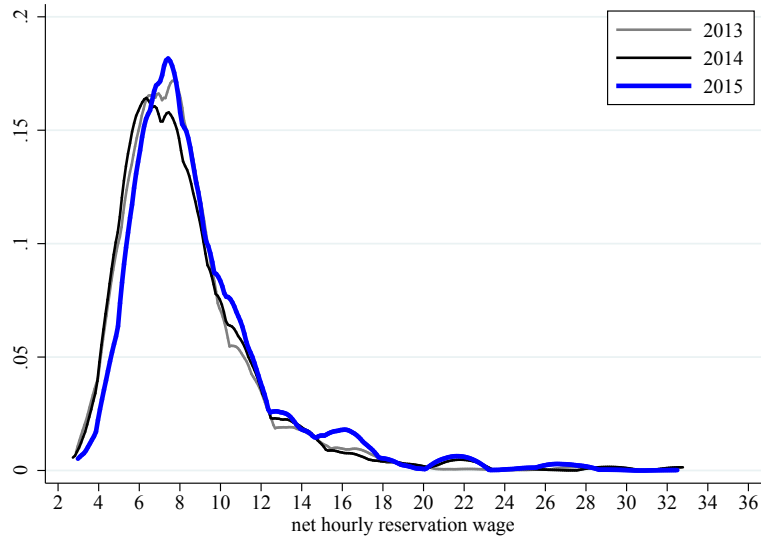
We use the 2013 to 2015 waves of the Socio-Economic Panel, a representative longitudinal survey that, as of 2015, surveys approximately 15,000 households (doi: 10.5684/soep.v32). The survey asks non-working individuals,<sup>4</sup> *"What would your net income (in euros per month) have to be for you to accept a position?"* Subsequently, they are asked, *"How many hours per week would you have to work for this income?"* Using this information, we calculate net hourly reservation wages. Figure 1 shows the density of the distribution of hourly reservation wages and demonstrates that although the distribution remains almost unchanged in 2013 and 2014, it ex-

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<sup>3</sup>These relationships are demonstrated by the sign the first order conditions of the reservation wage equation with respect to  $\alpha$  and  $[1 - F(w)]$ .

<sup>4</sup>Including respondents in voluntary military service, voluntary social year, or federal volunteer service, but excluding respondents in any type of employment, in training programs, in apprenticeships, or in partial retirement.

hibits a substantial shift to the right in 2015, when the statutory minimum wage was introduced.



**Fig. 1:** Distribution of hourly reservation wages, 2013-2015

*Source:* SOEP v32, own calculations. Net hourly wages are CPI adjusted.

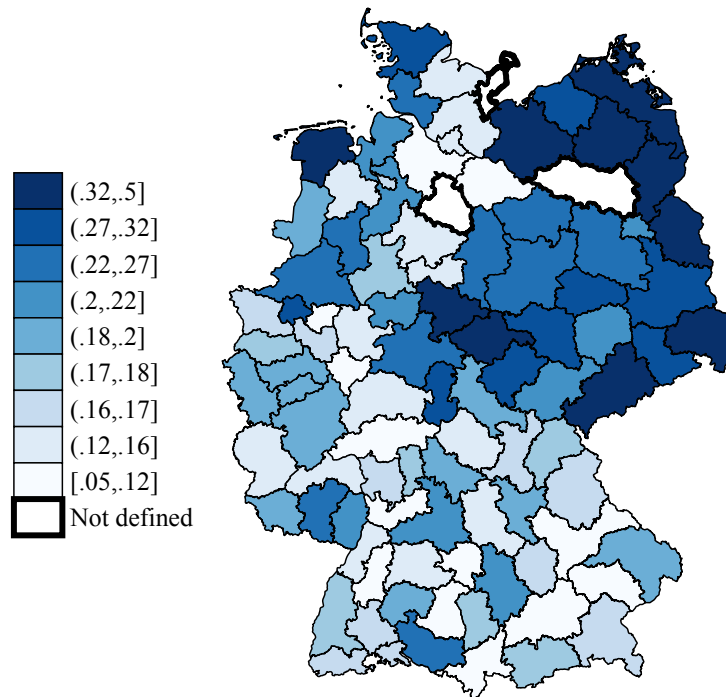
For the three survey years, we have 6,708 observations for which we observe information on reservation wages and socio-demographic characteristics (gender, age, citizenship, highest educational level, marital status, and presence of children in the household). We trim the top and the bottom percentile of annual reservation wage distributions. Table 1 describes the sample by survey year and shows that the analyzed sample remains stable over time.

To establish a causal link between reservation and minimum wages, we use the introduction of a high-impact statutory minimum wage in Germany as a quasi-natural experiment. The statutory minimum wage was introduced on January 1, 2015, for the vast majority of German employees and immediately set at a high level – €8.50 per hour (gross). Thus, the new minimum wage was binding for 16 percent of eligible employees (Amlinger et al., 2016), which corresponds to the Kaitz-index of 0.49 (OECD, 2015). Despite the nationally uniform introduction of the minimum wage, its impact differs across regions. Figure 2 shows the shares of eligible employees with actual gross hourly wages below €8.50 in 2013 in 96 planning regions in Germany ( $Bite_r^{2013}$ ). Due to data limitations, we exclude three regions with fewer than 30 observations.

**Table 1:** Sample description (2013-2015)

	2013	2014	2015	Total
Female share	0.54	0.54	0.54	0.54
Age, average	42.03	42.62	43.13	42.54
German share	0.86	0.87	0.89	0.87
Primary education share	0.32	0.30	0.28	0.30
Secondary education share	0.45	0.46	0.47	0.46
Tertiary education share	0.24	0.24	0.25	0.24
Married share	0.62	0.62	0.62	0.62
Living in HH with children below 16, share	0.50	0.48	0.47	0.49
Observations	23,022	19,915	17,922	60,859

Source: SOEP v32, own calculations.

**Fig. 2:** Share of employees with actual hourly wages below the minimum wage in 2013

Source: SOEP v32, own calculations.

### 3 Estimation strategy

The continuous measure of the minimum wage bite enters a difference-in-differences estimation as follows:

$$\log(RW_{irt}) = \alpha + \beta \times D_t^{2015} + \gamma \text{Bite}_r^{2013} + \delta (D_t^{2015} \times \text{Bite}_r^{2013}) + \mu \mathbf{X}_{irt} + \epsilon_{irt}. \quad (1)$$



The dependent variable is the log of the net hourly reservation wage of individual  $i$  at time  $t \in (2014, 2015)$  residing in region  $r$ .  $D_t^{2015}$  is a dummy variable distinguishing the pre- and post-reform year, with  $D_t^{2015} = 1$  if  $t = 2015$  and zero otherwise.  $Bite_r^{2013}$  denotes treatment intensity as captured by the region-specific shares of eligible employees with actual hourly wages below €8.50 (divided by the average regional bite in 2013, such that the average  $Bite_r^{2013} = 1$ ). In order to rule out potential anticipatory effects, we use the lagged bite for 2013. The coefficient  $\delta$  on the interaction term  $D_t^{2015} \times Bite_r^{2013}$  captures the treatment effect of the reform. Vector  $\mathbf{X}_{irt}$  additionally controls for gender, age, marital status, German citizenship, the highest level of education (3 categories), presence of children aged below 16 in the household, as well as the lagged regional unemployment rate and GDP per capita. The latter control for the regional potential to adapt to the reform (Dube et al., 2010; Dolton et al., 2015).

Because we expect the minimum wages to have a differential effect along the distribution of reservation wages, we estimate an unconditional quantile regression based on the re-centered influence function (Firpo et al., 2009).

## 4 Results

Table 2 presents estimates of the coefficients  $\delta$ ,  $\beta$  and  $\gamma$  from specification 1 for quintiles of the distribution of log hourly reservation wages. At the 10th percentile, the interaction term documents a growth of 4.2 percent due to the reform. Given the reservation wage of €5.24 at the 10th percentile in 2014, this wage growth amounts to €0.22/hour. In the 25th percentile, the growth is 3.9 percent, or  $€6.24 \times 0.039 = €0.24$ /hour. In higher quintiles, the effect is insignificant. This result confirms that the introduction of the minimum wage induced an increase in reservation wages exclusively at the bottom of the distribution, where potential low-wage workers are disproportionately located.

The upper panel of Table A1 in the Appendix presents the estimates of a placebo regression based on the specification 1 using one-year lagged variables and confirms that there is no effect on the distribution of reservation wages prior to the reform, which supports the validity of our identification strategy.

The impact on reservation wages roughly corresponds to the adjustment in the

**Table 2:** Causal Effect on Reservation Wages by Percentiles (2014-2015)

	Percentiles of log net hourly reservation wages				
	P10	P25	P50	P75	P90
$D^{2015} \times \text{Bite}^{2013}$	0.042** (0.020)	0.039** (0.020)	0.023 (0.019)	0.014 (0.025)	-0.064 (0.050)
$D^{2015}$	-0.042 (0.039)	-0.031 (0.039)	0.008 (0.040)	-0.009 (0.057)	0.219* (0.112)
$\text{Bite}^{2013}$	-0.058*** (0.018)	-0.070*** (0.016)	-0.046*** (0.015)	-0.041** (0.020)	0.005 (0.034)
Observations	2416	2416	2416	2416	2416

*Source:* SOEP v32, own calculations. Robust standard errors in parentheses.

Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

observed hourly wages, which increased by 5.5% in the bottom decile as a result of the reform. Results for the effect on observed wages, as estimated from specification 1 with log gross hourly wages of eligible employees as the dependent variable, are displayed in the lower panel of Appendix Table A1. Results confirm that the minimum wage reform similarly affected the distributions of observed and reservation wages.

In order to investigate the channels through which the minimum wage might affect reservation wages, we refer back to the standard search model discussed in the introduction. The increase of 5.5% in the bottom quintile of the observed wage distribution should have a positive effect on reservation wages and, in fact, likely caused the growth of reservation wages at the lower end of the distribution. While an increase in the job arrival rate,  $\alpha$  would likewise cause an upward adjustment in reservation wages, it is implausible that the introduction of a minimum wage would induce employers to announce *more* vacancies. Although the lack of individual-level data on job arrival rates prevents us from causally identifying the impact of the reform on  $\alpha$ , our results imply that, in the lowest quantile of reservation wages, any decrease in  $\alpha$  must have been offset by the rightward shift in  $F(w)$ .

## 5 Heterogeneous treatment effects

In this section, we investigate heterogeneous effects among two demographic groups with differential exposure to the minimum wage reform: Germans and immigrants<sup>5</sup> (Caliendo et al., 2017). In particular, we re-estimate the regression from Equation (1) by interacting the main DiD-terms with a dummy variable equal to one for Germans and zero for immigrants. Table 3 presents this triple interaction estimated using a RIF-regression for unconditional quantiles of the distributions of reservation wages (upper panel) and observed wages (lower panel). The table documents that, below and at the median, Germans exhibit an adjustment in reservation wages of up to 16.5 percentage points higher than immigrants. Above the median, no significant difference exists. Concerning observed wages, the lower panel of Table 3 also reveals no differential impact.

**Table 3:** Growth in Reservation and Observed Wages for German Citizens (2014-2015)

Percentiles of:	P10	P25	P50	P75	P90
Log hrly reservation wage					
$D^{2015} \times Bite^{2013} \times German$	0.114*	0.165***	0.132**	-0.005	-0.050
s.e.	0.061	0.059	0.058	0.083	0.155
Log hrly observed wage					
$D^{2015} \times Bite^{2013} \times German$	0.069	-0.028	-0.034	-0.034	-0.081
s.e.	0.090	0.070	0.047	0.048	0.059

*Source:* SOEP v32, own calculations. Robust standard errors in parentheses.

Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

The differential adjustment in reservation wages may stem from disparate expectations of the two groups concerning the job arrival rate. While we do not have individual-level information on job arrival rates, we approximate  $\alpha_i$  for individual  $i$  by the respective group-specific transition rate from unemployment into employment:  $\alpha_g = UE_{g,t}/U_{g,t-1}$ .  $UE_{g,t}$  denotes a transition from unemployment to employment in time  $t$  and  $U_{g,t-1}$  represents the share of job seekers in the given sub-

<sup>5</sup>Immigrants are defined as not having German citizenship.

group in  $t - 1$ . Table 4 provides descriptive statistics for Germans and immigrants at or below the median reservation wage,<sup>6</sup> including the changes in  $\hat{\alpha}$ . Because the approximation of  $\hat{\alpha}_i$  necessarily captures an effect from previously adjusted reservation wages, it must be considered an approximation of job acceptance rates rather than job arrival rates if reservation wages are not static. As such,  $\Delta\hat{\alpha}$  provides suggestive evidence for strategic non-adjustment among immigrants, who may anticipate a lower job arrival rate and adjust their reservation wage downward in order to boost their job finding probability. Whereas natives in 2014 had a higher  $\hat{\alpha}$  than immigrants, it was significantly lower in 2015, indicating a higher change in job acceptance rates among immigrants compared to natives. Thus, if job security motivated the observed negative reservation wage adjustment among immigrants, this search strategy appears to have been successful.

**Table 4:** Characteristics of Germans and immigrants, at or below the median 2013-2015

	Immigrants	Germans	Diff. p-value
Female share	0.52	0.48	0.350
Average Age	39.88	39.30	0.625
Primary education share	0.64	0.50	0.001
Secondary education share	0.25	0.44	0.000
Tertiary education share	0.12	0.06	0.008
Living in HH with children below 16, share	0.41	0.29	0.000
Avg. job acceptance rate 2014, $\hat{\alpha}_{t-1}$	0.17	0.24	
Avg. job acceptance rate 2015, $\hat{\alpha}_t$	0.33	0.26	
% Change 2014-2015 job acceptance, $\Delta\hat{\alpha}$	98.37	11.88	
Observations 2013-2015	8913	72414	

*Source:* SOEP v32, own calculations.

<sup>6</sup>Reservation wage quantiles stem from the 2013 distribution.

## 6 Conclusion

In this paper, we exploit a natural experiment consisting of the introduction of a statutory minimum wage in Germany in 2015 in order to provide novel evidence of a causal impact of minimum wages on reservation wage growth. We also show that reservation wages adjust differentially across groups. In particular, natives adjust their reservation wages more than immigrants. One potential explanation is adaptation to increasing productivity requirements on labor and readiness to trade wage growth for job security. These findings have implications for job search and unemployment duration (e.g. Brown and Taylor, 2015).

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# Appendix

## A Additional Tables and Figures

**Table A1:** Growth in reservation wages in 2013-2014 (upper panel) and growth in real wages 2014-2015 (lower panel)

Percentiles of log net hourly reservation wages (2013-2014)					
	P10	P25	P50	P75	P90
$D^{2014} \times \text{Bite}^{2012}$	0.014 (0.039)	-0.024 (0.047)	-0.040 (0.049)	0.024 (0.042)	0.053 (0.038)
$D^{2014}$	-0.010 (0.068)	0.068 (0.086)	0.093 (0.096)	-0.036 (0.092)	-0.105 (0.086)
$\text{Bite}^{2012}$	-0.120*** (0.030)	-0.150*** (0.038)	-0.122*** (0.040)	-0.127*** (0.034)	-0.092*** (0.028)
Observations	2205	2205	2205	2205	2205
Percentiles of log gross hourly wages (2014-2015)					
	P10	P25	P50	P75	P90
$D^{2015} \times \text{Bite}^{2013}$	0.055*** (0.018)	0.009 (0.015)	-0.018 (0.011)	-0.004 (0.012)	0.009 (0.014)
$D^{2015}$	-0.025 (0.032)	0.016 (0.028)	0.063*** (0.022)	0.038 (0.024)	-0.004 (0.030)
$\text{Bite}^{2013}$	-0.091*** (0.015)	-0.105*** (0.012)	-0.074*** (0.009)	-0.066*** (0.010)	-0.053*** (0.012)
Observations	20240	20240	20240	20240	20240

*Source:* SOEP v32, own calculations. Robust standard errors in parentheses.

Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table A2:** Characteristics of bottom wage quintiles, 2013-2015

	Observed	Reservation
Female share	0.65	0.52
Age, average	42.37	39.41
German share	0.86	0.86
Primary education share	0.38	0.54
Secondary education share	0.52	0.40
Tertiary education share	0.11	0.06
Married share	0.55	0.28
Living in HH with children below 16, share	0.29	0.25
Observations	4878	980

*Source:* SOEP v32, own calculations.