



Industrial relations and social dialogue
**Minimum wage research in the EU,
Norway and the UK, 2020**

[Minimum wages in 2021: Annual review](#)

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Introduction

This paper complements the Annual review of minimum wages 2021 by providing an overview of and briefly summarising (some) of the latest policy relevant research in the EU, Norway and the UK on minimum wages. These studies were identified via the Network of Eurofound Correspondents (NEC) and via literature review by Eurofound. From countries with statutory minimum wages, again, a number of studies were published recently during 2019 and 2020, focussing on the impacts of changes to the minimum wages on workers and companies. Most often, wage and employment effects are the focus of these studies, but there is now a slowly growing amount of research which seeks to go beyond these outcomes. Some of these include the impacts on workers in terms of motivation or participation in training or working hours. Other studies look into company level outcomes including profits, productivity and firm closures or changes to prices. Other research – including also countries without statutory minimum wages - focuses on the impact of minimum wage increases on other wages (spill-overs) and subsequently wage inequality. Only few new studies were identified this year which investigate the impact of minimum wage increases on (in-work) poverty.

The mapping of recent – policy relevant – research also identified a number of reports, which are directly feeding into the annual rounds of updating of minimum wages or evaluate related policy changes ex-ante or ex-post; and papers of a more political nature, which are partially also feeding into the regular updating and policy debates on minimum wages, including some related to the EU level initiative. An overview of these studies is provided in Table 1 and some are presented in further detail in Table 2 and throughout this paper. This paper focuses in particular on the current research related to minimum wages and its relationship with or effect on:

- Employment
- Wages and income inequalities
- In-work poverty
- Compliance

Table 1: Latest minimum wage research in EU Member States and the UK

Theme covered	Country and references
Characteristics of minimum wage workers or companies employing minimum wage workers	France: Pinel, 2020; Ireland: Redmond, 2020; Lithuania: Garcia-Louzao and Tarasonis, 2020
Regional and sectoral differences in incidence of minimum wage workers	Poland: Majchrowska and Strawiński, 2019
Impact of minimum wage increases on:	
employment, working hours	Cyprus: Mitsis, 2019; Estonia: Ferraro et al, 2018b; Germany: Heise and Pusch, 2020; Kölling, 2020; Greece: Georgiadis et al, 2020; Ireland: Redmond and McGuinness, 2021; Netherlands: SEO Economisch Onderzoek, 2020; Poland: Albinowski and Lewandowski, 2020; Portugal: Alexandre et al, 2020; Slovenia: Laporšek et al, 2019; UK: Aitken, et al 2020
wage levels or incomes, collectively agreed wages, spill-over effects	Bulgaria: Vasilev et al, 2019; Cyprus: Mitsis, 2019; France: Gautier et al, 2019; Poland: Albinowski and Lewandowski, 2020; Incomes Data Research, 2020
wage and/or income inequality	Belgium: Vandekerckhove et al, 2020; Estonia: Ferraro et al, 2018 ^a ; Germany: Bossler and Schank, 2020; Romania: Militaru et al, 2019; Norway: Jordfald and Svarstad, 2020
in-work poverty	Germany: Backhaus and Müller, 2019; Vom Berge et al, 2020;
budgetary consequences for the state	Netherlands: Central Planning Bureau, 2020
prices and company revenues or profits, firm exits	Portugal: Alexandre et al, 2020; UK: Aitken et al, 2020
participation in education, vocational traineeships, work placements	Netherlands: SEO Economisch Onderzoek, 2020
motivation to work	Czechia: Schulz, 2018
Compliance with minimum wage regulations	Germany: Roth, 2020; Ireland: McGuinness et al, 2020; Italy: Garnero and Lucifora, 2020
Ex ante impact studies	Lithuania: Garcia-Louzao and Tarasonis, 2020; Netherlands: Central Planning Bureau, 2020; Poland: Sierpińska, 2020; UK: Incomes Data Research, 2020
Official reports, feeding into the setting of minimum wage rates or evaluations	France: Groupe d'experts SMIC, 2020; Germany: Ehrentraut et al, 2020, Herzog-Stein et al, 2020; Greece: IMF, 2020; Netherlands: Ministerie Sociale Zaken en Werkgelegenheid, 2020; Portugal: GEP/MTSSS, 2020; UK: Low Pay Commission, 2020
Political discussion, debated changes to (aspects of) wage-setting mechanisms	Czechia: Sadovský and Matějková, 2019; Germany: Knabe et al, 2020; Lesch and Schröder 2020; Italy: INPS, 2020; INAPP, 2020; Nordic Countries: Furåker and Larsson, 2020;

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	EU level (concerning the EU minimum wage directive): Lovén Seldén, 2020; Ståhl et al, 2020; Müller, and Schulten, 2020;
Needs-based approaches (living wage)	Austria: Hofmann and Zuckerstätter, 2019; Nordic Countries: Alsos et al, 2019
Minimum wage setting, wage determination including via collective agreements	France: Askenazy, 2019; Italy: Menegatti, 2019; Norway: Jordfald, 2019; Italy and Spain: Adamopoulou and Villanueva 2020; Sweden: Hällberg and Kjellström, 2020
Collective bargaining coverage	Germany: Bispinck et al, 2020; Italy: INAPP, 2021; Portugal: DGERT/MTSSS, 2021

1. Characteristics of minimum wage workers

Pinel (2020) outlines the effects the 1.2% increase of the minimum wage in France in 2020 had on employees in the private sector. Using data from the Acemo quarterly and Acemo TPE surveys the proportion of beneficiaries from this 1.2% increase is explored. In total 2.25 million employees benefited from this 1.2% increase in the minimum wage. Out of these 2.25 million employees benefiting from the increase over 1.33 million were women. Women represent 44% of the employees in the private non- agricultural sector but they also represent 59.3% of the employees who benefited from the 1.2% increase in the minimum wage. It was found that in all groups except one, women were overrepresented in the group of beneficiaries from the minimum wage increase. The one group where women were not overrepresented was the handling, cleaning, recovery and security sectors. It was also found that those in part time employment benefited three times more from the increase in minimum wage compared to full time employees. As 30 % of those in part time employment benefited from the increase compared to 9% in full time. Out of those who benefited from the increase 39% were employed by very small companies. Out of all the sectors the catering, hotel and tourism sector had the highest proportion of the beneficiaries from the minimum wage increase with 38% of its employees benefiting and 63% of those were in part-time employment. The sectors least affected by the increase were finance, banking, insurance, metallurgy, steel, plastics, rubber, fuels, glass, materials, construction, legal and accounting with only 5% of its employees benefiting from the increase in minimum wage.

Redmond (2020) looks at the incidence and employment characteristic of minimum wage workers in Ireland. He does this by pooling Labour Force Survey (LFS) data from 2017 to 2019 as they include a question in their survey that directly asks respondents if they earn the minimum wage. It showed that 8% of all employees in Ireland earn the minimum wage but the incidence varies across sectors. In the accommodation and food sectors, 30% of employees earn the minimum wage and in the retail sector 20% of its employees earn the minimum wage. Whilst 5% of employees in all other sectors of work who have been pooled together are earning the minimum wage. Using the LFS data the average characteristics of minimum wage worker in Ireland can also be explored. It was found that more women than men are minimum wage employees with 55% of all minimum wage workers being female, and the overall incidence 8.3% of all female employees are minimum wage workers compared to 6.8% of all male employees. They are also disproportionately more likely to be non-Irish nationals as 23% of all minimum wage workers are foreign nationals whilst overall, they only represent 18% of the total employees in Ireland. Minimum wage earners are also more likely to be young. Those aged between 15-24 years old make up half of all minimum wage workers whilst only accounting for 10% of all employees in Ireland. Those who earn the minimum wage are also more likely to work part-time as 60% of those who earn the minimum wage are part-time workers. Whilst part time work overall only accounts for 20% of the economy.

In both papers, similarities arise between the characteristics of minimum wage workers although Pinel (2020) looks at those who have benefited from the increase in the minimum wage this does not mean all those who benefited are earning the exact minimum wage. With this in mind both papers highlight that women are more likely to benefit from or be in receipt of the minimum wage. In France they represent 59.3% of employees who benefited from the minimum wage increase and in Ireland they represent 55% of all minimum wage workers. Those who benefit from or are in receipt of the minimum wage are also likely to be part-time employees as in France 30% of all those

who benefited from the minimum wage increase were in part-time employment and in Ireland 60% of all minimum wage employees work part-time. In both papers, similar sectors have the largest proportion of employees who benefit from or are in receipt of the minimum wage. In France, 38% of all employees in the catering, hotel and tourism sector were beneficiaries from the increase in minimum wage, whilst in Ireland 30% of all employees in the accommodation and food sector earn the minimum wage.

Garcia-Louzao and Tarasonis (2020) explore the incidence of the minimum wage in Lithuania between 2013 and 2020 mainly using data from Social Security records from the State Social Insurance Fund Board (SoDra). In Lithuania part time workers represent around 8% of the total number of employees and roughly 80% of them earned the minimum wage between 2013-2020. To characterise the incidence, they use two complementary measures based on the proportion of workers who earn at maximum the minimum wage and the level of the minimum wage in relation to the average monthly wage in the economy. Whilst examining the data they found both young workers and women have a larger low pay incidence and minimum wage bite. They also found that 20% of the workforce fall under their definition of low pay, whilst around 8% is covered by the minimum wage. The difference between the two percentages is mainly due to part-time employment which usually has a larger incidence of minimum wage workers. Between the years 2014 and 2020 they found that the national minimum wage was increased seven times with each increase ranging between 3.5 to 9.5%.

2. Employment effects

The employment effects of minimum wage increases are one of the busiest research areas in labour economics, with a multitude of new studies appearing each year. Theoretically the effects are ambiguous: neoclassic economic theories predict a clear negative relationship, implying employment losses when minimum wages are increased, as increased labour costs reduce companies demand for labour. Keynesian models suggest the outcome is indeterminate. Other schools stress the existence of imperfections in labour markets, the possibility that labour supply increases as more workers are willing to work at a certain wage level, or an offsetting effect, as workers are more likely to stay with the same employer at a higher wage level and increases in productivity can compensate employers for increased labour costs (see, for instance, Manning 2021).

When researching the employment effects of minimum wage increases, studies usually begin to investigate whether the raises resulted in measurable effects of wage increases especially of the affected workers earning close to the minimum wage, as the failure to identify significant wage effects would question whether any employment effects can be present at all.

The latest research results from 2019 and 2020 in EU Member States and the UK on employment effects of minimum wages – a non-exhaustive selection – shows mixed results in terms of measurable impacts. It is however important to stress that the country specific circumstances, as well as the state of the business cycle should be taken into account when interpreting these findings. For countries (and periods) with a lower ‘bite’ of the minimum wage, in good economic and financial circumstances, with a lower share of companies under distress, it can be less expected that minimum wage rises lead to significant employment impacts.

Negative effects of minimum wage rises were found in studies from Cyprus, Slovenia and Portugal:

For Cyprus a recent study based on household budget surveys covered the period 1990 to 2009, during which the occupational statutory minimum wages in terms of average wages increased from about 37% to nearly 50%. It finds that a 1% increase of occupational minimum wages decreased the probability of employment for workers covered by the regulation and earning close to the minimum wage by 0.5%, but it also decreased the probability of employment of those not covered, and even among the self-employed (Mitsis, 2019).

Another study which detected larger disemployment effects for all lower skilled sub-minimum wage workers was made for Slovenia, covering the period 2009 to 2015 in which the effects of the financial and economic crisis hit the whole workforce. Using an extensive dataset of individual work histories, earnings and labour market status of the whole Slovenian population, the authors find that minimum wage workers tended to be substituted by ‘super-minimum wage workers’ and were more likely to be not employed five years after the large minimum wage hike of 2010. Sub-minimum wage workers who remain in employment received larger increases in earnings, but the group overall lost in earnings, because of labour market exits (Laporšek et al, 2019).

Located in a period of a more favourable economic development is a Portuguese study, which detected a slow-down of employment growth among all firms, but especially among financially distressed firms; but because of favourable economic development a reallocation of workers to other companies and thus a ‘cleansing effect’ occurred (Alexandre et al, 2020).

While most studies investigate the effects of increased minimum wages, the introduction of a subminimum wage for youth in 2012 in Greece de-facto represented a decrease for younger workers

below the age of 25 years. Georgiadis et al (2020) investigated the impacts of this policy on the wages and employment of younger workers and adults, within a period which was marked by wage declines across the board. They found that adult wages decreased more in firms with a higher share of youth employment and this was associated with a higher rate of adults moving from such firms to other employers. The decrease of youth wages did not differ across firms and on average the study finds positive employment effects following the minimum wage decrease across all age groups. This positive effect is driven by an increase in new hires while there was no change in separations.

Smaller effects on employment, such as reduced employment growth, or impacts predominantly confined to some smaller groups were found in recent studies from Germany and Poland:

Heise and Pusch (2020) find limited employment loss of 26,500 workers following the introduction of the German minimum wage in 2015, caused by a small sectoral shift from low wage industries to higher wage industries. A substitution of lower qualified workers with medium qualified workers, following the introduction of the minimum wage in 2015, was also detected by another recent German study, which however also found this effect to be decreasing again after the first increase of the minimum wage in 2017 (Kölling, 2020).

No substantial employment effects of the de-facto increase of the minimum wage for young workers between 18 to 21 years, due to the change of age-categories within the legislation, were found by a study in the Netherlands. This age group benefitted from an increase of 3 to 5% in earnings and are now more often found to be earning exactly the minimum wage.

For Poland, Albinowski and Lewandowski (2020) estimate the impacts of minimum wage increases between 2003 to 2018, drawing on a regional dataset. They find small negative employment effects for regions in the lowest earnings tercile but no employment effects for the remaining two thirds of regions.

A study for the UK Low Pay Commission investigated the introduction of the UK living wage (NLW) in 2016 and its impact on businesses, including employment growth. It finds the employment growth in firms with minimum wage workers to be about two to three percentage points weaker than in other firms, but cannot confirm that the minimum wage hike was indeed the cause of this, as similar employment trends among the different companies observed were already present before (Aitken et al, 2020).

Very little to no effect on employment retention for workers where found by a study in Estonia, which investigated the increase of the minimum wage between 2013 to 2016 (Ferraro et al, 2018b). Likewise in Ireland, a new study for the Irish Low Pay Commission researching the impact of the 2016 hike, found no employment effects, not even among companies with a very high share of minimum wage workers. The study detected some reduction of overtime hours of part time workers in these firms, but compensated by increased working hours of full-timers, thereby suggesting a reallocation of work had taken place (Redmond and Mc Guinness, 2021).

More details on the quoted studies can be found in Table 2.

3. Wage and income inequality

Spill-over to other wages

What impact do minimum wages exert on other wages? A study for **Cyprus**, where statutory wages only exist for some occupations, finds that these occupational minima do spill-over to other wages and reach also the non-covered workforce in the form of ‘shadow wages’ (Mitsis, 2019). A **Bulgarian** study uses a time-series approach (VAR model) to study the interaction between minimum wages and actual wages in the private and public sector. They conclude that in Bulgaria minimum wages do not exert any impact on wages in the private or the public sector, but that wage developments are driven by private sector wages, while public wages follow (Vasilev et al, 2020). This is in contrast to the findings of a **French** study by Gautier et al (2019), which shows that raises in the statutory national minimum wage via the collectively agreed sectoral minimum wages spill over to and raise actual wages in France (in addition to the impact of inflation).

Wage and income inequality

Minimum wage changes have the potential to change wage inequalities between workers by raising the pay of the lower paid relatively more than the pay of medium and higher paid workers. Whether this happens and the magnitude of the effect depends on the extent to which they exert an impact on higher wages, how far this impact reaches up the wage distribution, and how the wages of higher earners develop.

A new study from **Belgium**, where collectively agreed minima play a stronger role in determining workers’ pay than the (relatively low statutory minimum wages which are paid to a rather small proportion of workers) sheds light how these two types of minimum wages affect wage inequality. The study uses a dataset covering one fifth of the Belgian working population and a time-series of minimum wage floors from 43 collective bargaining committees. According to the results, collectively agreed wage increases tend to create more wage equality, or at least counteract latent trends in increasing wage inequality. The study finds that in the long run in Belgium, wage inequality has been remarkably stable, pointing to the importance of collective bargaining for the Belgian minimum wage setting (Vanderkerckhove et al, 2020).

Somewhat contrasting findings on the role of centralised sectoral collective bargaining for influencing wage inequalities were reported from **Italy**. Devicienti et al (2019) based on the Veneto work history database show that wage inequality has grown in Veneto between 1982 and 2001. Their findings indicate that there has not been a growth in firms’ wage premiums dispersion, given that the dispersion in firm-specific wage policies has declined over time. Instead, they argue that the wage dynamics settled within the relevant industry-wide collective agreements drive a large proportion of the growth in earning dispersion over the entire period considered, showing that the growth in wage dispersion has almost entirely occurred between job titles (*livelli di inquadramento*) for which a set of minimum wages is bargained at the nation-wide sectoral level.

Ferraro et al (2018a) studied the minimum wage effect of wage distribution in **Estonia** as in Estonia wage and income inequality are rather high. They use Estonian Labour Force Survey data covering full-time employees between 2001 and 2014 and estimate the effect of minimum wage on different percentiles. They conclude that the spill-over effect from minimum wage to lower percentiles is

substantial, but the effect declines rather fast when approaching the median wage and thus overall the minimum wage appears to have contributed to lower wage inequality.

A similar effect was found by a recent **German** study by Bossler and Schank (2020), which is based on register data from the social security system (at the individual level) between 2000 and 2017. They found that following the introduction of the German minimum wage monthly wages increased significantly at the bottom of the wage distribution but also up to the median, and that the introduction of the statutory minimum wage accounted for 40 to 60% of the overall decline in wage inequality (see also Pusch et al., 2021). Evidence from Germany has also indicated that minimum wages reduce wage inequality between men and women (Pusch, 2018).

A study on behalf of the **UK** Low Pay commission investigated employers' responses to changes of the minimum wage via case studies in low-paid sectors. The study found that above-inflation increases of the minimum wage had sizeable impacts on wage compression and differentials, reducing or eliminating differentials between employees at the lowest levels and their immediate supervisors in many organisations. In other organisations, attempts to retain differentials lower down the pay scale had reduced differentials higher up the pay scale (Incomes Data Research, 2020).

Table 2: Overview of recent empirical research in the EU, Norway and the UK on employment impacts of minimum wage increases, 2020

Study	Country	Period covered	Dataset	Method	Main outcome variables	Main findings
Albinowski and Lewandowski, 2020 ;	Poland	2003-2018	Local databank, Statistics Poland	Panel, using variations of the regional bite of minimum wages as continuous treatment variable.	Wages and employment	Minimum wage hikes had a significant positive effect on wage growth and a significant negative effect on employment growth only in regions of Poland that were in the first tercile of the regional wage distribution in 2007. These effects were moderate in size and appear to be more relevant for wages: if there had been no minimum wage hikes after 2007, by 2018, the average wage in these subregions would have been 3.4% lower, while employment would have been 1.2% higher. No effects in the other two thirds of regions.
Alexandre et al, 2020	Portugal	2006-2017	The Integrated Business Accounts System (SCIE, 'Sistema de Contas Integradas das Empresas', INE, 2018b) from Statistics Portugal's Registry of Statistical Units and the QP (Quadros de Pessoal), a linked employer employee dataset collected through a mandatory survey.	Potential relative cost increase as treatment variable; Logit and linear probability model.	Employment growth, firm profitability, firm closure	The study is set against the context of a high growth in minimum wages and related to it the share of minimum wage workers between 2014 and 2017. Minimum wage increases had a negative impact on employment growth and firm-profitability and a greater impact on firms which were already financially distressed, in terms of a higher decline of profitability and a higher likelihood of them exiting. Employment growth was negative for all, but more so for distressed firms. During 2012 to 2017, the share of distressed firms was peak level in 2014 where it stood at 5.8% among all firms, employing 5% of workers and adding 1.3% of gross value added. Minimum wage increases might have a stronger impact on distressed firms

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Study	Country	Period covered	Dataset	Method	Main outcome variables	Main findings
						because they already have a higher share of minimum wage workers, but the impact could also go via profitability and employment growth. The negative impact on employment and profitability was compensated by an expansionary phase of the economy, leading to worker reallocation to more productive firms.
Aitken et al, (2020)	UK	2015-2018	Business Structure Database (BSD) and Annual Survey of Hours and Earnings (ASHE),	Difference-in-differences estimators based on companies employment of wage workers;	Employment growth, survival rates of companies; turnover per employee. Prices	Following the introduction of the national living wage in 2016, employment growth in firms employing a higher share of minimum wage workers was about 2 to 3 percentage points (pp) weaker than in other firms. The employment effects were most common in smaller establishments and in multi-unit chains in retail, which points to some potential substitution between labour and capital (i.e. self-scan). Firms with minimum wage workers have 2pp higher survival rates than others, but this could be explained with fewer start-ups being present among that sector (who tend to have lower survival rates). Firms with minimum wage workers also have 3pp lower turnover per employees three years after the introduction. Overall, robustness checks show that there is no clear evidence that the minimum wage uplift of 2016 was the cause of the results. They could be due to other ongoing trends.

Study	Country	Period covered	Dataset	Method	Main outcome variables	Main findings
Ferraro et al, 2018b	Estonia	2009-2016	Micro data from the LFS for 2008–2016	Difference-in-differences methodology	Employment, wages,	The increases in the minimum wage in 2013-2016 had very little to no effect on employment retention for works who were both directly and indirectly affected.
Georgiadis et al, 2020	Greece	2009-2017	Social security records, EFKA dataset by the Greek Ministry of Labour, matched employer-employee	Difference-in-differences estimators based on companies different share of youth employment.	Wages and employment of younger and adult workers	Greece introduced a sub-minimum wages for youth in 2012. Adult wages decreased by more in firms with a higher share of youth employment, but youth wage decreases did not differ across firms. On average positive employment affects following the decrease across age groups. This positive effect is driven by increase in new hires, there was no change in separations. A higher move rate of adults to other employers was detected in firms with higher youth employment rates (and in such firms adult wages also decreased more strongly than in others).
Heise and Pusch, 2020	Germany	2014-2018	EVS (Einkommens- und Verbrauchsstichprobe) dataset and consumption price deflator sub-categories supplied by the German Federal Statistical Office (Statistisches Bundesamt).	A quantitative approach using a post Keynesian two-sector model including an employment market.	Employment, job loss or gain.	It is found that the introduction of the statutory minimum wage in 2015 caused overall very little employment loss. The loss amounted to about 26,500 workers caused by a small sectoral shift from low wage industries to higher wage industries.
Kölling, 2020	Germany	2014-2017	Data from IAB Establishment Panel	Fractional panel probit approach	Relationship between labour	The substitutive relationship between employees with low and medium qualification levels is strengthened

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Study	Country	Period covered	Dataset	Method	Main outcome variables	Main findings
				for estimating labour demand elasticities. Sharp regression discontinuity for differences in the periods and IV regressions;	demand elasticities for low skilled workers and their complementary to or substitution with medium or higher skilled workers	after the introduction of the statutory minimum wage but decreased again after the first increase in 2017 (which was lower than the initial increase due to the introduction).
Laporšek et al, 2019	Slovenia	2009-2015	Link of five administrative databases, covering the entire workforce and for every worker information on employment, unemployment and wages.	Panel data, estimating employment probabilities	Employment probability, hours worked, wages, and earnings	The study analyses the effects of the large minimum wage rise of Slovenia in 2010, based on a longitudinal dataset in which they can follow individuals and their labour market status over five years after the minimum wage increase. It finds large and persistent negative employment effects on low-skilled workers, both because of a higher likelihood of moving into non-employment and a lower likelihood of transitioning into employment from non-employment, as well as a larger reduction of working hours, so increases in the minimum wage did not compensate for loss of earnings. They also find some evidence for a substitution with ‘super minimum workers’.
Mitsis, 2019	Cyprus	1990-2009	The minimum wage decrees of the Cyprus Ministry of Labour and Social Insurance and the Household Budget Surveys of the	Wage regressions and binomial probit analysis for the employment impact.	Employment, wages, workers: covered by MW and uncovered and self-employed.	The existence of a minimum wage for certain occupations also influence the wage setting in non-covered occupations. Non-covered occupations may experience an increase in wages when the minimum wage rises but only for uncovered occupations whose monthly earnings are near to the minimum wage. The employment effect for those covered and not covered

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Study	Country	Period covered	Dataset	Method	Main outcome variables	Main findings
			Statistical Service of Cyprus.			by minimum wage is largely the same. When the minimum wage is raised it shows a decrease in probability that a worker will be employed in both covered and non-covered occupations.
Redmond and McGuiness, 2021	Ireland	2008-2016	Earnings Hours and Employment Costs Survey (EHECS)	Difference-in-differences estimators based on companies different share of minimum wage workers	Average labour costs of firms, employment, number of hours worked, overtime hours.	Only for firms with a very high intensity of minimum wage workers (of more than 50%) labour costs rose by 5.4% on average (viz a viz others) when the minimum wage was substantially uprated in 2016. These firms however only make up 3% of all firms. These high intensity firms also reduced overtime of part-time workers by 6 pp, but there is also evidence that this coincided with an increase in the number of fulltime hours. The study detected no negative employment effect in firms with a high intensity of minimum wage workers. For firms with 10% to 50% of minimum wage workers among their employees no statistically significant effect on average labour costs was detected.
SEO Economisch Onderzoek (2020)	Netherlands	2010-2020	Administrative micro data Statistics Netherlands (linked datasets): Data on income (UWV (PES)), data on education (DUO) and data on individual characteristics from	Mix of quantitative and qualitative research methods. Difference-in-difference method (using linear regression models). The 'shock' of a change	Employment changes, participation in education, hourly wage rate, and participation in vocational traineeships and work placements	This study examines the short-term effects of increasing the minimum wage rate for youths between 18 and 21 years of age. The background here is that in January and July of 2019 the wage rate for youths were increased in the Netherlands. The study found that at that stage, eight months after the second wage increase, the increase in minimum wages did not have much effect on the employment rate, participation in education, or the participation rate in vocational traineeships and work placements. The report makes

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Study	Country	Period covered	Dataset	Method	Main outcome variables	Main findings
			the basis registration (BRP).	in 2019 is in a central position.		note however that this is a short-term examination and that the medium and short-term effects of this wage increase are not yet clear.

4. In-work poverty

Backhaus and Müller (2019) evaluate the effects of the introduction of the statutory minimum wage in Germany on (in-work) poverty and income inequality based on data from the German Socio-Economic Panel. Their findings suggest – in line with previous research for Germany – that the impact on poverty and incomes for the lowest earning households was limited, as minimum wage workers do not tend to live in poor households. They also simulate that neither a full compliance, nor substantial increases of the minimum wage (to €12) would reduce inequality and poverty. Vom Berge et al (2020), based on data from the PASS survey, show that only around 28% of German minimum wage earners live in poor households; 54% are found in the lowest three earnings deciles, but the remainder live in medium and higher earning households.

Romanian researchers, in contrast, and based on EU-SILC, found recently that minimum wage increases lead to a reduction of inequality between households' disposable incomes, as in Romania most minimum wage earners come from poor households with numerous children (Militaru et al, 2019).

5. Compliance

We know that in countries that have a minimum wage some level of non-compliance is likely to exist. However, it is very difficult to estimate the level of non-compliance. The three papers below use various data sources and methods to estimate the level of minimum wage non-compliance in their countries and explore the profiles of non-compliant minimum wage workers and the effects non-compliance can have.

McGuinness et al (2020) use a question from the Irish Labour Force Survey that encapsulates the reasons for workers being paid below the minimum wage to explore minimum wage non-compliance in Ireland. The findings suggest that 5.6% of minimum wage workers are being paid sub-minimum rates for reasons other than those allowed under legislation. They also found that these workers are most likely to be Irish, male and over the age of 35. Geographically they are more likely to live in the Mid-West of the country. In terms of employment when compared to compliant minimum wage workers, non-compliant sub-minimum workers are more likely to work in the domestic personnel sector and hold occupations related to personal care, childcare and agriculture. Lastly, they found that these workers were more likely to hold temporary contracts and to work alone.

Roth (2020) discusses the difficulty in estimating the level of minimum wage non-compliance in Germany using existing data from the structure of earnings survey (VSE) of the Federal Statistics Office and the Socio-Economic Panel (SOEP). The study explores the estimated level of those earning under the minimum wage in 2018 which ranged from 483,000 to 2.4 million people. In doing so, several variables are highlighted that need to be considered when analysing data from the VSE and SOEP to determine the number of workers being paid below the minimum wage, making it very difficult to have an error-free estimation. The VSE contains information on monthly earnings and paid working hours whereas the SOEP is an annual household survey which provides information on agreed working hours and actual hours worked as well as the total amount of income. For both datasets an hourly wage must be calculated to estimate the level of non-compliance. Using the VSE data, it is estimated that 483,000 employees were paid below the minimum wage in 2018 that is about 1.3% of all employees. However, it is pointed out that when making this assessment there are various factors that need to be taken into account, such as wage supplements for weekend or shift work and the age of workers as around 10,000 employees are minors without vocational training and they do not receive the minimum wage. On the other hand estimations based on the SOEP are significantly higher than the VSE as it is estimated that 2.4 million employees are paid below the minimum wage. This is about 6.8% of all employees. The estimation is based on the hourly wage, which is calculated from the agreed working time and the compensation received for it. The SOEP also contains questions for employees who indicate that they earn under €10 an hour and if this was used to estimate non-compliance, it is estimated that 745,000 employees are being paid below the minimum wage. It is pointed out that this method also has its shortcomings as the question is only asked to those who indicate they earn under €10 which means that people whose employment is not based on hourly wage are not included. As such, no conclusive level of minimum wage non-compliance in Germany is available. The calculations based on the VSE and SOEP indicate that employees within the scope of social security contributions in full time positions are less likely to fall below the minimum wage threshold compared to employees within the scope of social security

contributions in part-time positions and especially those exclusively working in marginal employment.

An Italian study carried out by Garnero and Lucifora (2020) looks at the link between non-compliance with collectively agreed minimum wages and employment. They modelled the hiring and compliance behaviour of firms in relation to the Italian institutional setting. In doing so, they found that when the anticipated costs of non-compliance are internalised by the employers the effect of deviating from collectively agreed minimum wages on employment rates are little to none. Using data from the Italian Labour Force Survey they found evidence of a small but positive trade-off between non-compliance and employment rates. When non-compliance exists and the rate of non-compliance stays relatively low, they found that that employment levels were higher. However, this is only the case when the rate of non-compliance is low and when it is high it reverses the positive employment effect.

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