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ABSTRACT

Decent Wage Floors in Europe: Does the Minimum Wage Directive Get It Right?*

The Directive on Adequate Minimum Wages represents a watershed initiative adding substance to the EU's social dimension. It contains two ambitious objectives: establishing the minimum level of statutory minimum wages (SMWs) at 60% of the gross median wage, and increasing collective bargaining coverage (CBC) to at least 80% of workers. In this paper, we assess how minimum wages and collective bargaining affect low pay. Using a time series cross-section of EU-SILC for income years 2004-2019, we identify and assess the absolute and relative size of 'effective wage floors' for full-time employees in 30 countries. We specify multilevel, random effects within-between (REWB) regression models to assess the individual and joint effects of SMW and CBC on wage floors. Our results indicate that SMW and CBC both have distinct roles to play in establishing the effective wage floor. First, countries with a statutory minimum wage have a lower share of workers earning below 60% gross median wage than countries without one. Furthermore, higher rates of CBC are essential for pushing down the share of workers on below-decent pay. Countries without a SMW but with CBC above the 80% target value have roughly the same proportion of below-decent pay as SMW countries with CBC less than 30-40%. However, at higher rates of CBC, SMW countries are predicted to overtake non-SMW countries on this measure. A hypothetical SMW country meeting the target value of 80% CBC is predicted to have less than 6.5% of full-time employees earning below-decent pay.

JEL Classification: J38, E24, J50, C23

Keywords: minimum wage, collective bargaining, European Union, multilevel analysis

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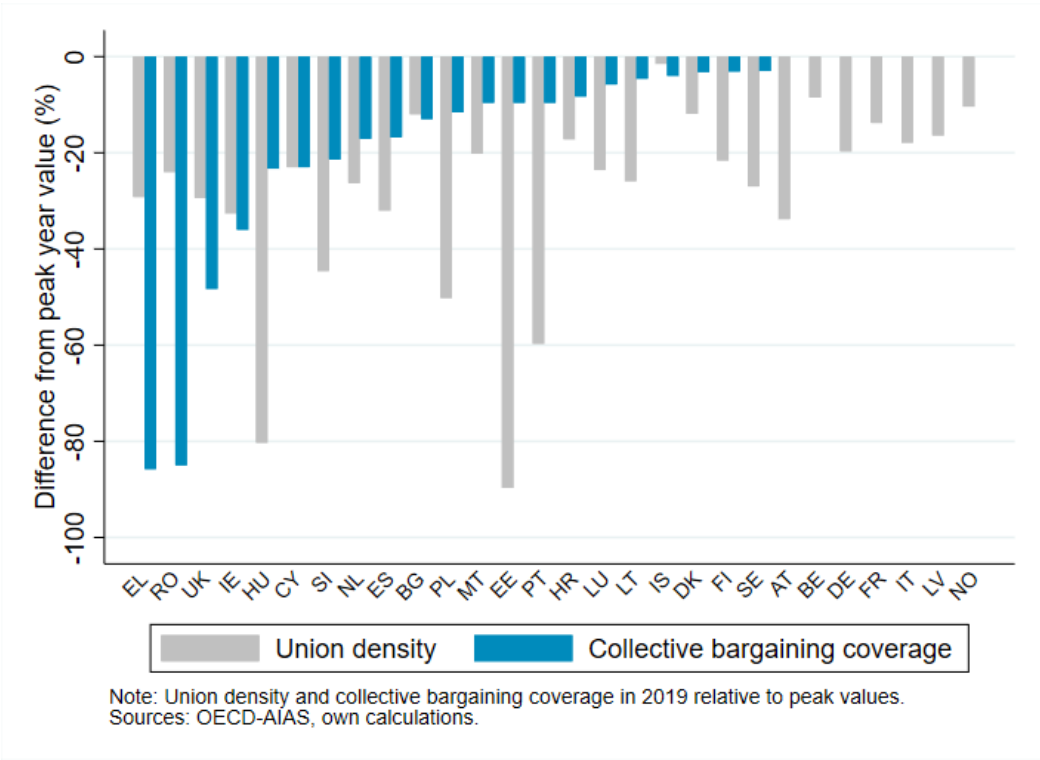
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Following the labour market turmoil inflicted by the Covid-19 pandemic, rising inflation and concerns of skill-biased technological change upending traditional forms of employment, questions regarding decent wages and fair distribution of income are more relevant than in ages. In this paper we ask what is more important for the determination of adequate minimum wages: statutory minimum wages (SMWs) or collective bargaining coverage (CBC). A brief look into the industrial relations landscape in Europe reveals the tensions underlying this question, as the Nordic countries with the highest levels of CBC do not have an SMW and strongly oppose plans to introduce one.

Guaranteeing adequate earnings at the bottom has become all the more urgent as Russia's war in Ukraine has pushed up the global prices for energy and food, leading the UN Secretary General Antonio Guterres to warn of an upcoming 'winter of global discontent'. For observers of industrial relations, these words take us back to the original 'winter of discontent' of 1978/79 when trade unions in the United Kingdom organised unprecedented levels of national action to reject the past decade's policy of wage restraint and fight for pay rises above inflation (Hay 2010). The current situation with an upsurge in inflation upending years of stagnant wage development draws uncomfortable parallels. Indeed, the story of the last few decades for wage-earners is not a favourable one. Collective bargaining coverage and trade union membership have declined almost universally from their peak levels in the post-war decades (Figure 1). After the Great Recession, it took nearly a decade for labour incomes to return to their pre-crisis trends, both in the United States (Smeeding et al. 2021) and in Europe (Crespy 2020). The decline of manufacturing, automation of routine skills and proliferation of non-standard employment have also made it increasingly more challenging for workers without complex, abstract skills or high levels of formal education to find work with decent pay, good working conditions and unimpeded access to the social rights and protections which the welfare state provides for employees.

Figure 1. Union density and collective bargaining coverage in 2019 relative to peak values post-1960.



The flexibilisation and liberalisation of employment and the austerity policies applied in response to the Great Recession have cast a long shadow of inequality. However, they have also generated a profound political interest in redressing some of the harms inflicted upon the working population. Events such as the United Kingdom’s vote to leave the European Union and the election of Donald Trump to the US presidency are often interpreted as signals from the ‘losers of globalisation’ or the ‘forgotten working class’ to reject the status quo largely built upon facilitating cross-border trade and commerce in a global market economy (Gifford 2021). Nonetheless, the establishment is fighting back. The emergence of the European Pillar of Social Rights (EPSR) under Jean-Claude Juncker’s Commission and the increasing prominence of social policy in EU decision-making were undoubtedly influenced by the need to keep the political backlash from austerity from further aggravating the Eurosceptic block (Zeitlin and Vanhercke 2018).

The European Pillar of Social Rights, formally launched in Gothenburg in 2017, is characterised as the most significant new headway for social convergence in Europe in the last 20 years (Garben 2018). It is a set of 20 principles affirming basic social rights for EU citizens under three main topics: equal opportunities and access to the labour market; fair working conditions; and social protection and inclusion. In practice, the rights declared in the EPSR do not have a

'hard law' status making them internationally binding in the sense of the EU Charter of Fundamental Rights, the European Social Charter or the ILO Conventions on labour rights (Garben 2018). Rather, they present a vision of European society meant to serve as a guide for lawmakers at European and member-state levels when drafting social legislation. An important step in this legislative process is the Directive on Adequate Minimum Wages in the European Union, or the Minimum Wage Directive (MWD) for short.

The Minimum Wage Directive: a watershed but controversial initiative

The recently approved MWD ranks among the most controversial EU initiatives of recent times. Scholars of European Union law have had heated debates over the question of whether EU law actually allows for such a directive. Sceptics argue that the EU treaties do not even come close to offering a basis for legislative action in this area (Sjödín 2022). Advocates refer to the European Pillar of Social Rights, especially principle 6 which states: "Workers have the right to fair wages that provide for a decent standard of living. Adequate minimum wages shall be ensured, in a way that provide for the satisfaction of the needs of the worker and his / her family in the light of national economic and social conditions, whilst safeguarding access to employment and incentives to seek work. In-work poverty shall be prevented."

The more voluntaristic camp has clearly prevailed. The MWD stipulates that minimum wages can be ensured by either collective bargaining between employers and trade unions ('the social partners') or legislation in the form of statutory minimum wages.

The provision that adequate wage floors can be set through collective bargaining came only after strong opposition from Sweden, Denmark and some other countries with strong roles for collective bargaining. In fact, initial opposition came from an 'unholy alliance' of neoliberals in Austria and the Netherlands, right-wing populists in Poland and Hungary, and social democrats in Denmark and Sweden. As a result, the Directive became more vague and less binding than some would have wanted.

It is perhaps somewhat of an irony that a Directive aimed at adding substance and credibility to Europe's social dimension received most opposition from exactly the countries with the most exemplary social and employment outcomes in terms of union membership, collective bargaining coverage, wage inequality and purchasing power of low wages. It was leftist parties and trade unions in Denmark and Sweden who saw the MWD as a danger for their labour market

model because it implies political interference in a field where the social partners cherish their autonomy from the state.

The Commission has tried to counter their concerns by stating that collective bargaining is deemed to be fully equivalent as a minimum-wage setting mechanism to statutory regulation subject to political interference – the main point of contention for the Nordic Member States. In fact, in this paper we will show that collective bargaining is not just to be seen as equivalent to minimum wage legislation, but actually as superior to it. In particular, both countries with and without statutory minimum wages could reduce low pay by increasing their collective bargaining coverage.

To begin with, it is worth emphasising that countries without SMWs are the exception. Statutory minimum wages exist in 84% of ILO member states (ILO 2020: 60; Appendix table A3). The system of Sweden and Denmark, where wage floors are exclusively defined in collective agreements with no legally binding minimum, is only found in eleven countries globally.¹ Social partners in non-SMW countries hold the position that there is no functional need for an SMW as long as wage floors negotiated in collective agreements cover the entire labour force and trade unions have sufficient power resources to monitor and enforce compliance. Trade unions particularly in the Nordic countries argue that the high wage floors and egalitarian wage distributions are the result of negotiated minimum-wage setting where the minimum rates are outlined in workplace-level, sectoral or national collective agreements (Alsos et al. 2019). Persistent opposition from the Nordic countries has also made it difficult for trade unions at the European level to formulate a common position on SMWs (Furåker 2020). An apparent duality has emerged on this front: countries without SMWs strongly defend their particular system of wage-setting, whereas countries with SMWs exercise collective bargaining with this statutory instrument as a final safety net.

The Minimum Wage Directive, approved by the Council on 4 November 2022, enters right in the middle of this debate with two central policy objectives on SMWs and CBC. First, the directive requests member states to increase their minimum wages, whether statutory or collectively bargained, to meet reference values of no less than 50% of the mean or 60% of gross median wage. Figure 2 demonstrates that nearly all member states are currently falling short of these objectives.

¹ These countries are Austria, Denmark, Finland, Iceland, Italy, Namibia, Norway, San Marino, Sweden, Switzerland and Zimbabwe.

Figure 2. Bar graph of statutory minimum wages relative to 50% gross mean and 60% gross median wage, in purchasing power standards, in 2019.

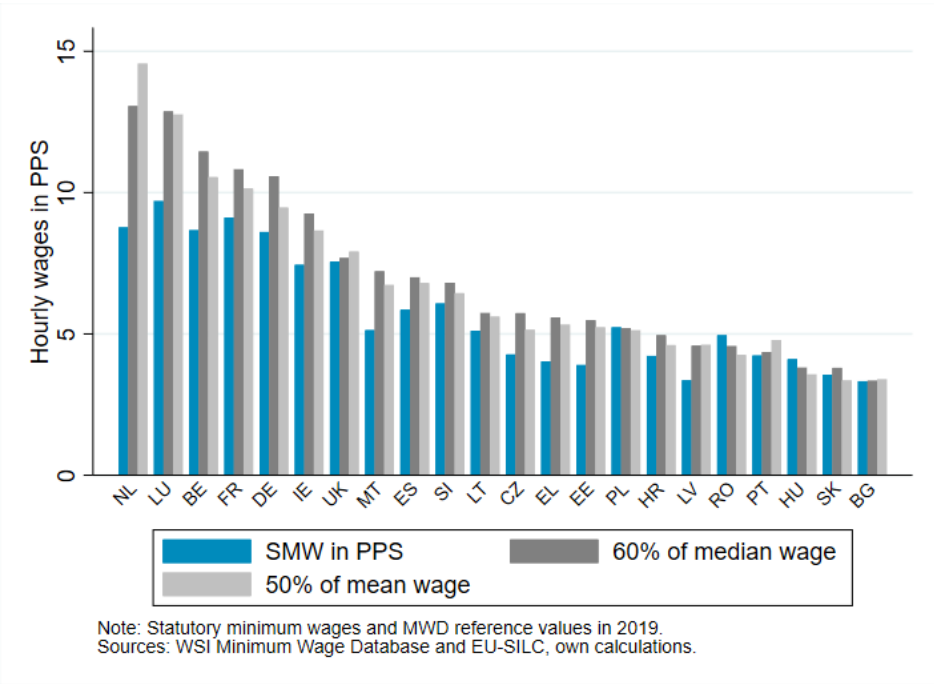
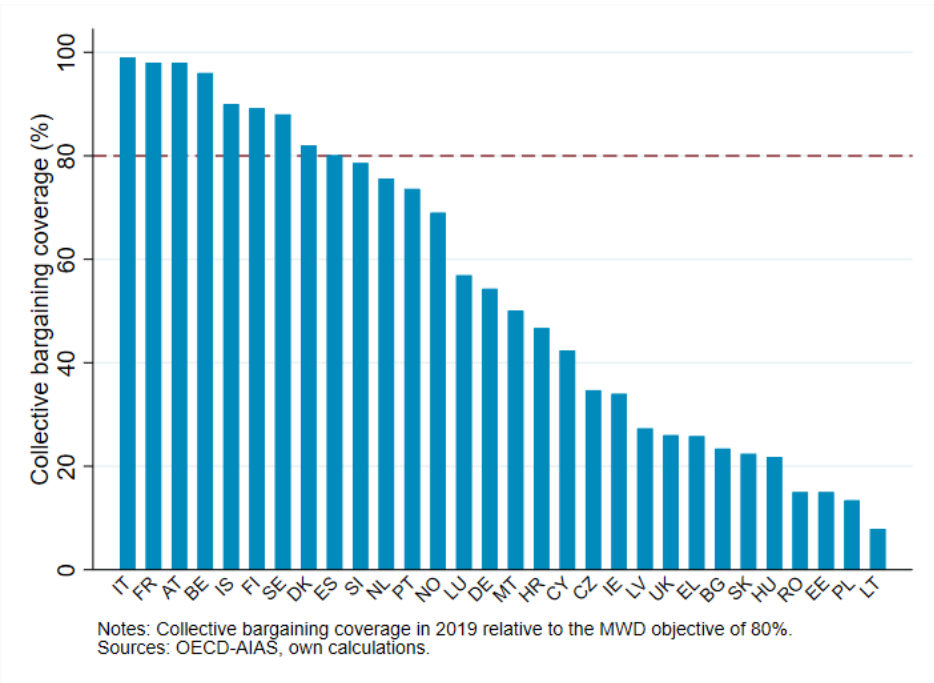


Figure 3. Bar graph of collective bargaining coverage in 2019 relative to the 80% objective (horizontal dashed line) in the Minimum Wage Directive.



Second, the Directive calls for a stronger role for workplace social dialogue and social partners, with the aim of increasing CBC to no less than 80%. As Figure 3 shows, this objective is also met by only a minority of member states.

In recognition of the subsidiarity principle in a policy field which has historically been a central domain of member states, the directive gives 'full respect for the autonomy of the social partners' performing their roles in collective bargaining, and the above-mentioned numbers have the status of 'indicative reference values' serving as guides to member-state decision-making. Nonetheless, it is hard to overstate the significance of these objectives and what they entail for European socio-economic governance more broadly. EU-level interventions in social and employment policy have recently seen a substantive shift away from the deregulatory attitudes which characterised this field up until the early 2010s. The 'Laval quarter' of anti-union ECJ rulings and the austerity response to the Great Recession were prominent examples of negative integration taking precedence over the coordination and strengthening of social policies (Dølvik and Visser 2009, Crespy 2020). One decade after these decisions which were particularly harmful to the weakest and most precarious people on the labour market, codifying the right to adequate minimum wages into European law together with an encouragement of social dialogue and collective bargaining truly amounts to a sea change (Müller and Schulten 2022).

While the numbers expressed in the MWD are highly ambitious, the operative clauses are worded carefully to respect both the social policy competences of member states and the primacy of social partners in industrial relations. Most evidently, the directive does not take a stance on the necessity of SMWs, with no obligation on the six non-SMW member states to introduce an SMW.² However, recent developments show it is scarcely possible to enforce wage floors throughout the labour market without an SMW unless CBC is close to universal.³ Indeed, falling CBC was a crucial motivation for Germany's decision to adopt an SMW in 2015 (Bosch 2018). With the backdrop of four decades of declining CBC and bargaining decentralisation throughout the advanced democracies, this raises a serious concern for the weakest in the labour market. The aim of increasing CBC to 80% is a strong indication of an EU-level shift away from laissez-faire socio-economic policy attitudes.

² EU member states without SMWs: Austria, Cyprus, Denmark, Finland, Italy and Sweden. Other non-SMW countries covered by this paper are Iceland and Norway.

³ Excluding Cyprus, the average level of CBC in the non-SMW countries in 2019 was 87.9%. Cyprus, with 42.4% CBC, is sometimes considered a 'hybrid' system where collectively bargained wages in various sectors receive statutory recognition (Eurofound 2022: 13-4). The country is due to adopt an SMW at the beginning of 2023.

The MWD is a substantive step forward in realising the goals of the European Pillar of Social Rights, namely the right to fair wages providing a decent standard of living and preventing in-work poverty (§6), and the strengthening of social dialogue (§8). However, it is not obvious whether minimum wages on their own are sufficient for reducing wage inequality or in-work poverty. Even nominally high minimum wages do not necessarily guarantee 'living wages' enabling a decent standard of living, especially for part-time minimum-wage workers or sole breadwinners with dependents (Hick and Marx 2022). There is also a high risk that employers respond to higher minimum wages by reducing their demand for working hours, resulting in no change in take-home pay (Bruckmeier and Bruttel 2021).

Likewise, there is no a priori reason to expect higher levels of CBC to automatically translate into more favourable low-pay outcomes. The main function of trade unions as representative organisations is to bargain for better outcomes for their members. Thus, the composition of union membership has a substantive impact on collective bargaining. Following the decline in blue-collar manufacturing, the main groups of unionised workers in advanced democracies are white-collar professionals, public sector administrators and other groups of middle-income workers (Becher and Pontusson 2011). Some authors suggest this undermines the ability of unions to engage in solidaristic wage bargaining as union members prioritise gains for their own reference group over broader equality in the wage distribution (Cronert and Forsén 2021).

Wage inequality between sectors with different levels of CBC or different positions in pattern bargaining demonstrates that in certain situations, maximising sectoral gains may lead to greater inequality at the country-level. At the limit this can evolve into labour market dualisation, where labour market 'insiders' employed in highly unionised sectors rarely have to face competition from 'outsiders' in weakly unionised sectors characterised by low pay, precarious employment and few prospects of breaking through to the insider bubble (Berglund et al. 2020). Hence, countries where wage-setting institutions are inclusive and robust on multiple dimensions including union density, centralisation and predominant level of collective bargaining, and the strength of employment and income protection legislation tend to have more equal wage outcomes (Howell 2021). It is far from a certainty that low pay can be reduced through higher CBC alone – the details of how governments and social partners work together to increase CBC, while avoiding excessive between-sector inequalities or sectors completely uncovered by collective bargaining, are crucial.

Minimum wages and collective bargaining: the research evidence

Research on the labour market effects of minimum wages concentrates on two distinct outcomes: employment and earnings. Regarding the first, a wealth of econometric evidence following the seminal work of Card and Krueger (1994) has demonstrated that SMWs set at reasonable levels do not necessarily have negative consequences for the employment rate. In particular, studies have demonstrated that there is no significant fall in the number of people employed as the SMW increases, provided that the changes are in line with the general development in wages and consumer prices (Machin and Manning 1997, Grimshaw 2013, Grimshaw et al. 2014, Belman et al. 2015, Salverda 2018, Card and Cardoso 2022). However, even if vacancies are broadly unaffected, evidence from Germany and the UK shows a reduction in the hours worked by low-wage workers following the introduction and level increases in the SMW (Bruttel 2019, Datta et al. 2019, Blundell 2022). Box 1 summarises some of the evidence on the effects of the German SMW, which was introduced in 2015 despite protestations from businesses and influential economists that job destruction would ensue. The very limited impact of the minimum wage on employment, despite having a substantive bite on earnings at the wage floor, was influential in shaping the debate at the EU level and eventually tilting the majority opinion towards an ambitious MWD. Instead of looking at the impact on vacancies, the focus of minimum wage research has therefore shifted towards earnings and the wage distribution more broadly.

Box 1: Pushing up the wage floor can be done: the case of the minimum wage in Germany

Germany established a general statutory minimum wage on January 1, 2015. In doing so it was a late adopter of SMWs. By that time, the vast majority of European countries already had an SMW. Germany thus offers a rare yet prominent example of a legally binding wage threshold being introduced nationwide in a large developed country.

That happened in a particular context. Germany had strong social dialogue and collective bargaining until the late 1980s. But collective bargaining coverage began to erode from the early 1990s onwards, beginning in East Germany. Productivity in many of the newly established companies was still very low. In the context of a rapid rise in unemployment, many companies wanted opportunities to set wages unilaterally without negotiating with the trade unions. Some employers were openly in favor of withdrawing from collective agreements. CBC subsequently declined; by 2013, it had fallen from its peak of 85 per cent before reunification to just 60 per cent in West Germany and 48 per cent in East Germany (Bosch 2018).

Low-paid employment went up rapidly and some German sectors had become notorious for extremely low pay and substandard work conditions. It was in this context that the idea of a national SMW started to gain traction.

First SMW evaluations happened in 2011, when the Federal Ministry of Labour and Social Affairs commissioned the evaluation of eight of the sectoral minimum wages. Most of these studies found that sectoral wage floors had significant positive effects on the wages of low-paid workers. Evidence pointed to minimal or no job losses. But there were exceptions for some sectors and in certain regions. For instance, in the roofing sector in East Germany significant negative employment effects were identified (Aretz et al. 2013).

Overall employment in Germany continued to grow quite strongly after the introduction of the SMW in 2015. In 2016 and 2017, there was an increase of 1.9 and 1.8 percent. Standard full-time employment subject to social security contributions in particular continued to increase. The number of people working exclusively in marginal part-time employment (Minijobs) decreased noticeably.

A host of studies tried to estimate the impact in a more sophisticated way (Bruttel 2019). All these studies found that after the introduction of the SMW, the number of marginally employed people declined.

The findings are more mixed when it comes to standard employment. Some studies found negative effects, other studies positive, still other no significant effects. Either way, the effects measured were small and never indicated actual job losses. Rather the studies suggested slower employment growth than there might have been without the SMW. A possible explanation for the small employment effects was that many of the industries highly affected by the SMW, such as the restaurant and hotel industry, but also retail, exhibited monopsony-type labour market structures under which earnings effects dominate employment effects (Bachmann and Frings 2017).

Studies suggest that the first-round effects of the SMW were far less ambiguous. The introduction of the SMW in 2015 resulted in a significant increase of hourly wages at the bottom of the wage distribution. Hourly wages for employees who earned less than €8.50 SMW in 2014 increased by roughly 14 percent on average between 2014 and 2016, while the average 2-year increase between 1998 and 2014 was only about 1 percent for this group (Buraue et al. 2018). That is clearly a vast difference. The principal gainers included female employees, low-skilled workers, workers in smaller businesses and employees in marginal, part-time jobs (Minijobs). After the strong one-time effect following the introduction of the SMW, increases were broadly in line with overall wage development. This is not surprising as the Minimum Wage Commission that decides on the SMW takes the development of collectively agreed wages as a benchmark. Interestingly, effects at the level of monthly gross wages were considerably weaker due to declines in contractually agreed working hours, offsetting in large part the far stronger hourly wage effects (Bruttel 2019).

In conclusion, recent assessments seem to indicate that the SMW has been successful in increasing hourly wages at the lower end of the wage distribution but that this often has come along with fewer working hours and lower work intensity, leaving monthly net earnings similar to pre-reform levels for many low-earners (Caliendo et al. 2017; Bruttel et al. 2018). However, the limited effect on employment proved crucial in tilting the balance of opinion at the EU level in favour of an ambitious Minimum Wage Directive.

Assessing the effect of the minimum wage on earnings is more complex than the effect on vacancies. First of all, it is essential to understand who exactly are earning the minimum wage and whether their earnings are sufficient to cover the costs of living. The picture of a worker at or near the minimum wage has in recent decades become considerably more diverse than the stereotypical teenage fast-food worker, the subject of Card and Krueger (1994). Low pay is over-represented in retail, food and accommodation services, workers under 25, as well as women, migrants and the low-educated (Eurofound 2022). Nonetheless, as box 2 demonstrates, few sectors are completely free from minimum-wage work.

Box 2: Demographic and employment characteristics of minimum-wage workers, EU average in 2018.

- Minimum-wage employment is more common among women (5%) than men (3%)
- Out of workers aged 15-35, more than 5% are paid the minimum wage
- 7% of workers with less than upper secondary education are paid the minimum wage, compared to 2% of university-educated workers
- Workers in small and medium enterprises are more likely to earn the minimum wage (7% in companies with 10 or fewer employees, 5% in companies with 11-50 employees)
- A little over 8% of workers on temporary contracts earn the minimum wage, compared to 3% of workers on permanent contracts
- 8% of part-time workers earn the minimum wage against 3% of full-time workers
- Sectors with the highest incidence of minimum-wage employment include hotels, restaurants and catering (9%), agriculture (9%) and other services (7%)
- Lowest minimum-wage employment (< 2%) in the financial services, information and communications sectors
- Elementary occupations and skilled agricultural occupations (over 10% of each) have the highest shares of minimum-wage employment, followed by salespersons (7%)
- Lowest shares of minimum-wage employment (<2%) in professional and managerial occupations

Source: Eurofound 2022, p6

The widespread presence of part-time and non-standard minimum-wage employment reminds us that even relatively generous minimum wages, defined in hourly or full-time equivalent monthly terms, can fall short of providing decent earnings for workers on limited hours. This problem can be exacerbated if employers compensate for rising labour costs by reducing working hours. As income insecurity displaces employment insecurity as the central issue for low-paid workers, this results in highly precarious situations where workers' private lives and long-term planning are constrained by variable take-home income or the need to remain 'on-call' for the employer on short notice (Moore et al. 2017). Although precarious low-wage

employment has received much coverage in the United Kingdom, a country characterised by very liberal labour markets and exceptionally weak trade unions by European standards, similar issues have surfaced throughout the EU (European Parliament 2016, Bruttel 2019).

Minimum wages also have substantive implications for incomes outside the labour market. To the extent that unemployment can be conceptualised as a reservation option for accepting work, research finds it a quasi-necessary employment incentive to keep the maximum level of unemployment benefit below the minimum expected income from work (Boeri 2012: 284). The same logic applies to restrict the generosity of out-of-work benefits such as minimum income protection. As the financial sustainability of modern welfare states strongly relies on maintaining high rates of employment for the working-age population, great effort is put into eliminating dependency traps and encouraging the take-up of work. In practice this means the minimum wage produces an effective 'glass ceiling' for out-of-work benefits: since the lowest incomes from employment must exceed the lowest incomes from social assistance, minimum incomes cannot be increased unless the wage floor also increases (Cantillon et al. 2020).

In addition to the economic argument, the growth potential of minimum wages is circumscribed by the political balance of power. Critics argue that trade unions have moved further from the defence of low-paid workers in their attempt to capture the middle class (Rueda 2007).⁴ If low-paid workers do not have sufficient political or industrial bargaining power, this results in greater wage inequality at the bottom of the distribution or a lower effective wage floor (Boeri 2012, Howell 2021).

Another line of research by Garnero et al. (2015a, 2015b) emphasises the importance of credible enforcement mechanisms. It is not enough to merely set a generous minimum wage in legislation or collective agreements – the 'bite' of the minimum wage, or the extent of employer compliance, is found to depend on CBC. However, this is where the different levels of CBC in SMW and non-SMW countries come in. Historically, European countries with the strongest bargaining institutions have outright refused legislative inference in wage-setting, positing that the system of minimum-wage setting through collective agreements is able to uphold effective wage floors as well as SMWs (Fernández-Macías and Vacas-Soriano 2016). According to

⁴ If union wage-bargaining strategies are informed by the (re)distributive preferences of their members, and the position of the average union member on the income distribution shifts upward, this implies a reduction in pro-poor preferences and bargaining of wage floors vis-à-vis median and high wages (Pontusson 2013). Together with the decline in manufacturing, this explains why unions representing the growing middle class risk producing gaps in their coverage of low-paid workers. In non-SMW countries such as Finland, the Left Alliance has called for an SMW to support the increasing cohort of precarious, non-standard or service-sector workers who are weakly covered by unions.

Garnero et al. (2015a), this results in the duality of wage-setting systems we observe today: in countries with an SMW, CBC tends to be at low-to-medium levels, whereas each country without SMWs has a high level of CBC. The authors argue this is because countries where trade unions have sufficient power to negotiate and enforce wage floors via high CBC have no functional need for an SMW. Conversely, in countries where the wage floor is set by SMW, the focus of bargaining shifts towards the middle of the distribution. This risks producing a self-reinforcing feedback loop where unions increasingly represent the interests of intermediate wage earners while paying less regard to workers near the wage floor (Pontusson 2013, Vlandas 2018). To summarise what this entails for theory: we expect SMW and CBC to be effective substitutes rather than complements when it comes to minimum-wage setting.

Following the effective substitutes theory, the determination of non-SMW countries to protect their wage-setting system in the MWD is easy to understand. The view among trade unions is that high CBC particularly in low-paid occupations is sufficient to deliver adequate and binding wage floors (Alsos et al. 2019). Further support to this point hails from Belgium and France, two countries which challenge the effective substitutes theory by combining SMWs with very high CBC and detailed collective agreement pay scales. On a closer look, they fit the argument since the SMW functions more as an indicative or normative benchmark than an effective wage floor. Instead the *de facto* wage floors are contained in collective agreements, equivalent to the non-SMW system (Fougère et al. 2018). In Belgium, negotiated sectoral wage floors are on average 19% above the SMW, and only 3% of workers earn the SMW (Vandekerckhove et al. 2020). Thus, we expect the share of workers earning the statutory minimum to be lower in SMW countries with high levels of CBC than countries with lower CBC.

Lastly, the case of Germany indicates the effects of falling CBC on minimum-wage setting. After decades of bargaining decentralisation and declining CBC, the leading trade union confederations agreed to the introduction of an SMW in 2015 as they had become too weak to enforce the negotiated wage floors throughout the large low-wage segment of the German economy (Bosch 2018). Notably, unions representing predominantly low-wage workers such as the service sector union ver.di were early proponents of the policy change. In contrast, unions representing the manufacturing sector with high average wages and very little decline in CBC only joined the campaign after the inability of collective bargaining to uphold wage floors throughout the economy became obvious. From the power resources perspective, trade unions have a strong interest in defending the wage-setting model of negotiated wage floors upheld by high CBC as long as possible. Unions fear that introducing an SMW would severely limit their

political-economic influence since giving final say on the wage floor from social partners to lawmakers would increase the exposure of industrial relations to political intervention (Meyer 2016, Furåker 2020).⁵

To sum up this discussion, we present our primary hypotheses:

H1. Countries without SMWs require a high level of CBC to uphold high effective wage floors near the MWD objective of 60% gross median wage. If CBC declines past a critical level, the wage floor will be lower than in the presence of an SMW.

H2. In countries with an SMW, higher levels of CBC increase the effective wage floor and reduce the proportion of workers earning less than 60% of gross median wage.

In the empirical analysis we set out to determine the 'critical level' of CBC necessary for non-SMW countries to maintain high effective wage floors and compact wage distributions, and the interactions between CBC and SMW in regulating effective wage floors. This will allow us to assess whether CBC and SMW behave as substitutes or complements in minimum-wage setting.

Minimum wages and low pay: defining the boundaries

Any discussion of minimum wages and low pay requires great conceptual clarity, as the terms are interlinked but refer to slightly different concepts. Indeed, the most commonly-used threshold for 'low pay', two-thirds of gross median wage, is far above the minimum wage in practically all European countries (Schulten and Müller 2019). On the other hand, indicators for an 'adequate' minimum wage generally refer to either 50% of mean or 60% of gross median wage, also levels that only a handful of countries are able to meet (Dingeldey et al. 2021). Median-based indicators are usually preferred as they are more robust to changes at tails of the wage distribution. However, using relative indicators implies that the threshold for an adequate minimum wage can decline artificially with a fall in median wages, as can happen during a recession. This approach also fails to take purchasing power into consideration, an issue particularly in Central-Eastern European countries where median wages are comparatively low and thus the share of workers with inadequate earnings might be underestimated.

⁵ In many SMW countries, the risk of the statutory minimum wage being manipulated for political purposes is reduced by delegating the task of setting the SMW to an appointed 'low pay commission', usually consisting of both elected representatives, social partners and neutral professionals such as labour economists or academics.

Another way of setting the threshold for adequate minimum wages independently from the rest of the wage distribution is to define a level of pay considered sufficient for a decent standard of living, also known as a 'living wage' (Hirsch 2017). In countries characterised by large low-paid sectors such as the UK, the debate on living wages started from the recognition that the SMW was not sufficient for families to meet their day-to-day living expenses, especially in the largest and most expensive cities. Consequently, the living wage may vary depending on country and place of living, family status, number of dependents or various other factors affecting essential needs. The living-wage approach is therefore capable of taking developments in the cost of living better into account: for instance during the energy crisis of 2022 exacerbated by Russia's war in Ukraine, trade unions are calling upon pay rises and targeted energy subsidies for workers and vulnerable individuals at risk of falling into energy poverty (ETUC 2022).

Taking household context into consideration is a valuable contribution of the living-wage approach. Here, it is essential to understand another conceptual distinction: wages are paid to *individuals*, whereas earnings and life situations cumulate to *households*. In fact, due to the prevalence of multiple-earner households where two or more adults are in employment, only a substantive minority of minimum-wage workers experience in-work poverty (Salverda and Rook 2022). The inverse is also true. Single breadwinners with dependents or part-time workers in single-person households, to highlight the most precarious examples, can easily fall below the in-work poverty line defined with reference to equivalised household disposable income even if they are paid above the minimum wage (Hick and Marx 2022). When considering the effect of policies such as minimum wages on in-work poverty, understanding this difference between individual and household earnings is of paramount importance.

In practice, comparative research tends to use relative indicators to define an adequate minimum wage to avoid the difficult and ultimately normative question of what goods and services ought to go into the reference budget for a decent standard of living. In the MWD, a central reference value for an adequate minimum wage is 60% of gross median wage. Although greater than the SMWs currently in place in practically every European country (see Figure 2), this is still a very low benchmark. For reference, the ILO's threshold for a 'decent' minimum wage is two-thirds of gross median wage (Lee and Sobeck 2012). Therefore raising the minimum wage to 60% gross median wage would not necessarily guarantee 'decent' living standards, particularly for solo-earner households or sole breadwinners with dependents. From a policy perspective, a

wage floor at this level amounts to a minimum-standards safety net with the expectation that employers compete for labour with wages *above* the SMW (Schulten and Müller 2019).

In the remainder of this paper we will follow the aims and terminology of the MWD in applying 60% of gross median wage as our threshold for an adequate minimum wage. However, as the living wage debate demonstrates, wage-earners at or below this level remain at high risk of struggling for subsistence. Hence the term 'adequate' as applied in the MWD needs to be viewed with the appropriate reservations.

Data

We use the European Survey of Incomes and Living Conditions (EU-SILC) as the basis for our wage estimates. It should be noted that EU-SILC does not measure wages *per se*. The survey contains information on incomes from annual and monthly employment, from which 'non-trivial assumptions' are necessary to construct estimates of monthly or hourly gross wages (Eurofound 2014: 102). Nonetheless, these data are the best available for the analysis of wages at the European level with wide cross-sectional and longitudinal availability. Our study covers the EU-27 countries plus the UK, Norway and Iceland, with survey waves 2005-2020 covering earnings from years 2004-2019.

We follow established procedures in the literature (eg. Eurofound 2014, Berger and Schaffner 2015, Fernández-Macías and Vacas-Soriano 2016, Salverda and Rook 2022) in deriving our approximations of the hourly wage distribution as our primary level of analysis. Specifically, our sample consists of individuals aged 18-65 in full-time dependent employment, with information on annual gross incomes from employment (PY010G), employment status (PL031), number of months worked full-time (PL073) and hours usually worked per week (PL060). We derive gross hourly wages using Equation 1.

$$\widehat{hrwage} = \frac{PY010G/PL073}{4.33 * PL060} \quad (1)$$

To minimise the bias from outliers, we exclude the top and bottom 1% of gross incomes and observations with excessively low or high self-reported working hours.⁶ While this process gives us sufficiently robust estimates of the wage distribution for full-time workers, it excludes

⁶ In practice, this means excluding observations with reported weekly working hours below 15 or above 70, which are respectively below the 1st percentile and above the 99th percentile of the country-year observations for full-time employees.

part-time and non-standard workers who are notoriously poorly covered by EU-SILC (Salverda and Rook 2022). This is a serious analytical limitation since precisely these groups of workers face a heightened risk of low pay (Westhoff 2022). Consequently our estimates for the prevalence of low wages might be downward biased. Nonetheless we believe that the focus on full-time dependent employment is justified because the standard employment relationship continues to set the benchmark for collective bargaining and the wage distribution in the aggregate economy. Additionally, since any evidence for wage inequality is likely to be an underestimate of reality, this suggests a high rate of sensitivity for our analysis.

Using these measures for the hourly gross wage distribution, we obtain our dependent variables. First, we define the share of low-paid workers as the percentage of full-time employees paid less than 60% of gross median wage, corresponding to the threshold in the MWD. Second, we identify the 'effective wage floor' as the 5th percentile of the country-year wage distribution, observed in purchasing power standards (PPS). With these two indicators we assess the adequacy of the wage floor in relative and absolute terms.

The low-paid worker share provides a direct assessment of the proportion of workers earning below-adequate wages. While directly related to the policy objective of the MWD, as a median-based indicator variations may arise from changes to the median rather than changes to low earnings. Therefore in Appendix B we fix the median wages for each country to the (inflation-adjusted) first year of observation. The second dependent variable, effective wage floor, aims to assess how minimum wages correspond to the absolute lowest earnings. Past research estimates the extent of below-SMW pay at 3-10% of all workers, varying by country (Garnero et al. 2015a). We apply the 5th percentile as the effective wage floor rather than the more commonly used 10th percentile as the former is the lowest percentile which can be identified relatively robustly across countries and over time. Inaccuracy at the top and bottom of the wage distribution is a known issue with survey-based estimates of earnings, and this is particularly true for the EU-SILC (Eurofound 2014). Not only do the tails lose precision due to fewer respondents, but these respondents may particularly struggle with producing a precise estimate of their annual earnings or may deliberately provide inaccurate information. For robustness, in Appendix B we reproduce the models using the 10th percentile as the effective wage floor.

For the sake of cross-national comparability, our central explanatory variables for minimum wages and collective bargaining are measured at the country level. For the 21 member states with SMWs (including Germany post-2015), we obtain the SMWs expressed in euros from the WSI-Mindestlohnatenbank. Wages are then converted to purchasing power standards (PPS)

using the Eurostat price level index. Our primary source material for indicators on CBC, union density and the predominant level of collective bargaining is the OECD-AIAS (formerly Visser) database. However, since the data for some countries is discontinuous, inconsistent or missing for a large number of years, we supplement the data with CBC from ILOSTAT. The data are cross-validated with reference to Müller et al. (2019).

Statistical methods

We first assess the bivariate associations between SMW, CBC and low pay outcomes across our sample of countries followed by a series of multivariate regressions. Specifically, we fit a multilevel model with a random effects within-between (REWB) design (Bell and Jones 2014). This regression design enables the joint identification of within-country and between-country processes from time series cross-sectional (TSCS) data. Our dataset consists of 30 countries observed over a maximum of 17 occasions (years) for a total of 427 country-years. In the multilevel modelling terminology, the country-years are our Level 1 observations nested in countries as Level 2 observations.

At the heart of the REWB design is the decomposition of country-year variation into its within-country and between-country components. The within-country coefficients (Level 1) correspond to coefficients in the conventional country and year fixed-effects regression. The between-country components (Level 2), on the other hand, apply country-specific means over all years for the given variable. This variation is lost in the fixed-effects specification (Bell and Jones 2014). The multilevel REWB design comes with certain econometric advantages: most importantly, the errors at each respective level are by design orthogonal from one another, avoiding the common critiques of endogeneity and heterogeneity directed at single-level random-effects models (Hamaker and Muthén 2020).

The use of countries as Level 2 units has been criticised for inducing multicollinearity and autoregressive behaviour, since repeated observations from the same country will resemble each other on a variety of unobserved characteristics (Hamaker and Muthén 2020). We address this by correcting for autoregressive (AR(1)) residuals at both the country and country-year levels. Furthermore, we keep the number of Level 2 explanatory variables as low as practically possible to account for the limited degrees of freedom (Bryan and Jenkins 2016).

$$\begin{aligned}
y_{cy} = & \beta_0 + \beta_1^W(CBC_{cy} - \overline{CBC}_c) + \beta_2^W(SMW_{cy} - \overline{SMW}_c) \\
& + \beta_3^W(SMWdist_{cy} - \overline{SMWdist}_c) + \beta_4^B(\overline{CBC}_c - \overline{CBC}_{cy}) + \beta_5^B(SMW_c) \\
& + \beta_6^B(\overline{SMWdist}_c - \overline{SMWdist}_{cy}) + \beta_7^W(X_{cy} - \overline{X}_c) + \beta_8^B(\overline{X}_c - \overline{X}_{cy}) \\
& + \beta_9 Year_{cy} + v_c + \varepsilon_{cy} \tag{2}
\end{aligned}$$

Equation (2) outlines the workhorse model. We input two dependent variables y_{cy} , namely the low-pay share and effective wage floor as described above. Our central explanatory variables are CBC, dummy for SMW, and the level of SMW expressed in purchasing power standards. Since we include both a dummy and level indicator for SMW, their effects should be interpreted in conjunction with each other: the binary dummy variable captures differences between countries with and without SMWs. The PPS variable describes, for a country with SMW, the effect of differences in levels. For the non-SMW countries both the dummy and PPS variables are coded as 0.

The vector of control variables X includes controls for union density, inflation (household index of consumer prices), unemployment rate, part-time employment rate, and the mean age and female share of workers in dependent employment. Finally, a linear time trend centered to year 2012 is included to control for time-variant processes not otherwise documented. We allow the slope of year to vary by country (random slopes), in contrast to our other explanatory variables which are restricted to the same coefficient of variation for all countries (random intercepts). Last, v_c and ε_{cy} represent the Level 2 and 1 error terms respectively.

Since our lowest level of observation is years, nested in countries, all explanatory variables are observed at the macro-level or aggregated from micro-level data. Our aim with this research design is to identify and assess the main macroeconomic drivers of low-pay outcomes at the European level; for a more precise understanding of low pay and collective bargaining in specific industries or workplaces, detailed micro-level analyses are necessary. However this type of analysis is beyond the scope of our paper.

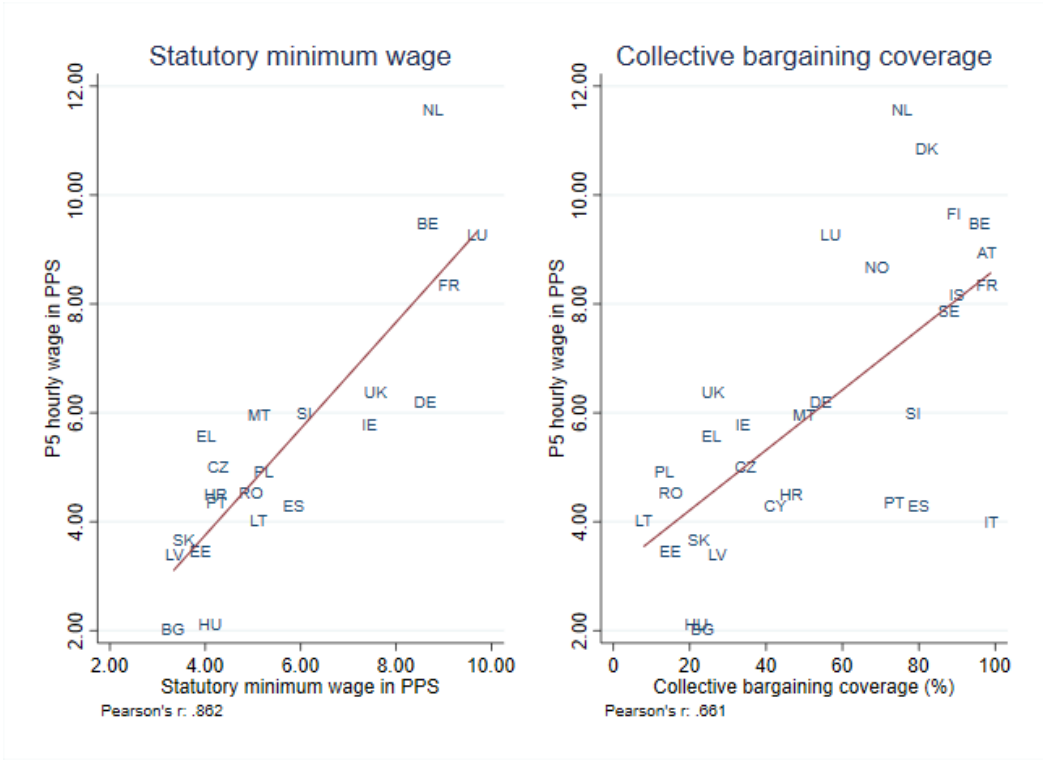
Results

Descriptive results

To begin with, we assess the bivariate associations between pay at the 5th percentile, share of low-paid workers, SMW and CBC. Due to space limitations, summary statistics for variables used in the analysis are available in Tables A1 and A2, Appendix A.

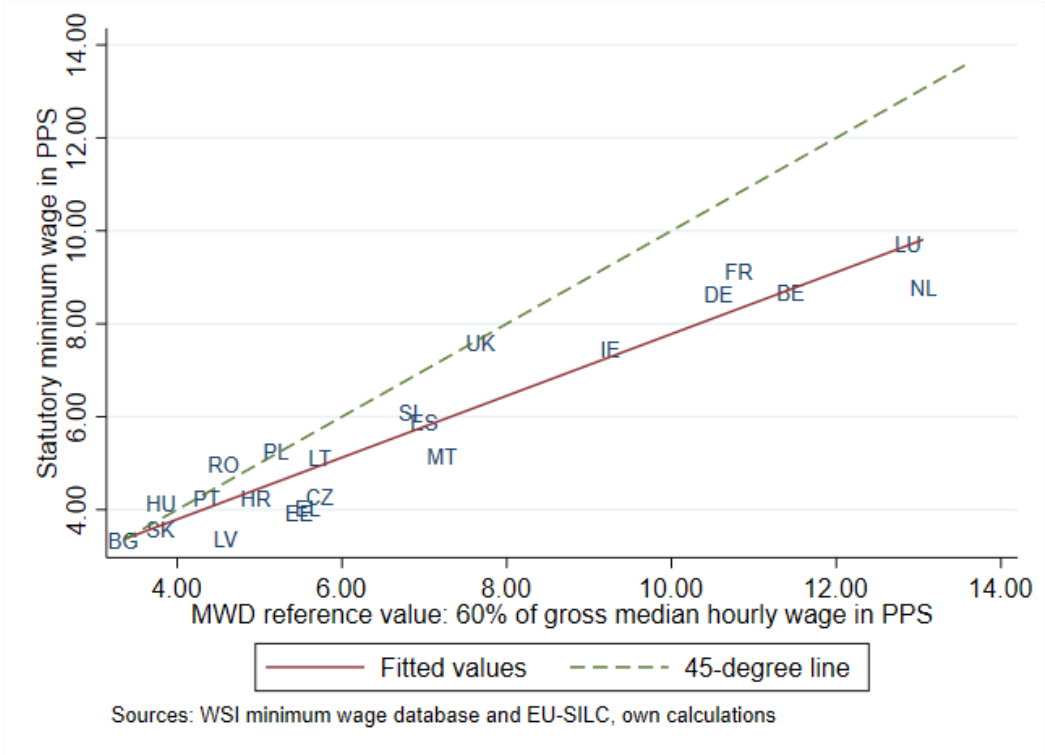
In Figure 4, we see a strong linear association ($r=.862$) between the PPS value of SMW and the effective wage floor, as well as a strong correlation between CBC and the effective wage floor ($r=.66$). Both these tendencies are well-documented in the industrial relations literature, with the strong bivariate trend between CBC and the effective wage floor in particular indicating the capability of unions to bargain for more favourable low-wage outcomes.

Figure 4. Scatterplots of 5th-percentile hourly wages relative to the statutory minimum wage and collective bargaining coverage in 2019.



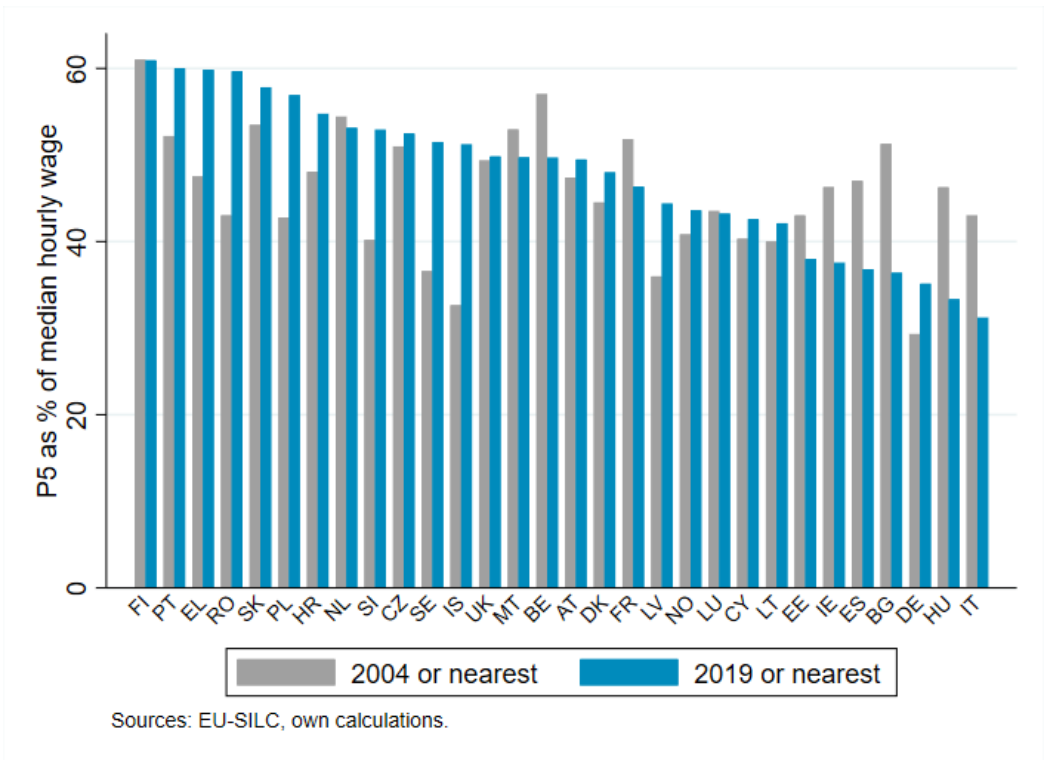
In Figure 5, we plot the level of SMWs in 2019 against the MWD objective of 60% gross median wage. Practically no country in our sample meets the objective for an adequate minimum wage, indicated as the observations lying beneath the 45-degree line. Exceptions to this general trend are Hungary, Romania and Poland whose wage floors are at or marginally above the 45-degree line. Nonetheless, the lowest earners in these countries have extremely low purchasing power. This suggests that despite the relatively compressed wage distributions, workers throughout the labour market are able to afford significantly less goods and services than workers in Western European countries. Another exception is France whose SMW was above the MWD objective in most years in our observation window, only falling below the 45-degree line in 2019.

Figure 5. Scatterplot of real statutory minimum wages and the MWD objective of 60% gross median wage, in purchasing power standards (PPS), in 2019.



An assessment of the effective wage floor over time reveals that nominal pay at the 5th percentile has increased, by and large in tandem with median wages and the rate of inflation (see Table A2, Appendix A). Figure 6 suggests the wage floor is approaching the level of 60% gross median pay in an increasing number of countries, notably Finland, Portugal, Greece and Romania. However, a lot of work remains to raise both statutory and effective minimum wages towards the MWD objective throughout the EU.

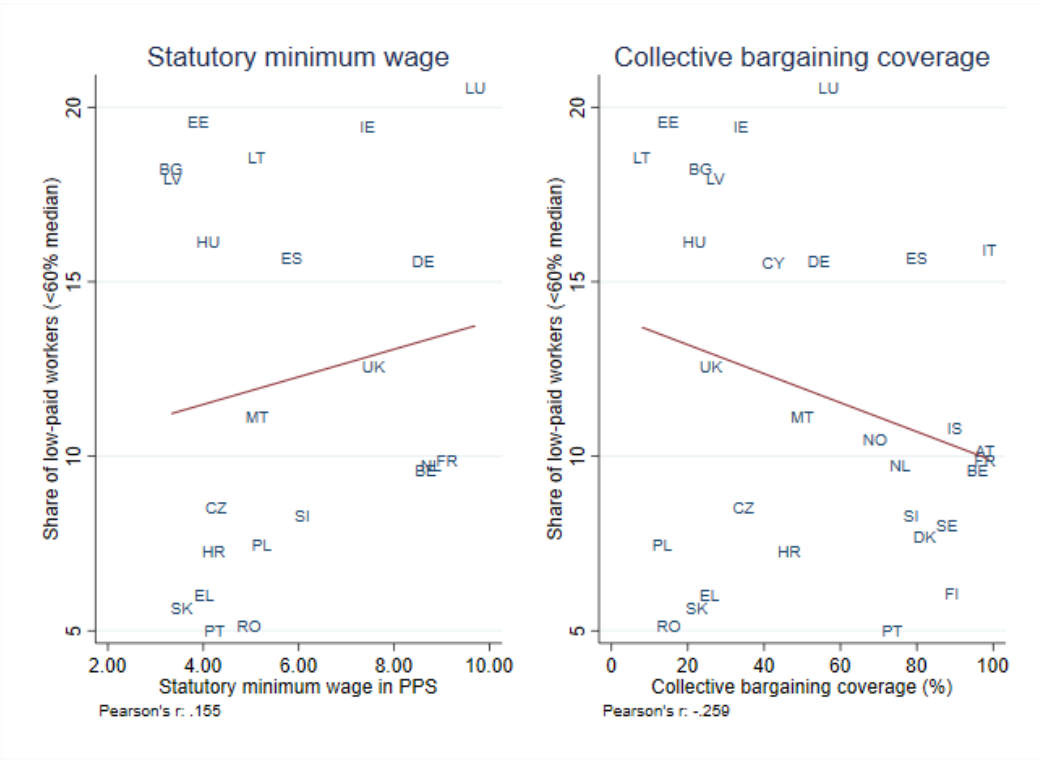
Figure 6. Bar graph of 5th-percentile pay as a percentage of median hourly wage, first and last year of analysis.



For our second dependent variable, the proportion of workers earning below 60% gross median wage, we observe substantive variation between countries. This share ranges from just over 5% of full-time workers in Finland and Belgium to levels of around 20% in Latvia, Lithuania, Luxembourg and Germany. Across our sample of countries, the proportion of workers earning below-MWD wages in 2019 was 10.3% (calculations from Table A1, Appendix A). This constitutes a lower bound for our estimate of the prevalence of non-decent pay in Europe.

Lastly, in Figure 7 we plot the bivariate associations between the below-MWD earner share and our central explanatory variables. While the correlation coefficients are much weaker than for the effective wage floor, they indicate a divergence. In countries with higher levels of SMW, the share of below-MWD earners is marginally higher ($r=.155$). This finding is not without precedent, as Garnero et al. (2015b) find that higher SMWs are associated with a greater degree of non-compliance. This contrasts to CBC, which is associated with a lower share of below-MWD earners ($r=-.259$). Thus it appears that countries with higher CBC have both high effective wage floors and compact wage distributions. This is consistent with decades of inequality research finding that high CBC contributes in particular to the compression of gross wages (the pre-distribution), leaving less work for redistributive institutions to level out the playing field in terms of net disposable income inequality (Blanchet et al. 2021, Howell 2021).

Figure 7. Scatterplots of the share of workers earning below 60% gross median wage relative to the statutory minimum wage and collective bargaining coverage in 2019.



Multivariate results

Table 1 summarises the results of our REWB models. Since all level 1 variables are country-mean-centred and all level 2 variables except the SMW dummy are grand-mean-centred, the coefficients have a straightforward interpretation: namely the predicted effect of a one-unit deviation from the mean of an explanatory variable on the dependent variable. This also implies the constant has a substantive interpretation as the value of the outcome variable in a hypothetical country with mean values on all explanatory variables and no SMW (SMW dummy = 0).

Outcome 1: below-MWD earner share. First of all, the within-country effects of CBC, SMW dummy and SMW level fail to reach statistical significance, indicating that changes over time from the country-specific mean have no impact on the share of workers earning less than 60% of gross median wage. Models 2 and 3 include controls such as the rate of inflation, whereas all models 1-3 include a linear time trend. The within-country coefficient for SMW generosity scarcely reacts once changes in the consumer price index are controlled for. Nonetheless, the lack of a statistically significant result suggests that the largely conservative annual SMW adjustments applied in most countries have at best contributed to maintaining the status quo between the bottom and median of wage-earners, rather than fostering either convergence or divergence in the wage distribution.

The other within-country indicators, CBC and the SMW dummy, perhaps fail to reach statistical significance due to limited variation. CBC has in the vast majority of countries been relatively constant or experienced at most a slight decline over the study period, with the exception of Romania, Greece and Slovenia where political decisions were taken to radically dismantle bargaining institutions (see Table A2, Appendix A). On the other hand, Germany was the only country changing systems to adopt an SMW. Any conclusions drawn from this coefficient are therefore based on a single point of variation and should be appropriately conservative.

Table 1. Results from random effects within-between (REWB) regression models.

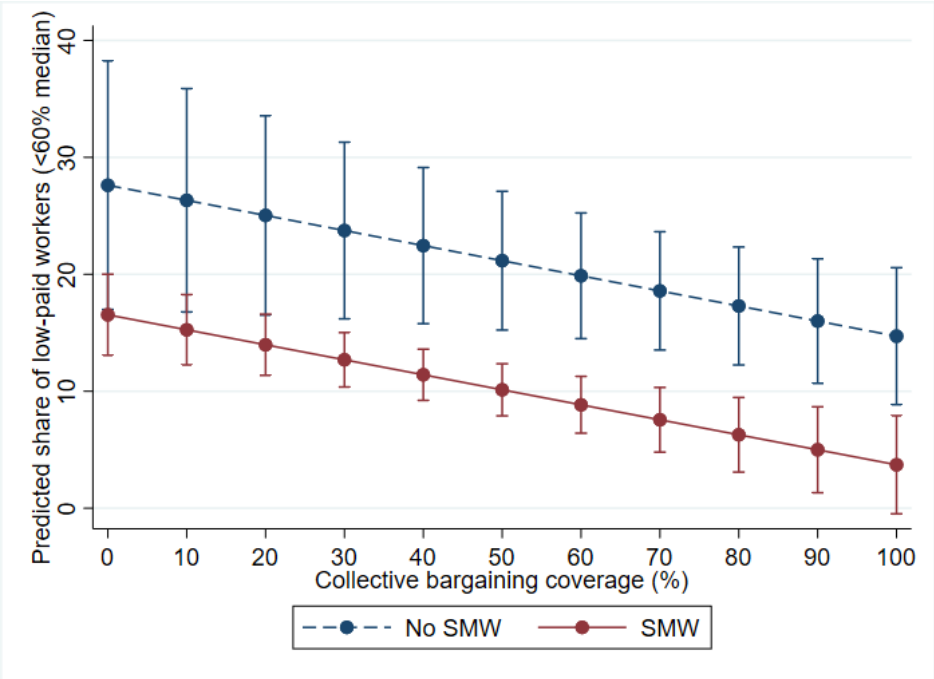
VARIABLES	DV: share of workers on <60% median wage			DV: effective wage floor (P5 in PPS)		
	(1)	(2)	(3)	(4)	(5)	(6)
Within: CBC	0.021 (0.017)	0.015 (0.017)	0.015 (0.017)	0.002 (0.005)	0.000 (0.005)	0.000 (0.005)
Within: SMW dummy	3.250 (3.040)	3.009 (3.109)	3.010 (3.109)	-2.310*** (0.887)	-1.958** (0.916)	-2.104** (0.915)
Within: SMW PPS	-0.462 (0.321)	-0.462 (0.330)	-0.462 (0.330)	0.318*** (0.094)	0.270*** (0.097)	0.285*** (0.097)
Between: CBC	-0.123*** (0.030)	-0.128*** (0.029)	-0.129** (0.063)	0.011 (0.009)	0.005 (0.007)	0.035*** (0.013)
Between: SMW dummy	-5.599** (2.792)	-11.027*** (3.670)	-11.031*** (3.688)	-5.302*** (0.866)	-1.767** (0.873)	-1.525** (0.764)
Between: CBC*SMW dummy			0.001 (0.069)			-0.039*** (0.014)
Between: SMW PPS	0.518 (0.385)	0.955* (0.515)	0.953* (0.532)	0.977*** (0.118)	0.637*** (0.122)	0.711*** (0.111)
Constant	16.195*** (2.093)	20.086*** (2.695)	20.094*** (2.789)	8.970*** (0.656)	6.415*** (0.643)	5.990*** (0.579)
Year FE	X	X	X	X	X	X
Controls		X	X		X	X
Number of observations (country-years)	432	427	427	432	427	427
Number of groups (countries)	30	30	30	30	30	30

Notes: Multilevel models run with *mixed* command in Stata. AR(1) autoregressive residuals and unstructured random effect covariances. Coefficients for control variables and random part not displayed.

*** p<0.01 ** p<0.05 * p<0.1

Second, the between-country coefficients for CBC, SMW indicators and the interaction between CBC and the SMW dummy are statistically significant at conventional levels. Comparing models 1 and 2 shows that controlling for union density, inflation, unemployment, part-time employment and general demographics is especially important for specifying the size of the SMW coefficients. Interpreting between-country effects in an MLM is predominantly an exercise in comparing hypotheticals (Hamaker and Muthén 2020). For instance, model 2 indicates that out of two otherwise identical countries, one with an SMW is expected to have 11 percentage points fewer workers earning below 60% of gross median wage. This is a very sizeable difference in favour of the SMW, as it predicts less than half the proportion of low-paid workers compared to a non-SMW country (whose predicted value can be read from the coefficient at 20.1%). However, higher level of the SMW is associated with an increase in the share of low-paid workers, although this coefficient is only significant at the 10% level. Finally, the null interaction between CBC and the SMW dummy suggests no divergence in the potential of CBC to reduce low pay between SMW and non-SMW countries. As Figure 8 illustrates, a 10 percentage-point increase in CBC is associated with a 1.3pp decline in the share of low-paid workers, with the combination of high CBC and SMW delivering the most promising results. Increasing CBC to the MWD objective of 80% in a country with SMW could push the share of low pay to less than 6.5% of full-time workers.

Figure 8. Predicted share of workers earning below 60% gross median wage, results from between-country interaction effects.



Outcome 2: effective wage floor. In this case, the within-country coefficients for both the presence and level of SMW are significant at the 1% level. However, robustness checks in Appendix B suggest that these results are not robust to alternative specifications, particularly the dummy variable representing Germany's move to adopt the SMW. Other reviews from this policy decision found a notable increase to the lowest hourly wages which was however offset by a reduction in working hours (Bruckmeier and Bruttel 2021). This suggests that the negative coefficients which we find for this variable across our model specifications may reflect declining aggregate earnings over the income year (the numerator in our construction of hourly wages) rather than declining working hours (the denominator). However, our model fails to represent the German case in sufficient detail to make strong conclusions.

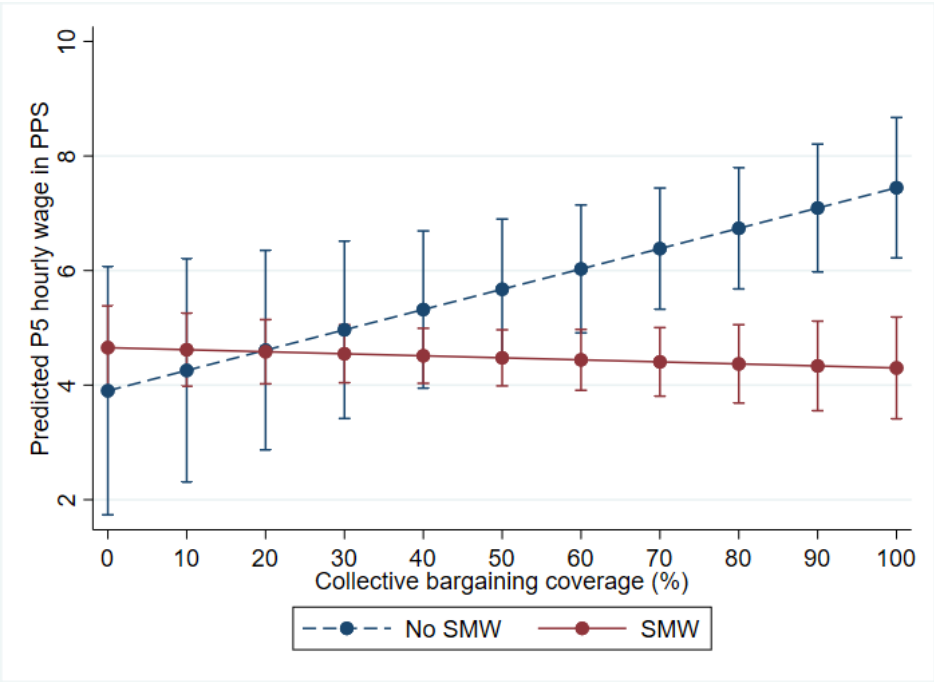
The within-country PPS variable indicates that a one-unit increase to the SMW corresponds to a relatively minor increase in the effective wage floor of less than .3 purchasing power standards. Taken at face value this implies less than one third of an SMW hike filters through to the effective wage floor, indicating a very low 'bite'. While some previous literature makes a similarly pessimistic assessment over the bite of the minimum wage, our estimates can also be downward biased due to factors such as asynchronies between datasets. For instance, it is not uncommon for countries to update SMWs during different months of a year or on an altogether irregular basis (Lübker and Schulten 2022). Moreover, our estimates of the wage distribution necessarily amount to country-year averages, incorporating pre- and post-change earnings. It is beyond the scope of this paper to provide a more detailed assessment of the within-country effects of SMW changes on the effective wage floor.⁷

At the between-country level, we again find results with greater statistical significance. First, the SMW bite appears stronger between countries than it does within, with models 5 and 6 suggesting a one-unit difference in SMW corresponds to a 0.7 PPS difference in the effective wage floor. This appears closer to a 'true' value for the minimum wage bite since the short-term noise from asynchronous policy changes is by construction eliminated from the between-country averages (Bell and Jones 2014). Second, the presence of an SMW is strongly negatively associated with 5th-percentile wages. Combined with the results of models 2 and 3, our analysis suggests that SMW countries have both a lower share of below-MWD pay and a lower effective wage floor. In other words, the wage distributions in these countries are both more compressed and overall more to the left than the non-SMW countries.

⁷ For an inspirational example see Card and Cardoso (2022).

Lastly, CBC on its own does not have any relationship with the effective wage floor in models 4-5. However, the interaction between CBC and the SMW dummy is significant, indicating divergence between wage-setting systems. Model 6 suggests CBC is associated with higher effective wage floors, but only in the absence of an SMW. In a comparison of two hypothetical non-SMW countries, one with 10 percentage points higher CBC is predicted to have .35PPS higher pay at the 5th percentile. However, the difference in the effective wage floors between two SMW countries at varying rates of CBC is nonexistent. This is visualised in Figure 9 as the effective wage floor frozen near an average of 4.5PPS in SMW countries at any level of CBC, whereas in non-SMW countries the positive effect of CBC dominates. The critical level of CBC after which the non-SMW wage floor supersedes the SMW wage floor, with a confidence interval of 95%, is estimated at approximately 60% CBC. In 2019, 13 countries including only 6 SMW countries exceeded this level of bargaining coverage, and Cyprus was the only non-SMW country below the threshold.

Figure 9. Predicted 5th-percentile wages in purchasing power standards (PPS), results from between-country interaction effects.



Robustness checks

To check the robustness of our findings, in Appendix B we present a series of alternative specifications. As discussed, the between-country effects are robust across our models. Particularly the strong role of CBC in reducing the share of low-paid workers and increasing the effective wage floor comes across as our main finding. In addition, higher levels of SMW appear to reliably and directly correspond to higher effective wage floors. We employ three methodological and two theoretical checks of our findings. First, our results are robust to fixing the median wage to its inflation-adjusted value in the starting year and to choosing the 10th percentile as the effective wage floor. The results are also robust when using three-year smoothed averages.

We also specify two more theoretical robustness checks. First, we replace the SMW PPS indicator with SMW as a percentage of the median wage to more directly assess the impact of higher relative minimum wages on the wage distribution. These results suggest relative minimum wages are not associated with the absolute level of the wage floor, but they do have a strong negative impact on the share of low-paid workers. This implies that accomplishing the MWD objective of minimum wages at 60% gross median wage would be an effective step towards reducing bottom-end wage inequality.

Second, we assess whether our findings are driven by the substantive differences in wages between Western and Eastern Europe. In contrast to the US, wage inequality in Europe is greater between the old and new member states than inequality within particular member states (Filauro and Parolin 2019). Since all non-SMW countries in this analysis are Western European, it is possible that the effects we observe are attributable to regional differences. Excluding Central-Eastern Europe, we find that CBC remains the most important driver for reducing the share of low-paid workers. However, the divergent role of CBC in determining the effective wage floor between SMW and non-SMW countries becomes more difficult to identify. The role of higher SMWs in setting higher 5th-percentile wages is highlighted.

Discussion: what role for minimum wages and collective bargaining in bringing about decent wages?

The results from our REWB models covering 30 European countries over 2004-2019 indicate that SMW and CBC both have distinct roles to play in establishing the effective wage floor and reducing the share of low-paid workers. First, the role of the SMW: *ceteris paribus*, our model predicts that countries with a statutory minimum wage have a lower share of workers earning below 60% gross median wage than non-SMW countries. However, this is despite the fact that SMWs are currently not close to this target value for a decent minimum wage except for a small handful of countries. Furthermore, we find that higher rates of collective bargaining coverage are essential for pushing down the share of workers on below-decent pay. Non-SMW countries with CBC above the 80% target value (which in practice describes Sweden, Denmark and Finland) have roughly the same proportion of below-decent pay as SMW countries with CBC less than 30-40%. However, at higher rates of CBC, SMW countries are predicted to overtake non-SMW countries on this measure. A hypothetical SMW country meeting the target value of 80% CBC is predicted to have less than 6.5% of full-time employees earning below-decent pay.

This first set of findings points towards an important dual role for SMW and CBC in compressing the wage distribution and thus reducing *relative* wage inequality. While measures to reduce the share of workers earning less than 60% gross median wage are important from the perspective of social equality, cohesion and fairness, they do not automatically support workers struggling to cope with the cost of living. After all you need money, not percentages, to pay for your bills. Therefore policies also need to focus on the *absolute* wage floor.

Second, our findings for pay at the 5th percentile – our measure of the effective wage floor – support our hypotheses distinguishing between the wage-setting logics of SMW and non-SMW countries. High CBC only seems to be associated with a higher effective wage floor in countries without an SMW; on the contrary, in countries with an SMW, CBC has a far smaller impact on wages at the 5th percentile. However, this does not imply that SMWs are a worse mechanism for regulating the wage floor. Our between-country estimates suggest that higher levels of SMW correspond almost linearly to the level of the effective wage floor. We also find a strong and significant within-country effect indicating that SMW adjustments filter through to earnings at the bottom end of the labour market almost immediately. However, our estimate for the 'bite' of the minimum wage is near to the lower bound in the literature. We encourage future country-specific work to narrow down on this estimate, for instance drawing upon micro-level administrative datasets.

The implications of our findings for the MWD are carefully encouraging. While it is left for the member states to find the most appropriate means to establish the SMW at 60% of gross median wage or increase CBC to 80%, our results point out how these objectives are interconnected. First of all, we find that higher levels of CBC are essential for reducing the share of workers paid below 60% of gross median wage regardless of whether the country has an SMW. We also find that while the presence of SMW is associated with lower low-pay shares, the absolute level of SMW has no such association.

While we find that countries working towards the objective of 80% CBC can directly benefit from lower wage inequality, the absolute purchasing power at the effective wage floor appears predominantly driven by the system of minimum-wage setting. Higher levels of CBC directly influence the wage floor in non-SMW countries, whereas this is not the case in SMW countries where the lowest rate of pay is fixed in legislation. However, the French and Belgian wage-setting systems indicate the potential for collective bargaining to increase the share of workers earning wages above the SMW (Vandekerckhove et al. 2020). In particular, the extensive networks of collective agreements in these countries ensure that changes in the SMW are reflected in wage scales across the labour market, increasing nominal wages throughout the distribution. This model of high-CBC pattern bargaining in fact closely resembles the Nordic model with the addition of the SMW as a last-resort safety net.

In the end it is worth returning to some limitations of the present study. First, restricting the analysis to full-time workers in dependent employment unfortunately omits a large share of workers truly at or even below the effective wage floor, namely people in part-time and non-standard employment. It should be emphasised that our estimates for the effective wage floor and proportion of low-paid workers are a lower bound for the situation in the labour market at large.

Second, our most impactful results refer to the effectiveness of CBC and SMW between countries. Although we find robust effects demonstrating more favourable low pay outcomes in countries with high levels of CBC or a generous SMW, one should avoid committing the ecological fallacy of applying the same dynamics within countries. Industrial relations institutions are very path-dependent, making major systemic changes as in Germany the exception rather than the norm (Fernández-Macías and Vacas-Soriano 2016). This also implies that countries with very low CBC or minimum wages relative to the median are going to require greater effort to meet the objectives of the MWD. Especially in Central-Eastern Europe where

industrial relations were built upon a heavily decentralised model, reaching 80% CBC might not be realistic without deeper reforms to the bargaining system.

Third, our analysis abstracts from the details of national wage-setting systems which are often difficult to capture in statistical indicators, such as delicate changes in the tripartite balance of power between employers, unions and governments. For example, the increase of low-paid employment in the Netherlands has been attributed to political pressure to bring collectively bargained pay scales closer to the SMW. Future research could look into the composition of wage-setting institutions to assess the relative importance of CBC vis-à-vis factors such as bargaining centralisation, labour market legislation and political dynamics (Howell 2021).

Overall, our evidence suggests that higher CBC is instrumental in reducing the inequality and inadequacy of low wages, both in countries with and without SMWs. Furthermore, we find that non-SMW countries require CBC in excess of 60% to achieve lower shares of low-paid workers than SMW countries with lower rates of CBC. If SMW countries increased their CBC to 80% as envisioned in the MWD, they could reduce the share of low-paid workers below the levels currently seen in the most equal non-SMW countries. Therefore it seems that the two systems of wage-setting are guiding European countries onto two different paths towards the common destination of adequate minimum wages.

References

- Alsos, K., Nergaard, K., & Van Den Heuvel, A. (2019). Collective bargaining as a tool to ensure a living wage. Experiences from the Nordic countries. *Transfer: European Review of Labour and Research*, 25(3), 351-365.
- Aretz, B., Gregory, T., & Arntz, M. (2013). The Minimum Wage Affects Them All: Evidence on Employment Spillovers in the Roofing Sector. *German Economic Review*, 14, 282-315.
- Bachmann, R., & Frings, H. (2017). Monopsonistic competition, low-wage labour markets, and minimum wages – An empirical analysis. *Applied Economics*, 49(51), 5268-5286.
- Becher, M., & Pontusson, J. (2011). Whose Interests Do Unions Represent? Unionization by Income in Western Europe. In Brady, D. (ed.) *Comparing European Workers Part B: Policies and Institutions*, pp. 181-211.
- Bell, A., & Jones, K. (2014). Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data. *Political Science Research and Methods*, 3(1), 133-153.
- Belman, D., Wolfson, P., & Nawakitphaitoon, K. (2015). Who is affected by the minimum wage? *Industrial Relations*, 54(4), 582-621.
- Berger, M., & Schaffner, S. (2015). *A note on how to realize the full potential of the EU-SILC data*. ZEW Discussion Paper 15-005.

- Berglund, T., Håkansson, K., & Isidorsson, T. (2020). Occupational change on the dualised Swedish labour market. *Economic and Industrial Democracy*.
- Blanchet, T., Chancel, L., & Gethin, A. (2021). *Why is Europe More Equal than the United States?* Working Paper. Paris: World Inequality Lab.
- Blundell, R. (2022). Inequality, Redistribution and Wage Progression. *Economica*, 89(S1).
- Boeri, T. (2012). Setting the minimum wage. *Labour Economics*, 19(3), 281-290.
- Bosch, G. (2018). The Making of the German Minimum Wage: A Case Study of Institutional Change. *Industrial Relations Journal*, 49(1), 19-33.
- Bruckmeier, K., & Bruttel, O. (2021). Minimum Wage as a Social Policy Instrument: Evidence from Germany. *Journal of Social Policy*, 50(2), 247-266.
- Bruttel, O. (2019). The effects of the new statutory minimum wage in Germany: a first assessment of the evidence. *Journal for Labour Market Research*, 53(1).
- Bruttel, O., Baumann, A., & Dütsch, M. (2018). The new German statutory minimum wage in comparative perspective: Employment effects and other adjustment channels. *European Journal of Industrial Relations*, 24(2), 145-162.
- Bryan, M. L., & Jenkins, S. P. (2016). Multilevel Modelling of Country Effects: A Cautionary Tale. *European Sociological Review*, 32(1), 3-22.
- Burauel, P., Caliendo, M., Grabka, M. M., Obst, C., Preuss, M., Schröder, C., & Shupe, C. (2020). The Impact of the German Minimum Wage on Individual Wages and Monthly Earnings. *Jahrbücher Für Nationalökonomie und Statistik*, 240(2-3), 201-231.
- Caliendo, M., Fedorets, A., Preuss, M., Schröder, C., & Wittbrodt, L. (2017). *The Short-Term Distributional Effect of the German Minimum Wage Reform*. IZA Discussion Paper no. 11246.
- Cantillon, B., Parolin, Z., & Collado, D. (2020). A glass ceiling on poverty reduction? An empirical investigation into the structural constraints on minimum income protections. *Journal of European Social Policy*, 30(2), 129-143.
- Card, D., & Cardoso, A. R. (2022). Wage Flexibility under Sectoral Bargaining. *Journal of the European Economic Association*.
- Card, D., & Krueger, A. B. (1994). Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania. *American Economic Review*, 84(4), 772-793.
- Crespy, A. (2020). The EU's Socioeconomic Governance 10 Years after the Crisis: Muddling through and the Revolt against Austerity. *Journal of Common Market Studies*, 58(S1), 133-146.
- Cronert, A., & Forsén, R. (2021). Like worker, like union? Labor market risk exposure, white-collar predominance and trade unions' policy advocacy. *Socio-Economic Review*.
- Datta, N., Giupponi, G., & Machin, S. (2019). Zero-hours contracts and labour market policy. *Economic Policy*, 34(99), 369-427.
- Dingeldey, I., Grimshaw, D., & Schulten, T. (Eds.). (2021). *Minimum Wage Regimes: Statutory Regulation, Collective Bargaining and Adequate Levels*. London: Routledge.
- Dølvik, J. E., & Visser, J. (2009). Free movement, equal treatment and workers' rights: can the European Union solve its trilemma of fundamental principles? *Industrial Relations Journal*, 40(6), 513-531.
- ETUC. (2022). *End the Cost of Living Crisis: Increase Wages, Tax Profits!* <https://www.etuc.org/en/document/end-cost-living-crisis-increase-wages-tax-profits>. Retrieved 29 September 2022.
- Eurofound. (2014). *Pay in Europe in the 21st Century*. Luxembourg: Publications Office of the European Union.

- Eurofound. (2022). *Minimum wages in 2022: Annual review*. Luxembourg: Publications Office of the European Union.
- European Parliament. (2016). *Precarious Employment in Europe Part I: Patterns, Trends and Policy Strategy*. Study for the EMPL Committee.
- Fernández-Macías, E., & Vacas-Soriano, C. (2016). A coordinated European Union minimum wage policy? *European Journal of Industrial Relations*, 22(2), 97-113.
- Filauro, S., & Parolin, Z. (2019). Unequal unions? A comparative decomposition of income inequality in the European Union and United States. *Journal of European Social Policy*, 29(4), 545-563.
- Fougère, D., Gautier, E., & Roux, S. (2018). Wage floor rigidity in industry-level agreements: Evidence from France. *Labour Economics*, 55, 72-97.
- Furåker, B. (2020). The issue of statutory minimum wages: Views among Nordic trade unions. *Economic and Industrial Democracy*, 41(2), 419-435.
- Garben, S. (2018). The European Pillar of Social Rights: Effectively Addressing Displacement? *European Constitutional Law Review*, 14(1), 210-230.
- Garnero, A., Kampelmann, S., & Rycx, F. (2015a). Minimum wage systems and earnings inequalities: Does institutional diversity matter? *European Journal of Industrial Relations*, 21(2), 115-130.
- Garnero, A., Kampelmann, S., & Rycx, F. (2015b). Sharp Teeth or Empty Mouths? European Institutional Diversity and the Sector-Level Minimum Wage Bite. *British Journal of Industrial Relations*, 53(4), 760-788.
- Gifford, C. (2021). Brexit and Trump: contesting new cleavage formation. *Journal of Contemporary European Studies*, 29(3), 309-321.
- Grimshaw, D. (Ed.) (2013). *Minimum Wages, Pay Equity and Comparative Industrial Relations*. London: Routledge.
- Grimshaw, D., Bosch, G., & Rubery, J. (2014). Minimum Wages and Collective Bargaining: What Types of Pay Bargaining Can Foster Positive Pay Equity Outcomes? *British Journal of Industrial Relations*, 52(3), 470-498.
- Hamaker, E. L., & Muthen, B. (2020). The fixed versus random effects debate and how it relates to centering in multilevel modeling. *Psychological Methods*, 25(3), 365-379.
- Hay, C. (2010). Chronicles of a Death Foretold: the Winter of Discontent and Construction of the Crisis of British Keynesianism. *Parliamentary Affairs*, 63(3), 446-470.
- Hick, R., & Marx, I. (2022). *Poor Workers in Rich Democracies: On the Nature of In-Work Poverty and Its Relationship to Labour Market Policies*. CSB Working Paper 22/03.
- Hirsch, D. (2017). Contemporary UK wage floors and the calculation of a living wage. *Employee Relations*, 39(6), 815-824.
- Howell, D. R. (2021). *Low Pay in Rich Countries: Institutions, Bargaining Power and Earnings Inequality in the U.S., U.K., Canada, Australia and France*. Working Paper. Washington Center for Equitable Growth.
- ILO. (2020). *Global Wage Report 2020-21: Wages and Minimum Wages in the Time of COVID-19*. Geneva: International Labour Office.
- Lee, S., & Sobeck, K. (2012). Low-wage work: A global perspective. *International Labour Review*, 151(3), 141-155.
- Lübker, M., & Schulten, T. (2022). *WSI Minimum Wage Report 2022*. Düsseldorf: WSI Institute of Social and Economic Research.
- Machin, S., & Manning, A. (1997). Minimum wages and economic outcomes in Europe. *European Economic Review*, 41(3-5), 733-742.
- Meyer, B. (2016). Learning to Love the Government: Trade Unions and Late Adoption of the Minimum Wage. *World Politics*, 68(3), 538-575.

- Moore, S., Antunes, B., White, G., Tailby, S., & Newsome, K. (2017). *Non-Standard Contracts and the Living Wage: A Report for the Low Pay Commission*.
- Müller, T., & Schulten, T. (2022). *Minimum-wages directive: history in the making*. socialeurope.eu, 1 July 2022.
- Müller, T., Vandaele, K., & Waddington, J. (Eds.). (2019). *Collective Bargaining in Europe: Towards an Endgame*. (Vol. I-IV). Brussels: European Trade Union Institute.
- Pontusson, J. (2013). Unionization, Inequality and Redistribution. *British Journal of Industrial Relations*, 51(4), 797-825.
- Rueda, D. (2007). *Social Democracy Inside Out: Partisanship and Labor Market Policy in Industrialized Democracies*. Oxford: Oxford University Press.
- Salverda, W. (2018). Low earnings and their drivers in relation to in-work poverty. In H. Lohmann & I. Marx (Eds.), *Handbook on In-Work Poverty*. Cheltenham: Edward Elgar.
- Salverda, W., & Rook, V. (2022). *The Entanglement of Labour-market and Income Inequalities in Dual-earner Society: Overqualification at the Bottom and High-educated Homogamy at the Top*. Unpublished work.
- Schulten, T., & Müller, T. (2019). What's in a name? From minimum wages to living wages in Europe. *Transfer: European Review of Labour and Research*, 25(3), 267-284.
- Sjödin, E. (2022). European Minimum Wage: A Swedish Perspective on EU's Competence in Social Policy in the Wake of the Proposed Directive on Adequate Minimum Wages in the EU. *European Labour Law Journal*, 13(2), 273-291.
- Smeeding, T. M., Romich, J., & R. Strain, M. (2021). The Long Recovery from the Great Recession: An Introduction. *The ANNALS of the American Academy of Political and Social Science*, 695(1), 8-26.
- Vandekerckhove, S., Desiere, S., & Lenaerts, K. (2020). *Minimum Wages and Wage Compression in Belgian Industries*. National Bank of Belgium, Working Paper no. 387.
- Vlandas, T. (2018). Coordination, inclusiveness and wage inequality between median- and bottom-income workers. *Comparative European Politics*, 16(3), 482-510.
- Westhoff, L. (2022). Wage Differences between Atypical and Standard Workers in European Countries: Moving beyond Average Effects. *European Sociological Review*.
- Zeitlin, J., & Vanhercke, B. (2018). Socializing the European Semester: EU social and economic policy co-ordination in crisis and beyond. *Journal of European Public Policy*, 25(2), 149-174.

Appendix to “Decent wage floors in Europe: Does the Minimum Wage Directive get it right?”

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IZA working paper

Appendix A: Summary Statistics

Table A1. Summary statistics (mean and standard deviation) for variables used in the present analysis.

Country	Year		N	Share of <60% median wage (%)		5th-percentile wage in PPS		SMW dummy		SMW in PPS		Coll. barg. coverage (%)	
	Min	Max		mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
AT	2004	2019	16	12.72	1.51	6.08	1.21	0	-	0.00	-	98.00	0.00
BE	2004	2019	16	5.84	1.69	9.58	0.98	1	-	7.90	0.63	96.00	0.00
BG	2006	2019	14	13.02	3.79	1.64	0.38	1	-	1.98	0.75	26.08	1.88
CY	2004	2019	16	17.20	1.34	3.38	0.63	0	-	0.00	-	50.41	8.35
CZ	2004	2019	16	10.53	0.99	3.45	0.71	1	-	2.92	0.58	36.13	2.03
DE	2004	2018	15	17.70	1.09	4.95	0.89	0.27	0.46	2.26	3.88	59.22	3.18
DK	2004	2019	16	7.32	1.42	9.11	1.73	0	-	0.00	-	83.24	1.00
EE	2004	2019	16	17.93	2.26	2.42	0.50	1	-	2.62	0.74	21.45	4.62
EL	2007	2019	13	10.35	2.51	4.89	0.34	1	-	4.17	0.25	45.43	27.45
ES	2005	2019	15	16.89	2.04	3.73	0.52	1	-	4.20	0.58	80.04	2.34
FI	2008	2019	12	5.78	0.44	8.96	0.61	0	-	0.00	-	89.38	1.31
FR	2004	2019	16	7.37	0.94	6.56	0.80	1	-	8.29	0.73	97.70	0.75
HR	2009	2019	11	9.58	0.99	3.51	0.54	1	-	3.46	0.40	51.98	5.44
HU	2004	2019	16	11.53	3.77	2.30	0.44	1	-	2.94	0.70	25.65	3.24
IE	2005	2019	15	16.70	1.46	6.98	0.60	1	-	7.04	0.44	37.10	3.33
IS	2004	2017	14	11.96	2.12	6.38	1.24	0	-	0.00	-	90.00	0.00
IT	2006	2018	13	13.06	1.41	4.53	0.34	0	-	0.00	-	99.00	0.00
LT	2006	2019	14	19.32	2.22	2.27	0.75	1	-	2.79	0.93	9.27	1.09
LU	2004	2019	16	19.60	1.54	8.35	0.50	1	-	8.62	0.68	56.96	1.43
LV	2006	2019	14	19.74	2.23	2.28	0.68	1	-	2.48	0.68	19.85	2.70
MT	2008	2018	11	10.57	0.68	5.61	0.38	1	-	4.97	0.22	51.04	0.84
NL	2004	2019	16	9.37	1.22	9.95	1.22	1	-	8.17	0.38	82.49	5.74
NO	2008	2019	12	10.45	0.51	7.68	0.59	0	-	0.00	-	71.29	1.75
PL	2007	2019	13	11.53	3.37	3.35	0.78	1	-	3.91	0.92	17.11	1.76
PT	2006	2019	14	7.54	1.87	3.48	0.32	1	-	3.51	0.41	76.90	3.51
RO	2006	2019	14	8.26	4.06	2.18	1.10	1	-	2.32	1.19	50.73	37.25
SE	2008	2019	12	9.51	1.11	6.29	0.96	0	-	0.00	-	88.53	0.50
SI	2004	2019	16	9.81	1.86	4.86	0.85	1	-	4.79	0.88	76.51	12.34
SK	2004	2019	16	7.71	2.03	2.89	0.65	1	-	2.73	0.45	32.56	7.31
UK	2004	2017	14	12.72	0.76	5.88	0.33	1	-	6.33	0.69	30.93	3.22
Total	2004	2019	432	12.05	1.77	5.12	0.72	-	-	4.47	0.78	58.37	4.81

Table A1 continued

Country	Union density (%)		Inflation index (HICP)		Mean age of employees		Female share of empl. (%)		Unemployment rate (%)		Share of part-time empl. (%)	
	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
AT	28.99	2.55	93.86	8.50	39.64	0.68	33.45	0.81	4.92	0.55	25.17	2.60
BE	52.88	1.73	94.83	8.53	39.80	0.56	36.30	2.06	7.38	0.92	23.26	1.19
BG	15.75	0.57	96.56	8.36	41.61	1.09	48.09	1.55	8.31	2.77	2.04	0.27
CY	50.41	8.35	95.40	6.43	39.54	0.40	47.90	3.28	8.68	4.42	9.48	2.56
CZ	14.98	3.01	94.63	8.56	40.85	0.78	45.52	1.99	5.47	1.92	5.07	0.69
DE	18.74	1.67	94.49	6.34	41.43	0.66	33.84	1.48	6.68	2.60	25.71	1.32
DK	68.72	1.38	95.03	6.47	42.51	0.72	44.18	2.85	5.42	1.35	20.24	1.09
EE	6.58	1.94	91.03	13.87	41.43	0.72	49.48	1.12	8.11	3.52	8.51	1.45
EL	20.61	2.76	99.41	4.14	40.89	0.98	42.23	1.34	18.49	6.99	7.75	1.72
ES	15.81	1.98	96.26	6.44	41.19	1.44	41.29	2.61	16.87	6.07	13.47	1.66
FI	66.90	4.32	97.12	5.35	42.16	0.27	50.60	0.67	7.35	0.91	12.78	0.76
FR	8.84	0.21	95.74	6.23	40.06	0.74	41.79	1.96	8.64	0.91	17.51	0.59
HR	25.51	3.80	98.37	3.83	40.54	0.42	46.27	0.74	12.28	3.54	5.68	0.82
HU	12.77	3.34	90.72	13.73	41.24	1.47	47.08	1.43	7.38	2.64	4.97	1.02
IE	30.17	3.11	98.24	2.83	39.55	0.70	42.18	3.86	8.91	4.18	19.56	2.39
IS	88.14	1.75	82.04	18.26	42.20	0.54	42.62	2.83	3.86	1.84	18.78	1.65
IT	34.38	0.99	95.69	5.67	42.37	1.29	39.10	2.12	9.38	2.38	16.16	2.15
LT	8.65	1.02	95.95	10.07	41.46	0.96	52.56	1.64	9.70	4.19	7.81	0.99
LU	35.91	4.30	93.80	8.72	39.29	0.34	34.14	2.01	5.04	0.66	17.81	0.78
LV	13.76	2.01	95.80	9.89	41.56	1.04	52.71	1.39	10.92	4.37	7.36	1.26
MT	50.31	3.42	96.84	5.14	35.96	0.55	37.13	2.94	4.96	0.89	12.21	1.38
NL	18.91	1.91	94.98	6.71	40.69	0.74	19.15	1.57	4.68	1.23	44.99	1.96
NO	50.03	0.24	98.74	7.36	42.21	0.41	43.38	1.17	3.21	0.63	24.35	0.70
PL	15.36	1.78	96.85	6.57	39.71	0.93	46.38	1.23	7.55	2.41	6.83	0.59
PT	17.56	2.79	97.25	5.04	40.74	1.34	48.52	2.92	10.69	3.27	9.09	1.04
RO	27.07	5.88	92.14	12.12	40.20	1.13	43.57	0.48	6.09	1.16	8.00	1.13
SE	62.10	1.51	99.58	4.09	41.97	0.21	44.16	1.56	6.57	0.76	23.12	1.25
SI	31.92	5.14	94.52	8.20	40.49	0.87	46.51	1.30	6.93	1.91	8.31	0.94
SK	15.76	4.35	94.47	8.08	40.37	0.81	48.87	1.59	11.65	3.33	3.95	1.23
UK	25.99	1.44	90.65	9.37	39.81	0.28	40.87	1.47	5.27	1.25	23.46	0.74
Total	31.12	2.64	95.03	7.83	40.72	0.77	43.00	1.80	8.05	2.45	14.45	1.26

Table A2. First and last year values for variables used in the present analysis.

Country	Year		N	Share of <60% median wage (%)		5th-percentile wage in PPS		SMW dummy		SMW in PPS		Coll. barg. coverage (%)	
	Min	Max		First	Last	First	Last	First	Last	First	Last	First	Last
AT	2004	2019	16	10.3	10.2	5.96	8.95	0	0	-	-	98.0	98.0
BE	2004	2019	16	6.5	9.6	8.19	9.48	1	1	6.88	8.67	96.0	96.0
BG	2006	2019	14	12.9	18.2	1.12	2.03	1	1	1.11	3.33	29.3	23.4
CY	2004	2019	16	16.3	15.5	3.34	4.31	0	0	-	-	65.5	42.4
CZ	2004	2019	16	10.9	8.5	2.40	5.02	1	1	2.26	4.27	40.4	34.7
DE	2004	2018	15	17.3	15.6	4.40	6.20	0	1	-	8.61	65.3	54.3
DK	2004	2019	16	9.0	7.7	6.34	10.84	0	0	-	-	85.1	82.0
EE	2004	2019	16	16.2	19.6	1.50	3.47	1	1	1.53	3.90	28.0	15.0
EL	2007	2019	13	14.5	6.0	4.52	5.57	1	1	4.08	4.03	82.9	25.8
ES	2005	2019	15	13.2	15.7	4.19	4.30	1	1	3.48	5.86	76.8	80.1
FI	2008	2019	12	5.2	6.1	8.15	9.67	0	0	-	-	87.5	89.2
FR	2004	2019	16	8.0	9.9	5.53	8.36	1	1	6.72	9.12	96.1	98.0
HR	2009	2019	11	11.5	7.3	2.81	4.52	1	1	2.97	4.22	61.0	46.7
HU	2004	2019	16	15.3	16.1	1.57	2.11	1	1	1.98	4.11	34.5	21.8
IE	2005	2019	15	14.7	19.4	6.00	5.79	1	1	5.82	7.45	41.7	34.0
IS	2004	2017	14	16.2	10.8	3.89	8.17	0	0	-	-	90.0	90.0
IT	2006	2018	13	12.0	15.9	4.79	4.00	0	0	-	-	99.0	99.0
LT	2006	2019	14	21.6	18.5	1.70	4.03	1	1	1.72	5.11	10.4	7.9
LU	2004	2019	16	20.6	20.6	7.34	9.27	1	1	7.40	9.70	58.0	56.9
LV	2006	2019	14	22.9	18.0	1.26	3.39	1	1	1.22	3.36	18.3	27.3
MT	2008	2018	11	8.9	11.1	5.38	5.98	1	1	4.59	5.13	52.4	50.1
NL	2004	2019	16	6.3	9.7	8.76	11.57	1	1	7.51	8.77	84.9	75.6
NO	2008	2019	12	9.7	10.5	7.02	8.69	0	0	-	-	74.0	69.0
PL	2007	2019	13	17.1	7.5	2.18	4.93	1	1	2.29	5.23	18.9	13.4
PT	2006	2019	14	11.7	5.0	3.09	4.36	1	1	2.93	4.24	80.4	73.6
RO	2006	2019	14	17.2	5.1	1.05	4.54	1	1	1.00	4.96	98.0	15.0
SE	2008	2019	12	9.3	8.0	5.57	7.87	0	0	-	-	88.9	88.0
SI	2004	2019	16	11.6	8.3	3.02	6.01	1	1	3.62	6.08	100.0	78.6
SK	2004	2019	16	9.3	5.7	1.79	3.66	1	1	2.19	3.55	40.0	22.4
UK	2004	2017	14	12.4	12.6	5.80	6.39	1	1	5.24	7.56	34.8	26.0
Total	2004	2019	432	12.0	10.3	4.29	6.12	-	-	3.65	5.78	66.9	60.7

Table A2 continued

Country	Union density (%)		Inflation index (HICP)		Mean age of employees		Female share of empl. (%)		Unemployment rate (%)		Share of part-time empl. (%)	
	First	Last	First	Last	First	Last	First	Last	First	Last	First	Last
AT	34.8	26.3	80.6	107.0	38.8	40.8	31.8	33.8	5.4	4.3	20.4	27.5
BE	55.3	49.1	80.6	107.8	39.0	40.3	32.8	39.8	7.1	5.2	21.2	24.2
BG	16.2	14.6	76.0	105.0	40.3	43.2	45.6	47.4	8.6	4.2	1.7	1.8
CY	65.5	42.4	83.2	100.8	39.4	39.8	41.2	49.0	4.3	7.0	7.4	10.1
CZ	20.6	11.1	80.2	107.8	39.8	42.5	42.5	48.5	8.0	2.0	4.4	6.1
DE	22.2	16.6	83.8	104.0	41.2	42.2	31.1	35.9	10.9	3.3	22.1	26.8
DK	71.7	67.0	83.5	102.5	41.7	43.5	40.8	45.8	5.2	4.7	18.4	20.9
EE	10.5	4.2	66.6	110.5	40.7	42.7	48.0	50.4	9.9	4.4	6.8	10.9
EL	22.6	14.9	89.8	102.5	40.7	42.7	38.0	43.0	8.3	17.3	5.3	9.0
ES	15.5	12.5	83.3	104.3	39.2	43.3	35.1	42.8	8.7	13.8	11.7	14.2
FI	69.9	58.8	87.9	103.6	41.7	42.3	49.0	51.0	5.6	6.1	11.2	13.9
FR	8.9	8.7	84.9	104.9	39.6	41.7	38.8	44.8	8.6	8.2	16.7	17.3
HR	30.5	19.6	91.6	103.0	39.8	41.3	47.2	46.7	8.8	6.4	6.4	4.7
HU	17.9	7.9	66.7	109.5	39.1	43.6	44.3	46.9	5.7	3.3	4.3	4.3
IE	32.4	25.0	91.3	101.7	38.5	40.0	34.0	44.1	4.1	4.6	15.4	18.1
IS	88.5	90.9	55.4	99.1	41.6	42.4	36.9	45.3	3.2	2.4	17.7	20.3
IT	33.6	32.6	85.6	102.5	40.7	43.8	35.1	42.4	6.5	10.5	13.0	18.3
LT	9.8	7.4	74.6	109.5	40.0	43.1	49.2	54.6	5.7	6.4	9.9	6.2
LU	43.4	28.2	77.9	105.9	39.2	39.9	32.0	38.2	4.9	5.3	16.4	16.6
LV	18.0	10.9	71.8	108.5	40.0	43.9	50.6	52.2	6.7	6.4	5.6	8.0
MT	54.6	43.8	88.3	103.9	35.2	35.9	31.9	40.1	4.9	3.3	10.4	12.3
NL	21.3	15.4	84.3	105.8	39.8	41.3	16.2	21.2	4.2	3.0	42.2	46.8
NO	49.8	50.4	88.7	111.5	41.2	42.7	41.7	45.3	2.0	3.3	24.8	23.9
PL	16.7	12.0	83.3	104.8	38.6	41.1	43.6	48.1	9.6	3.2	8.0	5.9
PT	21.1	12.9	88.3	103.7	39.8	43.0	42.9	50.6	7.8	6.4	8.1	7.9
RO	36.0	21.3	69.2	108.2	38.1	41.7	43.8	44.0	7.0	3.7	8.2	5.8
SE	64.6	59.6	92.8	106.9	41.6	42.3	41.4	46.5	5.1	6.0	24.3	20.9
SI	37.1	23.8	79.3	105.1	39.4	41.9	44.7	47.9	6.0	4.4	7.4	7.9
SK	25.4	11.1	79.5	106.3	39.0	41.9	46.5	51.6	18.0	5.6	2.5	4.5
UK	27.6	23.2	76.5	103.4	40.0	40.0	38.7	41.8	4.0	3.8	23.3	23.6
Total	23.1	18.8	81.1	105.6	40.1	42.1	36.0	44.6	7.9	6.8	19.3	13.7

Table A3. Year of introduction of statutory minimum wages.

country	Introduction	Source
AU	1923/1964/1977/1997	years refer to broad reforms, Bray (2013)
BE	1975	OECD (2017)
BG	1990	Loukanova and Tzanov (2011)
CY	2023	Bloomberg (2022)
CZ	1991	OECD (2017)
DE	2015	OECD (2017)
EE	1991	Vaughan-Whitehead (2010)
EL	1955: national minimum wage set in national-level bipartite bargaining 2012: statutory minimum wage without any inputs from collective bargaining	Karamessini and Grimshaw (2017)
ES	1963	OECD (2017)
FR	1970 (SMIC: salaire minimum interprofessionnel de croissance, successor of the 1950 SMIG – salaire minimum interprofessionnel garanti)	Concialdi (1999)
HR	1998: national minimum wage by extension of the lowest bargained wage 2008: statutory minimum wage linked to the average wage	Vaughan-Whitehead (2010)
HU	1989	Vaughan-Whitehead (2010)
IE	2000	OECD (2017)
LT	1991	Vaughan-Whitehead (2010)
LU	1945: general minimum wages 1957: minimum wages with regular adjustment	Starr (1981)
LV	1991	Vaughan-Whitehead (2010)
MT	1974	Vaughan-Whitehead (2010)
NL	1968 (coverage later extended from 25+ to 23+)	Centrum voor Parlementaire geschiedenis (2014)
PL	1989	OECD (2017)
PT	1974-1978: national minimum wage (lower rate for agriculture, forestry and domestic workers) 1991: general national minimum wage (except lower rate for domestic workers)	Nascimento (1997)
RO	1990	Vaughan-Whitehead (2010)
SI	1995	OECD (2017)
SK	1991	OECD (2017)
UK	1999	Edwards (1999)
US	1938	James (2007)

Figure A1. Share of workers earning below 60% gross median wage over time, by country.



Figure A2. 5th-percentile wages in purchasing power standards (PPS) over time, by country.



Appendix B: Robustness Checks

RC1. Low pay share relative to inflation-adjusted start-year median hourly wage.

VARIABLES	DV: share of workers on <60% median pay (fixed start-year median)		
	(1)	(2)	(3)
Within: CBC	-0.018 (0.038)	0.017 (0.045)	0.017 (0.045)
Within: SMW dummy	18.155** (7.874)	9.593 (8.380)	9.597 (8.381)
Within: SMW PPS	-2.674*** (0.856)	-1.343 (0.913)	-1.340 (0.913)
Between: CBC	-0.127** (0.056)	-0.179*** (0.055)	-0.114 (0.118)
Between: SMW dummy	-10.825** (5.362)	-15.321** (6.841)	-14.813** (6.842)
Between: CBC*SMW dummy			-0.079 (0.129)
Between: SMW PPS	0.979 (0.726)	1.712* (0.961)	1.852* (0.984)
Constant	18.929*** (4.061)	22.250*** (5.020)	21.365*** (5.181)
Year FE	X	X	X
Controls		X	X
Number of observations (country- years)	432	427	427
Number of groups (countries)	30	30	30

Notes: Multilevel models run with *mixed* command in Stata. AR(1) autoregressive residuals and unstructured random effect covariances.

Coefficients for control variables and random part not displayed.

*** p<0.01 ** p<0.05 * p<0.1

RC2. Effective wage floor defined as 10th percentile of hourly wages.

VARIABLES	DV: effective wage floor (P10 in PPS)		
	(1)	(2)	(3)
Within: CBC	0.003 (0.004)	0.001 (0.004)	0.001 (0.004)
Within: SMW dummy	-2.791*** (0.739)	-2.507*** (0.750)	-2.607*** (0.750)
Within: SMW PPS	0.419*** (0.078)	0.384*** (0.079)	0.391*** (0.079)
Between: CBC	0.013 (0.010)	0.006 (0.007)	0.029** (0.013)
Between: SMW dummy	-7.318*** (0.981)	-2.856*** (0.840)	-2.676*** (0.777)
Between: CBC*SMW dummy			-0.028** (0.014)
Between: SMW PPS	1.137*** (0.135)	0.688*** (0.117)	0.743*** (0.112)
Constant	11.596*** (0.743)	8.362*** (0.623)	8.049*** (0.594)
Year FE	X	X	X
Controls		X	X
Number of observations (country-years)	432	427	427
Number of groups (countries)	30	30	30

Notes: Multilevel models run with *mixed* command in Stata. AR(1) autoregressive residuals and unstructured random effect covariances. Coefficients for control variables and random part not displayed.

*** p<0.01 ** p<0.05 * p<0.1

RC3. Main models with three-year smoothed averages.

VARIABLES	DV: share of workers on <60% median pay (smoothed avg)			DV: effective wage floor (P5 in PPS) (smoothed avg)		
	(1)	(2)	(3)	(4)	(5)	(6)
Within: CBC	-0.003 (0.010)	-0.008 (0.010)	-0.009 (0.010)	0.002 (0.003)	0.001 (0.003)	0.001 (0.003)
Within: SMW dummy	0.861 (1.572)	0.863 (1.576)	0.866 (1.576)	-0.214 (0.450)	-0.281 (0.445)	-0.300 (0.445)
Within: SMW PPS	-0.149 (0.166)	-0.155 (0.166)	-0.155 (0.166)	0.047 (0.047)	0.054 (0.047)	0.057 (0.047)
Between: CBC	-0.121*** (0.030)	-0.131*** (0.030)	-0.140** (0.064)	0.010 (0.009)	0.007 (0.008)	0.035** (0.015)
Between: SMW dummy	-4.461 (2.850)	-9.183** (3.783)	-9.229** (3.799)	-5.641*** (0.864)	-2.205** (0.943)	-2.100** (0.883)
Between: CBC*SMW dummy			0.011 (0.070)			-0.035** (0.016)
Between: SMW PPS	0.398 (0.392)	0.845 (0.534)	0.822 (0.552)	0.955*** (0.119)	0.655*** (0.133)	0.738*** (0.128)
Constant	15.606*** (2.136)	18.885*** (2.776)	18.992*** (2.868)	9.120*** (0.651)	6.647*** (0.691)	6.339*** (0.667)
Year FE	X	X	X	X	X	X
Controls		X	X		X	X
Number of observations (country- years)	397	392	392	397	392	392
Number of groups (countries)	30	30	30	30	30	30

Notes: Multilevel models run with *mixed* command in Stata. AR(1) autoregressive residuals and unstructured random effect covariances. Coefficients for control variables and random part not displayed.

*** p<0.01 ** p<0.05 * p<0.1

RC4. Replacing SMW PPS indicator with SMW: median ratio.

VARIABLES	DV: share of workers on <60% median pay			DV: effective wage floor (P5 in PPS)		
	(1)	(2)	(3)	(4)	(5)	(6)
Within: CBC	-0.027 (0.037)	0.023 (0.044)	0.023 (0.044)	0.001 (0.005)	0.001 (0.005)	0.000 (0.005)
Within: SMW dummy	4.772 (3.940)	3.472 (4.104)	3.455 (4.104)	-0.450 (0.499)	-0.278 (0.510)	-0.294 (0.513)
Within: SMW: median	-0.198*** (0.040)	-0.117*** (0.045)	-0.117*** (0.045)	0.015*** (0.005)	0.011* (0.006)	0.011* (0.006)
Between: CBC	-0.099** (0.044)	-0.102** (0.046)	-0.087 (0.103)	0.042*** (0.012)	0.017* (0.009)	0.027 (0.020)
Between: SMW dummy	16.660*** (6.172)	17.527*** (6.759)	17.837** (6.974)	4.763*** (1.680)	2.389* (1.325)	2.528* (1.317)
Between: CBC*SMW dummy			-0.018 (0.109)			-0.013 (0.021)
Between: SMW: median	-0.380*** (0.104)	-0.417*** (0.112)	-0.416*** (0.112)	-0.082*** (0.028)	-0.009 (0.022)	-0.009 (0.021)
Constant	-0.931 (4.596)	-1.461 (4.933)	-1.805 (5.308)	1.082*** (0.298)	1.126* (0.597)	1.292*** (0.182)
Year FE	X	X	X	X	X	X
Controls		X	X		X	X
Number of observations (country- years)	432	427	427	432	427	427
Number of groups (countries)	30	30	30	30	30	30

Notes: Multilevel models run with *mixed* command in Stata. AR(1) autoregressive residuals and unstructured random effect covariances. Coefficients for control variables and random part not displayed.

*** p<0.01 ** p<0.05 * p<0.1

RC5. Main models, EU15 + NO, IS only.

VARIABLES	DV: share of workers on <60% median pay (West Europe)			DV: effective wage floor (P5 in PPS) (West Europe)		
	(1)	(2)	(3)	(4)	(5)	(6)
Within: CBC	0.025 (0.024)	0.018 (0.023)	0.014 (0.023)	0.008 (0.010)	0.003 (0.010)	0.003 (0.010)
Within: SMW dummy	0.368 (3.379)	0.550 (3.364)	1.121 (3.376)	-1.477 (1.443)	-1.198 (1.452)	-1.295 (1.455)
Within: SMW PPS	-0.133 (0.379)	-0.208 (0.379)	-0.236 (0.380)	0.229 (0.162)	0.190 (0.163)	0.194 (0.163)
Between: CBC	-0.113*** (0.043)	-0.140*** (0.027)	-0.240*** (0.074)	0.000 (0.014)	0.005 (0.008)	0.023 (0.022)
Between: SMW dummy	-2.295 (4.340)	-3.566 (5.018)	-4.530 (4.870)	-5.103*** (1.491)	-1.236 (1.469)	-1.055 (1.461)
Between: CBC*SMW dummy			0.117 (0.083)			-0.021 (0.025)
Between: SMW PPS	0.161 (0.587)	-0.133 (0.609)	-0.287 (0.591)	0.896*** (0.200)	0.510*** (0.178)	0.537*** (0.178)
Constant	12.758*** (2.608)	13.543*** (2.927)	14.610*** (2.923)	9.649*** (0.912)	7.439*** (0.858)	7.242*** (0.874)
Year FE	X	X	X	X	X	X
Controls		X	X		X	X
Number of observations (country- years)	245	244	244	245	244	244
Number of groups (countries)	17	17	17	17	17	17

Notes: Multilevel models run with *mixed* command in Stata. AR(1) autoregressive residuals and unstructured random effect covariances. Coefficients for control variables and random part not displayed.

*** p<0.01 ** p<0.05 * p<0.1