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Article

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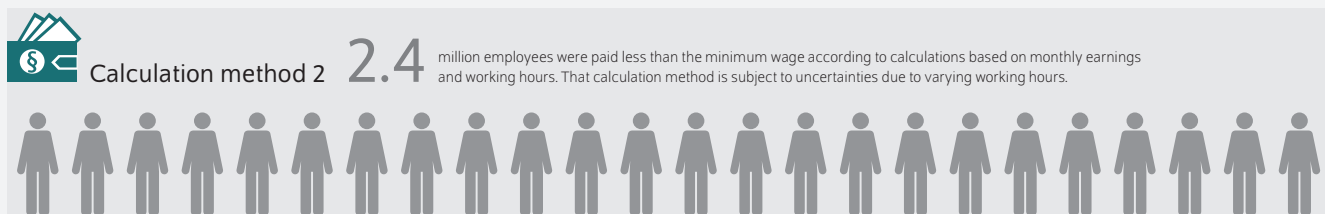
AT A GLANCE

Minimum wage: many entitled employees in Germany still do not receive it

By Alexandra Fedorets, Markus M. Grabka, and Carsten Schröder

- Calculations based on Socio-Economic Panel data show to what extent the German minimum wage was not paid to those entitled to it in 2017
- Around 1.3 million employees were paid below the minimum wage in their main employment despite being entitled to it
- Additionally, around half a million received less than the 8.84 euro-per-hour minimum wage for their secondary employment
- Even though the minimum wage was raised in 2017, the positive trend in low wages observed since 2015 did not continue
- Controls should be intensified; the introduction of a "fair-pay label" would also be a way to ensure that the minimum wage is being paid

According to conservative calculations, more than a million employees entitled to the minimum earnings in Germany actually got paid less than the legal minimum of 8.84 euros per hour in 2017



Source: authors' own calculations based on the Socio-Economic Panel (soep v.34).

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FROM THE AUTHORS

“Companies duly paying the minimum wage to their employees should not suffer any competition disadvantage compared to those who don't. One solution would be a 'fair-pay label', similar to an organic food certification. That would allow consumers to be fully informed before making their choices.” — Alexandra Fedorets, author —

MEDIA



Audio Interview with Alexandra Fedorets (in German)
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Minimum wage: many entitled employees in Germany still do not receive it

By Alexandra Fedorets, Markus M. Grabka, and Carsten Schröder

ABSTRACT

There has been a universal statutory minimum wage in Germany for a good four years, but many employees still do not receive it. This is the finding of new calculations based on the Socio-Economic Panel (SOEP), which have updated noncompliance with the minimum wage for 2017. Even conservative calculations indicate that around 1.3 million people who are entitled to the minimum wage receive a lower wage in their main employment. And they are joined by around a half a million persons in secondary employment. The contractually agreed wages of the ten percent of employees with the lowest wages did indeed rise by around 13 percent between 2014 and 2016. But despite the first-time minimum wage hike to 8.84 euros in 2017, the positive trend did not continue. The extent to which the decision of the European Court of Justice, which obligates employers to record all of the hours worked by employees, can curb noncompliance with the minimum wage depends on how the decision is implemented in practice. Further, the implementation of a “fair-pay label” to identify companies that can provide traceable documentation of their compliance with the minimum wage is recommended. As with organic certification, such a seal would enable consumers to make conscious informed decisions about which products and services from which manufacturers and providers to buy.

On January 1, 2015, a universal statutory minimum wage of 8.50 euros per hour was implemented in Germany as a measure for improving the remuneration of employees in the lower wage segment. The reform initially applied to the sectors of the economy that did not have a sector-specific minimum wage. On January 1, 2017, the minimum wage was raised for the first time – to 8.84 euros per hour. At the same time, the transitional arrangements of various exempted sectors expired,¹ causing the number of entitled employees to increase.

The following analyses examine whether or not all employees who were entitled to the minimum wage (“entitled employees”) actually received it, or less, in 2017, the most current year for which data are available. The relevant literature terms the phenomenon “noncompliance.”² Data collected as part of the Socio-Economic Panel (SOEP) by the German Institute for Economic Research (DIW Berlin) in collaboration with Kantar are the empirical basis of the following calculations.³ The data on employees from the SOEP were compared to data from employers recorded in official statistics. While measured noncompliance is smaller in the employers’ records than in the SOEP, both data sources have limitations which again require working assumptions for the computation of noncompliance, so that all computed numbers hence come with some uncertainty. In each case, however, noncompliance is shown to remain a relevant phenomenon. This applies to the marginally employed (part-time jobs paying 450 euros per month) and those in secondary employment in particular.

¹ See Minimum Wage Commission, *Zweiter Bericht zu den Auswirkungen des gesetzlichen Mindestlohns Tabelle A1 (2018)* (in German; available online; accessed on July 3, 2019; this applies to all other online sources in this report unless stated otherwise).

² Low Wage Commission, *Non-compliance and enforcement of the National Minimum Wage (2019)* (available online).

³ SOEP is a recurring annual representative survey of private households. It began in West Germany in 1984 and expanded its scope to include the new federal states in 1990. See Jan Goebel et al., “The German Socio-Economic Panel (SOEP),” *Journal of Economics and Statistics*, (2018). The present report is based on version soep.v34 of the SOEP data (available online).

Box 1

Database and restrictions

Database

The Socio-Economic Panel (SOEP) is a representative sample of all persons living in private households in Germany. Since the same people are surveyed each year, the study provides a view of the situation before and after the minimum wage was implemented on January 1, 2015 and the first hike in the minimum wage on January 1, 2017, respectively.

Restrictions on interpretation

When interpreting the results presented in this report, please consider that due to the sample design, people coming from abroad to carry out gainful employment (for example, contract laborers or harvesters) are systematically excluded from the analyses, as is also the case with persons who live in institutions or homes.

Information on hourly wages is not directly requested in the SOEP. Hourly wages are calculated using the information on earnings received in the previous month, divided by the contractual or actual number of hours worked per week, and multiplied by a factor of 4.33¹ to arrive at monthly working hours. In the process, various measurement errors may occur. For example, some SOEP respondents refuse to answer questions about wages and hours worked. These cases are excluded from the analysis and their weight is allocated to the remaining valid cases. Employees who respond that they did not agree to work a specific number of hours are also excluded and their weight is allocated to the remaining valid cases.

When calculating hourly wages based on actual hours worked, the hourly wage can be underestimated if late compensation for overtime is not taken into account, for example. The sole use of contractual working hours does not map any extra work performed and can therefore lead to an overestimate of the hourly wage.

The information of employees in secondary employment was excluded from the present analyses up to and including 2017, since it is impossible to determine whether they were in dependent employment or self-employed. As of survey year 2017, secondary employment was recorded differently in the SOEP. As a result, it has been possible to account for an hourly wage based on actual hours worked for these employees.

Who is entitled to the minimum wage?

A uniform statutory minimum wage of 8.50 euros was implemented in Germany on January 1, 2015 and increased to 8.84 euros on January 1, 2017. The law includes a number of exemptions, however. They specifically affect long-term unemployed persons, unskilled youths under 18, and certain groups of interns and

trainees. Until 2017, transitional arrangements were in place for employees in sectors in which there already was a sector-specific minimum wage. They were excluded from receiving the statutory minimum wage.

Since the SOEP contains detailed monthly data from the previous year, long-term unemployed persons who were in their first six months of employment could be identified. They were excluded from the group of entitled employees in the analyses. Youths under 18 were also excluded, and trainees and interns were considered exceptions since the type and duration of their apprenticeship/ internship could not be clearly specified in the SOEP. Based on their current jobs, gainfully employed persons in sectors with existing collective bargaining agreements could also be pinpointed.² For the calculations of noncompliance with the minimum wage in 2015 and 2016, gainfully employed persons in the sectors that had sectoral minimum wages in 2015 and were subject to transitional arrangement were also excluded from the analyses. For 2017, employees from such previously excluded sectors in which the transitional arrangements expired were taken into account.³ All calculation of wage growth rates were carried out for all employees in the sectors in which the legal minimum wage was binding at the beginning of 2017.

In sum, the group of entitled employees that the present study focused on consists of all gainfully employed persons who do not belong to the exempted groups and are not self-employed. The group that indicates it is employed in private households was included in the calculations in the present study, even though it is not considered in the German Federal Statistical Office's VSE (*Verdienststrukturerhebung*) and VE (*Verdiensterhebung*). The same potentially applies to persons who pursue informal employment, since they cannot be differentiated from formally employed persons in the SOEP.

¹ This factor is the result of dividing the 52 weeks in a calendar year by 12 months. The German Federal Statistical Office applied a factor of 4.345 when calculating hourly wages using the 2016 VE.

² In the SOEP, employees are assigned to sectors based on self-disclosure. Information on both job and sector are used. However, we must consider that in certain situations persons may simplify their job or sector and provide information that is too general to precisely identify sectors with specific minimum wages.

³ Further, persons with more than 50 weekly working hours were excluded.

Figure

Nominal growth of contractual gross hourly wage by decile
In percent



Comment: entitled employees in their main employment are depicted.

Source: own calculations based on the Socio-Economic Panel (soep.v34).

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In 2017, contractual gross hourly wages in the lowest decile grew more slowly than before, despite the minimum wage hike.

The main SOEP variables used in the following are information on employees’ gross earnings in the previous month and their agreed contractual or actual hours worked (Box 1).⁴ From this two hourly wage concepts were constructed: the contractual hourly wage based on *contractual* working hours and an *actual* hourly wage based on actual hours worked, including any overtime. Actual hourly wages make it possible to describe employers’ adjustments in reaction to the implementation of the minimum wage: unpaid extra work, for example. They are lower than the contractual hourly wage and therefore yield higher noncompliance. The data also allows us to differentiate between the *calculated* contractual hourly wage and the contractual hourly wage employees *indicated in the survey*. The latter surveyed directly reported hourly wage has the advantage of eliminating the uncertainty that results from the different measurement periods for worked hours (week) and earnings (month). However, using the contractual hourly wage provided by respondents also has a number of weaknesses. First, many employees

⁴ Comparable information for a sample representative of the general population is available in the survey on earning structure (Verdienststrukturhebung, VSE) or survey on earnings (Verdiensterhebung, VE) of the German Statistical Office. Unlike them, the registry-based IAB (Institut für Arbeitsmarkt- und Berufsforschung) database does not contain detailed information on hours worked. Instead it only indicates whether employees work full- or part-time. It was impossible to calculate hourly wages using the information, although they are essential for the analyses carried out for the present study.

do not even have a contract that specifies their hourly wage. Second, “contractual” does not always mean “received,” particularly since the number of extra hours and how overtime is remunerated are often not clearly delineated.

The analyses in this report both enhance the available studies⁵ on noncompliance with the minimum wage around the year 2017, and thanks to the improved SOEP survey used in survey year 2017, they also allow noncompliance in secondary employment to be quantified for the first time.

Upon implementation of the minimum wage, contractual hourly wages rose sharply in the lowest decile

2014 was the year before the minimum wage was implemented. That year, the contractual gross hourly wage calculated in nominal terms was around 17 euros for all dependent entitled employees in main employment. Across the deciles,⁶ the average calculated contractual gross hourly wage increased from around 6.60 euros in the lowest decile – the ten percent of entitled employees with the lowest hourly wage – to around 14.60 euros in the fifth, and around 34.90 euros in the tenth decile (Figure). In the first two years after the minimum wage was implemented, wages in the lower deciles grew more dynamically than those in the upper deciles in comparison to the previous decade.⁷ At 13 percent, growth in the first (lowest) decile was the strongest, while in deciles three to eight, the change was around six percent. In the top two deciles, growth was three percent. At least some of the strong growth in the first decile is due to implementation of the minimum wage.⁸ Despite the above-average rate of growth in the lower range of the wage distribution, at around 7.50 euros the average wage determined for the first decile was also significantly below the minimum wage in 2016.

In 2017, the minimum wage was raised to 8.84 euros, but despite this the calculated contractual wage in the first decile remained the same in both 2016 and 2017. As a consequence, the calculated contractual hourly wage of many entitled employees was still below the minimum wage in 2017. When we consider entitled employees in main employment only, a proportion of 7.7 percent was determined, or around 2.4 million employees whose calculated contractual hourly wage is below the minimum wage threshold (Table 1).⁹

⁵ See Patrick Burauel et al., “Mindestlohn noch längst nicht für alle – Zur Entlohnung anspruchsberechtigter Erwerbstätiger vor und nach der Mindestlohnreform aus der Perspektive Beschäftigter,” *DIW Wochenbericht*, no. 49 (2017): 1109–1123 (in German; available online).

⁶ To form deciles, entitled employees were sorted by wage in ascending order and then divided into groups of equal size.

⁷ See Patrick Burauel et al., “Mindestlohn noch längst nicht für alle.”

⁸ See Marco Caliendo et al., “The Short-Term Distributional Effects of the German Minimum Wage Reform,” *SOEPpapers*, 948 (2017) (available online).

⁹ According to the survey of the Panel Study Labor Market and Social Security (PASS) of the Federal Employment Agency, the proportion of entitled employees whose actual hourly wage was below the minimum wage equaled 19.6 percent in 2014 and 14.4 percent in 2015. See Toralf Pusch and Miriam Rehm, “Mindestlohn, Arbeitsqualität und Arbeitszufriedenheit,” *WSI-Mitteilungen*, no. 7 (2017): 491–498.

Table 1

Employees with hourly wages below the legal minimum wage

		2014			2015			2016			2017		
		95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound
According to VSE and VE	Million persons	3.973			1.014			0.751			0.832		
According to the Socio-Economic Panel (SOEP)													
Main employment													
Calculated contractual hourly wage	Million persons	2.531	2.812	3.090	1.886	2.108	2.346	1.637	1.835	2.029	2.173	2.388	2.586
	Percent	9.9	10.9	11.7	7.5	8.3	9.3	6.2	7.0	7.8	7.0	7.7	8.4
Calculated actual hourly wage	Million persons	3.310	3.601	3.898	2.582	2.828	3.142	2.310	2.569	2.865	2.922	3.180	3.409
	Percent	12.9	14.0	14.9	10.4	11.3	12.3	8.9	9.9	10.9	9.5	10.3	10.9
Contractual hourly wage (surveyed)	Million persons										1.109	1.311	1.517
	Percent										3.9	4.6	5.3
Secondary employment													
	Million persons										0.400	0.500	0.608
	Percent										32.0	38.5	45.0

Comment: employees without sector-specific minimum wages between 2014 and 2016 are shown. Information on secondary employment not available before 2017.

Sources: own calculations based on the Socio-Economic Panel (soep.v34); German Federal Statistical Office, Verdienstrukturhebung 2014, Verdiensterhebung 2015, 2016, and 2017.

Including estimated overtime in the calculated actual hourly wage raised the number of those affected to 3.2 million. When it comes to employees in secondary employment, around 500,000 persons receive wages that are below the minimum wage threshold.

As described above, the SOEP also contains information on directly surveyed contractual hourly wages earned during the pursuit of main employment. Using this measurement concept yields a total of around 1.3 million entitled employees who reported to receive less than 8.84 euros per hour in 2017. This number is significantly lower than the level of noncompliance that was found when calculated hourly wages were used. These are assumed to contain a higher level of uncertainty in this wage segment due to variable working hours. Although surveyed hourly wages have some preferable features, the following comparisons over time are based on calculated wages because only they are available for the period beginning in 2014.

Noncompliance fell between 2015 and 2016, but rose again after the minimum wage hike in 2017

A comparison of growth over time yields a wave-like curve. In 2014, the 2.8 million people in main employment in economic sectors without a sector-specific minimum wage had a calculated contractual hourly wage below 8.50 euros. Their number decreased by a total of one million in each of the subsequent two years (Table 1). After the minimum wage was raised in 2017 and extended to additional sectors in which

transitional arrangements previously applied, the number rose again to around 2.4 million. The growth of calculated actual hourly wages proceeded approximately in parallel, although at a higher level.

Noncompliance particularly high among the marginally employed and persons in secondary employment

Noncompliance with the minimum wage varied strongly with employee characteristics (Table 2). The proportion of employees in main employment who received less than the minimum wage of 8.84 euros according to the calculated actual hourly wage was around ten percent in 2017. For those in secondary employment, however, it was around 38 percent. The proportions are also higher for women and employed non-Germans, young employees under 24, those eligible for retirement, employees without high school diplomas, and employees in East Germany. The type of employment also plays a role. The proportions of entitled employees who do not receive the minimum wage are higher than average among fixed-term employees and employees working in small and micro enterprises. In the case of the marginally employed, noncompliance is around 50 percent, although it must be kept in mind that the uncertainty involved in calculations for this group is particularly high. In a sectoral comparison, noncompliance with the minimum wage is particularly marked in the hospitality, personal services, retail, and contract and temporary work sectors.

Table 2

Entitled employees with calculated actual hourly wages below 8.84 euros in 2017 by group

	Proportion in percentage		Proportion of group of all entitled employees below the minimum wage in percent	
	Main job	Secondary job	Main job	Secondary job
Total	10.3	38.5	100	100
Gender				
Women	13.4	40.9	52.4	52.1
Men	7.4	35.8	47.6	47.9
Age group				
18–24	30.7	59.4	5.9	6.1
25–34	10.6	37.4	17.5	17.5
35–44	6.8	32.3	27.0	27.0
45–54	7.2	37.3	30.8	30.8
55–65	10.5	38.9	17.4	17.3
65 and over	37.2	34.8	1.3	1.4
Educational level				
Primary	16.0	46.1	22.8	23.4
Secondary	10.1	35.7	47.5	47.3
Tertiary	4.0	20.1	27.1	26.7
Region				
West Germany	9.2	39.2	78.7	78.8
East Germany	15.2	33.2	21.3	21.2
Citizenship				
German	9.8	39.5	87.9	87.6
Non-German	14.5	30.3	12.1	12.4
Type of employment				
Full-time	6.2	39.3	62.2	60.5
Part-time	13.2	37.4	16.7	16.2
Marginal	50.8	52.4	5.7	5.5
Fixed-term				
No	8.6	37.1	85.9	85.4
Yes	19.7	44.6	11.2	11.5
Company size				
Under 5 employees	25.9	60.1	4.9	5.1
5–9 employees	22.3	35.9	7.5	7.5
10–19 employees	18.7	17.1	7.3	7.4
20–99 employees	12.0	25.6	16.7	16.8
100–199 employees	9.7	39.7	8.6	8.6
200–1999 employees	6.8	32.8	22.2	22.0
2000 and more employees	4.8	53.2	31.2	30.8
Type of occupation				
Managers	0.6		4.8	
Academic professions	2.4		18.9	
Technical and equivalent non-technical professions	5.3		26.5	
Office workers and related professions	10.1		10.3	
Service providers and sales	24.0		14.1	
Tradesmen and related professions	6.2		9.4	
System and machine operators, installation professions	14.5		6.1	
Unskilled labor	30		8.9	
Military	2.3		0.5	
Selected sectors				
Hospitality	34.2		3.1	
Retail	22.4		8.3	
Construction	7.2		4.6	
Personal services	43.3		0.5	
Contract and temporary work	16.0		2.1	

Comment: dependent employees without sector-specific minimum wages between 2014 and 2016 are listed. Information on type of job and sector is not available for secondary employment.

Sources: own calculations based on the Socio-Economic Panel (soep.v34).

Measurement under conditions of uncertainty

The empirical evidence based on information provided by employees clearly indicates that noncompliance with the minimum wage remains high. At the same time, we must remember that the data available are not ideal, which leads to uncertainty with regard to the actual extent of noncompliance (Box 2). However, assuming that the calculated level of noncompliance is solely due to measurement errors in the data is unrealistic for a number of reasons. First, other household surveys (for example, the Panel Study Labor Market and Social Security (PASS) of the Federal Employment Agency) contain clear indications of non-payment of the minimum wage to entitled employees – to an extent comparable to that of our calculations.¹⁰ Second, the German Customs Service, which is responsible for monitoring compliance with the minimum wage, also reports that many companies are violating the minimum wage or the obligation to document and record actual hours worked. Since the number of company audits is rather small, the sanctions for noncompliance tend to be moderate, and the effort involved in preparing the relevant documentation for the court is so great, it is not surprising that in 2017, the third year after the minimum wage was implemented, the pay of a relevant number of entitled employees was below the minimum wage. And as presented in the following section, calculations based on company reports also contain a clear indication of noncompliance.

Limitations of data on minimum wage compliance from official statistics

To better understand the SOEP results on noncompliance with the minimum wage, we compared them with data from the Federal Statistical Office.¹¹ For this purpose, data from the survey on earnings structure (*Verdienststrukturhebung*, VSE) in 2014 and the survey on earnings (*Verdiensterhebung*, VE) from 2015 to 2017 were used. These data contain reports from company human resources departments. In the VSE and VE, wages are determined based on paid hours worked (including paid overtime and excluding non-paid overtime). However, only the VSE is based on information that companies are obligated to supply.

According to the VSE, almost four million employees were paid less than 8.50 euros per hour in 2014, the year immediately preceding the implementation of the minimum wage (Table 1). This figure is similar to that of the SOEP (3.6 million), although secondary employment is not included in the SOEP information.

After the reform, the information companies provided was significantly different to that of their employees. Excluding the sectors with transitional arrangements, according to the VE around one million employees received less than the

¹⁰ See Toralf Pusch and Miriam Rehm, "Mindestlohn, Arbeitsqualität."

¹¹ For a comparative discussion of the two data sources, see: Matthias Dütsch, Ralf Himmelreicher, and Clemens Ohlert, "Calculating Gross Hourly Wages – the (Structure of) Earnings Survey and the German Socio-Economic Panel in Comparison," *Journal of Economics and Statistics*, (2019).

minimum wage in 2015. In 2016, the figure was 0.75 million. In comparison to the SOEP-based statistics, these values are low. This is primarily due to the fact that according to the VE, many employees receive hourly wages in the range of 8.50 to 8.59 euros.¹² Accordingly, companies are able to coordinate their employees' working hours and pay them – through overtime bonuses, for example – such that the resulting hourly wages are “perfectly compatible” with the lower wage threshold established by the minimum wage.

However, uncertainty is also the rule when calculating non-compliance using data provided by companies. This is due to various factors:

- **Voluntary participation:** Unlike the VSE, company participation in the VE is voluntary. Indeed, only approximately 13 percent of originally responding companies participated in the 2015 VE.¹³ It is also possible that willingness to participate depends on characteristics that also play a role in compliance.
- **Incomplete information:** Not all companies report all required characteristics to the German Federal Statistical Office. For example, around 40 percent of companies in the 2015 VE reported contractual working hours instead of actual hours worked.¹⁴ Therefore, the information provided by these companies was invalid. For companies that relied on marginal employment, all of the missing information was replaced by statistical methods with inherent degrees of uncertainty. This affected the information of around 700,000 employed persons.
- **Restrictions in the overall population:** Not all employment is permanent. Many employees have short-term contracts. The VE, however, only accounts for employment that existed for the entire reporting month and that in which wages continued to be paid (in the case of illness, etc.) in the reporting month. Therefore, “*employment that did not begin or end exactly to the month and dormant employment [...] were not recorded.*”¹⁵ However, the analyses based on employee data showed that persons in irregular employment often do not receive the minimum wage although they are entitled to it. Employees whose employers are private households are not included in the VE either. Such employees often have marginally paid service jobs, and the possible violation of the minimum wage in this sector is not recorded either. Further, the VSE and VE data sets for 2016 and 2017 account for five to 5.8 million

marginally employed persons each – considerably fewer than the SOEP (around 7.3 million) and the Federal Employment Agency.¹⁶ Their underrepresentation is a problem to the extent that the findings of the Minimum Wage Commission indicate that employers with marginally employed personnel have an above-average frequency of noncompliance with the minimum wage.¹⁷

- **Validity of information:** It is known that accounting departments use software solutions with automated alerts to flag situations in which the data in the system indicate potential violations of the minimum wage. The extent to which the information in these databases reflect the workaday reality of employees is impossible to pinpoint within the scope of this study.

In sum, we can say that the voluntary reports of companies have limitations and do not allow a precise quantification of the level of noncompliance with the minimum wage. In case of doubt, only the obligation to properly document the actual beginning, end, and duration of hours worked and to confirm this on both sides can provide information. At the same time, the data available are in accord with those of Customs, which regularly finds violations in the course of its audits.¹⁸

Conclusion: “fair-pay label” could reduce noncompliance with the minimum wage

The minimum wage was implemented on January 1, 2015 as a means of establishing a lower wage limit for all employees – with some exceptions. The present findings show that this has been only partially successful. In 2017, conservative calculations showed that around 1.3 million entitled employees in main employment received wages that were below the minimum wage threshold. Further, there were approximately one-half million employees in secondary employment whose pay was lower than stipulated by the minimum wage law.

The European Court of Law’s decision of May 14, 2019 obligates employers to record their employees’ total hours worked. This laid the foundation upon which employees in the low-wage sector had better chances of enforcing their rights as employees, including the right to receive the minimum wage. Much now depends on how the decision is implemented and monitored.

In any case, there is need to act. The German Customs Service was tasked with conducting full-coverage intensive audits to monitor compliance with the minimum wage, but it has been unable to do so due to a lack of personnel. Consumers could step up and take responsibility here. Until now, they have not had the opportunity to vote with their purses since products and services produced under compliance with the

¹² According to the VE, 1.712 million employees were paid between 8.50 and 8.59 euros per hour in 2015, and in 2016 the number dropped to 1.586 million.

¹³ See German Federal Statistical Office, *Verdienerhebung 2015. Abschlussbericht einer Erhebung über die Wirkung des gesetzlichen Mindestlohns auf die Verdienste und Arbeitszeiten der abhängig Beschäftigten*, (2017). In the 2016 VE, the response rate was only 6.3 percent. See German Federal Statistical Office, *Verdienerhebung 2016*, (2017).

¹⁴ See Oliver Bruttel, Arne Baumann, and Ralf Himmelreicher, “Der gesetzliche Mindestlohn in Deutschland: Struktur, Verbreitung und Auswirkungen auf die Beschäftigung,” *WSI-Mitteilungen*, no. 7 (2017): 473–481. In the 2016 VE, companies were obligated to provide information on paid hours worked.

¹⁵ See German Federal Statistical Office, *Verdienste und Verdienstunterschiede – Verdienststrukturerhebung*, (2019) (in German; available online).

¹⁶ For example, the Federal Employment Agency (2019) reported 7,415,900 persons working for marginal compensation in March 2019 (in German; available online).

¹⁷ See Minimum Wage Commission, “Zweiter Bericht zu den Auswirkungen.”

¹⁸ The Customs Service’s audits are not random. Instead, they are risk-based. For this reason, they do not permit projections of noncompliance on the aggregate level.

minimum wage are not labeled as such. Certifying employers who traceably document the hours their employees work would be an appropriate way to provide assistance in this situation. Based on other recognized seals of quality or compliance, a “fair-pay label”¹⁹ could be an incentive for more employers than ever before to comply with the minimum wage, if it provides them with a competitive advantage.

¹⁹ See Alexandra Fedorets and Mattis Beckmannshagen, “Her mit der ‘Fair Pay-Plakette!’” *Süddeutsche Zeitung*, October 21, 2018 (in German; available online).

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Box 2

Robustness test of the SOEP findings

The following section describes three approaches to testing and improving the estimates of the results based on the Socio-Economic Panel (SOEP).

Sample errors: The SOEP is a random sample of the overall population of households in Germany, which is why all SOEP-based results can only be best estimates of the “true” value for the overall population. The statistical uncertainty can be quantified with confidence intervals that indicate the probability (here 95 percent) of the true estimate being inside a specific range. For example, the value range for the contractual wage in 2017 fluctuates between 2.173 million and 2.586 million entitled employees.¹

Measurement errors regarding working hours and pay: Employees’ responses regarding working hours and monthly pay may contain errors because they no longer remember the exact amounts or round the values up or down. Such imprecision could lead to the surveyed hourly wage being below the minimum wage threshold even though the (unobserved) true value is above it. Of course the reverse scenario is also possible. Therefore, employees were also excluded who have a higher probability of inexact working hour information because they started their job only one month ago, work on call, or are in the year in which they prepare for partial retirement (Table 1). This solution made noncompliance with the minimum wage for employees in main employment for the calculated contractual hourly wage fall from around 2.4 to just under 2.1 million in 2017, for example.

Exclusion of values at the minimum wage threshold: In order to test how imprecise information affects monthly wages or information on working hours, the threshold of 8.50 euros (or 8.84 euros) was varied (Table 2). In the process, the authors assumed that entitled employees whose hourly wages were calculated to be five percent below the minimum wage threshold also received the minimum wage. As a result, the number of employees with a calculated contractual hourly wage that was less than the minimum wage went from around 2.4 million to 1.75 million in 2017.

¹ See Table 1 in the present report.

MINIMUM WAGE

Table 1

Employees with hourly wages below the legal minimum wage

Sample after exclusion of potentially volatile working hours

		2014			2015			2016			2017		
		95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower limit	Point estimate	95-percent confidence interval, upper limit	95-percent confidence interval, lower limit	Point estimate	95-percent confidence interval, upper limit	95-percent confidence interval, lower limit	Point estimate	95-percent confidence interval, upper limit
Main employment													
Calculated contractual hourly wage	Million persons	2.255	2.504	2.769	1.689	1.898	2.155	1.45	1.656	1.841	1.858	2.061	2.28
	Percent	9.32	10.23	11.14	7.2	8.01	9.11	5.82	6.72	7.43	6.39	7.07	7.82
Calculated actual hourly wage	Million persons	2.962	3.234	3.487	2.285	2.526	2.816	2.083	2.338	2.604	2.507	2.756	2.978
	Percent	12.22	13.27	14.27	9.79	10.71	11.79	8.53	9.52	10.47	8.67	9.5	10.19
Secondary employment with hourly wages below the minimum wage													
Actual hourly wage	Million persons										0.362	0.464	0.569
	Percent										31.0	37.3	44.0

Comment: dependent employees without sector-specific minimum wages between 2014 and 2016 are shown. Information on secondary employment not available before 2017.

Sources: own calculations based on the Socio-Economic Panel (soep.v34).

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Table 2

Employees with hourly wages below 95 percent of legal minimum wage

		2014			2015			2016			2017		
		95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound	95-percent confidence interval, lower bound	Point estimate	95-percent confidence interval, upper bound
Main employment													
Calculated contractual hourly wage *0.95	Million persons	2.02	2.266	2.529	1.491	1.669	1.9	1.185	1.357	1.526	1.549	1.751	1.946
	Percent	7.94	8.76	9.59	5.91	6.61	7.54	4.55	5.21	5.91	5.06	5.64	6.28
Calculated actual hourly wage *0.95	Million persons	2.69	2.951	3.23	2.04	2.26	2.523	1.827	2.034	2.262	2.258	2.507	2.688
	Percent	10.43	11.46	12.44	8.17	9	9.96	7	7.83	8.73	7.4	8.12	8.73
Secondary employment with hourly wage below minimum wage													
Actual hourly wage *0.95	Million persons										0.341	0.436	0.541
	Percent										27.0	33.6	40.0

Comment: dependent employees without sector-specific minimum wages between 2014 and 2016 are shown. Information on secondary employment not available before 2017.

Sources: own calculations based on the Socio-Economic Panel (soep.v34).

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