# How much employment did the German minimum wage cost?

## Or: Were the warning voices right after all?

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### *1. Introduction*

The heated academic debate about the employment effects of the statutory minimum wage is now about a decade ago. After no noticeable job losses could be recorded in the course of the introduction of the minimum wage, the admonishing voices became calmer. Employment effects of the statutory minimum wage have now also been examined for Germany in a number of ex-post studies (e.g. Caliendo et al. 2018; Bonin et al. 2018; Bossler and Gerner 2019), which, however, could only show minor or insignificant effects of the minimum wage.

As clear as the results of empirical studies may be, they do not satisfy some critics. As an example, this article refers to a recent article by Knabe, Schöb and Thum, three authors critical of the minimum wage, who have published a contribution in the perspectives of economic policy in defense of their own earlier ex-ante forecast of a job loss in the order of about 426,000 to 912,000 jobs (Knabe et al. 2020). (Knabe et al. 2014)

In their more recent contribution, Knabe, Schöb and Thum look (2020) not only at the direct effects on jobs, but also at the reductions in working hours and the extent of the circumvention of the minimum wage, which in their view have dampened the decline in employment. Finally, the authors present the results of the above-mentioned ex-post studies on minimum wage effects as absolutely consistent with their previous employment projections. However, since a different picture had emerged in the

professional public, namely that the high employment losses originally predicted in a series of ex-ante studies were far missed, a closer look at the argumentation of Knabe, Schöb and Thum is (2020) of particular interest.

The aim of this study is therefore to deal with the thesis of Knabe, Schöb and Thum (2020)that substantial employment effects as a result of the minimum wage are covered by the empirical state of research. To this end, we proceed in several stages following their argumentation. In section 2, we first discuss the direct employment effects of the minimum wage. We then turn to the effects of working time (Section 3). Section 4 examines the scope of minimum wage avoidance. Finally, the income effects of the minimum wage are considered (Section 5), which are composed of all the effects mentioned above and therefore form a good conclusion. Section 6 takes stock.

## *2. Employment effects of the statutory minimum wage*

A major argument of the economists opposed to the introduction of the minimum wage in Germany was its expected negative job effects: Up to 1.2 million jobs were predicted to be lost (see overview in ). In the reference study used for this article, employment losses of 426,000 in the monopsone model and 912,000 jobs in the neoclassical standard model were calculated Rehm and Theurl 2017(Knabe et al. 2014). In comparing the empirical state of research, we refer below mainly to prognosis in the monopsone model, which stands for the relatively smaller loss of employment.

Since, according to the calculations, the development of employment for marginally employed persons in the main earnings ('mini-jobs') and employees subject to social security contributions Knabe et al.(2014) differs greatly from , a differentiated comparison of the employment forecast for these employment groups with the empirical literature is advantageous. In the study, the Knabe et al.(2014) employment losses for mini-jobs in the main earnings and employees subject to social security contributions, but excluding pensioners and students, were indicated. The latter were considered separately. The empirical literature usually does not make this distinction. The employment forecast for mini-jobs and employees subject to social insurance contributions therefore had to Knabe et al.(2014) be

recalculated using the modelling of data from the SOEP that they also used.[1]

For the calculation of the employment effects in the monopsone model, the reference scenario without minimum wage effect was simulated with SOEP data from 2014 and a wage update up to 2015. Subsequently, the employment effect for mini-jobs was recalculated, which would occur if low wages were raised to the minimum wage in the monopsony model. The relative loss of employment in the monopsony model for mini-jobbers with an hourly wage of less than € 8.50 is therefore about 16% or 377,000 jobs. For employees subject to social insurance contributions with an hourly wage of less than € 8.50, the loss of employment amounts to approximately 2.6% or 48,000 jobs. The figures are then compared with the results of microeconomic and macroeconomic studies on the employment effects of the minimum wage. First, however, a brief overview of the economic development after the introduction of the minimum wage will be given.Knabe et al.(2014)[2][3]

### *2.1 Descriptive overview of economic and employment trends*

The economic and employment trend in Germany was relatively stable after the introduction of the statutory minimum wage (Table 1). Admittedly, it is not necessarily possible to draw conclusions about the employment effect of the statutory minimum wage, because these could have been

[1] The SOEP is a widely used data set in empirical social research with about 30,000 respondents per year, including data for about 12,000 employees, with which calculations for hourly and monthly wages can be made.

[2] The calculation ultimately results in numbers similar to those in . The latter, Knabe et al.2014however, assume employees entitled to minimum wages in the order of 35 million (own calculation based on the employment rates documented there). Based on the same database, the own calculation only comes to 32 million employees, despite reweighting for missing data as in the reference study. The difference could be due to the fact that exceptions to the minimum wage, such as trainees and students in compulsory internships, have also been taken into account. They do not mention them in their contribution.Knabe et al.2014

[3] The calculated loss of employment differs slightly from the Knabe et al.2014 calculated value of 426,000 in the monopsone model, as more recent data from the SOEP could be used here (in particular, no wage update from 2012 was necessary).

masked by a strong positive employment trend, for example. Nevertheless, the development can at least be seen as an indication that the effects of the minimum wage on the number of employees have not been great. The third report of the Mindestlohnkommission (2020b: 87) also points out that the sectors more affected by the minimum wage recorded above-average employment development in 2015 and 2016. Against the background of the model forecasts, this is Knabe et al.(2014) actually counterintuitive, because employment losses would be expected according to the modeling, especially in these sectors.

*Table 1: Data for economic and labour market developments*

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|
| Real gross domestic product (percentage change over previous year) | 0,5 | 1,9 | 1,7 | 2,2 | 2,5 | 1,5 | 0,6 |
| Persons in employment in Germany (in millions) | 42,3 | 42,7 | 43,1 | 43,7 | 44,3 | 44,9 | 45,3 |
| Employees subject to social insurance contributions (in millions) | 29,6 | 30,2 | 30,8 | 31,4 | 32,2 | 32,9 | 33,4 |
| Mini-jobs (exclusively, in millions) | 5,1 | 5,1 | 4,9 | 4,9 | 4,8 | 4,7 | 4,6 |
| Unemployed (millions) | 3,0 | 2,9 | 2,8 | 2,7 | 2,5 | 2,3 | 2,3 |
| Unemployment rate (in percent) | 6,9 | 6,7 | 6,4 | 6,1 | 5,7 | 5,2 | 5,0 |

Quelle: Data from the second and third reports of the Minimum Wage Commission (2018, p.21 for the figures 2013 and 89; 2020b, pp. 22 and 87 for subsequent years), statistics of the Federal Employment Agency (SVP employees and mini-jobs, reference month June)

In line with the model forecasts, a stronger decline in mini-jobs in the main job can be Knabe et al.(2014) observed in 2015, and there were also declines in the following years. This development applies above all to the mini-jobs in the main job, but not to the mini-jobs in the part-time job. The sum of both has rather increased (: 180). Over the same period, employment subject to social insurance contributions rose significantly – a trend that is partly related to the minimum wage, but could also be partly due to the generally favourable labour market development.Federal Statistical Office 2021

### *2.2 Microeconometric studies on employment effects of the minimum wage*

For the most part, the ex-post evaluations of the minimum wage were carried out with employment data (partly also establishment and aggregated employment data at regional level) and the microeconometric approach of difference-of-differences estimates. Table 2 gives an overview of some study results. It can be seen that it was possible to show a decline in employment for the exclusively marginally employed persons in the main earnings ('mini-jobs'), with increases in part estimated for employment subject to social security contributions. The latter could be linked to the conversion of mini-jobs into employment relationships subject to social security contributions (vom Berge und Weber 2017). Transitions to better-paid jobs in better-paid firms are also indicated by the results of Dustmann et al.(2022) .

*Table 2: Employment effects of the minimum wage in microeconometric ex-post impact studies*

| | **social security jobs** | **Marginal jobs** | **Total number of employees** |
|---|---|---|---|
| **Ahlfeldt et al. (2018)** | ./. | ./. | positive, by around 0.06 percent |
| **Bonin et al. (2018) (Beschäftigten-daten)** | no | negative, by around 1.5 to 3 percent | negative, by around 0.5 to 0.8 percent |
| **Bonin et al. (2018) (Betriebsdaten)** | no | negative, by around 0.9 percent | negative, by around 0.7 percent |
| **Bossler et al. (2018)** | ./. | ./. | negative, by around 1.7 percent (or around 46 to 59 thousand jobs) in affected companies |
| **Caliendo et al. (2018)** | Inconclusive, trending negative, by around 0.2 to 0.3 percent (or around 52 thousand jobs) | negative, by around 3 percent (or around 189 thousand jobs) | negative, by around 0.4 to 0.5 percent (or around 140 thousand jobs) |
| **Garloff (2016)** | positive growth rate, up by around 0.4 percentage points | negative growth rate, down by | Inconclusive, growth rate down by around 0.01 to |

| | | | |
|---|---|---|---|
| | | around 1.1 percentage points | 0.1 percentage points |
| **Schmitz (2019)** | negative, down by around 0.1 percentage points Growth rate | negative, around 1 to 1.4 percentage points lower Growth rate | ./. |
| **Stechert (2018)** | positive, up around 0.2 percentage points Growth rate (negative for 15- to 24-year-olds) | negative growth rate, around 0.3 percentage points lower (not clear for 15- to 24-year-olds) | positive growth rate of around 0.08 percentage points higher (negative for 15- to 24-year-olds) |

Source: Bruttel et al.(2019)
Note: ./. = notpart of the study

For the employment as a whole (sum of employment subject to social insurance contributions and mini-jobs), only very small effects were estimated in the studies. The contribution of Caliendo et al.(2018) marks the upper end with an estimated job loss of 140,000. In a number of studies, insignificant and partly positive effects were also estimated (Table 2).

At best, minor to insignificant employment effects of the statutory minimum wage are consistent with the international literature, which has mainly worked with microeconometric approaches, especially in recent times. So-called meta-studies provide a condensed overview and can provide indications of a publication bias, according to which often only significant results are considered worthy of publication. Using the results of hundreds of international studies, we have shown that minimum wages do not have a significant impact on the level of employment. Wolfson and Belman (2014) Doucouliagos and Stanley(2009)

### *2.3 Macroeconomic evaluations of the employment effects of the minimum wage*

The results of microeconometric studies presented in the previous section predominantly used the so-called difference-of-differences method. These studies can lead to a biased estimate of the macroeconomic effects of the minimum wage. Before presenting the results of some macroeconomic

studies, this problem of purely microeconometric studies of minimum wage effects should therefore be briefly discussed.

Decisive in the difference-of-differences method is the so-called common trend assumption as a prerequisite for group comparisons. In the simplest case, for example, the employment development of minimum wage employees is compared with a group of employees with higher hourly wages. Alternatively, employment data are often used in conjunction with regional data on the depth of intervention of the minimum wage. The assumption used is then that employment in low-wage regions and high-wage regions developed similarly before the introduction or increase of the minimum wage. Differences in the development of employment that occur after the introduction or increase of the minimum wage are attributed to the minimum wage. This assumption of the parallel trend can be checked for the past with a so-called placebo test, but not for the period from the introduction or increase of the minimum wage.

In reality, however, the assumption of parallel trends is not without problems. For example, employees can experience income increases and consume more through the minimum wage. However, higher consumption can also affect economic output and employment in higher-earning regions. Difference-of-difference analyses would tend to interpret such an increase in employment in high-wage regions as a negative employment effect of the minimum wage. According to this method, the employment effect results from the difference in development between low-wage regions and high-wage regions. In addition, with possible price effects of the minimum wage, there is another effect that can increase employment in high-wage regions. This is because price increases triggered by the minimum wage can lead to a partial shift in consumption towards High-wage goods, as they have lower price increases as a result of the minimum wage.

Both effects, higher consumer spending as a result of wage increases and effects of minimum wage-related price changes, point to this. Since income (positive) and price (negative) effects have an opposing effect, relatively small net effects of the minimum wage on employment can be expected.  predict a small negative employment effect of the statutory minimum wage of 27,000 employees. However, positive employment reactions could also be envisaged in such an analysis; the direction of the effect ultimately depends on how strongly consumption responds to changes in income and prices. Heise and Pusch (2020) Heise and Pusch(2020)

Also in a Keynesian-oriented model framework (2018) calculate a neutral employment effect of the minimum wage. The authors point out that employment could also increase if higher government revenues associated with income increases flow back into the economy. In an additional ex-post analysis with a VAR model, which can map macroeconomic interactions, the authors found no evidence of employment effects of the minimum wage in the two years after its introduction. On the other hand, there are indications that the minimum wage has led to slight price increases compared to the otherwise expected development.Herr et al.

Macroeconomic effects of minimum wages on the labour market can also be examined in the empirical literature without recourse to complex macroeconomic models with macroeconomic panel data. One example is a study by Arpaia et al. (2017) , which examined the effects of the minimum wage in a panel of 18 EU member states. You cannot show a significant effect of minimum wages on the employment rate in the countries under consideration. On the other hand, there is a weak negative correlation with the employment rate of low-skilled workers (significant only at the 10% level) and, for some specifications, with the employment rate of younger employees. In this study, however, no robustness checks were carried out with regard to the selection of estimation methods. Interesting in this context is a panel study of Sturn (2018) with data for 19 OECD member countries, in which a number of additional methods were also used to map endogeneity of the minimum wage level. [4] According to this study, there is no evidence of effects of minimum wages on the employment of low-skilled and younger workers.

## *3. Working time effects of the statutory minimum wage*

After the overview of the state of research on the employment effects of the minimum wage, it is realistic to assume an employment effect close to zero. However, Knabe, Schöb and Thum point out that a hidden employment effect could lie in the reductions in working hours. In this section, we look at these changes in working hours. First, we consider the development

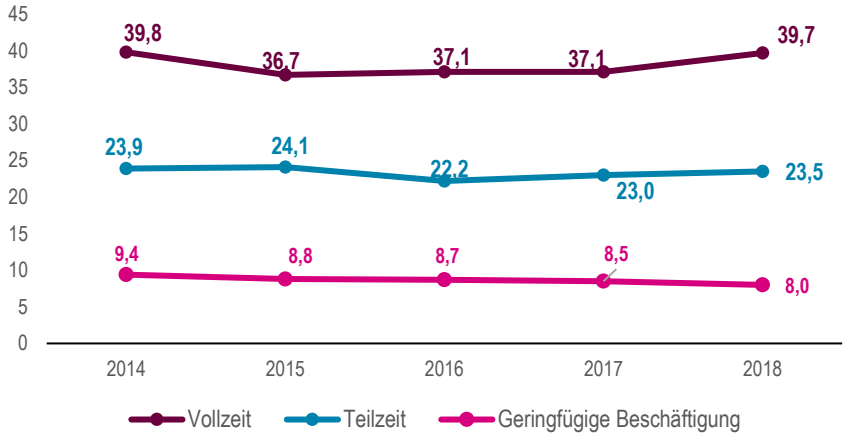
[4] Endogenicity can become a problem, for example, when minimum wages are introduced in economically difficult times and the employment effects are thereby distorted.

of working time descriptively before presenting some findings from causal studies and comparing them with the forecasts from the study. (2020)Knabe et al.(2014)

### *3.1 Descriptive findings on the development of working time*

Descriptive findings show that working hours fell by 1.4 hours or about 15% between 2014 and 2018, especially for mini-jobs in the minimum wage range. In comparison, the working hours of employees subject to social security contributions in the minimum wage sector have changed only slightly. For full-time employees, the decrease by 2018 was 0.1 hours or 0.2%. The decrease in working time among part-time employees was slightly larger, at 0.4 hours or 1.6% (Figure 1).Mindestlohnkommission(2020a)[5]

Figure 1: Average paid working hours of minimum wage jobs in hours per week




Quelle: Mindestlohnkommission (2020a, S. 111) based on data from the VSE/VE

[5] When interpreting these figures, however, it should be noted that the minimum wage range has shrunk significantly over time, as the proportion of employees with wages up to the minimum wage has decreased. The structure of the minimum wage range is therefore likely to have changed over time.

### *3.2 Microeconometric findings on the development of working time*

Similar to the descriptive view, causal analysis studies also find reductions in working hours, especially in the case of marginally employed persons (; ). The number of studies is smaller here than for employment effects, a selection of results is shown in Table 3.Bonin et al. 2018Pusch et al. 2020[6]

Overall, it is striking in the results of the studies that the reductions in working hours as a result of the minimum wage among employees subject to social insurance contributions have decreased over time, this applies to the contractually agreed and regular working hours, in 2016 the effects in the studies are already partly insignificant. The studies, which examine the development of working time among only marginally employed persons, find a greater decline in working time over time. However, the estimated values for 2016 differ relatively strongly, possibly there could be a problem in the Pusch et al.(2020) PASS data set used by a change in the working time survey between the years 2014 and 2015.

*Table 3: Working time effects of the minimum wage in ex-post impact studies*

| | Database | Employees subject to social insurance contributions | Only marginal employees |
|---|---|---|---|
| **Bonin et al. (2018)** | SOEP | 2015 contr. WT: -4,5 % (sig.)<br>2016 contr. WT: -2,5 % (ins.)<br>2015 act. WT: -2,5 % (ins.)<br>2016 act. WT: -1,3 % (ins.) | 2015 contr. WT: -11,1 % (sig.)<br>2016 contr. WT: -13,5 % (ins.)<br>2015 act. WT: -6,8 % (ins.)<br>2016 act. WT: -13,4 % (ins.) |
| **Bossler und Gerner (2019)** | IAB-Betriebspanel | 2015 contr. WT: -0,4 % (sig.)<br>2016 contr. WT: -0,2 % (ins.)<br>(Vollzeit contr. WT) | ./. |
| **Burauel et al. (2020)** | SOEP | 2015 contr. WT: -5,1 % (sig.)<br>2016 contr. WT: -1,5 % (ins.)<br>2015 act. WT: -2,5 % (ins.)<br>2016 act. WT: -1,3 % (ins.) | ./. |
| **Pusch et al. (2020)** | PASS | ./. | 2015 act. WT: -16 % (sig.)<br>2016 act. WT: -31 % (sig.)<br>2017 act. WT: -28 % (sig.)<br>2018 act. WT: -32 % (sig.) |

Note: contr. WT = contractual working time, act. WT = actual working time

[6] Only studies were selected that at least cover effects in 2016 and allow statements about mini-jobs and/or employees subject to social security contributions.

In summary, according to the microeconometric impact studies, there seems to have been mainly working time effects among marginally employed persons. On the other hand, the working time effects of employees subject to social insurance contributions seem to have been reduced quickly.

However, three of the studies mentioned have a common problem: they measure the reduction in working time at the individual level with difference-of-difference estimates, which requires repeated observations of employees. However, employment relationships in the low-wage sector are more frequently characterised by fluctuation. Effects of short-term employment can therefore only be partially captured, whereas they are included in the descriptive findings of Figure 1. The study Bossler and Gerner(2019) of is less affected by this, since working time developments are measured at company level. However, this study only examines full-time working hours, so it also only depicts a part of what is happening.

### *3.3 Classification of empirically estimated working time effects as possible employment effects of the minimum wage*

The argument that reductions in working time represent a decline in labour demand should be considered, in view of the results documented in Sections 3.1 and 3.2, especially for mini-jobbers. However, working hours here are likely to have declined not only due to falling labour demand, but also due to a supply effect. There are several reasons for this: mini-jobs are often carried out as additional earnings in addition to a social transfer (Pusch et al. 2021: 119); exceeding additional earnings limits leads to a decline in these social benefits. The tax exemption of mini-jobs is also likely to play a role in many cases. Conversion of mini-jobs into employment subject to social security contributions[7] is therefore often not desired by employees. In these cases, reductions in working hours remain a way out. The maximum working time in a mini-job introduced with the

[7] Such conversions have occurred to a relevant extent in the course of the introduction of the minimum wage, cf. vom Berge et al. (2016).

minimum wage was initially 12 hours 13 minutes in 2015 and has fallen to 10 hours 35 minutes per week by the beginning of 2022.[8]

Supply-side reductions in working hours for mini-jobbers are difficult to model. The contribution of Knabe et al.(2014) does not include such effects but assumes that mini-jobbers expand their labor supply linearly with rising wages. Insofar as this expansion of labour supply is Knabe et al.(2014) compensated by a decline in labour demand in the neoclassical models of , abstraction is no longer problematic. However, the extent to which this is actually the case in the models remains open.

The loss of employment among mini-jobbers with hourly wages of less than € 8.50 in the monopsony model is about 16% or 377,000 jobs (see introduction to Section 2). Knabe et al.(2014) This figure is comparable to the measured decrease in working time in the descriptive analysis as well as the working time effects in the contribution of . For employees subject to social insurance contributions with hourly wages of less than € 8.50, the loss of employment in the monopsony model is about 2.6% or 48,000 jobs. This result is also similar, at least for 2015, to the findings presented above for the development of working time in the study by Bonin et al.(2018)Knabe et al.(2014)Bonin et al.(2018) . The descriptive findings for the years 2015 and 2016 go in a similar direction to the study by , but in the following years the reductions in working hours have almost completely decreased. Bonin et al.(2018)

The empirical findings thus suggest that reductions in working hours could represent part of the Knabe et al.(2014) predicted loss of employment. However, the objection mentioned in Section 2.3 above also applies to reductions in working hours that the effects of the minimum wage may also occur elsewhere than for employees directly affected by the minimum wage. If the minimum wage has led to an increase in employment (or more paid working hours) in sectors of the economy that are less affected by the minimum wage (as in the model of Heise and Pusch 2020), these effects are understated in microeconometric models. The reason is that the effects in microeconometric studies are measured directly in the affected employees, regions or companies. The reductions in working hours would have to

[8] 2015: €450 maximum earnings/(€8.50/h minimum hourly wage)/(4.33 weeks per month); 2022: €450 maximum earnings/(€9.82/h minimum hourly wage)/(4.33 weeks per month).

be offset against the (elsewhere) working time extensions or increases in employment (occurring elsewhere) in order to determine the net effect.

### *4. Circumvention of the statutory minimum wage*

Knabe et al. (2020) point out that the employment effects of the minimum wage are superfluous if many employers do not adjust wages illegally after the introduction of the minimum wage.

The decisive factor in this argument is how widespread the minimum wage violations are in reality. Due to the often inaccurate recording in survey data, however, there are large data uncertainties here. An example of such measurement inaccuracies is the SOEP data set frequently used in minimum wage research. In the SOEP, there are initially uncertainties with recorded wage components, not all minimum wage-relevant wage components and supplements are recorded there. In addition, the gross wage information is often rounded (gross wages are mainly specified to an accuracy of € 50 or € 100, Pusch 2019). Rounding and inaccuracies can affect working hours in addition to gross wages.

In the case of an assumed accumulation of employees with an hourly wage equal to the minimum wage, the measurement inaccuracy in the data sets used leads to a dispersion of the calculated hourly wages around the minimum wage. As a result, many violations are found among workers who in reality receive the minimum (Pusch 2019)wage. In some cases, employer surveys are also used to measure minimum wage avoidances, but these are likely to lead to an underreporting of minimum wage avoidances, because software packages for payroll accounting often check compliance with the minimum wage (the earnings or structure of earnings surveys are usually used for this purpose, see Pusch 2019; Dütsch et al. 2019). Again, a quantification of the underestimation is not possible. The extent of minimum wage avoidance is therefore difficult to estimate overall.

### *5. Income effects of the statutory minimum wage as a net result of the previously discussed effects*

A look at monthly earnings is particularly interesting because all of the individual effects put forward, which relativize the amount of employment

losses as a result of the minimum wage, as Knabe et al.(2020) well as the extent of non-compliance with the minimum wage, should result in relatively low income effects of the minimum wage . In addition Knabe et al.(2014) to the employment effects, they also predicted the effects of the minimum wage on monthly wages. This forecast can be compared with the ex-post development. We look at the literature on the effects of the minimum wage on monthly wages and make our own calculation of the monthly wage development in the minimum wage range, which is tailored to a comparison with the results of Knabe et al.(2014) .

### *5.1 Development of monthly wages in the minimum wage sector*

Some studies are already available for the monthly wage effects of the minimum wage. Bossler and Schank (2020) estimate a minimum wage effect for 2017 that reaches about +24% in regions with an average minimum wage intervention depth at the 20% quantile of the monthly wage distribution (own calculations based on the estimation results in Table 2 of the article by Bossler/Schank 2020). The absolute monthly wages in this area of the monthly wage distribution are relatively low with about 650 € (2014), they are in the range of midi jobs. However, these effects measured in the monthly wage distribution can only be compared to a limited extent with the study of , because the latter have examined effects within the hourly wage distribution and not within the monthly wage distribution. More suitable for a comparison is a study by , which documented a very high rate of increase in monthly wages in the period from 2014 to 2018 for employment relationships in the 2nd decile of the hourly wage distribution with +27%. However, the 2nd decile already includes some employees with hourly wages above the minimum wage. Knabe et al.(2014) Himmelreicher(2020)

Since the empirical state of research on the income effects of the minimum wage is only conditionally suitable for comparison with the study results Knabe et al.(2014) , descriptive calculations are made with the SOEP data set in the following. For the minimum wage range of 2015, monthly wages of 2014 are extrapolated with the increase in the median hourly wage between 2014 and 2015 (reference scenario without minimum wage effect 2015). In the initial situation, 13.1% of employees had hourly wages of less than €8.50. The most recent year in the SOEP dataset

that can be used for comparison after the introduction of the minimum wage is 2019, which is also before the start of the corona pandemic. Here, too, employees in the bottom 13.1% of the hourly wage distribution are considered for comparison.

To illustrate a potential loss of employment up to 2019, the Bossler et al.(2020) loss of 50,000 jobs estimated in the study of 2018 is used. For the calculation in 2019, we therefore set an hourly and monthly wage of zero for an extrapolated 50,000 former employees, which are taken into account as part of the minimum wage range of the bottom 13.1% of the hourly wage distribution in 2019.[9]

For both years, the average monthly wage is calculated in the minimum wage range defined in this way. According to the study, average monthly wages in the minimum wage sector increased by 28.2% between 2015 and 2019. In order to estimate the minimum wage effect, a measure of the general wage development must be deducted from the growth rate of monthly wages in the minimum wage range, because even without the minimum wage, a positive general wage development can be assumed. We approximate the general wage development (similar to their wage Knabe et al. 2014 update for 2015) with the median wage development, since wages in the middle of the distribution are unlikely to be influenced by the minimum wage. Between 2015 and 2019, the median wage increased by 11.3%, according to SOEP data.

The wage bill in the minimum wage area has risen by 16.9% more than the average wage development. If this rate of increase is related to the calculated wage bill in the minimum wage range of 2015 (reference scenario), then this corresponds to an absolute increase of € 5.7 billion. This figure is well above the €4 billion figure reported for the monopsone model, so the minimum wage Knabe et al.(2014) range has experienced a much more dynamic payroll development after the introduction of the minimum wage than predicted in the monopsone model, not to mention the standard model of the neoclassical labour market of , in which the projected Knabe et al.(2014) wage bill increase is just under € 1.4 billion.

[9] Strictly speaking, employment relationships can also be lost as part-time jobs. The loss of employment of this magnitude applied here only to the main employment relationships can therefore be regarded as conservative. The calculated monthly wage effects of the minimum wage for the main jobs tend to be estimated somewhat too low.

### *5.2 Development of monthly wages for mini-jobs and employees subject to social insurance contributions*

As already argued in section 3.3. with regard to working time effects, mini-jobs represent a special case when considering minimum wage effects. Many employees in mini-jobs probably prefer reductions in working hours in the event of hourly wage increases in order to prevent exceeding the earnings limit in the mini-job and the conversion into employment subject to social security contributions. However, over time, mini-jobs were converted into employment subject to social security contributions. The number of mini-jobs in main earnings decreased by about 9 % between 2014 and 2019 (see Table 1 in Section 2.1.). In a mirror image, the proportion of employment subject to social insurance contributions has risen in the lower range of the hourly wage distribution. A simple comparison of the incomes of mini-jobs in 2015 and 2019 could therefore give a distorted picture.

In order to estimate the special effects of mini-jobs, the minimum wage range was defined as in Section 5.1. [10] Mini-jobs are mainly located in the lower half of the monthly wage distribution in the minimum wage range (0% to 50%). For the estimation of the monthly wage development for mini-jobs, we therefore consider the lower half of the monthly wage distribution in the minimum wage range in 2015 and 2019. The employment losses, which occur mainly in the case of mini-jobs, are modelled as in Section 5.1. – they do not distort the results, since employment losses taken into account in the calculation have a dampening effect on the measured income development. Some of the mini-jobs were converted over time into employment subject to social security contributions. However, conversions of mini-jobs into employment subject to social security contributions do not pose a problem for comparison with the prognosis of , Knabe et al.(2014) because these also implicitly assumed in their calculations that conversions of mini-jobs into employment subject to social security contributions would take place.

Analogous to mini-jobs, we consider the upper half of the monthly wage distribution in the minimum wage range (50% to 100%) for

[10] In particular, the minimum wage range for 2019 also includes an extrapolated 50,000 employees with hourly and monthly wage 0 to reflect job losses. For these, following the tenor of the literature (see section 2.2.), it is assumed that these are mini-jobs with monthly wage 0 (i.e. the employment was lost in the mini-jobs).

estimating the monthly wage development for employees subject to social security contributions. As in the previous section 5.1., the calculated monthly wage increases are reduced by the growth of median wages (11.3 %) in the investigation period 2015 to 2019 in order to determine the wage development in the minimum wage range. The development of monthly wages for mini-jobs and employment subject to social insurance contributions (SVP) is documented in Table 4.

*Table 4: Monthly wage increases in the minimum wage range 2015 to 2019*

| | absolut | relativ |
|---|---|---|
| 0 % bis 50 % der Monatslohnverteilung (Minijobs im Hauptverdienst) | 19,31 € | 6,1 % |
| 50 % bis 100 % der Monatslohnverteilung (Sozialversicherungspflichtig Beschäftigte) | 218,70 € | 21,4 % |

Quelle: SOEP v36, own calculations, calculated average monthly wage increases after deduction of median wage increases in the period 2015 to 2019

When looking at the monthly wage increases in Table 4, the value determined for employees subject to social insurance contributions of € +219 is about twice as high as forecast in the contribution of Knabe et al.(2014) . For part-time and full-time employees, they had calculated monthly wage increases of +€75 and +€122 in the monopsony model. The strong monthly wage growth among employees subject to social insurance contributions is clearly in contradiction to the forecast v of Knabe et al.(2014) .

In the case of mini-jobs in the main earnings, which are predominantly in the lower half of the monthly wage distribution in the minimum wage range, the growth of monthly wages was only about +19 €. This result is more in line with the forecast of Knabe et al.(2014) , which calculated an average monthly wage increase of +40 € for the mini-jobs.

## *6. Summary*

This article examines the question of whether the pessimistic forecasts presented by a number of well-known German economists in the run-up to the introduction of the minimum wage can be justified retrospectively if, in addition to the direct employment reactions, adjustments in working hours and evasive reactions are also taken into account. come to the conclusion in Knabe et al.(2020) a literature review, drawing on these arguments, that the employment losses of 426,000 to 912,000 jobs previously predicted by them would fully correspond to the state of research in empirical studies for the statutory minimum wage.

In contrast, this article summarizes the state of research in such a way that the ex-ante forecasts critical of the minimum wage can hardly be reconciled with the developments after the introduction of the minimum wage. This applies both to job losses and to observed developments in working time. The employment effects found in studies are rather small. Only the number of mini-jobs in the main job has decreased over time and their working hours have also fallen noticeably. At the same time, however, mini-jobs were converted into employment subject to social security contributions.

Since there has been a substitution between mini-jobs in the main job and employment subject to social security contributions after the introduction of the minimum wage, it is difficult to get an overview of the net effects on jobs and working hours. For this reason, in addition to the effects mentioned, income development in the minimum wage range is also considered. Knabe et al.(2014) predicted (in their view) negligible income increases of about € 4 billion in the monopsone model of the labor market and about € 1.4 billion in the neoclassical standard model of the labor market. However, own calculations with the SOEP data set in this article can show that the monthly wage increases in the minimum wage range amounted to about € 5.7 billion.

Knabe et al.(2014)For employees subject to social security contributions in the minimum wage range, the actual increase in monthly wages was about twice as high as in the monopsone model of and about four times as high as in the neoclassical standard model. These model predictions can therefore be regarded as refuted. The minimum wage has cost hardly any employment and has not stood in the way of an increase in income among low-wage earners.

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