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# The interplay of statutory minimum wages and collective wage bargaining across European sectors

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## Abstract

The EU policy agenda to ensure adequate wages for workers relies on two major instruments: statutory minimum wages and collective wage bargaining. The extent to which minimum wages and collective wage bargaining reinforce or weaken each other is a contested issue. This working paper, which constitutes deliverable 2.2 of the BARWAGE project (European Union social dialogue grant 101052319), uses linked cross-sectional microdata on applicable statutory minimum wage rates and earned wages, and asks to what extent coverage by a collective agreement on pay affects the probability of earning between 100% and 110% of the statutory minimum wage. To take into account differences in the ability of wage bargaining to set wages above the statutory minimum, we then ask to what extent the impact of collective bargaining varies by bargaining level and depending on the ratio of the statutory minimum to the median wage (Kaitz index).

Keywords: minimum wage, wage bargaining, Kaitz index

## Acknowledgments

# BARWAGE

BARWAGE investigates the potential of collective bargaining as a tool for ensuring adequate minimum wages in the European Union. It explores the size of four wage-setting arenas across EU countries and industries: the national or peak level, sector-level collective bargaining, firm-level collective bargaining, and individual (non-collective) negotiations. BARWAGE uses microdata to identify what share of the workers are earning under 110% of the statutory minimum wage are covered by sectoral or enterprise collective bargaining. Using coded data of 900 CBAs from 9 EU countries, the presence and nature of pay scales in the sectoral and firm-level collective bargaining agreements (CBAs) are analysed. To deepen the insight into the impact of collective wage bargaining, national level data will be used to detail the wage arenas in 2 EU countries (Netherlands and Italy). The project lasts 2 years (2022-2024) and includes 6 work packages.

# Utrecht University

The Faculty of Social & Behavioural Sciences of Utrecht University is a leader in education and research in the social and behavioural sciences. The Department of Interdisciplinary Social Science deals with issues such as discrimination in the job market, reintegration at work, growing up in a multicultural neighbourhood, developing your individual identity, high-risk behaviour in young people, growing inequality and the accessibility of care. Interdisciplinary Social Science focuses on understanding these complex issues and on finding solutions to the individual and societal problems that play a role in them.

# Fondazione Giuseppe Di Vittorio

The Fondazione Di Vittorio (FDV) is national institute both for historical, social, and economic research, and for trade union education and training of trade union confederation CGIL. The FDV centres its activities around the core issues of work and employment, economics and welfare. Its aim is to put people and their rights back on the centre stage, along with their living and working conditions, their interests and the demands they express, linking all this to the values and ideals that make the CGIL one of the most important social and political entities in Italy.

# Central European Labour Studies Institute (CELSI)

Central European Labour Studies Institute (CELSI) is a non-profit research institute based in Bratislava, Slovakia. It fosters multidisciplinary research about the functioning of labour markets and institutions, work and organizations, business and society, and ethnicity and migration in the economic, social, and political life of modern societies. CELSI strives to make a contribution to the cutting-edge international scientific discourse.

# WageIndicator Foundation

WageIndicator Foundation collects, compares and shares labour market information through online and offline surveys and research. Its national websites serve as always up-to-date online libraries featuring (living) wage information, labour law and career advice, for employees, employers and social partners. In this way, WageIndicator is a life changer for millions of people around the world.

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# Introduction

Since the adoption of the Inter-Institutional Proclamation on the European Pillar of Social Rights in 2017 and the subsequent inclusion of adequate minimum wages in the 2019-2024 political guidelines of the European Commission, wage floors have become a part of the EU policy agenda (European Union Institutions, 2017; von der Leyen, 2019). This policy agenda consists of two major instruments. Firstly, statutory minimum wages (SMWs) set one or a limited number of wage floors through legislation applicable across a given country's labour market (Eurofound, 2017; ILO, 2014; Schulten & Müller, 2021). Secondly, wage floors or differentiated pay rates in specific organizations or sectors are fixed through collective bargaining and cover about 60% of European employees (Eurofound, 2015a; OECD, 2019; OECD & AIAS, 2021).

SMWs and collective wage bargaining have, independently from each other, been theoretically and empirically associated with decent wages, wage premiums, and reduced wage inequality (Berg, 2015; Dube, 2019; Eurofound, 2015b; Garnero, 2020; Moore & Tailby, 2015; OECD, 2018; Vaughan-Whitehead, 2010). Research suggests, however, that the relation between the two instruments is complex and heterogeneous, depending on institutional configurations and according to different schools of thought (de Beer et al., 2017; Grimshaw et al., 2014; Haapanala et al., 2022; Heery, 2000; Swaffield, 2014). On the one hand, collective wage bargaining has been theorized to reinforce ripple effects of the SMW when collective agreements restore existing wage differentials following the uprating of the SMW (Dingeldey et al., 2021; Grimshaw, 2013; Haapanala et al., 2022). On the other hand, SMW have been argued to 'crowd out' collective bargaining by creating a disincentive to negotiate pay rates above the SMW (e.g., Kahancová & Martišková, 2022). Complementarities between the two instruments depend on the ability or willingness of actors to set SMWs at relatively high or low levels, as well as on the coverage and modalities of wage bargaining institutions (Grimshaw, 2013; Grimshaw et al., 2014; Haapanala et al., 2022; Koeniger et al., 2016).

While SMWs in the EU member states are set almost exclusively at the national level, wage fixing practices through collective bargaining vary substantially across sectors (Eurofound, 2015a, 2015b; OECD & AIAS, 2021; van Klaveren & Gregory, 2019). The interplay between the SMW and collective wage bargaining, might therefore also differ between sectors in a given member state (Grimshaw, 2013; Grimshaw et al., 2014). Studying these potential sectoral differences is crucial because they align with drivers that shape the interaction between the SMW and wage bargaining, including collective bargaining coverage and the prevalence of low pay (Grimshaw et al., 2014). Moreover, higher collective bargaining coverage rates in high-paid sectors and occupations (OECD, 2019), may lead to an overestimation of the impact of collective bargaining on reducing the share of low paid workers. Empirically, estimating ripple effects of collective bargaining on the sector level allows for a clearer view of gaps in the impact of wage bargaining, that can help prioritize sectors for policy makers aiming to achieve the goal of adequate wages for all EU workers. Analytically, differences in the impact of collective bargaining across sectors that refer to the same SMW but differ in terms of collective bargaining coverage, can yield new insights into the nature of institutional complementarities in wage fixing.

This working paper, which constitutes deliverable 2.2 of the BARWAGE project (European Union social dialogue grant 101052319), focuses on the interplay of the wage setting arenas of the SMW and collective wage bargaining across sectors in EU member states. Its objective is to study the extent to

which collective wage bargaining is associated with ripple effects above the SMW for workers earning wages below the median. This objective contributes to the EU policy agenda by providing quantitative evidence for the de-facto potential of collective bargaining as a policy instrument for achieving decent wages in Europe, as well as estimating its added value compared to SMW rates. While building on previous country-comparative work, our study deepens understanding of the complementarities between SMWs and collective wage bargaining by exploring sectoral differences.

To provide an impression of the potential impact of collective bargaining on setting adequate minimum wages, our first research objective is descriptive: we study the extent to which workers who earn wages close to the SMW are covered by collective bargaining agreements (CBAs) in different sectors of EU member states. Using linked cross-sectional microdata on applicable SMW rates and earned wages, we then ask to what extent employment in a firm that is covered by a collective agreement on pay affects the probability that a worker earns between 100%-110% of the SMW. To interrogate sectoral differences in the ability of collective wage bargaining to create ripple effects, we then ask to what extent the impact of collective bargaining varies depending on the ratio of the SMW to the median wage (Kaitz index), collective bargaining coverage in the sector, and the characteristics of workers in the sector.

# Theoretical background

SMW and collective wage bargaining are two major instruments for wage fixing in Europe, and are therefore instrumental in realizing adequate minimum wages. SMWs, usually determined by the government or by social dialogue, fix the minimum amount of compensation for labor that employers must pay an employee, regardless of the type of work or the size of the company (Eyraud & Saget, 2005; ILO, 2014). Collective wage bargaining refers to the negotiation process between trade unions and individual employers or employers' associations, which commonly results in CBAs that set out the amounts or minimum amounts of compensation for groups of workers performing specified job tasks in specified firms, industries and occupations (Berg, 2015; Eurofound, 2015b; OECD, 2018). Both instruments have been argued to potentially lead to improvements in workers' standard of living through the promotion of decent work, boosting the income of low-wage workers and reducing wage inequality (Belser & Rani, 2015; Berg, 2015; Besamusca, 2019; Devicienti et al., 2019; Dube, 2019; Eyraud & Saget, 2008; Gautié, 2018; Moore & Tailby, 2015; van Klaveren et al., 2015)[1].

While in practice SMWs and collective wage bargaining often co-exist, and therefore often impact the level of earned wage in tandem, they are two separate wage fixing institutions. Crucially, for the purposes of this study, there are differences in their effective coverage. In the remainder of this section, we firstly discuss the impact of the presence of SMW and the presence of collective wage bargaining separately and then explore the theories and (limited) empirical evidence on their interplay.

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[1] The impact of both SMW and collective wage bargaining on employment have also been under debate, although the overview study on the impact minimum wages of Dube finds little evidence of this (2019). Employment effects, however, are outside the scope of this study.

## The impact of SMWs on low pay and earnings distributions

The first SMW laws that were adopted in the late 19th century aimed to guarantee decent living standards for workers in industrial sectors where market forces failed to do so (Belser & Rani, 2015; Besamusca, 2019; Eyraud & Saget, 2005, 2008; Gautié, 2018; ILO, 2014). More recently, SMW have gained some popularity as a pre-distributive policy to ensure that work pays and to curb inequalities (Besamusca, 2019; Dube, 2019; Moore & Tailby, 2015; Vaughan-Whitehead, 2010). This is reflected in the popularity of the so-called Kaitz index, which measures the level of the SMW as a share of the median wage in a given country. In its annual report on minimum wages, Eurofound (Eurofound, 2023) reports that five EU Member States (namely, Belgium, Bulgaria, Ireland, Slovakia, and Spain) already relied at least partially on such relative benchmarks to fix minimum wage increases. When the European Directive on adequate SMW comes into force in 2024, a European-wide target for SMWs to be set at 60% of the gross median wage or 50% of the gross mean wage is introduced. SMWs thus have the potential to guarantee decent incomes to the soaring numbers of non-standard, precarious and/or flexible workers who are not covered by collective bargaining (Aloisi & Gramano, 2019; Gumbrell-McCormick, 2011; Pulignano et al., 2016).

Globally, many different minimum wage rates may be fixed within a given territory (e.g., by occupation in India) and rates may be differentiated geographically (e.g., city, state and national minimum wages in the U.S.) (Besamusca et al., 2021; Tijdens & van Klaveren, 2019). In EU member states, SMWs almost always set a single amount, sometimes adding a small number of exceptions such as sub-minimum wage rates for young workers (Besamusca et al., 2021; Tijdens, 2017; Tijdens & van Klaveren, 2019). Sector-level variation of SMW is rare in the EU. Only Cyprus sets SMW for a limited number of sectors, although the country is currently transitioning to a national minimum wage (Müller, 2023). A number of Central Eastern European countries set different minimum wages for teachers (for example, Estonia) while other member states sub-minimum wage rates for youth (e.g., Belgium, the Netherlands) (Besamusca et al., 2021).

The single minimum wage rate applicable in most EU member states limits its relevance for higher-earning employees, since their wages already exceed the legislated minimum by some margin (Haapanala et al., 2022). In consequence, the SMW can be expected to have more impact in low-paid compared to high paid sectors (Koeniger et al., 2016; Machin et al., 2003). Moreover, as low educated workers, women and youth are overrepresented in low paid sectors and jobs, SMW hikes have been associated with the compression of wage inequality and the reduction of wage gaps (Hallward-Driemeier et al., 2017; Rubery et al., 2005). At the same time, minimum wage hikes do not necessarily drive up the wages of all low paid workers. SMW hikes can lead to spikes at the bottom of the income distribution, as the wages of workers earning below the new SMW catch up with those of workers previously earning marginally more than the SMW. These kinds of concentration of workers have been reported, for example, in Slovenia and Estonia (Ferraro et al., 2018; Laporšek et al., 2019).

In practice, the SMW is usually expected to affect the earnings of a broader group of workers than those earning wages inferior to the newly fixed minimum wage rate because pre-existing wage inequalities are commonly restored after SMW upratings (Adamopoulou & Villanueva, 2020; Dube, 2019; Garnero et al., 2015). The estimated size of this 'ripple effect' or 'spill-over effect' of the SMW varies. Spill-over effects appear to have been limited to non-existing following the introduction of the German SMW in 2015 (Burauel et al., 2020; Caliendo et al., 2019). Studying ripple effects of minimum

wage hikes in the U.S. between 1983 and 2002, Wicks-Lim (2008) estimates that hikes upwardly affected the wages of employees earning up to 125% of the SMW prior to the uprating, and total salary costs for employers increased by 2.5 times the costs related to salary raises up to the new SMW (Wicks-Lim, 2008). Spill-over effects until 145% of the SMW and until the 45% percentile of the earnings distribution were found in Slovenia (Laporšek et al., 2019) and Estonia (Ferraro et al., 2018) respectively.

## The impact of collective bargaining on low pay and earnings distributions

Collective bargaining agreements on pay are applicable to a subset of workers, which can range from members of the signatory trade union federation employed by the signatory employer, to all workers employed in a sector when a multi-employer agreement is extended (Martins, 2021; Traxler, 2010). Collective bargaining agreements often include a comprehensive pay system that fixes different wages rates based on the type of work an employee performs (e.g. for a janitor compared to a teacher employed in the same school) (Armstrong, 2007). As a wage fixing institution, collective bargaining is thus more limited in its application across economic activities compared to the SMW, but potentially more impactful to workers in higher paid jobs. Across European Union member states, collective wage bargaining might impact the wages of under 10% of workers (Estonia) to over 95% of workers (Austria, Belgium, Italy) (OECD & AIAS, 2021).

There is ample evidence that social partners in the EU negotiate about wages and that provisions on pay are commonly included in collective bargaining agreements (Eurofound, 2015b; Tijdens, 2021; Tijdens et al., 2022). The form and level of detail of these provisions varies both across and within countries. Some collective bargaining agreements fix only a single wage floor. This is common, for example, in Swedish collective bargaining agreements covering white collar occupations (Hällberg & Kjellström, 2020; Kjellberg, 2019; Skedinger, 2008). Other collective bargaining agreements contain detailed pay systems that fix different pay rates and pay ranges on the basis of workers' and job characteristics, such as job- and career families or tenure at the firm (Armstrong, 2007; Berg, 2015; Besamusca et al., 2022; OECD, 2018). Dutch collective agreements, for example, tend to contain detailed tables on pay bands for workers in different jobs, and specify different rates within those bands based on tenure within these jobs. Between these two extremes, a large variety in wage fixing practices can be observed in collective bargaining agreements in the EU, varying both across and within countries. Collective bargaining may thus affect earned wages through a negotiated wage floor, not unlike SMW do, or they may set out negotiated pay rates across the earnings distribution.

Studies into the impact of collective bargaining on earned wages are primarily based on micro data of wages earned by workers in firms that are or are not covered by CBAs (Addison et al., 2014; Canal Domínguez & Rodríguez Gutiérrez, 2016; Garnero, 2020; Garnero et al., 2020; Magda et al., 2012; Teulings & Hartog, 1998; Wallerstein, 1999). These studies generally conclude that earned wages in firms covered by collective bargaining agreements exceed those in non-covered firms (Addison et al., 2014; Garnero et al., 2020) and some report relatively lower wage dispersion in firms covered by collective bargaining agreements (Canal Domínguez & Rodríguez Gutiérrez, 2016; Teulings & Hartog, 1998; Wallerstein, 1999).

Studies occasionally explore within-country variation in collective agreements. For example, using a large, matched employer-employee dataset, Magda et al. (2012) explored the impact of company and industry bargaining agreements on wages in the Czech Republic, Hungary and Poland, finding that industry agreements increase wages for low-skilled workers, and that company agreements increase medium- and high-skilled wages. Blien et al. (2013) did the same over time for Western Germany, whereas Heinbach and Schropfer (2008) concluded that for Germany, the impact of CBA opening clauses on employment levels in collective negotiations affected wage bargaining, as well as non-wage issues. An OECD report (OECD, 2018) using micro-level data from the Structure of Earnings Survey and other sources showed that workers covered by firm-level bargaining in OECD countries had higher wages, while no effect was found for workers covered by sector bargaining. Using Belgian linked employer-employee panel data, firm-level CBAs was shown to benefit both employers and employees by creating higher productivity and wages, without being detrimental to their performance (Garnero et al., 2020).

However, collective wage bargaining does not necessarily focus on fixing decent wages for low-paid workers. Especially U.S.-based, and some European scholars have pointed out that trade unions are membership-based organizations that aim to defend the interests of their members (Cronert & Forsén, 2023; Haapanala et al., 2022; Kalleberg et al., 2000; Moore & Tailby, 2015). They have argued that while pressure to increase wages of low-paid workers in CBAs should be expected to come primarily from trade unions (as opposed to from employers' associations), the extent to which this happens will depend on whether this is in their members' interest. Since the membership composition of trade unions differs across EU member states, the extent to which collective wage bargaining leads to adequate wage floors for covered workers may vary too. Moreover, studying 35 Swedish trade unions, Cronert and Forsén (2023) point to substantial differences between sectors, arguing the wages of workers in the lowest pay scales of a collective agreement will be a larger priority for unions whose members are low-income workers (e.g., cleaners) than those whose members are not (e.g., civil servants).

## The combined effects of SMWs and bargained wage floors on low pay and earnings distributions

SMW and collectively bargained pay rates, where they co-exist, have been theorized to affect the level of the minimum payable wage as well as the prevalence of low pay via multiple, sometimes contradictory pathways. SMWs temporarily distort the wage distribution when they are uprated, bringing the wages of a select group of low paid workers up to the a new, increased minimum without legally affecting the wages of other workers. This would result in the compression of wage inequality, unless the wages of other workers are increased as well to restore pay differentials in the economy. The existence, or absence, of additional collective wage bargaining might impact the extent to which wage distributions are re-adjusted to reflect those prior to the minimum wage uprating (Grimshaw et al., 2014; Heery, 2000). The more they do so, the larger the 'ripple effect' of the SMW. There is considerable scientific disagreement over the question whether collective wage bargaining increases the ripple effect of SMW (Elias Moreno & Ruidavets Barcons, n.d.; Haapanala et al., 2022; Kahancová & Martišková, 2022).

SMWs are sometimes argued to crowd out collective wage bargaining. Proponents argue that fixing a minimum amount decreases incentives for employers to negotiate higher wages with trade unions (Kahancová & Martišková, 2022). Due to this sticky floor effect of the SMW, trade unions then experience difficulties negotiating higher pay rates at the bottom of the pay distribution (de Beer et al., 2017; Grimshaw et al., 2014). The effective substitutes theory argues that in countries with a SMW, wage bargaining prioritizes wages for workers higher in the distribution over workers earning near the wage floor (Haapanala et al., 2022; Vlandas, 2018). Where the crowding out thesis holds, collective wage bargaining should not be associated with larger ripple effects. In consequence, being employed in a firm covered by collective bargaining should not lower an employee's probability of being paid up to 110% of the SMW (hypothesis 1).

Crowding out could occur in the opposite direction too, when collectively bargained wage floors are set at levels far above the SMW, reducing the SMW's relevance for wage fixing in the labour market. Grimshaw et al. (2014) point to Spain prior to 2004 as an example of a country where collectively bargained wages far outpaced the SMW, which was fixed at very low levels out of concerns for rising welfare costs. Theoretically, hypothesis 1 should be true in these cases too, although empirically only small shares of employees would effectively earn between 100% and 110% of the SMW in this scenario.

Another common view is that SMWs and collective wage bargaining reinforce each other – for example, the presence of a SMW might provide a baseline from which collective bargaining can negotiate pay for workers in higher paying jobs (Wicks-Lim, 2008). This strand of literature views collective wage bargaining as an instrument to increase 'ripple effects'. The size of the ripple effects in practice (i.e., until which income deciles the ripple carries forward) can depend on a range of factors, such as the financial situation of firms, trade union strength or the size of the minimum wage uprating (Ferraro et al., 2018; Laporšek et al., 2019; Wicks-Lim, 2008). When ripple effects are limited, the uprating of the SMW affects only the wages of minimum wage workers and those earning just in excess of the minimum wage. When ripple effects are larger, however, uprating of the SMW is reflected in (negotiated) wage increases into higher deciles of the wage distribution. If collective wage bargaining mutually reinforce each other, collective wage bargaining should be associated with larger ripple effects. In consequence, being employed in a firm covered by collective bargaining should lower an employee's probability of being paid up to 110% of the SMW (hypothesis 2).

Few scholars today would argue that either crowding out or ripple effects will universally follow from the co-existence of SMW and collective wage bargaining. Rather, the shape of institutional complementarities, and thus whether crowding out or ripple effects occur, is seen as context specific. For example, Grimshaw and colleagues (2014) suggest that the impact of SMW on wages in the bottom half of the income distribution (ripple effect) is more limited in the absence of strong collective bargaining carrying SMW increases upward into higher wage deciles. They argue that complementarities depend on the combination of strong versus weak SMW (interpreted as high and low Kaitz index scores) and strong or weak collective bargaining. Where collective wage bargaining covers low wage workers as much or more so than to higher earning workers, the incentive to bargain for a ripple effect increases. As Haapanala and colleagues (2022) point out, lower collective bargaining coverage in low-wage sectors compared to higher-paying sectors would similarly result in limited incentive for social partners to negotiate higher wages for workers earning wages around the SMW.

The impact of collective bargaining on the probability of earning wages just above the SMW may differ depending on the level of the SMW, as well as between sectors, depending on whether collective bargaining coverage in a sector is high or low, and the prevalence of low pay in the sector.

# Methods

## Data

To study the impact of collective wage bargaining around the SMW, we used microdata from the structure of earnings survey (SES), a large survey of enterprises conducted in 2018, provided by Eurostat. Response units in the SES are enterprises or local units of enterprises, who provide detailed and comparable information about wage levels and individual characteristics of employees. We restricted the sample to observations from EU Member States that fixed SMW in 2018, thus dropping Austria, Cyprus, Denmark, Finland, Island, Italy, Norway, and Sweden. Germany was removed because information about the collective wage bargaining was not available, and Luxembourg and Slovenia because enterprise identifiers were not available. The sampling frame of the SES includes enterprises with at least 10 employees and excludes enterprises active in agriculture, forestry and fishing sectors. We excluded workers employed in public administration, defence and compulsory social security sector, who are predominantly public employees and were sampled only in a sub-set of countries.

The focus of our analysis is on workers who earn wages below the median in each country since the collectively bargained wage floors are potentially more important to workers at the bottom end of the wage distribution.[2] Our sample included workers between 20 and 59 years old who work at least 50% of what constitutes full-time hours in their firm of employment. We dropped workers earning below the SMW and converted wages of part-timers to their full-time equivalent earnings, but we did not manipulate or limit data otherwise. The estimation sample comprised of 2.57 million workers employed in 181,698 enterprises in 17 countries[3].

Microdata from the SES were complemented with information about SMW rates from the WageIndicator Minimum Wage Database (MWDB). This database has more than 20,000 SMW in 188 countries that are updated monthly. It has time series data for all EU Member States from January 2014 on (WageIndicator, 2023). WageIndicator operates national websites about work and wages in almost 200 countries. The MWDB is used to post information about SMW rates on these websites, which are frequently visited particularly in countries with complex SMW. The data allows the SMW fixing machinery to be reconstructed globally, specifically for countries that issue more than one rate.

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[2] We checked that our results remain valid if models are estimated using full workforce. The estimates on CBA remain significant but are smaller in magnitude.
[3] Sample includes countries with instituted SMW: Belgium (BE), Bulgaria (BG), Croatia (HR), Czechia (CZ), Estonia (EE), France (FR), Greece (EL), Hungary (HU), Latvia (LV), Lithuania (LT), Malta (MT), the Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), and Spain (ES).

## Operationalization

Our main outcome variable was a binary indicator for *low pay* and measured whether workers earn between 100 and 110 percent of the applicable SMW. To do so, a variable measuring the applicable minimum wage rate in the reference month used in the SES was created from the WMWD (for most countries, the reference month was October 2018). Most countries had a single SMW in 2018 that is coded as a reference for all respondents. In countries with multiple SMW rates, such as teachers' wages in Estonia, the applicable rate was coded for each observation. SMW rates for young workers (21 and 22 years old) in the Netherlands could not be applied in our sample since age is made available in 10-year brackets in the SES. The Stata script to link the MWDB to the SES microdata is available open source from the BARWAGE project's Zenodo page (https://zenodo.org/communities/barwage).

Earned wages from the SES were compared to the applicable SMW. For the construction of the indicator, the wage variable refers to gross earnings in the reference month. This may include earnings related to overtime (22% workers report non zero values) and special payment for shift work (41% workers report non zero values). Results remained robust if these were deducted from gross monthly earnings, but since 22% workers has negative earnings after deduction we opted to use monthly gross earnings without adjustment as the reference wage variable.

Our key explanatory variable indicates whether a worker is employed in a firm that is covered by a collective agreement on pay. This information is necessary to test whether collective bargaining can act as a policy instrument for achieving decent wages in Europe, as well as to estimate its added value compared to the SMW. In the SES, collective bargaining coverage is available at the level of the reporting unit, being an enterprise or a local unit. For this reporting unit, the SES measures whether any collective agreement on pay covers at least 50% of the employees in the local unit, and at which level of bargaining it was negotiated. In the microdata we can distinguish between firms that are not covered by an agreement, covered by a single-employer or by a multi-employer agreement. The distinction between single- or multi-employer agreements was not proven significant in the analysis hence we keep coverage as a dichotomous variable and do not distinguish the type of coverage in the analysis. The phrasing of the coverage question and answer options have been criticized for forcing employers to select a single agreement while multiple agreements may cover the workforce or some share of employees may not be excluded from the agreement. It is, however, the closest proxy available for collective bargaining coverage of workers in the dataset.

We further note that the share of firms covered by a collective agreement on pay exceeds national statistics on collective bargaining coverage in many countries (OECD & AIAS, 2021). We attribute this to the sampling frame of the SES. Micro-firms (i.e., firms employing fewer than 10 employees) are excluded from the SES sampling frame in most countries, and 60% of workers are employed in firm of over 250 employees (own calculation). According to Eurostat estimates for 2018, 45% of employed persons in the EU worked in firms with under 10 employees, and 35.6% in firms with over 250 employees (Eurostat, 2019). This affects collective bargaining coverage estimates because larger firms are more likely to bargain collectively, especially in countries without extended sector-level collective agreements (OECD, 2019). We argue that the exclusion of micro-firms does not affect the validity of our measure, as long as the coverage of a sampled firm is measured accurately. It does, however, imply that our findings cannot be generalized to micro-firms.

For controls that might affect the probability of being low paid at the individual level, we use gender; four age groups (20–29 years, 30–39 years, 40–49 years, and 50–59 years); four education levels (primary or lower secondary, upper secondary, tertiary bachelor level, and tertiary master level and doctorate); temporary vs permanent employment contract; full-time vs part-time work; and the firm prevalent ownership (public vs private). To measure the bite of the SMW we calculate a country-level Kaitz index as the ratio of SMW to the sample median wage.

## Estimation equation

For our analysis we rely on a large sample of workers (2.57 million) who we observe in 181,698 enterprises sampled in 17 countries. Our dependent variable is a dichotomous variable so we estimate the linear probability multilevel random intercept models in which employees (level 1) are nested in enterprises (level 2) which are nested in their country (level 3). The multilevel models address the dependence of observations for multiple workers employed in the same firm or the same country (e.g., De Leeuw & Meijer, 2008; Hox & van de Schoot, 2018; Stegmueller, 2013). We estimate the following equation:

$$Y_{iec} = \beta_1 + \beta_2 CBA_{iet} + \beta_3 X_{iec} + \beta_3 Z_{ec} + \theta_e + \delta_c + \varepsilon_{iec} \ (1)$$

The outcome $Y_{iec}$ of our model is the low pay indicator observed for individual $i$, employed in the entreprise $e$ and country $c$ and is assumed to depend on observed predictors and unobserved factors. $CBA_{iet}$ is our key control variable that identifies workers covered by CBA. $X_{iec}$ contains individual-level variables such as age, education, gender, type of contract, and work schedule. $Z_{ec}$ contains enterprise characteristics such as the type of ownership. There are also unobserved individual ($\varepsilon_{iec}$), enterprise ($\theta_e$) and country ($\delta_c$) effects, each assumed to be normally distributed and uncorrelated with $X_{iec}$ and $Z_{ec}$. In the extended analyses we added the interaction term between CBA variable and the variable of interest that is defined at country (Kaitz index), sector (the share of female or tertiary educated workforce in the sector and overall sector coverage) or worker level. Finally we estimated the baseline specification model for the sub-sample of workers employed in different sectors.

## Descriptive evidence

In the analysis we test if collective wage bargaining affects the probability of being low paid, exploiting the variation in the institutional setting between countries. In our sample the SMW takes values from EUR 261 (in Bulgaria) to EUR 1594 (in Belgium and in the Netherlands). The ratio of SMW to median sample wage (Kaitz index) varies between 39 in Malta and 63 in the Netherlands (Table 1). A higher Kaitz index indicates a lower inequality of wages in the bottom half of workforce while lower Kaitz index means more wage diversity since the SMW and median wage are father apart. In the analysis we test if collective wage bargaining is efficient also in countries with high Kaitz index where the scope for wage increase above SMW can be limited.

In the seventeen EU member states included in the study, collective bargaining coverage of workers earning below the median varies from full coverage in France to under 5% in Estonia and Hungary (Table 1, column 3). The coverage is around 90% in Belgium, Spain and Portugal, as well as in Greece and Romania, as a result of the oversampling of large firms in the SES. The large majority of workers in these countries is thus covered by both the SMW and a collective agreement on pay. In most of

these countries, excepting Romania, multi-employer bargaining was the standard bargaining practice. Between 25% and 75% of workers were covered by a collective agreement on pay in the Netherlands, Slovakia, Croatia, Malta, Czechia, Latvia and Poland. Thus creating more heterogeneity in the extent to which workers can rely on collective bargaining agreements on top of the SMW. Under 25% of workers were covered by any collect agreement on pay, thus relying solely on the SMW, in Bulgaria, Lithuania, Hungary and Estonia.

Our main outcome variable, the low pay variable, identifies workers earning between 100 and 110 percent of minimum wage. The proportion of low paid workers varies from 2 to 41 percent among countries in our sample (Column 4). In general, the proportion of low paid workers was lower in countries with a higher share of workers in firms covered by a CBA. However, we also observe some countries high prevalence of low pay despite a large share of workers being covered by a CBA (Romania), or a low share of low paid of workers despite only a few workers working in firms that are covered by CBAs (e.g. Estonia, Hungary).  Among the group of low paid workers the coverage is very similar to the estimation sample in many countries but it is significantly lower in Bulgaria, Czechia, Estonia, Hungary, Lithuania, and Malta (Column 5).

*Table 1 Descriptive statistics*

| Country | Country characteristics | | | Estimation sample | | Sub-sample of low paid workers |
|---|---|---|---|---|---|---|
| | SMW | Median wage | Kaitz index | CBA | Low pay | CBA |
| | (1) | (2) | (1)/(2) | (3) | (4) | (5) |
| BE | 1594 | 3050 | 52.3 | 93 | 4 | 90 |
| BG | 261 | 422 | 61.8 | 20 | 41 | 10 |
| CZ | 476 | 1123 | 42.4 | 58 | 2 | 34 |
| EE | 500 | 1150 | 43.5 | 3 | 10 | 1 |
| EL | 586 | 1261 | 46.5 | 94 | 8 | 98 |
| ES | 736 | 1679 | 43.8 | 94 | 2 | 91 |
| FR | 1498 | 3049 | 49.1 | 100 | 8 | 99 |
| HR | 464 | 1004 | 46.2 | 47 | 10 | 37 |
| HU | 433 | 815 | 53.1 | 4 | 11 | 2 |
| LT | 400 | 770 | 51.9 | 21 | 19 | 11 |
| LV | 430 | 816 | 52.7 | 39 | 20 | 37 |
| MT | 747 | 1925 | 38.8 | 76 | 2 | 17 |
| NL | 1594 | 2533 | 62.9 | 74 | 13 | 75 |
| PL | 493 | 915 | 53.9 | 28 | 24 | 20 |
| PT | 580 | 1000 | 58 | 88 | 8 | 89 |
| RO | 408 | 726 | 56.2 | 92 | 31 | 89 |
| SK | 480 | 1019 | 47.1 | 72 | 7 | 64 |

*Source: Own elaboration based on SES (2018) and MWDB*

*Note:* SMW *and median wage are converted to EUR taking the annual exchange rate from Eurostat (table tec00033). Kaitz index is defined as the ratio of* SMW *to median wage multiplied by 100. Estonia defines a specific* SMW *(EUR 800) for teachers in primary and secondary education that is not shown in table. CBA in Columns (3) and (5) defines the share of workers covered by the collective agreement. Low pay in Columns (4)*

*indicates the share of workers earning between 100 and 110 percent of* SMW. *Statistics in Column (5) are calculated using a sub-sample of low paid workers.*

Table 2 presents the characteristics of workers in our sample by CBA coverage. Almost 14 percent of workers in our sample is identified with low pay. The incidence of low pay is lower (10 percent) in the group of workers covered by CBA than in the group not covered (23 percent). The workers who benefit from the collectively bargained wages may differ in their characteristics from workers not covered by collective agreement, which may affect their wage levels. Table 2 shows that both groups of workers are very similar in terms of gender and age characteristics. Workers covered by CBA attain lower education levels as they have two times higher representation in lower secondary and tertiary bachelor education relative to workers not covered by CBA who are more presented in upper secondary and tertiary master/doctoral education. Workers with CBA are more likely to have part-time work; more likely to have permanent than temporary contracts; and more concentrated in the public sector, compared to workers in firms that are not covered by a CBA. In the analysis we control for these confounding factors to test for the impact of coverage by a CBA on the probability of earning a low wage.

Table 2 Characteristics of workers by CBA coverage

|  | Workers all | Workers not covered by CBA | Workers covered by CBA | Ratio |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (3)/(2) |
| Low pay | 13.6 | 23.0 | 10.4 | 0.5 |
| Female | 52.6 | 53.8 | 52.2 | 1.0 |
| Age 20-29 | 19.2 | 20.2 | 18.9 | 0.9 |
| Age 30-39 | 28.3 | 27.0 | 28.7 | 1.1 |
| Age 40-49 | 28.7 | 28.7 | 28.7 | 1.0 |
| Age 50-59 | 23.8 | 24.1 | 23.7 | 1.0 |
| Edu lower secondary | 25.6 | 13.7 | 29.6 | 2.2 |
| Edu upper secondary | 52.5 | 66.6 | 47.8 | 0.7 |
| Edu bachelor | 15.1 | 9.6 | 17.0 | 1.8 |
| Edu master/doctoral | 6.8 | 10.2 | 5.6 | 0.6 |
| Part-time work | 16.7 | 10.6 | 18.8 | 1.8 |
| Temporary contract | 19.8 | 24.8 | 18.1 | 0.7 |
| Public sector | 17.2 | 14.6 | 18.1 | 1.2 |

Source: *Own elaboration based on SES (2018)*

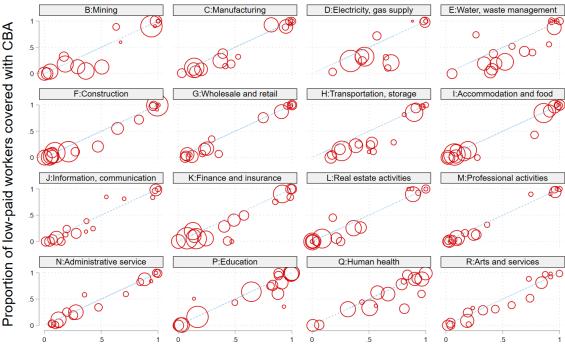*Note: Low pay indicates the share of workers earning between 100 and 110 percent of SMW.*

While the proportion of workers covered by CBA differs between countries, the variation in the CBA coverage is larger between economic sectors. Figure 1 shows employment in firms which are covered by a CBA as a share of all workers earning below the median (x-axis) and as a share of low paid workers, earning between 100-110 percent of the SMW (y-axis). The position of the circles represents the coverage of workers and the size of circles indicates the proportion of low-paid workers. Circles represent individual countries. The vast majority of circles is below the 45 degree line, which means the coverage of low paid workers is lower than the coverage of all workers in our sample (i.e. all workers earning below the median wage). Yet there are situations when the coverage of low paid

workers is close to 100 percent (i.e. the position of circles in the upper right corner) or near 0 percent (i.e. the position of circles in the lower left corner).

The size of the circle indicates the proportion of workers in the sector in a given country that is low paid. The size of the circles is tentatively larger in countries and sectors that have a lower coverage (i.e. circles with larger diameter are more often placed towards the left side in the graphs in Figure 1). This suggests, at least descriptively, that workers tend to benefit from collectively bargained wage levels.

Figure 1 CBA coverage of workers against the CBA coverage of low paid workers and the incidence of low pay (size of circle) by economic sector



Source: *Own elaboration based on SES (2018)*

*Note: Low paid workers are defined as earning between 100 and 110 percent of SMW. Each circle represents one country and the size of circle indicates the proportion of low-paid workers in the country in a given sector.*

## Results

### Complementarities in coverage by collective bargaining and SMW

We test for the impact of collective wage bargaining on the probability of low pay in the sample of workers earning below the median wage in each country. Table 3 presents baseline estimates. The dependent variable in all models is the dichotomous variable that indicates whether a worker has earnings between 100 and 110 percent of SMW. The positive estimates thus imply the higher probability of wage levels closer to SMW and negative estimates imply the higher likelihood of earning

more than 110% of the SMW. The negative coefficient of the CBA variable is negative, implying that working in a firm that is covered by collective bargaining is negatively related to the incidence of low pay. The effect is non-trivial as CBA coverage reduces the risk of low pay by 5.5 percentage points (p.p.), which amounts to a 40 percent risk reduction. These findings agree with the earlier descriptive evidence presented above. It seems that collectively agreed wage levels help workers to obtain wages above the SMW. The interpretation of other coefficients is intuitive. Workers with higher education and older workers (with more work experience) are less likely to be low paid. Women earn less than men and also have higher incidence by 2 percentage points of being low paid. Workers in firms with public ownership face lower risk of low pay (by 7 p.p.) and workers with temporary contracts or in part-time work have higher risk of low pay (by 3 and 4 p.p. respectively).

Table 3 The incidence of low pay earnings

|  | Coefficient | SE |
|---|---|---|
| CBA | -0.0545*** | 0.0019 |
| Edu lower secondary | (ref) | . |
| Edu upper secondary | -0.0590*** | 0.0005 |
| Edu bachelor | -0.1208*** | 0.0007 |
| Edu master/doctoral | -0.1366*** | 0.0007 |
| Age 20-29 | (ref) | |
| Age 30-39 | -0.0045*** | 0.0004 |
| Age 40-49 | -0.0087*** | 0.0004 |
| Age 50-59 | -0.0083*** | 0.0005 |
| Female | 0.0185*** | 0.0003 |
| Firm with public ownership | -0.0717*** | 0.0016 |
| Temporary contract | 0.0301*** | 0.0004 |
| Part-time contract | 0.0387*** | 0.0006 |
| N | 2,565,306 | |
| Number of groups | 181,698 | |
| Number of countries | 17 | |
| var(_cons[id_entreprise]) | 0.0554*** | 0.0002319 |

Source: Own elaboration based on SES (2018)

*Note: Dependent variable is dichotomous variable identifying workers earnings between 100 and 110% of SMW. Estimates are from the linear probability multilevel random intercept models in which employees (level 1) are nested in enterprises (level 2) which are nested in their country (level 3). The reference category constitutes a male, of age 20-29, with lower secondary or primary education, employed by private company, with permanent contract and full-time employment. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1*

## Sensitivity of our findings to the definition of low pay workers

We test the robustness of our results to the definition of a low pay worker. In the baseline model, the dependent variable identifies workers with earnings between 100% and 110% of minimum wage. We replicate the baseline model increasing the threshold to 120, 140, 160, and 180 percent of SMW. Figure 2 shows the coefficients on CBA variable from these estimations (see Table A1 in the Appendix for full estimates). The collective wage reduces the risk of low pay even more up to the threshold of 160 and the effect declines afterwards. Results imply that our baseline analysis provides

rather conservative estimate. We continue the analysis by using the threshold of 110% of SMW to define low pay workers.
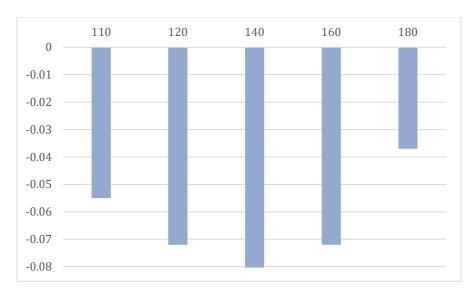
Figure 2 The impact of CBA on low pay for different thresholds defining low pay workers



Source: Own elaboration based on SES (2018)

*Note: Plotted are coefficients on CBA variable from models with dependent variable defined with different threshold of low pay workers.*

Figure 3 The marginal effect of collective bargaining on the incidence of low pay for different values of Kaitz index
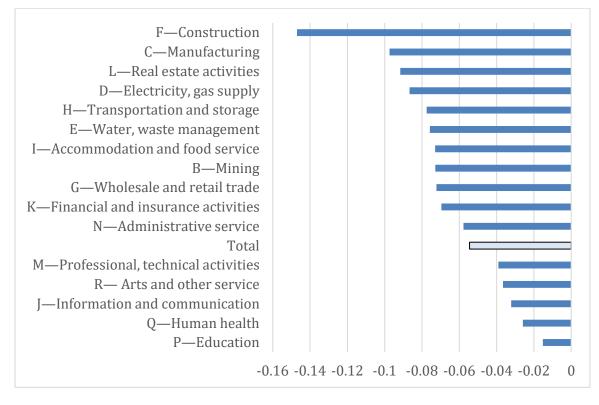


*Source: Own elaboration based on SES (2018)*

*Note: Predictions are based on the estimation of baseline model (see note to Table 1) with added interaction term between coverage bargaining and Kaitz index. 95% confidence intervals are shown.*

## Impact of Kaitz index

Next we examine the impact of collective wage bargaining in countries with different ratio of SMW relative to the median wage (Kaitz index). According to the crowding out thesis, which holds that SMW disincentivise employers from bargaining higher wages, the collectively bargained wage grid may be particularly difficult to sustain over SMW in countries that have SMW closer to the median wage. To test for this we introduce the interaction term between collective bargaining and Kaitz index in the baseline specification. Figure 3 shows the calculated marginal effect of collective bargaining for different values of Kaitz index with 95% confidence intervals. Kaitz index is observed in the range from 40 to 60 among EU countries. In contrast to our expectations the collective wage bargaining is eight times more efficient in countries with high Kaitz index in comparison with countries with low Kaitz index. It thus follows that countries with high SMW also operate an efficient system of collective bargaining that helps workers to sustain their wages above minimum wage levels.

Figure 4 Coefficients on CBA variable for different sectors



*Source: Own elaboration based on SES (2018)*

*Note: Presented are estimates on CBA variable obtained from models estimated separately for each sector (see note in Table 3). All estimates are confirmed significant at 1% level.*

## Sector differences in the impact of collective bargaining

The variety in wage fixing practices both across and within countries provides an opportunity to test for the impact of working in a firm covered by a CBA between sectors. We estimate the equation (1) separately per subsample of workers in the 16 economic sectors included in the study. Figure 4 shows the estimates on CBA coefficient obtained from separate models. Estimates in all sectors are confirmed significant at 1% level. The magnitude of coefficient is lowest in education and health sector and reaches the highest values in construction and manufacturing sectors. The contribution of collective bargaining is weaker in sectors employing high-skilled workers such as information and communication and professional, scientific and technical activities sectors, which is unsurprising given chosen threshold of 110% of the minimum wage.

## Impact of sector characteristics

Collective bargaining practices differ substantially between sectors. Therefore, we test how the impact of CBA on low pay differs with the sector characteristics. The effect of collective bargaining can differ in sectors with dominant female or tertiary educated workforce. Some sectors are male-dominated (e.g. Construction, Mining, Transportation, Utilities & Waste Management) and others female-dominated (e.g. Education, Finance, Health). Manufacturing and professional activities sectors have the lowest and highest share of tertiary educated workers respectively. In addition we examine the interaction of individual coverage and the overall sector coverage. Specifically differences in sector coverage are extremely large between countries. Table 4 previews sectoral differences between 17 EU countries.
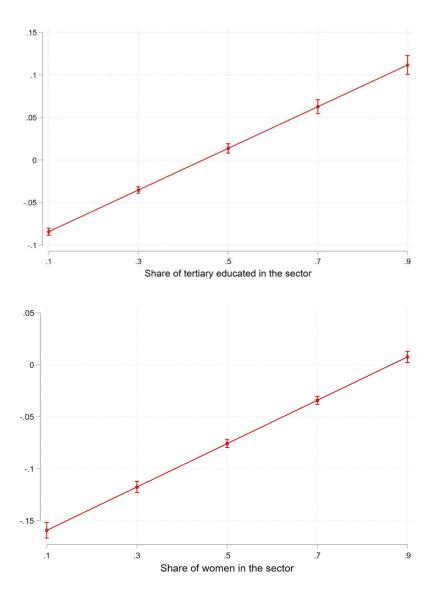
Table 4 Sectoral differences in the characteristics of workforce between 17 EU countries

|  | Female workforce | | Tertiary education workforce | | CBA coverage | |
| --- | --- | --- | --- | --- | --- | --- |
|  | min | max | min | max | min | max |
| B—Mining | 0.10 | 0.87 | 0.00 | 0.27 | 0.00 | 1.00 |
| C—Manufacturing | 0.32 | 0.64 | 0.04 | 0.27 | 0.02 | 1.00 |
| D—Electricity, gas supply | 0.00 | 0.56 | 0.00 | 0.64 | 0.16 | 1.00 |
| E—Water, waste management | 0.17 | 0.39 | 0.04 | 0.27 | 0.04 | 1.00 |
| F—Construction | 0.08 | 0.48 | 0.04 | 0.20 | 0.01 | 1.00 |
| G—Wholesale and retail trade | 0.48 | 0.78 | 0.04 | 0.28 | 0.04 | 1.00 |
| H—Transportation and storage | 0.14 | 0.51 | 0.04 | 0.24 | 0.17 | 1.00 |
| I—Accommodation and food service | 0.36 | 0.81 | 0.03 | 0.23 | 0.01 | 1.00 |
| J—Information and communication | 0.34 | 0.60 | 0.25 | 0.73 | 0.01 | 1.00 |
| K—Financial and insurance activities | 0.52 | 0.87 | 0.16 | 0.71 | 0.00 | 1.00 |
| L—Real estate activities | 0.48 | 0.66 | 0.06 | 0.46 | 0.00 | 1.00 |
| M—Professional, technical activities | 0.49 | 0.69 | 0.19 | 0.71 | 0.01 | 1.00 |
| N—Administrative service | 0.33 | 0.68 | 0.03 | 0.32 | 0.05 | 1.00 |
| P—Education | 0.58 | 0.89 | 0.12 | 0.84 | 0.00 | 1.00 |
| Q—Human health | 0.60 | 0.91 | 0.09 | 0.47 | 0.00 | 1.00 |
| R— Arts and other service | 0.47 | 0.76 | 0.14 | 0.47 | 0.01 | 1.00 |
| Total | 0.00 | 0.91 | 0.00 | 0.84 | 0.00 | 1.00 |

Source: Own elaboration based on SES (2018)

Figure 5 presents the calculated marginal effect of collective bargaining for sectors with different proportions of female and tertiary educated workers. It follows that the impact of collective bargaining is higher in sectors with dominant low-skill workforce and male dominated sectors. Figure 6 shows that the coverage of workers is more beneficial to prevent the risk of low pay in sectors with a lower proportion of workers covered by CBA. This suggests that firms who bargain collectively in a context where this is uncommon, offer a substantially better deal to workers earning below the median wage.

Figure 5 The marginal effect of collective bargaining on the incidence of low pay for different sector characteristics



*Source: Own elaboration based on SES (2018)*

*Note: Interaction term between CBA and sector characteristics (share of women and share of tertiary educated workers) is added to baseline specification (see note to Table 1).*
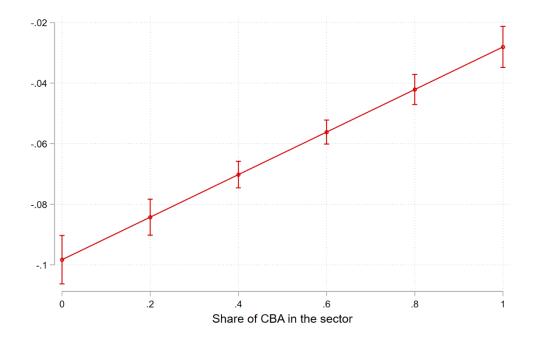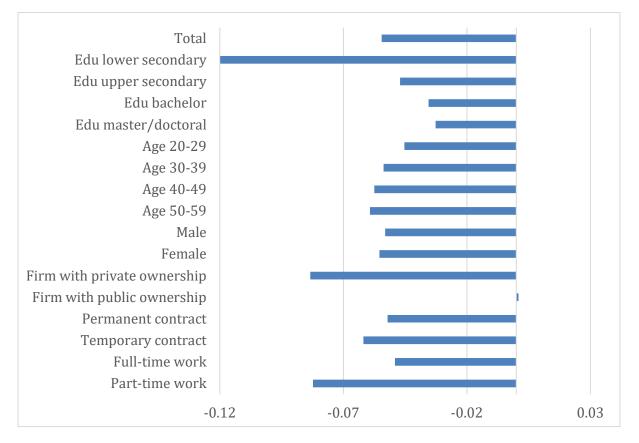
Figure 6 The marginal effect of collective bargaining on the incidence of low pay in sectors with different bargaining coverage



*Source: Own elaboration based on SES (2018)*

*Note: Interaction term between CBA and sector characteristics (the share of workers covered by CBA in the sector) is added to baseline specification (see note to Table 1).*

## Heterogenous impact of collective bargaining

Finally we examine the heterogenous effects of collective wage bargaining on the probability of being low paid. To this aim we augment the baseline specification with the interaction terms between coverage and characteristics of workers (education, age, gender) and the parameters of their job (firm ownership, type of contract). Estimates on CBA variable from separate models with interaction terms are presented in Figure 7. The impact of collective wage bargaining on wage levels is higher for workers with lowest education attainment, older workers, those employed in private firms, and workers with temporary contracts or with part-time work.

Figure 7 Coefficients on CBA variable calculated for different group of workers



Source: Own elaboration based on SES (2018)

*Note: Separate models are estimated by adding interaction terms between coverage and characteristics of workers (education, age, gender) and parameters of their job (firm ownership, type of contract) to baseline specification (see note to Table 3).*

## Conclusion and discussions

This working paper, developed for the BARWAGE project (European Union social dialogue grant 101052319), aimed to measure the extent to which collective wage bargaining is able to set wages above the SMW across 16 sectors in 17 EU member states. In so doing, it contributes to an ongoing academic debate about the interplay between SMW and collective bargaining.

We contrasted the crowding out hypothesis and the reinforcement thesis. The former argues that employers will be disincentivized to negotiate wage floors above the SMW, because the SMW serves as a legitimized wage floor. The perfect substitution thesis expects the same disincentivizing effect for trade unions, because they reorient their focus to defending the wages of higher-earning members. We posited that if the SMW effectively crowds out collective wage bargaining, low skill workers' wages would be expected to cluster around the amount of the SMW. Whether workers are employed in a firm that is or is not covered by a collective agreement should, in that case, not affect their probability of earning between 100%-110% of the SMW (H1).

The reinforcement thesis, on the other hand, argues that collective bargaining will restore existing wage differentials when the SMW is uprated, thus enlarging the 'ripple effect' of the SMW. Both employers and trade unions seek to maintain wage inequalities in a given firm's pay system, which have been legitimized by arguments around returns to education, greater skill and effort. Trade union members will pressure their representatives to raise pay rates by at least the same amount as the SMW to avoid the label of 'minimum wage worker'. We hypothesized that if collective wage bargaining reinforces the effect of the SMW on earnings, low skill workers' wages would be expected to cluster around the amount of the minimum wage to a smaller extent when workplaces are covered by collective wage bargaining, compared to those that are not. Employment in a firm covered by a collective agreement, should therefore reduce the probability of being paid between 100% and 110% of the SMW (H2).

Using the 2018 Structure of Earnings Survey (SES), linked with data on SMW from the WageIndicator Foundation, our primary conclusion is that working in a firm that is covered by a collective agreement on pay does reduce the probability of earning between 100%-110% of the SMW. This result is replicated when moving the threshold up to 180% of the SMW, lending credence to the argument that collective wage bargaining reinforced the ripple effect of the SMW. Hence, the reinforcement thesis is supported.

However, our study does suggest that there are differences in the efficiency of collective bargaining in reducing the risk of low pay across groups of workers, sectors, and countries. The protective effect of collective bargaining was particularly large in the construction, manufacturing, real estate, transportation and utility & waste management sector, where being employed in a firm covered by a CBA reduced the risk of being low paid by more than eight percentage points. It suggests that policy makers and social partners aiming to achieve adequate wages, might prioritize theses sectors in countries where they are lagging behind in terms of collective bargaining coverage. An interesting question for future research in this area, is whether the larger effect in these sectors is a consequence of the relatively high share of low wage workers in these sectors, or whether it reflects a larger priority for improving the wages of low paid workers among trade unionists and employers in these sectors.

Our results further suggest that the protective effect of collective wage bargaining is largest in sectors with a relatively small share of tertiary educated workers and that are relatively male dominated. Marginal effects show that there is no significant protective effect of collective bargaining in sectors where over 90% of employees are female, and that the risk of earning low pay is even enhanced by collective bargaining in sectors where over half of employees have a tertiary education degree. The lower efficiency in more female dominated sectors is troubling, both because of the overrepresentation of women among minimum wage workers, and in light of the literature on equality bargaining (Cronert & Forsén, 2023; Moore & Tailby, 2015).

Finally, we found no evidence that setting the SMW at a higher pay level (i.e., at higher Kaitz index values) reduced the impact of collective bargaining. On the contrary, the protective effect of employment in a firm covered by a CBA was larger in countries with a higher Kaitz index. This is good news for the EU Directive on adequate minimum wages, which introduces a target for SMW to be set at least at two thirds of the median wage.

We note several limitations. First, the SES database used in this study excludes micro-firms (0-9 employees) from its sampling frame. Any findings we report here, thus pertain to the effect of collective bargaining on the wages of employees in firms with 10 or more employees. About 45% of all EU workers are employed in such micro-firms (Eurostat, 2019). This thus leaves a large knowledge gap for future research, especially in light of the lower collective bargaining coverage among these firms. Moreover, we refrain from making causal claims based on our study, since the SES is a cross-sectional dataset.

Our study contributes makes both theoretical and empirical contributions to the debate about the interaction between SMW and collective wage bargaining. Empirically, we show that the ability of collective wage bargaining to reduce the risk of low pay, while acting as a protective factor in general, does differ in efficiency across sectors. Theoretically, our study deepens understanding of the complementarities between SMW and collective wage bargaining coverage by exploring sectoral differences. Furthermore, we contribute to the EU policy agenda by providing quantitative evidence for the de-facto potential of collective bargaining as a policy instrument for achieving decent wages in Europe, as well as estimating its added value compared to SMW rates.

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# Appendix

Table A1 The impact of CBA on low pay for different thresholds defining low pay workers

| Threshold | t110 | | t120 | | t140 | | t160 | | t180 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | b/se | | b/se | | b/se | | b/se | | b/se | |
| Collective pay agreement | -0.055 | *** | -0.072 | *** | -0.086 | *** | -0.072 | *** | -0.037 | *** |
| | (0.002) | | (0.002) | | (0.002) | | (0.002) | | (0.001) | |
| Edu upper secondary | -0.059 | *** | -0.088 | *** | -0.111 | *** | -0.101 | *** | -0.077 | *** |
| | (0.000) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Edu bachelor | -0.121 | *** | -0.185 | *** | -0.273 | *** | -0.261 | *** | -0.176 | *** |
| | (0.001) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Edu master/doctoral | -0.137 | *** | -0.22 | *** | -0.322 | *** | -0.32 | *** | -0.238 | *** |
| | (0.001) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Age 30-39 | -0.005 | *** | -0.011 | *** | -0.016 | *** | -0.02 | *** | -0.011 | *** |
| | (0.000) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Age 40-49 | -0.009 | *** | -0.019 | *** | -0.026 | *** | -0.029 | *** | -0.019 | *** |
| | (0.000) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Age 50-59 | -0.008 | *** | -0.017 | *** | -0.017 | *** | -0.017 | *** | -0.008 | *** |
| | (0.000) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Female | 0.018 | *** | 0.036 | *** | 0.063 | *** | 0.082 | *** | 0.078 | *** |
| | (0.000) | | (0.000) | | (0.001) | | (0.001) | | (0.001) | |
| Firm with public ownership | -0.072 | *** | -0.071 | *** | -0.052 | *** | -0.008 | *** | -0.003 | *** |
| | (0.002) | | (0.002) | | (0.002) | | (0.002) | | (0.001) | |
| Temporary contract | 0.03 | *** | 0.046 | *** | 0.079 | *** | 0.093 | *** | 0.088 | *** |
| | (0.000) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| Part-time contract | 0.039 | *** | 0.058 | *** | 0.095 | *** | 0.072 | *** | 0.053 | *** |
| | (0.001) | | (0.001) | | (0.001) | | (0.001) | | (0.001) | |
| N | 2565306 | | 2565306 | | 2565306 | | 2565306 | | 2565306 | |

Source: Own elaboration based on SES (2018)

Note: Plotted are coefficients on CBA variable from models with dependent variable defined with different threshold of low pay workers.