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Low-wage employment in Central and Eastern European Member States

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INTRODUCTION

Developed countries have experienced a rise in wage and income inequality in recent decades (Blanchet et al., 2021; Dreger et al., 2015; Organisation for Economic Co-operation and Development (OECD), 2018). One significant aspect of this inequality is the growing number of employees earning low wages, which has become a pressing concern. In the literature, the term low wages, often referred to as low pay, usually refers to earning less than two-thirds of the national median wage.[1] Working for a low wage may have serious negative consequences for individuals and for society at large.

Central and Eastern European (CEE) countries generally have lower average wages than their Western European (WE) counterparts, despite the ongoing economic convergence. The growth in wages that started in the 1990s slowed after the 2008/2009 recession, affecting both CEE and Mediterranean countries significantly.[2] However, CEE countries managed to recover and return to wage convergence. Nevertheless, by 2022, the average wage in CEE countries was only about 69% of that in WE.[3] The share of the overall economic output going to employees' wages has consistently been lower in CEE than in WE countries (Večerník and Mysíková, 2018). Wage inequality within countries is also a concern, with CEE countries experiencing higher wage inequality[4] and a larger proportion of employees earning low wages. Over time, the incidence of low wages in CEE countries has been higher than the WE average, although that gap has reduced somewhat. According to 2018 Structure of Earnings Survey (SES) data, about 19% of workers in CEE countries earned low wages, compared to 11% in WE.[5] More recent data from Eurostat are not available, but OECD figures from 2020 do suggest that the trend has continued, with CEE countries having around 21% of workers in low-wage jobs, compared to 9% in WE.[6]

As the overall wages vary between CEE and WE, there could be systematic variations in the patterns and causes of low-paid employment in these regions. Comprehensively addressing the issue of persistent low-paid work as a potential contributor to increasing inequality necessitates understanding the

[1] The terms 'low pay' and 'low wage' are used interchangeably in the text.
[2] The main focus of this study is the CEE region. For more details on wage convergence in Southern Europe and in the EU as a whole, see, for example, Eurofound (2020) and (2021).
[3] In purchasing power standards (PPS) (Annual Macro-economic (AMECO) database of the European Commission's Directorate General for Economic and Financial Affairs, variable 'Nominal compensation per employee relative to EU-27'. The variable includes not only wages and salaries but also employers' social contributions.) Data on average wages in EU countries are not available from Eurostat.
[4] The largest disparities between CEE and WE were recorded between higher wages and lowest, first wage decile. In 2020, the ratio of the ninth to the first wage decile reached 2.84 in WE and 3.7 in CEE, while the ratio of the fifth to the first decile reached 1.51 in WE and 1.78 in CEE. The disparities between median and higher wages were not as pronounced (OECD (2021), Decile ratios of gross earnings).
[5] Eurostat (2018). SES.
[6] OECD (2021), Decile ratios of gross earnings. The definition of low wage work in terms of low-wage threshold set to two-thirds of the national median is similar in both data sources. Nevertheless, OECD data only refer to full-time employees and are mostly based on weekly or monthly average wages. In contrast, Eurostat works with hourly wages and considers part-timers as well.

complex relationship between individual workers' and household characteristics, and the specific macroeconomic and institutional conditions of countries.

A crucial aspect to consider when looking at the effects of low pay on individuals and on society, is whether it is a temporary situation or a more permanent state in people's working lives. If low pay is a short-lived phase that acts as a stepping stone to higher-paying opportunities, it may not pose as much of a problem. However, if individuals remain stuck in low-paid jobs for extended periods, it can lead to significant issues. Low wages could indicate lower productivity to potential employers, and having a low-paid job might result in a decline in skills and expertise. Consequently, working in such positions can harm future job prospects due to these so-called 'scarring' effects (Schnabel, 2021).

Research indicates that while some low-wage workers achieve upward mobility (Cai, 2014; Fok et al., 2015), this tends to be rather constrained. For specific groups of workers, working in low-paid jobs can become a persistent situation (Clark and Kanellopoulos, 2013). Mason and Salverda (2010) have referred to these types of jobs as 'sticky jobs', given their enduring nature. Past studies have shown that the persistence of low pay may be substantial in both individual countries and cross-country frameworks. However, these studies vary in their methods of assessing the influence of personal characteristics or job-related factors. Research on the persistence of low pay has mainly focused on WE countries, with only limited investigation in CEE.

The transition from low-paying to higher-paying jobs can be influenced by overall labour market conditions, labour policies, and economic and structural factors in a country (Schnabel, 2021). Differences in the incidence of low-wage employment across countries can also be partly attributed to the institutional aspects of their labour markets (Applebaum et al., 2010; Lucifora et al., 2005). Institutional setups vary in CEE and WE, and these differences shape labour market outcomes (Fialová and Schneider, 2009). However, the influence of labour market institutions and other factors on low-paid work, and its persistence in the context of CEE countries, has yet to be a main research focus.

More recently, the potential negative outcomes of low pay may have been intensified by the effects of technology-driven changes favouring specific skills (e.g. digitalisation causing wage polarisation) and the outsourcing of low-skilled jobs due to globalisation (Dreger et al., 2015). The COVID-19 pandemic brought new challenges, hitting low-wage workers hard (Eurofound, 2023), as they were more likely to lose jobs and income than their higher-paid counterparts (Witteveen and Velthorst, 2020). Additionally, the elevated inflation from 2021 decreased living standards for all income groups, with low-wage earners feeling the impact particularly strongly (International Labour Organization (ILO), 2022). Generally, both the COVID-19 impact[7] and inflation rates[8] were higher in CEE countries than in WE. The Russian aggression in Ukraine caused a significant inflow of Ukrainian migrants into CEE, which could theoretically influence the low-paid labour market. At least temporarily, this migration

[7] Varied across Member States (Bohle et al., 2022).
[8] 2022 annual average rate of change in Harmonised Index of Consumer Prices (HICP) was 13.1% in CEE and 8.5% in WE (Eurostat [PRC_HICP_AIND]).

could increase the labour supply in low-paid sectors, due to language and administrative barriers for higher-paid jobs (Leontiyeva, 2014), although these barriers were reduced by the application of the Temporary Protection Directive (2001/55/EC). The increased labour supply could potentially limit wage growth or even lead to lower wages, but as yet there is no empirical evidence for such effects.

This research note offers a comprehensive view of low-wage employment. It investigates the nature and extent of low-pay persistence in European countries, using longitudinal data from the European Union Statistics on Income and Living Conditions (EU-SILC) spanning 2004 to 2019. The study focuses on the overall EU situation while highlighting differences between CEE and WE countries. It contributes to the limited research on low-wage employment in CEE countries, shedding light on the characteristics of low-wage populations across Europe and adding value for shaping social policies to tackle poverty and in-work poverty. It examines the institutional and macroeconomic factors that contribute to the incidence and persistence of low pay. Understanding the identity of low-wage earners and the drivers of low pay is pivotal in developing strategies to raise wages. The latest EU-SILC data only covers wage information to 2019, impeding a direct analysis of recent trends such as increasing energy costs, high inflation, the Ukraine conflict and related migration, digital and green transition, or the long-term impacts of the COVID-19 pandemic.

The research note first presents a review of the literature on low-pay persistence and determination of income inequality and low pay. The definition and measurement of low pay and the approach used are then discussed, together with the data employed. Following this, the main characteristics of low-wage employment in European countries, low-pay incidence and its transition probabilities are described, with a focus on differences between CEE and WE countries. The results are presented, following an outline of the methodological background for the model estimations. The final section concludes and discusses the results in light of recent policy issues.

LITERATURE REVIEW

Working in a low-paid job can lead to negative outcomes for both individuals and society. At the individual level, low pay may have similar effects on future job opportunities as unemployment, increasing both the risk of unemployment (Stewart, 2007) and inactivity (Stewart and Swafield, 1999, Fok et al., 2015). This implies that working in low-paying jobs might not effectively help people to escape poverty; rather, they might get 'stuck' in these jobs, leading to long-term poverty and in-work poverty (Clark and Kanellopoulos, 2013; Cooke and Lawton, 2008; Maitre et al., 2012). Low-pay persistence may even extend to future generations (Gregg et al., 2019). Working for a low wage may have a close relationship to increasing household indebtedness (Rajl, 2019) and, ultimately, lead to a rising share of debtors losing their homes or possessions. Low pay may increase workers' disincentives to work (OECD, 2005) as well as increasing incentives to join (at least partially) the shadow sector to avoid taxes and thus increase net wages. Involvement in the shadow economy may further deteriorate the working and living conditions of workers. Low-paid jobs might also push individuals to consider migration for better opportunities elsewhere.[9] While some low-paid workers might be motivated to improve their skills through education and training, low-wage jobs often provide limited opportunities to develop skills by investing in training or education, which may further reduce future wage growth prospects (Burdett and Smith, 2002; OECD, 2017). Finally, working for low pay can have negative consequences for individual well-being or subjective poverty (Clark et al., 2008).

The potential adverse consequences of low pay on individuals' incomes can be lessened by tax and benefits systems. Lower taxes on low incomes and support programmes targeting those with the lowest earnings can decrease income inequality. This approach has been successful in reducing inequality across Europe (Inchauste and Karver, 2018) and may mitigate the negative impact of low pay on incentives to work or worker well-being. This might also help to address the potential adverse effects of low pay on broader societal outcomes.

At societal level, growing income inequalities (where more low-paid workers have limited prospects for future earnings growth) can pose significant challenges to social cohesion and political stability

[9] Economic integration of CEE countries into the EU brought with it two factors that had a significant impact on wage growth: the inflow of foreign direct investment (FDI) and the possibility of labour migration to Western countries (Galgóczi, 2013). Galgóczi (2017) analysed the impact of FDI and showed that firms where investment flowed tended to have higher productivity. The migration channel also played a role. Highly skilled workers had a strong incentive to look for better-paid jobs abroad, which in many occupations caused a reduction in labour supply in CEE countries, leading to wage growth for these occupations (see Zaiceva, 2014). Holland et al. (2011) pointed out that labour outflows from Czechia, Hungary and Poland were heavily skewed in favour of highly skilled occupations, which was not the case for other countries in the region. The authors estimated that in 2009 this factor led to a real wage growth of 0.44% in Czechia, 2.73% in Poland and 0.68% in Hungary, with a slightly lower long-run effect. Atoyan et al. (2016) drew a similar conclusion on the positive effect of emigration from CEE countries on wage growth. They showed that an increase in opportunities to work abroad generally raised the reservation wage (the lowest wage at which one is willing to accept a job offer and start working) in the short term. A higher reservation wage then increased workers' bargaining power and wage prospects.

(van de Werfhorst et al., 2012). Where income inequalities are large, a significant portion of the population might not feel they are benefiting fairly from social and economic progress. Likewise, persistent low pay might signal unequal opportunities, which adds to concerns about fairness.[10] These factors can shape how workers see their economic and political status (Kreidl, 2000) and influence their political attitudes (Simpson and Loveless, 2017), potentially increasing the risks of social and political tensions (Nolan et al., 2013).

Excessive income inequalities, including the rise of low-wage employment, can have various negative economic outcomes. These include labour market segmentation, influencing how economic growth affects poverty reduction (Ravallion, 2004), or how income inequality impacts economic growth and sustainability (Ostry et al., 2014). At individual level, it could affect people's decisions about their education and career, potentially leading to less investment in skills and lower productivity (Stiglitz, 2012). More broadly, income inequality could result in the misallocation of resources, nepotism, and corruption (Uslaner, 2015), or it might decrease overall demand and economic growth because wealthier individuals tend to save more of their income compared to those with lower incomes (Dabla-Norris et al., 2015). Conversely, the incidence of low-wage jobs can be influenced by broader economic trends. When the economy slows and unemployment rises, more people may be pushed into accepting lower-paying jobs due to limited job opportunities (ILO, 2023).[11] Additionally, overall wage inequality tends to be pro-cyclical (Dreger et al., 2015).

Gaining a deeper understanding of the nature of low-wage employment necessitates understanding the degree to which the low pay reflects specific qualities of workers, whether observable or unobservable, that make them more likely to end up in low-paying jobs, and the degree to which working in a low-paying job itself increases the chance of staying in such a role. The former relates to differences between individuals, while the latter relates to state dependence and the influence of past experience in a low-paying job on future employment. Both the incidence and persistence of low pay are influenced by the characteristics of individual workers and their jobs, along with broader institutional and economic factors.

Research has consistently identified a significant degree of persistence in low-wage employment, both in studies focusing on particular countries and in cross-country frameworks (e.g. Bazen, 2001; Vieira, 2005; Cuesta, 2008; Stewart and Swaffield, 1999). However, the studies differ in the relative importance attributed to personal or job-related determinants. Cappellari (2000) found significant state dependence in low pay using Italian data and highlighted the importance of job-related factors in reducing low-pay inflow. Sloane and Theodossiou (1998) reported that individual characteristics such as age, education, and marital status explained differences in low-pay persistence in Britain, but job-related factors also played a role. Mosthaf et al. (2011) confirmed substantial low-pay persistence in

[10] The recently agreed Directive on adequate minimum wages (based on Principle 6 of the European Pillar of Social Rights) aims to promote the 'adequacy' of minimum wages potentially impacting low wages in general, with adequacy having two dimensions: decent standards of living and fairness.

[11] Low-pay dynamics and unemployment trends were significantly correlated in Czechia in 2004-2017 (Fialová, 2022).

Germany and revealed that upward wage mobility was higher for younger, higher-educated, male low-wage earners. Silva et al. (2018) examined Portuguese data and found that older, less well-educated women workers tend to stay longer in low pay jobs, with the size of the company and regional effects also proving important drivers.

Clark and Kanellopoulos (2013) conducted a cross-national analysis of European Community Household Panel (ECHP) data for 12 WE countries between 1994 and 2001 to estimate the extent of state dependence in low-paid jobs for male workers. They found statistically significant positive state dependence in all countries, albeit varying in magnitude. The authors did not offer a simple explanation for this variation, instead attributing it to differential unemployment dynamics between countries, or institutional differences. In CEE countries, Kiersztyn (2015) analysed long-term development in the persistence of low wages in Poland between 1988 and 2013, concluding that the experience of low-paid employment increased the likelihood of being low-paid five years later, even after controlling for the characteristics of workers and the effects of economic development. Fialová (2022) studied low-pay persistence in Czechia between 2004 and 2017 and concluded that low pay exhibited a significant degree of state dependence. In addition, the most important individual-level factors predisposing workers to work and get stuck in a low-paid job were low education and being female.[12]

Lucifora et al. (2005) showed that the composition of low-wage employment differed less between countries than the general level of low-wage employment. This finding was valid across different data sources, possibly suggesting that personal characteristics may have a minor role in explaining the differences in low-wage employment between countries. Pavlopoulos et al. (2010) concluded that multiple indicators must be taken into account to explain patterns in wage mobility, reflecting institutional framework, macroeconomic background, and socio-cultural factors.

Apart from personal attributes and characteristics of employers, the national institutional context plays a role in shaping the incidence of low-paid employment, wage mobility and persistence of low pay.[13] The institutional framework can have a range of direct and indirect effects on the labour market. Depending on the theoretical framework used, institutions can be expected to increase, decrease, or leave unchanged the efficiency of labour markets (Fialová and Schneider, 2009; Drahokoupil and Piasna, 2017). For instance, they may change total productivity and decrease wage mobility by reducing job mobility and labour market inflows (Lazear, 1990) due to safeguarding employment and wages of

[12] Bachmann et al. (2016) examined wage inequality and mobility in Europe between 2004 and 2011. They found that earnings persistence was higher in both tails of the distribution, compared to the middle. However, they did not provide detailed estimates of earnings persistence in CEE countries, despite reporting substantial cross-country differences in wage mobility. This finding was confirmed by Pavlopoulos et al. (2010), who identified a U-shaped pattern in wage mobility in European countries in ECHP data for 1994-2001, with a large low-wage persistence in all countries, and by Cappelari (2000), who found a low level of mobility in the lower bottom of the wage distribution in Italy.

[13] Country-specific macroeconomic and social factors may also be important (Dreger et al., 2015; Pavlopoulos et al., 2010). Lucifora et al. (2005) stressed the role of industrial structure of the economy, notably the effect of specific industries more prone to employing low-wage earners.

labour market 'insiders'. At the same time, some institutions may improve market outcomes by moving markets closer to optimum, for instance, centralised collective bargaining on wages (e.g. Teulings and Hartog, 1998).

Generally, the coverage of trade union organisation and collective bargaining practices are essential features of wage determination in European countries and can, to some extent, influence wage levels, inequality and the incidence of low-paid work (Lucifora et al., 2005; Appelbaum et al., 2010; Bosch et al., 2010). Similarly, employment protection legislation may influence wage mobility: A low level of employment protection may represent fewer barriers to job changes and ease transitions from one job to another, with wage mobility more likely than in a country with stricter employment protection (Pavlopoulos et al., 2010).

Statutory minimum wages and the generosity of unemployment benefits and other social policies may impact the lower-tail of the wage distribution, as well as motivation of individuals to work in low-paid jobs. The minimum wage can have a positive effect on the wages of the lowest paid workers (OECD, 2004), but its effect on the incidence of low pay may be generally limited, as the threshold defining low earnings often lies well above the minimum wage (see, for example, Bain et al., 2014, for the UK). Thus, the minimum wage can lead to a reduction in extremely low wages, while higher wages may be affected through indirect spill-overs (Gramlich 1976; Lopresti and Mumford 2016). Higher wages can also be positively influenced through an increase in demand for more skilled workers or through upward pressure on wages to sustain the motivation role of wage differentials reflecting differences in skills, productivity, seniority, etc. (ILO, 2010). The minimum wage can have a significant impact on the decline in low-wage work if it is set close to the threshold defined for low wages (Bosch et al., 2010; Mason and Salverda, 2010).

Schmitt (2012) showed that higher public social spending as a share of a country's Gross Domestic Product (GDP) is strongly negatively correlated with the share of employees working for low wages. This may be because a more generous welfare system forces employers to set wages high enough to compete with welfare benefits, or because stronger unions have a positive effect on the level of public social spending, while also influencing low-wage employment by extending the scope of union agreements to low-wage workers who are not union members. Similarly, high net replacement rates in unemployment may increase reservation wages of workers and increase the wages in the lower part of the distribution, reducing the extent of low-wage employment (Gautié et al., 2010).

There is a long tradition of empirical research on the effect of labour market institutions on low-paid employment. Blau and Kahn (1996), after accounting for differences in variety of worker characteristics, concluded that institutional factors played an important role in explaining the differences in low-wage employment across countries. OECD (1996) showed that institutional factors significantly affected the extent of low-wage work in national economies. The study considered the role of union organisation and collective bargaining coverage as one of the most important factors in altering the wage distribution and incidence of low pay by reducing wage dispersion. Similarly, Lucifora (1999)

concluded that variety in countries' labour market institutional settings may explain a large part of the difference in low-pay patterns across countries: while high union density reduced wage dispersion in the lower-tail of the wage distribution, generous social policies and minimum wages each appeared less effective. Pavlopoulos et al. (2010) showed that wage-setting institutions such as collective bargaining and employment protection regulation, together with macroeconomic factors, explained a substantial part of the cross-country variation in workers' wage mobility. The authors emphasised that wage mobility at country level was a very complex phenomenon, with many underlying factors. Chief among these, they noted, was the characteristics of particular country (rather than common trends in structural factors), pointing to the importance of not only institutional, but also socioeconomic and cultural factors.

Many other studies have confirmed the significant effect of wage regulations on low wage employment (DiNardo et al., 1996; Dreger et al., 2015; Fortin and Lemieux, 1997; Lucifora, 1999; Teulings and Hartog, 1998). Applebaum et al. (2010) suggested that while long-term structural factors may not explain international differences in the incidence of low-wage employment, inclusive labour market institutions – especially formal institutions but also partly informal institutions – were the main factors that could affect the share of workers working for low wages. These labour market institutions included collective bargaining and unionisation, minimum wage and employment protection legislation, active labour market policy (ALMP) programmes and social benefit systems for those with low or no wages (Bosch, et al., 2010). Transitions from low-paid to higher-paid jobs may be also influenced by the overall state of the labour market and labour market policies (Schnabel, 2021). Using ECHP data on European countries between 1994 and 2001, Sologon and O'Donoghue (2011) showed that less regulated, more flexible labour markets tended to have higher earnings mobility. The authors suggested a negative relationship between the earnings inequality and mobility (mirroring the results of Clark and Kanellopoulos (2013)), indicating that escaping low pay appeared more difficult in countries with a relatively large share of low-paid workers.

LOW-PAY MEASUREMENT AND DATA

The definition of low-wage work is not uniform in the literature.[14] In general, three main ways are used to define low-paid work, each with its own advantages and limitations. The three major measures are:

(i) Absolute wage level, derived from estimations of the minimum income that a household requires to avoid relative income poverty. This approach is often used to highlight the link between poverty and working for low wages (e.g. Millar and Gardiner, 2004; Cooke and Lawton, 2008). However, the variation of the measure over time and between countries makes comparisons difficult.

(ii) Relative wage threshold as a percentage of the average or median wage in the national economy. This approach is frequently used by organisations such as Eurostat or the OECD. It allows better international comparisons and considers both the social and economic aspects of relative income: companies make their investment and production decisions based on the relative price of individual production factors, while employees care about their relative income as a reflection of their social status. This definition raises the question of how to set the relative limit, including the base amount (median or average wage) and the sample of the working population (all employees, full-time employees, etc.).

(iii) A fixed share of employees in the distribution of income (e.g. the bottom 20% of employees). This definition is used less often (e.g. Sloane and Theodossiou, 1994; Clark and Kanellopoulos, 2013) and is mainly used to monitor the relative disadvantage of low-pay penalties between countries and over time. An underlying justification is that, given the incidence of low-skilled jobs across all countries, it is worth examining the variations in relative pay levels within the bottom 20% (or other amount) of employment (Grimshaw, 2011).

For each of these definitions, gross or net wages can be used. Gross earnings are most commonly used because they reflect the market evaluation of employee productivity and thus are close to a textbook definition of the price of labour. Wages can also be measured on an hourly or monthly basis.[15] Using a monthly (or weekly, or annual) wage is consistent with the idea of estimating a certain financial amount that covers basic needs.

A number of issues may arise with any of these definitions. However, this research note uses the second measure: the relative indicator of the share of employees working for a monthly gross wage lower than two-thirds of the national median[16] is used to measure the extent of low-paid work in baseline

[14] See, for example, Grimshaw (2011), Keese et al. (1998), or OECD (1996) for a detailed discussion of the properties of different low-wage measures.

[15] Hourly wage rate is preferred in order to eliminate the effect of variable working hours that is present in monthly or annual pay. It also enables straightforward analysis of part-time work.

[16] National medians were calculated from EU-SILC cross-sectional data files for each sample of respondents corresponding with various sample definitions in the analysis of longitudinal datasets.

estimations. Despite its apparent arbitrariness, the measure is in line with the approach of Eurostat or the OECD.[17] Alternative measures of low pay are used as robustness checks. Firstly, the threshold is modified to half of the sample median wage. Next, the low-paid population is defined as those workers earning wages within the first quartile (i.e. lowest 25%) and first three deciles (i.e. lowest 30%) of the wage distribution (third definition of low-wage employment).[18]

Longitudinal data on economic activity and wages are essential to studying low pay and its persistence. At micro level, the limited availability of internationally comparable data on individual incomes in CEE countries represents a significant obstacle to the analysis of low-paid work. Studies for WE countries often use the ECHP, the SES or the EU-SILC. The SES has several limitations for use in low-paid labour research: it omits the agricultural and public sectors, as well as small businesses with fewer than 10 employees, has no longitudinal component, and lacks information at household level. The ECHP ended in 2001 and did not cover many CEE countries. Lucifora et al. (2005) compared the low-wage employment data from these two sources (together with aggregate data from the OECD database) and found a substantial degree of variation. Significant differences occur at level of low-wage employment across European countries, as well as their rankings, and the differences go in both directions. The authors concluded that their '…comparisons provide a very strong health warning concerning the reliability of wage distribution data' (Lucifora et al., 2005, p. 264). This warning similarly extends to the data used here. Dreger et al. (2015) confirmed the existence of significant differences in information on wages from complementary datasets. They also showed that both in EU-SILC and SES data, inequality tends to be higher when measured in annual earnings than in hourly wages.

The data used in this research are derived from EU-SILC household surveys, which provide a detailed picture of the characteristics of low-paid employees. The data are unique in respect of the availability of both personal and household characteristics, as well as the cross-sectional and longitudinal components that are crucial for analysis of persistence in low pay. Data cover the 2004–2019 income period.[19]

EU-SILC is not a classical longitudinal dataset, but, rather, a four-year rotating panel, and the number of individual observations over time is limited. The dataset also has some limitations in terms of wage measurement (Iacovou et al., 2012; Jenkins and Van Kerm, 2014), which are typical of household surveys (Maitre et al., 2012; Bachmann et al., 2016). It is well-known that wages reported in household surveys are usually underestimated compared to data from surveys based on company records, which are commonly used for official wage statistics. However, this underestimation tends to increase with higher wages (Večerník and Mysíková, 2016). As a result, analyses related to poverty and low wages

[17] While Eurostat works with hourly wages, this research note uses monthly wages due to limitations in data.
[18] Use of a single European-wide absolute threshold (even accounting for differences in price levels and employing purchasing power parities) is problematic as it prevents comparison between countries, due to lasting large discrepancies in wage levels.
[19] Data used: Eurostat, cross-sectional EU-SILC—Cross UDB 2005–20, September 2022 version, and longitudinal EU-SILC—Long 2008–20, release 2, November 2022 version.

are subject to a lower statistical bias. To address the potential distortions resulting from these limitations, this research note adopts Engel and Schaffner's (2012) strategy for combining the different waves of EU-SILC data, deriving the monthly labour income and relating it to employment characteristics. Despite these limitations, the use of EU-SILC is appropriate for low-pay research as it is a data source in Eurostat's official calculation of poverty and inequality indicators.

The data present annual income variables and monthly economic activity during year *t,* while job characteristics and current economic activity relate to the survey collection time *t+1*. The data contain information on yearly gross wages in *t*; with gross monthly wages calculated according to the number of months worked in period *t.* Hourly wages are unavailable due to the lack of data on the number of hours actually worked. The wages of part-time workers are adjusted for number of hours worked to get their monthly wage equivalent of full-time work. For this purpose, the ratio of average hours worked by part-timers relative to average hours worked by full-timers for each country and year available in the Eurostat Labour Force Survey (EU-LFS) database is used.

For the panel model specification, the information for four consecutive years in the longitudinal datasets is used, i.e. there are four observations per individual.[20] However, once low-pay persistence is analysed, lagged variables are used, leaving three observations (transitions) per individual over the 2005-2019 period. The sample is limited to workers aged 20-64 years old.[21] Several sample definitions differing in coverage of full-time/part-time workers and workers with disruptions in their economic activity throughout *t* were constructed in order to eliminate potential biases in information on wages:[22]

- ***Full-time full-year employees.*** *Baseline sample.*
  The baseline case includes only those full-time workers who reported full-time (dependent) employment throughout the whole year *t* to ensure that low wages in monthly data coincide with low hourly pay rates (approach similar to that of OECD, 1996 and 2018). The information on wages should be most reliable in this sample, as there are no disruptions to economic activity throughout the year;
- ***Full-time and part-time full-year employees.*** *Robustness check sample.*
  Part-time workers who reported employment throughout the whole year *t* are added. The importance of covering part-timers in an analysis of low-wage employment was stressed (Lucifora et al., 2005) to account for their increasing role in the labour market. The wages of part-time workers are adjusted for number of hours worked to get their monthly wage equivalent of full-time work, enabling a similar analysis to full-time workers. However, analysis of part-time work experiences some limitations to data on wages because information on hours

[20] Only those individuals who were in each longitudinal dataset for all four periods were selected.
[21] Individuals who received any sickness benefits in period *t* were eliminated, as this biases the construction of their monthly wage variable. The analysis also excludes the self-employed population, whose wage rates are hard to measure in the data.
[22] Based on Maitre et al.'s (2012) analysis of EU-SILC data.

worked in each month of *t* is not available in individual EU-SILC data. Instead, the ratio of average hours worked by part-timers relative to average hours worked by full-timers for each country and year in the EU-LFS database is used. Nevertheless, this remains an approximation and wages of part-timers may be biased.[23] Using national average ratios of hours worked part-time/full-time aims to reduce the magnitude of this bias;

- ***All employees.*** *Robustness check sample.*
  Intermittent work is also added, along with workers (in full-time and part-time jobs) who have not reported being employed throughout all the months of *t.* This reflects that low-paid workers often move in a low-pay/no-pay cycle. However, any break in economic activity during the year (job changes, unemployment interruptions, etc.) may cause a bias in yearly data on wages. For workers with unstable careers, the biases in calculation of wages may be large (Engel and Schaffner, 2012). Accordingly, information on wages from this sample may be considered the least reliable.

Table 1 presents an overview of different selections of worker samples and definitions of low-wage employment applied to check the robustness of the estimations (see Table A.1 in the Appendix for sample sizes for different worker samples).

Table 1 Overview of baseline model and robustness checks: definitions of low wage and different samples of workers

Definitions of low-wage employment	
Baseline	**Employees working for a monthly gross wage lower than two-thirds of the national median wage**
Robustness checks	Employees working for a monthly gross wage lower than one-half of the national median wage
	Workers earning wages within the first quartile of the wage distribution
	Workers earning wages within the first three deciles of the wage distribution
Samples of workers	
Baseline	**Full-time full-year employees**
Robustness checks	Full-time and part-time full-year employees
	All employees

Longitudinal four-year weights are used for descriptive analyses of pooled longitudinal data to make the sub-samples representative of the longitudinal population of the year in which the rotational

[23] EU-SILC data does not offer information on reasons for part-time work, thus it is unclear whether workers' low/high wages result from low/high working hours, or whether a part-time job is voluntary. This research note does not seek to study the living standards, poverty or well-being of low-wage workers (which would necessarily be done at household level, taking into account structure and economic activity, etc.), but, rather, the low evaluation of their work reflected in low wage rates, as well as persistence in low-wage employment and its drivers.

group was first surveyed (Borst and Wirth, 2022).[24] However, weights are missing or set to zero in a significant number of cases across countries and years, introducing a non-random bias to the analysis (see Table A.2 in the Appendix). The data are analysed both with and without weights to compare the results.

Of the 27 EU Member States (EU-27) included in the EU-SILC database, this analysis does not cover Germany, Croatia, Ireland, and Malta, due to significant interruptions in time series of longitudinal waves or missing data on several important variables, primarily wages. Of the 23 countries included, 18 have data for the whole period 2004-2019, while five have data available for 2006-2019 only.[25] When using the lagged variables in the analyses, these periods are narrowed to 2005-2019 and 2007-2019, respectively.

[24] Personal cross-sectional weight is used to calculate medians and other aggregate wage statistics in cross-sectional data files.

[25] Countries with data for 2006-2019: AT, BE, BG, CY, CZ, DK, EE, EL, ES, FI, FR, HU, IT, LT, LU, LV, NL, PL, PT, RO, SE, SI, SK. Countries with data for 2004-2019: AT, BE, CY, CZ, DK, EE, FI, HU, LT, NL, PL, SE, SI, SK.

DESCRIPTIVE ANALYSIS

As a starting point for this analysis, the macroeconomic perspective on low wages and wage convergence across countries is presented from aggregate data. The analysis then looks in detail at low-pay incidence within EU Member States, together with low-pay transition probabilities derived from individual EU-SILC data. Descriptive statistics portraying low-paid employees in EU countries are also presented. This encompasses both the individual characteristics of workers and the economic conditions of their households, including elements such as poverty and economic vulnerability.

AGGREGATE WAGE LEVELS IN CEE AND WE COUNTRIES

CEE Member States exhibit persistently lower wage levels compared to their WE neighbours, despite the ongoing economic convergence (Myant, 2018), i.e. '…improving performance of Member States in terms of employment, working and living conditions alongside decreasing disparities between them' (Eurofound, 2020, p. 3). The variable describing the nominal compensation per employee relative to the EU-27 aggregate is used, giving a detailed picture of the development of wages in EU Member States (Figure 1).[26]

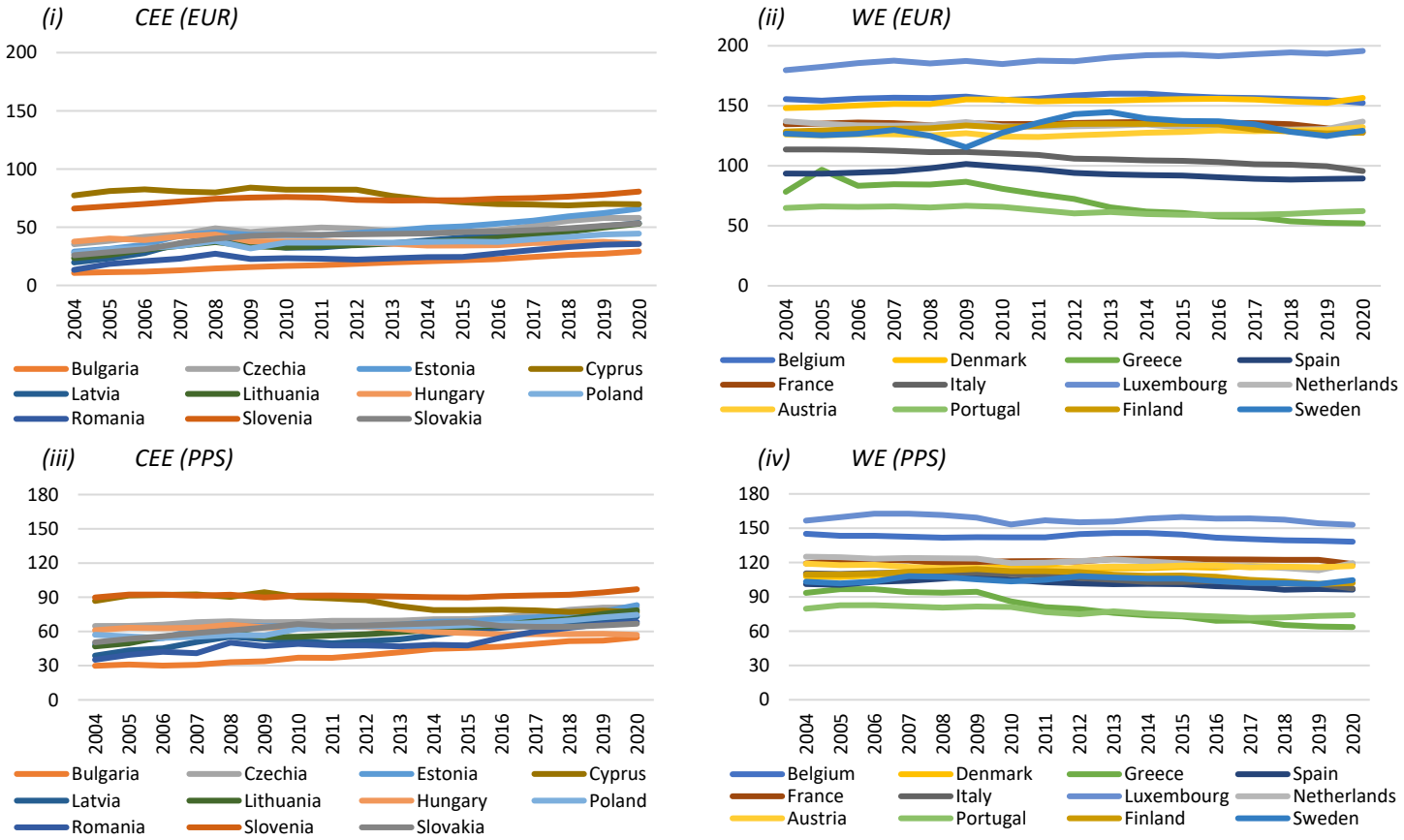
Large wage disparities are evident between countries, especially when expressed in euro (panel (i) and (ii)). Wage levels in CEE are generally far below those in WE, with only Cyprus and Slovenia having wages persistently higher than the rest of the group. Most CEE countries recorded a growth in their relative wage levels in the recovery after the recession in 2009, which interrupted wage convergence in the region (Eurofound, 2020). In WE, the Mediterranean Member States stand out for persistently lower relative wages. Similarly, these Mediterranean countries experienced a decline in their relative wage levels after the 2009 recession, interrupting their earlier convergence. By contrast, the rest of the WE group generally maintained a stable ratio of average wage to the EU-27 aggregate.

When considered in PPS – to factor in differences in the cost of living and inflation across EU countries (as shown in panels (iii) and (iv)) – the relative wage positions of countries become closer and the range of difference narrows. However, the overall trends remain similar and the country rankings remain relatively stable compared to those in euro. Within the CEE group, Slovenia approached 100% of the EU-27 level in 2020 and the other countries continued to follow an upward trajectory, except Cyprus. In this context, Cyprus exhibits dynamics similar to other Mediterranean countries in WE, with a decline in relative wage levels. Meanwhile, the leading North-Western Member States maintained their stable relative positions. The impact of the COVID-19 pandemic was not evident in 2020 income

[26] Data sourced from AMECO (see footnote 3).

data, as the upward trend in CEE persisted. However, this might be due to compositional effects resulting from the reduction in employment of low-paid workers at the beginning of the pandemic, similar to the effects observed during the recession (Eurofound, 2020 and 2021).

Figure 1 Nominal compensation per employee (%) (EU-27 = 100)



Source: AMECO database.

LOW-WAGE EARNERS SHARES AND TRANSITION PROBABLITIES

Table 2 summarises the main characteristics of low-wage employment in the EU Member States, including transition probabilities for the baseline sample of workers (full-time, full-year) on data pooled across the whole period 2005-2019 (see Table A.1. in the Appendix for country samples sizes). Overall, the baseline sample has 350,903 observations in CEE and 383,553 in WE.

The incidence of low-wage employment varies significantly across countries (column a). Generally, CEE Member States tend to have higher proportions of low-paid workers compared to WE countries. The highest rates, surpassing 20%, are in all three Baltic States, as well as in Luxembourg and Bulgaria. Conversely, the lowest rates, below 10%, are in Denmark, Sweden, Belgium, Finland and France. On average, Mediterranean countries exhibit higher rates compared to the remaining WE countries, ranging from about 15% to 19% (see Figure A.1 in the Appendix for the evolution of low-pay incidence in

each country). The figure highlights that countries differ in the incidence of low-paid employment and also in trends.

Table 2 Transition probabilities of low pay (%), 2005-2019

	Low-pay incidence $Pr\ (LP_t = 1)$ (a)	Low pay in successive years $Pr\ (LP_t = 1 \mid LP_{t-1} = 1)$ (b)	Low-pay inflow $Pr\ (LP_t = 1 \mid LP_{t-1} = 0)$ (c)	Low-pay outflow $Pr\ (LP_t = 0 \mid LP_{t-1} = 1)$ (d)	Low-pay persistence ratio (e) = (b)/(c)	Low-pay persistence difference (f) = (b) – (c)
BG	20.2	65	8.7	35	7.47	56.3
CY	18.9	80.4	1.7	19.6	47.29	78.7
CZ	16.2	76.8	3.6	23.2	21.33	73.2
EE	25.3	75.6	8.1	24.4	9.33	67.5
HU	17.6	58.8	6.9	41.2	8.52	51.9
LT	28	75	8.2	25	9.15	66.8
LV	28	72.5	8.7	27.5	8.33	63.8
PL	19.3	67.1	5.2	32.9	12.9	61.9
RO	15.5	74.9	5.4	25.1	13.87	69.5
SI	16	67.3	4.5	32.7	14.96	62.8
SK	13.3	64.8	4.3	35.2	15.07	60.5
CEE	**18.1**	**69.3**	**5.5**	**30.7**	**12.6**	**63.8**
AT	15.6	67.5	3.5	32.5	19.29	64
BE	8.9	53.4	3	46.6	17.8	50.4
DK	8	60.6	1.6	39.4	37.88	59
EL	16.8	70.7	4	29.3	17.68	66.7
ES	19.1	70.2	3.9	29.8	18	66.3
FI	8.5	61.2	1.6	38.8	38.25	59.6
FR	9.5	64.4	2.5	35.6	25.76	61.9
IT	14.9	67.4	3.4	32.6	19.82	64
LU	26.1	82	4.8	18	17.08	77.2
NL	12.1	74.9	1.6	25.1	46.81	73.3
PT	15.1	59	5.6	41	10.54	53.4
SE	8.3	42.8	1.5	57.2	28.53	41.3
WE	**13.5**	**66.5**	**3.2**	**33.5**	**20.78**	**63.3**

Note: Low-pay is defined as a wage lower than two-thirds of the sample's median gross wage, referring to full-time, full-year employees only; low-pay incidence (a) was calculated as a share of low-wage earners in t; low pay in successive years (b) was calculated as a share of the low paid in t, and who were also low paid in t – 1, from the total number of those who were low paid in t – 1; low-pay inflow (c) was calculated as a share of the low paid in t, and who were not low-paid in t – 1, from the total number of those who were not low-paid in t – 1; low-pay outflow (d) was calculated as a share of the not low-paid in t, and who were low-paid in t – 1, from the total number of those who were low-paid in t – 1.; data weighted by longitudinal weights.
Source: Authors' calculations based on EU-SILC 2008-2020.

Table 2 also presents a comprehensive overview of low-wage probabilities and transitions over the period in question. While column (a) describes raw probabilities, reflecting the incidence of low-wage employment without considering an individual's previous period status, columns (b–d) offer conditional probabilities, taking into account an individual's status in the previous period.

Column (b) shows the probability of being low-paid in period *t,* given that the individual was low-paid in period *t-1*. Essentially, this shows the likelihood of remaining in low-wage employment for two consecutive years. This probability tends to be higher than the raw low-wage incidence figure in every country (column a). It also generally tends to be higher in countries with higher low-wage incidence.[27] This suggests that in countries where low-paid work is more common, individuals are more likely to remain in low-wage jobs for more years. When looking at the overall numbers, the probability of remaining low-paid for two consecutive periods is higher in CEE countries.

Column (c) examines the inflow into low-wage employment, representing the probability that a worker not in a low-paid job in the previous year will transition into a low-paid job in the following year. This probability is lower than the likelihood of remaining low-paid for two consecutive years (column b). It also tends to be higher in countries with a higher incidence of low wages, and in CEE countries. On the other hand, column (d) shows the transition out of low-wage employment, i.e. the likelihood that a worker initially in a low-paid job will exit that status and find a better-paying job in the subsequent year. This probability is much lower than the probability of staying low-paid for two successive years (column b). The probability of transitioning out of low-paid employment is generally higher in countries with lower raw incidence of low pay. As a result, it is higher in WE than CEE countries.

Columns (e) and (f) quantify the initial perspective of low-pay persistence. Column (e) reveals how many times more likely low-paid workers are to remain low-paid in the following year, compared to those newly entering low-paid positions. Column (f) shows how much more likely (in terms of probability percentage points) low-paid workers are to stay in that status, compared to non-low-paid workers becoming low-paid. Both measures indicate that individuals low-paid in period *t-1* are substantially more likely to continue being low-paid in the subsequent period *t* compared to workers not low-paid in period *t-1*.[28]

These statistics only referred to a baseline sample covering full-time full-year employees.[29] Table A.3 in the Appendix displays the same figures of columns (a) and (b), calculated on the two other samples of workers, i.e. allowing for part-time and intermittent work. Low-pay incidence is generally higher in the two samples covering part-time and intermittent workers than in the sample covering full-time full-year workers only. When both full-timers and part-timers are considered, the sample accounting for intermittent work shows higher low-pay incidence rates than the sample covering full-year em-

[27] The coefficient of correlation between these two probabilities reaches 0.65 and is significant at 0.01 significance level.
[28] Figures in Table 2 calculated using longitudinal weights published by Eurostat. Yet, Greece, Finland, France, Luxembourg and Sweden have a significant share of missing values or zero weights, which may bias the weighted figures on low-pay incidence (see Table A.2). Therefore, the statistics not using weights were also calculated (see Table A.3). The use of weights, on average, slightly increases the calculations, but the effect is not uniform. The statistics should be read with caution for the two countries with the largest differences between weighted and unweighted figures and significant shares of missing or zero values of the weight variable, i.e. Greece, Luxembourg.
[29] See Table A.4 for comparison of low-pay incidence estimated from EU-SILC data with the official Eurostat low-pay statistics from SES.

ployees for all countries. This suggests that low pay is more widespread among workers whose employment is interrupted and who do not work throughout the whole year. This is also consistent with the fact that low-paid workers often move in a low-pay/no-pay cycle (Fok et al., 2015), impacting both their employment and wage prospects.

CHARACTERISTICS OF LOW-PAID WORKERS

The incidence of low-wage employment varies significantly among different socio-demographic subgroups. Within those subgroups, differences are also observed across countries. Low-paid work is more frequent among women than men across all Member States and the disparity is of a similar average magnitude in CEE and WE, with women's rates exceeding men's by a factor of 1.7 (Table 3). However, the extent of this gender disparity varies significantly between Member States. In general, this pattern aligns with the size of the gender pay gap.

Table 3 Low-pay incidence in groups defined by characteristics of workers and their households (%), 2005–2019

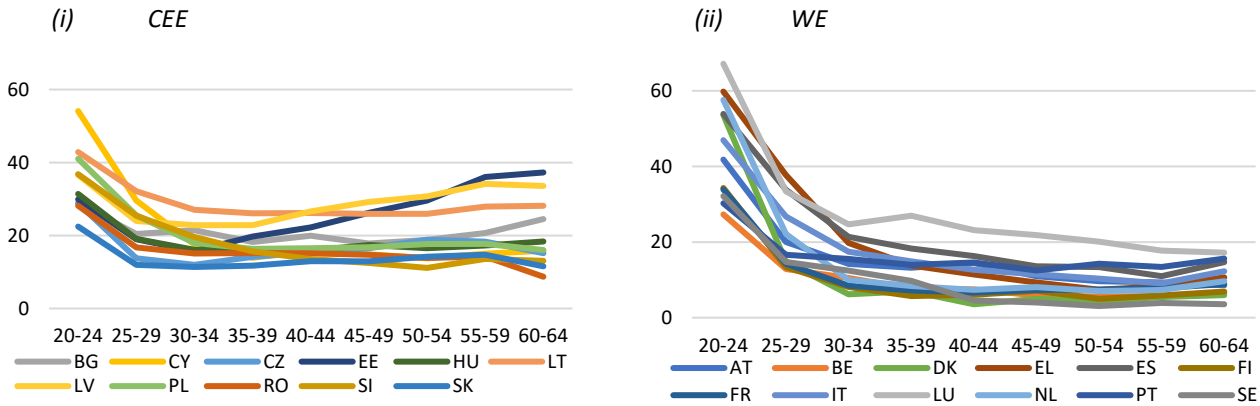
	Gender		*Temporary contract*	*Household sole earners*	*Household not sole earners*	*Children in household*	*No children in household*	*Low-pay incidence among workers in household at risk of poverty*	*Workers in household at risk of poverty in total low-paid workers*	*Low-pay incidence among workers in not at risk of poverty in household*	*Low-pay incidence among workers in household with difficulties in making ends meet*	*Workers in household with difficulties in making ends meet in total low-*
	Women	*Men*										
BG	25	16.3	40.2	17.2	20.4	22	19.2	67.8	22.2	16.9	25.3	65.9
CY	29.8	9.4	50	15.8	19.1	14.8	22.2	63.7	15.2	16.7	26.8	57.6
CZ	27.3	7.8	29.3	13.7	16.5	13.7	17.5	61.4	8.1	15.2	26	31.9
EE	33	17.9	29.3	22.2	25.9	22.6	26.6	85.7	19.9	21.5	48.9	19.8
HU	19.6	16	50.8	16.9	17.7	18.7	17.1	72.3	20.1	14.8	25.6	57.3
LT	32.6	23.4	35.6	27.8	28	30.8	26.1	80.8	19.2	24.2	40.7	28
LV	33.5	22.7	37.9	26.1	28.3	27.5	28.3	84.6	19.4	24.1	40.1	45.7
PL	23.4	15.7	34.3	13.6	19.7	18.9	19.6	55.3	16.1	17.1	30.8	35.8
RO	20.6	11.6	30.2	12.3	15.8	18.6	14	49	14.2	13.9	21.9	47.7
SI	19.4	13.5	31.5	18.5	15.9	16.6	15.6	64.6	9.6	14.9	26.5	31.2
SK	19.8	7.5	23.8	10.8	13.5	13.8	13.1	51.2	12.7	12.1	19.4	35.9
CEE	**23.4**	**13.7**	**34.4**	**15.2**	**17.8**	**18.7**	**18.4**	**59.5**	**15.9**	**16**	**26.7**	**41.5**
AT	26	10.3	26.4	13.8	16	16	15.5	71.3	15.8	13.6	34.3	16.6
BE	13.3	6.4	26.4	10	8.6	8.8	8.9	49.2	10.3	8.1	20	23.3
DK	9.4	7	23.5	8.7	7.8	5.3	9.5	57.7	10.7	7.3	15.8	8.7
EL	21.3	13.5	41.3	14.6	17	12.2	20.2	52.6	16.8	14.7	20.5	73.6
ES	25.7	14.6	43.6	16.8	19.4	17.4	20.2	65.2	20.2	16.2	30.5	34.2
FI	11.7	5.7	21.7	10	7.9	6.9	9.3	71.4	7.2	7.9	16.2	5.1
FR	13.2	6.9	30.7	8.6	9.8	8.4	10.4	44.3	17.6	8.2	16.1	22.4
IT	19	12.5	47	19	14.1	13.5	15.7	62.2	27.2	11.6	23.4	43.6
LU	31.6	23.3	61.6	19.7	27.5	30.3	23.1	78.7	23.9	21.5	65	19.8
NL	19.3	9.9	25.1	18.8	9.1	6.2	14.7	30.7	5	11.8	23.8	11.3
PT	20.2	10.3	25.8	11.6	15.4	15.4	14.8	47	17.1	13.2	21.2	44.7

	Gender		Tempo-rary contract	House-hold sole earners	House-hold not sole earners	Chil-dren in house-hold	No chil-dren in house-hold	Low-pay inci-dence among workers in house-hold at risk of poverty	Work-ers in house-hold at risk of poverty in total low-paid workers	Low-pay inci-dence among workers in not at risk of poverty in house-hold	Low-pay inci-dence among workers in house-hold with dif-ficulties in mak-	Work-ers in house-hold with dif-ficulties in mak-ing ends meet in total low-
	Women	Men										
SE	9	7.9	37.4	8.8	8.1	10.3	7.8	74.6	17	7.1	24.1	5.9
WE	**18.2**	**10.5**	**38.1**	**13.4**	**14.4**	**12.2**	**13.6**	**57.3**	**20**	**11.4**	**23.1**	**33.7**

Source: Authors' calculations based on EU-SILC 2008–2020.
Note: Sample of full-time full-year employees, weighted.

In most of the Member States analysed, the highest incidence of low-wage employment is among those aged 20-24. However, the patterns of low-wage employment differ between CEE and WE Member States (Figure 2).

Figure 2 Low-pay incidence age profiles (%), 2005–2019

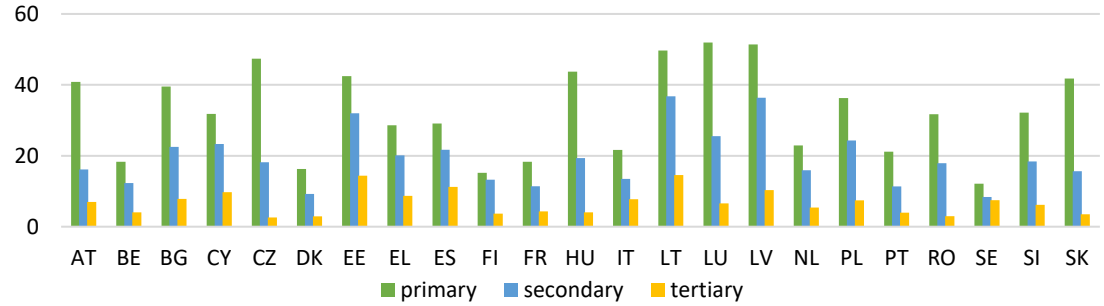


Note: Sample of full-time full-year employees, weighted.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Across all WE Member States, young workers aged 20-24 have the highest incidence of low-wage employment, surpassing all other age groups. This incidence then drops until the 35-39 age group, when it subsequently remains relatively stable. Many WE countries exhibit a moderate increase in low-wage incidence among older workers (aged 60-64), but their rates remain far lower than those for young workers. Conversely, the distinctions between the youngest and oldest age groups are not as pronounced in CEE countries. Generally, the lowest incidence of low-wage employment in the CEE region is observed within the 30-34 age group. The rates often begin to increase again as age rises. Interestingly, in the WE region, low-wage employment among younger workers – potentially seen as a transitional phase towards higher-paying jobs – is more prevalent. By contrast, CEE countries often experience higher rates of low-wage employment among older workers, suggesting a lower probability of low-wage employment being transitory.

The negative relationship between having a low-wage job and education follows expectations. However, the variations are substantial (Figure 3). Generally, in CEE countries, there are more low-paid workers with only primary or secondary education, compared to WE countries. For those with higher education, however, the percentage of low-paid workers is higher in WE countries.

Figure 3 Low-pay incidence, attained educational level (%), 2005–2019



Note: Sample of full-time full-year employees, weighted.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Table 3 shows that low wages are more common among workers with temporary contracts, especially in WE countries. Additionally, the percentage of low-paid workers is slightly lower among sole earners in households compared to those who are not the main earners. This suggests that, at household level, low wages are often complemented by another source of work income. The incidence of low pay does not significantly differ between workers with and without dependent children (under 15 years old) in both CEE and WE countries, but the difference varies.

A significant distinction appears between workers in households at risk of poverty and those living in households not classified as at risk of poverty.[30] While around 60% of employees at risk of poverty work for low wages in both CEE and WE countries, only 16% and 11% of those who are not at risk of poverty receive low wages, respectively. This suggests a link between low pay and poverty, although it is not straightforward. Many low-paid workers are actually in medium-income or high-income households: around 84% in CEE and 80% in WE of low-paid workers are not living in households at risk of poverty. This suggests that low pay is not solely an issue of poverty, but, rather, a broader issue that affects a significant share of the labour force.[31]

Among workers in households facing difficulty or great difficulty in making ends meet, approximately 27% in CEE countries and 23% in WE countries have low-paying jobs. However, when focusing solely on the low-paid group, almost 42% of low-paid workers in CEE and 34% in WE countries live in households reporting financial difficulties. This pattern is similar to that observed in at risk of poverty – workers in households facing financial difficulties make up only a small portion of all low-paid workers

[30] Households classified as poor in relation to their risk of income poverty, i.e. having equivalised disposable income (after social transfers) below the at-risk-of-poverty (AROP) threshold, set at 60 % of the national median equivalised disposable income.
[31] Low-pay work may be somewhat of a family decision about division of work in higher-income households, as one of the spouses may prioritise work motivation other than pay (e.g. flexibility).

in many countries. This suggests that in these countries, either low wages cover the needs of low-paid workers, or incomes are shared within households and the low wages are supplemented by other household members' incomes. The data also highlight significant differences between CEE and WE countries in respect of the living standards and economic vulnerability of the low-paid.

METHODOLOGY

Following the initial insights in Table 2, suggesting a persistence in low wages over time, the next sections explore the possible factors contributing to that persistence. More specifically, the study explores whether persistence is driven by differences among workers and/or their characteristics, or if it is the result of genuine state dependence in low pay. It investigates the primary factors contributing to both the incidence and persistence of low wages. The analysis first examines the incidence and persistence of low wages for individual countries and pooled samples in both the CEE and WE regions, using individual EU-SILC data. Those estimates are then used as dependent variables in panel regressions on aggregated data at country level to analyse drivers of low-wage incidence and persistence.

LOW-PAY INCIDENCE AND PERSISTENCE AT INDIVIDUAL LEVEL

Analyses of the patterns of low-wage employment at individual level examine the extent to which low pay is a 'sticky state', as well as the primary factors making workers more prone to low pay. Previous research has suggested that, apart from observable and unobservable characteristics that predispose workers to low pay, there is a certain degree of state dependence. That means that low pay in a particular time period has a direct causal effect on the probability of being low paid in future, irrespective of either observable and unobservable characteristics of workers. The approach used here is inspired by Clark and Kanellopoulos's (2013) examination of low-pay persistence in WE countries and was also employed by Fialová (2022) in her analysis of low-pay persistence in Czechia. A dynamic random effects probit model is employed that accounts for both observed and unobserved worker heterogeneity, which is necessary to estimate the state dependence.

The model needs to tackle the initial conditions problem, i.e. the potential endogeneity of the starting state, where low-pay status in the initial observed period of the individual history may be correlated with workers' unobserved characteristics. The issue stems from the fact that the first period observed in the data might not (and usually does not) correspond with the start of the low-paid employment (Grotti and Cutuli, 2018).[32] The approach builds on a simple solution to the initial condition problem introduced by Wooldridge (2005) and modified by Rabe-Hesketh and Skrondal (2013), which provides unbiased estimates and can be implemented even for unbalanced panels (Skrondal and Rabe-Hesketh,

[32] In addition to the initial conditions problem, data censoring issues may be present, given the longitudinal character of the dataset. This may arise from the fact that the information on low pay before and after the observation periods is not available. Similar to other studies, this research does not account for censoring, as the length of stay in low pay is not the research question, but, rather, transitions from one period to another.

2014), such as those here.[33] The Stata procedure *xtpdyn* proposed by Grotti and Cutuli (2018) is employed, with the estimation based on the *meprobit* Stata command. The estimated equation has the following form:

$$LP_{it} = \gamma LP_{it-1} + \beta X_{it} + \delta_1 LP_{i0} + \delta_2 X_{i0} + \delta_3 \bar{X}_i + \sum_{k=1}^{14} w_k W_{ik} + \alpha_i + u_{it}$$

(Eq. 1)

where LP_{it} is a binary dependent variable that equals 1 if an employee's wage fell below the low-pay threshold in period t (two-thirds of median wage in the baseline estimations) and is 0 otherwise. LP_{it-1} is a lagged dependent variable. X_{it} is a vector of explanatory variables, LP_{i0} is the initial period value of the dependent variable, X_{i0} is the initial period value of time-variant explanatory variables and $\bar{X}_i$ is an additional regressor representing the longitudinal means of all time-variant variables (with the exception of intrinsically time-varying variables, such as age and education (Cappelari and Jenkins, 2008)).

The control variables included in vector X_{it} are commonly used in this type of research and capture the effect of both demand and supply side factors in the wage-setting process. They cover a male dummy, dummies for age at five-year intervals, a dummy for being married and a dummy for not being married but living with a partner (reference category is being single, divorced or widowed living without a partner), as well as a dummy for presence of children younger than 15 years in the household. Educational attainment is reflected in dummies for primary and tertiary educational degree (reference is secondary educational level), type of occupation is covered by dummies for ISCO categories (categories 5 and 6 are merged into one category due to low number of observations, reference group is ISCO 1 Managers).[34] A dummy for being employed on a temporary contract and a dummy for being employed part-time are also included (the latter only for the sample including part-time workers). Regional effect is proxied by degree of urbanisation in the area of residence – dummies for medium and densely populated areas (reference group is thinly populated areas). Data limitations make it impossible to include regional dummies. The national rate of unemployment (aged 20– 64, from the EU-LFS) is also covered in order to account for trends in the macroeconomic environment.

[33] Unobserved heterogeneity of workers is addressed by the inclusion of the initial period values and within-unit averages of time-variant explanatory variables, as well as the initial period value of the dependent variable. Inclusion of the means for all time-varying variables may also deal with the potential correlation between the explanatory variables and unobserved heterogeneity (Mundlak, 1978). Intuitively, longitudinal averages of individual characteristics reflect underlying individual-specific factors, and, consequently, the remaining individual differences may be more plausibly expected to be independent of observed explanatory variables (Cappellari and Jenkins, 2008).

[34] ISCO classification used in the data changed in 2010 (EU-SILC LT 2011), from old classification ISCO 88 (variable PL050) to new ISCO 08 (PL051). From 2010, all countries have new numbering, except Belgium and Czechia, which still have old numbering in 2010, and Estonia, France, Greece, Romania and Spain, which had new numbering in 2009. Where the new classification coded in PL051 is available in the data, it is preferred. The change in classification may bias the results somewhat. Information on ISCO is missing for a large share of cases across countries and is inconsistent in some years. This large share of missing observations may introduce a non-random bias. Accordingly, in baseline estimations, the ISCO variable is excluded and used solely as a robustness check. Similar to other research studies, the highly heterogeneous and small category ISCO 0 (Armed Forces Occupations) is then excluded.

Calendar time may be an important factor affecting low-pay persistence and may reflect changes in the institutional environment, business cycle effects (not covered by including the unemployment rate) and other calendar time-varying effects. W_{ik} is a survey-year indicator variable for respondent *i*. The reference year *t* is 2007 (2006 = *t – 1*), α_i is the individual-specific constant unobserved heterogeneity and u_{it} is the unobserved error term. Subscript *t* refers to the order of an individual's observation and takes the values {2, 3, 4}. The longitudinal EU-SILC data are pooled across 2005-2019 and analysed as a panel, with individuals as the cross-sectional dimension and the order of an individual's observation as the time dimension.

An interaction variable between the survey-year indicator and lagged dependent variable is included in the extended version of the model, allowing the state dependence effect to vary in time. In such a case, the effect of lagged dependent variable is estimated separately for each year covered by the survey. The interaction variables are included in the low-pay probability (Eq. 1), modified into the following form:

$$LP_{it} = \gamma LP_{it-1} + LP_{it-1}\sum_{k=1}^{14}\gamma_k W_{ik} + \beta X_{it} + \delta_1 LP_{i0} + \delta_2 X_{i0} + \delta_3 \bar{X}_i + \sum_{k=2}^{14} w_k W_{ik} + \alpha_i + u_{it}$$

(Eq. 2)

where W_{ik} is a survey-year indicator variable and $\gamma + \gamma_k$ is the state dependence effect in survey year *k*. The reference year *t* is 2007, thus the state dependence effect in 2007 is equal to γ.

The transition probabilities of individuals in *t* may be further derived by conditioning on low-pay status in *t – 1*, itself done by using the estimated coefficients and other parameters of the model. State dependence in low pay refers to the extent to which the chances of being low paid in *t* differ according to whether an individual was low paid at *t – 1*, controlling for both observed and unobserved heterogeneity. The average partial effect (APE) is frequently used to measure the magnitude of state dependence (Cappelari and Jenkins, 2008), as it shows the 'partial effect averaged across the population distribution of the unobserved heterogeneity' (Wooldridge, 2004, p. 2). The APE is calculated by taking the difference between the predicted probability of low-paid status in *t*, conditional on low-paid status in *t – 1* (i.e. low-pay incidence in two successive years) and the predicted probability of low-paid status in *t,* conditional on being not low-paid in *t – 1* (i.e. low-pay inflow) for each individual and taking the average across all individuals (Cappelari and Jenkins, 2008). There are several ways to estimate the APE (Stewart, 2007). The relationship used here may be formalised in the following way (Grotti and Cutuli, 2018):

$$APE = \Phi(\beta X_{it} + \gamma) - \Phi(\beta X_{it})$$

(Eq. 3)

where $\Phi(.)$ represents a standard normal cumulative distribution function, X_{it} includes all time-varying and time-constant explanatory variables and variables capturing unobserved heterogeneity, β is the vector of associated coefficients and γ is the coefficient associated with the lagged dependent variable.

LOW-PAY INCIDENCE AND PERSISTENCE AT COUNTRY LEVEL

The second analysis examines the possible effect of the labour market institutional framework, macroeconomic policies and structural characteristics of countries on low-wage employment. The approach is inspired by previous work by OECD (2011) and Dreger et al. (2015) that related measures of inequality to a broad set of control variables. Two models are estimated for two different low pay indicators as explained variables in the following random effects panel regression model[35]:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \mu_i + \varepsilon_{it} \quad \text{(Eq. 4)}$$

where *i* and *t* denote country and time, and μ_i refers to unobserved cross-country heterogeneity. The dependent variable Y_{it} takes two forms: (i) low-pay incidence as a relative share of low-paid workers in individual countries drawn from EU-SILC data (see Figure A.1 in the Appendix, i.e. raw probabilities of low pay *Pr* ($LP_t = 1$) for each year), using weighted figures on sample of full-time full-year employees; (ii) low-pay persistence for each country and year covered by EU-SILC survey, as estimated by coefficients $\gamma + \gamma_k$ from individual-level dynamic probit regressions described by (Eq. 2) on sample of full-time full-year employees. This measure of low-pay persistence is net of characteristics of workers, both observable and unobservable.[36]

The explanatory variables included in the vector X_{it} cover several sets of factors that may affect low-wage employment and its persistence:[37]

National labour market institutions and policies:

- Extent of trade union organisation and collective bargaining may be accounted for by both trade union density (share of union membership) and collective bargaining coverage (level of employees coverage by collectively bargained contracts). Pavlopoulos et al. (2010) showed that collective bargaining coverage is a more significant driver of wage mobility than trade union density, and it is thus used to reflect the trade union effect on low-wage employment;
- Proportion of minimum wage on average wage in the country. Minimum wages are determined at various levels (national, industrial) and in different socioeconomic contexts (economic level of country reflected in wage level or GDP per capita, price level, etc.) which makes the analysis of minimum wage levels unfeasible. Instead, the proportion of the minimum wage of average wage

[35] The feasibility of this approach was tested: the Hausman test did not reject the null hypothesis (that the coefficients of both the fixed effects and random effects models are consistent and only the coefficients of the random effects model are efficient) in the majority of the model specifications, thus a random-effects model should be preferred. The estimated p-values are reported in the result tables.

[36] In years where the coefficients were not statistically significant, the variable is set to zero.

[37] See Table A.5 in the Appendix for detailed definitions of the variables and sources of data; see Table A.6 for their descriptive statistics.

is used, which represents the magnitude of the economic burden of the minimum wage and is comparable across countries;[38]
- Strictness of employment protection legislation;
- Generosity of social system proxied by net replacement rates in unemployment and ratio of government social protection expenditure to GDP;

Country-specific macroeconomic and structural factors:
- Share of employment in manufacturing;
- Share of employment in technology and knowledge intensive sectors captures the effect of technological change;
- Trade openness captures the effect of globalisation;
- Product market regulation as a policy variable;
- Labour market tightness, measured by vacancy rate;
- GDP per capita.

Broader social factors:
- Participation of adult population in education and training;
- Skill differences in the labour force, proxied by horizontal skill mismatch, which reflects the discrepancy between a person's current occupation and the education attained;
- Overqualification of workers, referring to proportion of individuals working in jobs below their formal qualifications;
- Size of shadow economy;
- International migration flows, both inflow and outflow.

The set of explanatory variables also covers a relative indicator of country wage level, proxied by average nominal compensation per employee relative to the EU-27 aggregate, which captures the effect of wage convergence. Information on the region of respondents' residence is often missing in the longitudinal datasets, impeding a regional perspective in the analysis. Although regional disparities may be an important factor driving low pay, it is not accounted for here. The primary source of aggregate data is Eurostat, supplemented by various indicators from OECD and World Bank databases (see Table A.5 in the Appendix). The time period covered is 2005-2019, but the information for several countries and variables is missing, making the panel unbalanced.

Labour market institutions, macroeconomic and structural characteristics: descriptives

Table A.6 in the Appendix provides descriptive statistics that highlight overall differences between CEE and WE countries' institutional environments, as well as in macroeconomic and structural character-

[38] The variable is used for countries with statutory minimum wages enforced by law, often set after consultation with social partners or by national intersectoral agreement. Other countries may have nationally negotiated minimum wages through collective agreements covering most of the labour force, but these are not accounted for here and this variable is set to zero in such cases.

istics in data pooled for the whole period. On average, CEE Member States maintained higher statutory minimum wages relative to average wages within their economies. However, CEE countries exhibited lower trade union density and collective bargaining coverage, indicating weaker trade union influence. By contrast, WE countries demonstrated a more generous social system, evident through higher net replacement rates in unemployment and a higher ratio of government social expenditure to GDP. Employment protection strictness and product market regulation showed comparable levels in both CEE and WE countries. However, the vacancy rate was higher in WE countries, indicating greater labour market tightness. CEE Member States had a larger proportion of employment in manufacturing and exhibited higher overall trade openness, but had a lower share of employment in technology and knowledge-intensive sectors. Participation of the adult population in education and training was higher in WE countries, where overqualification of workers was also more prevalent. Conversely, CEE countries experienced higher levels of horizontal skill mismatch, pointing to disparities in skill distribution within the labour force. Lastly, CEE countries had larger shadow economies and experienced larger migration outflows, while WE countries witnessed greater migration inflows.

EMPIRICAL ANALYSIS

DETERMINANTS OF LOW PAY AT INDIVIDUAL LEVEL

Figure 4 presents the marginal effects on the probability of being low-paid, derived from the dynamic probit analysis encompassing full-time full-year employees (Eq. 1). It shows the baseline model, which uses an individual's low-wage status, determined by a threshold set at two-thirds of the median wage within the sample. Only statistically significant estimates are reported (see Table A.7 in the Appendix for details and Table A.8 in the Appendix for full results). Marginal effects at means are reported, as they offer more straightforward and insightful interpretations than estimated coefficients. A marginal effect quantifies the estimated result as difference in probabilities and can be understood as the influence of a specific explanatory factor while maintaining all other factors at their average levels. For instance, the initial bar in Figure 4 demonstrates the dynamic marginal effect related to past low-wage status. It indicates that being in a low-wage job during time period *t-1* raises the likelihood of being in a low-wage job during time period *t* by 19.2 percentage points (pp) in CEE countries and 7.7 pp in WE countries.

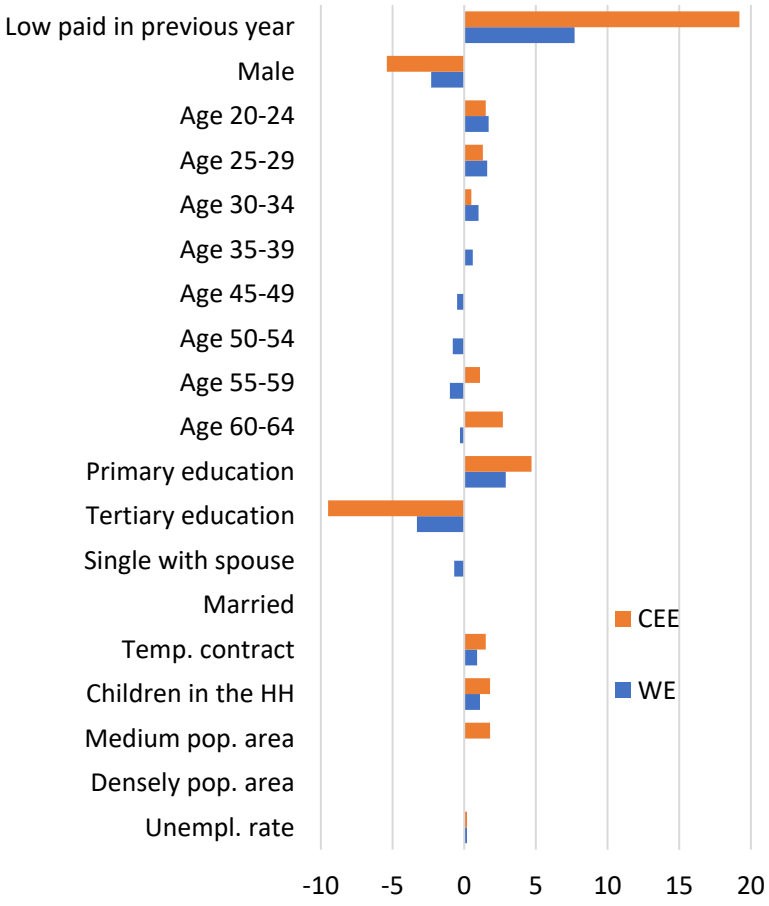
All of the Member States examined recorded a significant positive impact stemming from previous low-wage employment.[39] This implies that earning a low wage in the previous period substantially raises the likelihood of low pay in the subsequent period. However, to estimate the degree of state

[39] Estimated degree of low-pay persistence in some of the WE countries is generally lower (with the exception of Greece and Spain) to those estimated in previous research by Clark and Kanellopoulos (2013) for male employees only. The results of Cappellari (2000) for Italy, and Stewart and Swaffield (1999) for the United Kingdom (UK), suggest a larger degree of persistence in low pay. However, comparison of results is problematic, as the studies differ in relation to the definition of the sample and the methodology used to treat heterogeneity.

dependence in low pay (i.e. the extent of the effect of past low wages), average partial effects are used.

The results in Figure 4 uniformly confirm that men have a significantly lower chance than women of working in low-wage positions. This pattern is even more pronounced in the CEE region. In particular, men in CEE are around 5.4 pp less likely to earn low wages compared to women, whereas in WE countries, this difference is about 2.3 pp. This outcome aligns with prevailing gender wage disparities across countries, making women more susceptible to low pay.

Figure 4 Low-pay probability: marginal effects of dynamic random effects probit model with unobserved heterogeneity, full-time full-year employees (probability pp)



Note: Dependent variable: low-pay status in period t; low-paid status of an individual defined by the threshold set at two-thirds of the country sample's median wage as a dependent variable; reference categories: female, age 40-44, secondary education, being single, divorced or widowed living without a partner, having a permanent contract, children younger than 15 years not present in the household, living in a thinly populated area; see note to Table A.7 in the Appendix for more detail.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Consistent with the principles of human capital accumulation theory,[40] the youngest workers display a significantly higher likelihood of receiving low wages compared to the reference group of workers aged 40–44. This effect is more pronounced in WE countries, where the disparity gradually weakens as age increases. For workers older than 45 years, the probability of earning a low wage is lower than that of the reference group. However, a different trend is observed in CEE, where workers over 55 years old face a higher probability of being in low-paid positions compared to the 40-44 age reference group. Strikingly, those aged over 60 exhibit an even greater likelihood of low-wage employment compared to young workers. These findings suggest that in CEE Member States, the issue of low wages is not exclusive to young employees entering the workforce on lower wages due to their limited experience, but, rather, also affects older, more experienced workers later in their careers.

The impact of educational attainment on the likelihood of earning low wages follows the patterns projected by human capital theory. Notably, having an educational level both higher and lower than the reference category (completed secondary education) is significant in affecting the probability of low-wage employment. Workers with primary education have a significantly elevated likelihood of earning low wages across the majority of countries. Conversely, possessing a tertiary educational degree substantially reduces this probability, across all countries examined. Both effects are more pronounced in CEE countries: workers with primary education have a higher probability of low-wage employment compared to those with a secondary educational degree, by 4.7 pp in CEE and 2.9 pp in WE countries. By contrast, workers with tertiary education have a lower likelihood of low-wage employment, by 9.5 pp in CEE and 3.3 pp in WE Member States.

The presence of children under the age of 15 in a household has a significant effect on increasing the probability of working for low wages in both CEE and WE countries. The impact is more pronounced in CEE countries, with a larger marginal effect (1.8 pp, compared to 1.1 pp in WE countries). Working under a temporary contract also significantly raises the probability of earning low wages. The effect is stronger in CEE countries, where the marginal effect is 1.5 pp, compared to WE countries' marginal effect of 0.9 pp. Likewise, trends in the regional unemployment rate exert a significant and positive impact of similar magnitude in both CEE and WE regions. This implies that shifts in the unemployment rate translate into the probability of earning a low wage. When unemployment rates are higher, the probability of low-wage employment increases. However, variables such as marital status, living with a spouse, and urbanisation levels were not consistently statistically significant factors. In WE countries, single (and divorced or widowed) workers living with a spouse have significantly lower probability of working for a low wage compared to the reference category of workers who are single, divorced or widowed and living without a partner. In CEE, living in a medium populated area increases the likelihood of earning low wage, compared to the reference category of living in a thinly populated area.

[40] The concept of human capital theory (Becker, 1975) assumes that individuals have a specific set of abilities and skills that can be enhanced or accumulated through educational pursuits and training, including work experience.

The model was also estimated including ISCO occupational categories. After accounting for a range of workers' observable and unobservable characteristics, the type of occupation has no consistently significant impact on the likelihood of earning low wages.[41] Across the majority of countries, it appears that most occupational categories experience low wages due to factors other than their specific occupational group. However, the ISCO variable contains a significant number of missing values in several countries, which could introduce systematic biases in the results. Nevertheless, the inclusion of ISCO variables does not significantly alter the other outcomes derived from the model estimations.

Table A.9 in the Appendix presents estimations of the extended model that take into account interactions between an individual's low-wage status and the survey year (Eq. 2).[42] The data show substantial variability in the magnitude of low-pay persistence and its statistical significance across countries and in time.

The model estimations were also run on two other samples of workers: one including part-time workers and another allowing for intermittent work (see Table A.8 in the Appendix for results). Importantly, the primary findings from the baseline estimations remain consistent with these additional samples. Generally, the estimate of the dynamic marginal effect by low-pay status in prior period *t-1* on the probability of working for low pay in the current period *t* (first row) is of an approximately similar magnitude across these two samples. However, there are distinctions between these estimates and those derived from the baseline sample (full-time full-year employees only). In most countries, when the sample is expanded to include part-time workers, the estimated likelihood of staying in a low-paid job for two consecutive periods decreases compared to the baseline. This suggests that, for many countries, part-time work might serve as a flexibility device (Fialová, 2017). This notion is reinforced by the estimated marginal effect of the part-time work variable, which is consistently negative and significant in all countries. The impact is more pronounced in CEE countries, where part-time employment is associated with a 16.3 pp reduction in the probability of earning low wages. In WE countries, that reduction is 13.1 pp, according to the estimations on the sample of all workers (see Table A.8 in the Appendix). However, this should be read with caution, given the limitations in computing wages for part-time workers.

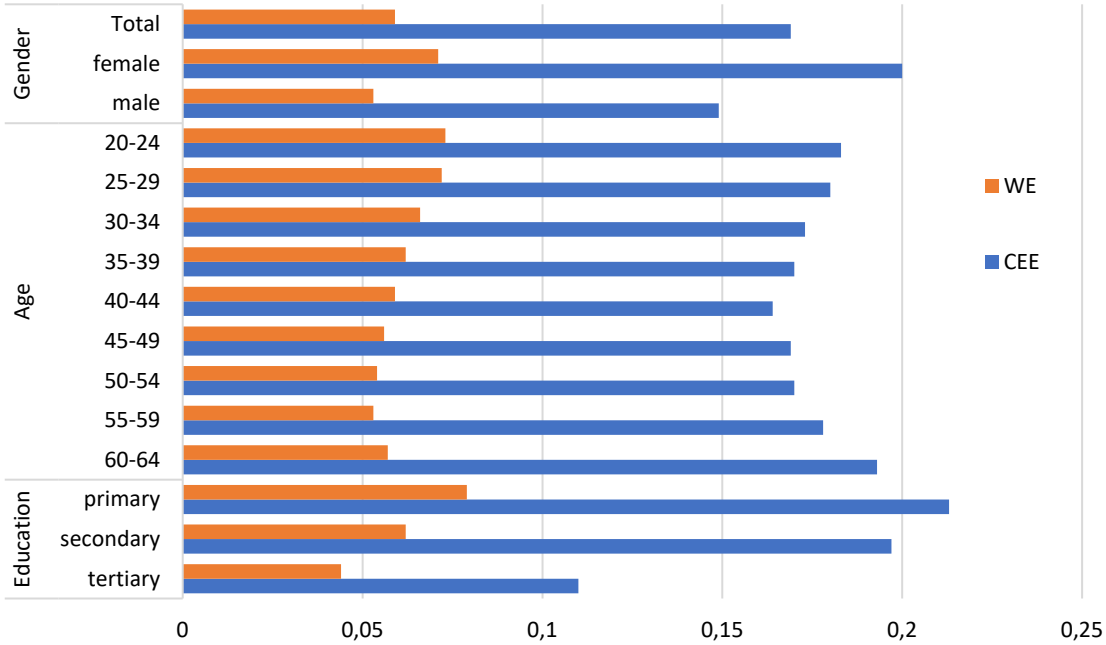
The estimated parameters from the baseline model (see Table A.7 in the Appendix) were used to calculate the APE, a commonly employed metric for measuring genuine state dependence in low pay. The summarised outcomes are presented in Figure 5, with country-specific details available in Table A.10 in the Appendix. The APE quantifies the extent to which prior low-wage status influences current outcomes, regardless of individual or job-specific characteristics. These APEs were computed for the entire sample and for specific subgroups defined by gender, age, and education. The APE estimates for the total sample ranged from 2.1 pp in Belgium to 23.8 pp in Bulgaria. This variation suggests that,

[41] Detailed results are available from the authors on request.
[42] Due to substantial technical requirements and time demands of the computations, only coefficients of the model are presented, not the marginal effects as per other output tables. Only the sign of the coefficient should be interpreted (no direct inference on the size of the impact is possible).

after accounting for individual differences, a history of low-wage employment is associated with an average increase in the probability of earning low wages by approximately 2-24 pp.

These results confirm the presence of genuine state dependence in low wages across European countries, independent of individual or job-related characteristics. However, the degree of this relationship varies significantly. The influence of past low-wage status is markedly higher in all CEE countries, where having a low-wage job in period *t-1* contributes to a 16.9 pp rise in the probability of being low-paid in period *t*. This is nearly triple the impact observed in WE countries, where the increase is 5.9 pp.

Figure 5 Average partial effect: estimation of state dependence in low pay for specific profiles, full-time full-year employees



Note: Estimates of the average partial effect (APE, (Eq. 3)) based on the results of a dynamic random effects probit model with unobserved heterogeneity; baseline estimations in Table A.8 in the Appendix; low-paid status of an individual defined by the threshold set at two-thirds of the sample's median wage as a dependent variable. Source: Authors' calculations based on EU-SILC data 2008–2020.

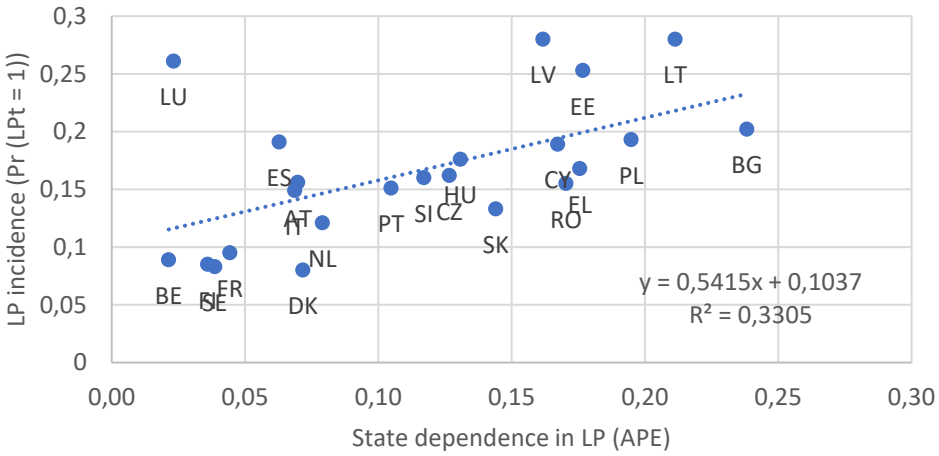
Figure 6 compares low-pay incidence (column (a) of Table 2) and state dependence (APE column (a) of Table A.10) across EU Member States. These values are estimated on pooled data for 2005-2019. The figure confirms a positive relationship between the share of low-paid workers and state dependence in low pay. Generally, Member States with a larger share of low-paid employees tend to exhibit a stronger degree of low-pay persistence. In other words, in countries where a large portion of the workforce earns low wages, transitioning from a low-paid job to a better-paying one becomes harder for workers.

The estimated APEs highlight a substantial gender disparity in state dependence in low pay. While low pay is much more of a female phenomenon, the persistence of low wages is higher for women in all countries except Luxembourg. On average, past low-pay status is associated with an increase in

women's probability of earning low pay of about 20 pp in CEE and 7 pp in WE countries (compared to 15 pp in CEE and 5 pp in WE for men).

The magnitude and pattern of the effect of past low-pay status vary significantly across different age groups. While in WE countries, the differences are rather small and the general trend reflects declining APEs with increasing age, the variance is larger in CEE and the aggregate pattern has a J-shape, with slightly higher low-pay persistence for younger workers and greater low-pay persistence for older workers.

Figure 6 Low-pay incidence and state dependence in low pay , 2005-2019



Note: see estimates of APE in Table A.10 in the Appendix; see estimates of low-pay incidence in Table 2.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Finally, the results reveal considerable variation in the impact of educational attainment on state dependence in low pay. The effect of education on low-pay persistence differs between the two regions. In WE countries, the reduction in APE for higher educational degrees is more gradual: workers with secondary education have about 0.8 times the APE of workers with primary education, and tertiary education further reduces the APE to about 0.7 times the value of workers with secondary education. In CEE countries, the differences between APEs of workers with primary and secondary educational degree are less pronounced. The largest differences emerge between workers with tertiary and secondary education: while secondary education reduces APE to about 0.9 times that of workers with primary education, workers with tertiary education exhibit APEs about 0.6 times the value of those with secondary education.

To address the lack of a clear consensus in defining the low-paid population, persistence of low pay is examined under varying low-pay thresholds. Alternative measures of low pay are employed and the results are presented in Table A.11 in the Appendix, serving as robustness checks on the baseline estimations. The results largely support the initial estimates, although some variations were observed, mainly due to differences in the sizes of the low-paid samples, which also affect the degree of state dependence in low pay.

The lowest APE values are observed in the sample where the low-pay threshold was set at one-half of the sample median, implying a lower incidence of low pay (see Table A.12 in the Appendix for a description of the incidence of low pay under different relative low-pay thresholds). Generally, higher APEs, and thus greater state dependence, are observed in larger low-paid populations. Notably, low-paid populations, defined as a constant share of wage distribution of the sample (i.e. the first quartile and first three deciles of the wage distribution), exhibit a substantially higher degree of state dependence. In both cases, state dependence in low pay (as measured by APE) is higher in CEE than in WE countries, in accordance with estimates obtained by relative low-pay threshold defined as a ratio on sample wage median (see Table A.10 in the Appendix). For the low-paid population covering lowest three deciles, APEs are estimated at 22.1 pp in CEE countries and 10.0 pp in WE countries. For WE countries, this is a large difference compared to the estimated APE of 5.9 pp for low-pay threshold set at two-thirds of country sample wage median. A slightly lower difference, but still more marked for WE countries, is evident for the low-paid population covering lowest quartile. Rather low state dependence is estimated for low-pay threshold set at one-half of country sample wage median, with the APEs estimated at 4.6 pp in CEE and 2.4 pp in WE countries. Here, a substantial drop was recorded in CEE, compared to APE of 16.9 pp estimated for low-pay threshold set at two-thirds of country sample median.

DETERMINANTS OF LOW PAY AT COUNTRY LEVEL

This section presents an overview of the relationship between low-pay incidence and persistence across EU Member States on one hand, and institutional, macroeconomic and structural characteristics on the other.

The figures[43] (see Figure A.2 in the Appendix) reveal several connections between low-pay incidence and country characteristics at a descriptive level. For labour market institutions, both measures of trade union power – trade union density (panel (b)) and collective bargaining coverage (panel (c)) – have a negative relationship with the share of workers who are low-paid. Similarly, government social expenditure (panel (f)) is generally higher in countries with lower low-pay incidence. Labour market tightness, approximated by the vacancy rate (panel (h)), then suggests some weak negative association, indicating that across countries, higher shares of low-paid workers are generally connected to fewer vacancies and less tight labour markets. A stronger negative relationship is observed between low-pay incidence and share of employment in technology and knowledge intensive sectors (panel (i)) and participation of adult population in education and training (panel (l)). Emigration outflow (panel (p)) shows a positive correlation with low-wage incidence, suggesting that countries with higher shares of low-paid workers have larger migration flows out of the country. Countries with higher low-pay incidence also tend to have greater shadow economies (panel (t)). Finally, the relationship between

[43] Estimates of low-pay incidence are average values of raw probabilities of low pay for full-time full-year employees (column (a) of Table 2). The estimates of low-pay persistence are coefficients γ (Eq. 1) estimated by dynamic probit regression for full-time full-year employees (see Table A.7 in the Appendix). Averages for the period 2005-2019 are presented.

low-pay incidence and relative economic level of the country, as measured by average nominal compensation of employees (panel (q)) and GDP per capita (panel (s)), as a proportion at aggregate EU-27 level, is negative in both cases.[44]

The relationships between countries' characteristics and persistence of low pay are not as straightforward. Of the labour market institutions, only net replacement rate in unemployment (panel (d)) appears to have a negative association with the degree of low-pay persistence. Persistence in low pay tends to be positively related to horizontal skill mismatch (panel (n)) – more frequent discrepancies between the formal education of workers and their current occupation are associated with a greater degree of low-pay persistence. Finally, countries with weaker product market regulation (panel (g)) tend to have lower persistence of low pay. None of the other country characteristics has a significant relationship to low-pay persistence in the bi-variate figures. However, the relationship may be more complex and thus not easily evident in the figures presented here.

Panel regressions with random effects are used in a bid to uncover this complexity. The models explain the dependent variables of low-pay incidence and persistence. Again, estimates of low-pay incidence are the average values of raw probabilities of low pay for full-time full-year employees (see Figure A.1 in the Appendix), while the estimates of low-pay persistence for each country/year are calculated from estimates of coefficients by past low-pay status, interacted with survey years for full-time full-year employees (see Table A.9 in the Appendix). The results of regression estimations (Eq. 4) are summarised in Table 4 and Table 5. Several model outcomes are presented. Firstly, the model is run for labour market institutions, macroeconomic characteristics of the countries and variables on international migration (columns (i) – (iv)). Adding variables on skill mismatch substantially decreases the numbers of observations (columns (v) – (viii)). The final model adds a variable reflecting the relative wage level of a country compared to the EU-27 aggregate (columns (ix) – (xii)).[45] All of the models are run on the total sample of countries, as well as separately for WE and CEE Member States. The CEE model is estimated both with and without the employment protection variable, which is missing for three countries (Bulgaria, Cyprus, Romania).

Table 4 shows that low-pay incidence is significantly related to several institutional, macroeconomic and structural characteristics of the countries examined. On institutional factors, the proportion of minimum wage of the average wage in the business economy seems to have a negative relationship with low-pay incidence, with higher minimum wages generally connected to lower shares of low-paid workers. That relationship is not significant in CEE Member States, however, possibly due to non-com-

[44] The figures for GDP are biased by outlying Luxembourg (panel (r)), which disrupts the link. Once Luxembourg is removed, the relationship becomes clearly negative (panel (s)).

[45] Due to multicollinearity issues, GDP variables are not covered. The indicator of collective bargaining coverage was used to gauge the impact of trade union activities, as it more realistically reflects the real power of trade unions in wage-setting compared to trade union density. It was also was identified as a preferred variable by previous research (Pavlopoulos et al., 2010).

pliance with minimum wage regulations for workers more prone to earn low wages (female, less-educated, working on a temporary contract, in small enterprises; Goraus-Tańska and Lewandowski, 2019). Also, the widespread shadow economies in CEE countries (Kelmanson et al., 2019) may dampen the effect of minimum wage on wages of low-paid workers. Hikes in the minimum wage may lead to a reshuffling between the formal and informal pay of workers, who are often engaged in both formal and informal work simultaneously (Williams, 2009), with a weaker effect on wages formally reported (Fialová and Mysíková, 2021).

More generous government social expenditure is significantly connected with lower low-pay incidence in the total sample. The largest part of this expenditure targets social protection and comprises social benefits and transfers (Eurostat, 2023), i.e. redistribution of income. Generous welfare systems may raise the reservation wages of employees and increase the pressure on employers to set low wages relatively higher, helping to 'make work pay' and reduce low-pay incidence. By contrast, higher net replacement rates in unemployment seem to be connected to greater low-pay incidence in CEE Member States. This may indicate that higher unemployment benefits do not increase the reservation wage of workers significantly, or that workers are not able to bargain with employers for higher wages. It may also reflect the stronger effect of the low-pay/no-pay cycle in CEE countries (possibly with simultaneous engagement in the shadow economy), although there is no empirical evidence for this effect. However, the causality could also be the opposite, i.e. high shares of workers earning low wages (in countries with relatively lower wage levels even after taking into account differences in purchasing power), who are also more prone to moving in low-pay/no-pay cycles, may have an effect on governments setting unemployment benefits relatively high in order to guarantee decent standard of living.

Labour market tightness seems to reduce the pool of the low-paid workers across the Member States, particularly in WE countries: the higher the vacancy rate (the more unfilled vacancies), the lower the incidence of low pay. The relationship is not significant in CEE Member States, however, which may be connected to workers' weaker bargaining power, as reflected in the lower strength of trade unions in CEE countries. The share of employment in technology and knowledge-intensive sectors seems to be negatively related to low-pay incidence in the overall sample of countries. This may be due to a greater orientation of the economy towards higher-value added and technologically advanced production, with associated higher wages.

The figures suggest the positive effect of globalisation, proxied by trade openness of the economy, particularly in the CEE region, i.e. countries that are more engaged in foreign trade and potentially more exposed to foreign competition generally tend to have larger pools of low-paid workers. Horizontal skill mismatch appears to have a negative relationship to low-pay incidence in the total sample of countries, suggesting that greater flexibility of workers across occupations may help to reduce the pool of low-paid workers. By contrast, workers' degree of overqualification is connected to greater low-pay incidence in WE countries, indicating that in countries where workers more frequently work

in occupations below their formal qualification, low-wage employment is more widespread.[46] In this sense, overskilling may be considered an important characteristic of low-paid employment in WE Member States.

[46] In line with Mysíková and Večerník (2019), who identified a negative relationship between the share of workers with tertiary education and returns to tertiary education in WE, but not in CEE countries.

Table 4 Low-pay incidence determinants at country level: regression estimations

	WE (i)	CEE (ii)	CEE (iii)	TOTAL (iv)	WE (v)	CEE (vi)	CEE (vii)	TOTAL (viii)	WE (ix)	CEE (x)	CEE (xi)	TOTAL (xii)
Collective bargaining coverage	0.000	0.000	-0.003***	0.000	-0.003	0.000	-0.003***	0.000	-0.002	-0.001	-0.004***	0.000
Minimum wage	-0.002***	-0.002	0.001	-0.002***	-0.002***	0.000	0.001	-0.001***	-0.002***	0.003	0.001	-0.001***
Employment protection legislation (EPL)	-0.042*	-0.008		-0.032***	0.003	-0.005		0.001	0.007	-0.098		-0.020
Net replacement rate	-0.001	0.002*	0.002***	0.001**	-0.001	0.002*	0.002**	0.001	-0.001	0.002*	0.003***	0.000
Social expenditure of government	-0.005	-0.015**	-0.008	-0.013***	-0.002	-0.014	-0.008	-0.008***	-0.001	-0.038**	-0.024***	-0.013***
Product market regulation	0.011	0.020	0.162**	0.014	-0.025	-0.004	0.189**	-0.011	-0.032	0.096	0.168***	-0.007
Vacancy rate	-0.013**	-0.004	0.001	-0.006**	-0.017***	-0.003	0.002	-0.009***	-0.018***	-0.013	-0.009	-0.012***
Employment in manufacturing	-0.007**	0.001	-0.006**	-0.002	0.005	0.003	-0.008**	-0.001	0.002	-0.005	-0.008***	-0.001
Employment in technology and knowledge-intensive sectors	-0.005***	-0.014**	-0.006	-0.009***	-0.001	-0.017**	-0.006	-0.009***	0.000	-0.015*	-0.002	-0.009***
Trade openness	0.000	0.001*	0.001**	0.001***	0.001***	0.001	0.002**	0.001***	0.002***	0.001*	0.001***	0.000
Participation in education and training	-0.005***	0.000	0.007***	0.000	-0.001	0.000	0.007***	0.001	-0.002	-0.005	-0.004*	0.000
Horizontal skill mismatch					0.001	-0.002	0.002	-0.004***	0.001	-0.003	-0.003	-0.003***
Overqualification rate					0.007***	-0.001	-0.001	0.002**	0.008***	-0.006	-0.007*	0.000
Shadow economy	0.000	0.005	-0.003	0.001	0.006**	0.005	-0.003	0.002*	0.006**	-0.002	0.005*	0.001
Immigration	0.037**	0.051	0.062	0.044***	0.010	0.022	0.079	0.048***	0.004	-0.043	-0.072	0.045***
Emigration	0.133*	-0.047	-0.027	0.010	0.291**	-0.063	-0.039	0.012	0.273**	-0.078	-0.105***	0.022
Relative wage level									-0.001	0.007**	0.008***	0.001**
CEE				-0.017				-0.002				0.015
Constant	0.804***	0.642	0.164	0.728***	0.073	0.755	0.105	0.626***	0.076	1.107	-0.090	0.791***
Observations	49	32	39	81	43	29	34	72	43	29	34	72
Wald chi2	363.34	261.88	139.32	577.48	381.93	208.41	98.26	598.21	380.55	272.12	299.38	647.7
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hausman test p-value	0.117	0.010	0.230	0.300	0.964	0.732	0.104	0.216	0.998	0.405	0.404	0.220
R-squared:	0.9144	0.9390	0.8479	0.8988	0.9363	0.9456	0.8452	0.9172	0.9384	0.9611	0.9463	0.9244
Within	0.2631	0.5291	0.2994	0.1164	0.3298	0.5142	0.3439	0.1833	0.3539	0.6503	0.7289	0.1827
Between	0.9992	0.9695	0.9335	0.9730	0.9994	0.9950	0.9321	0.9808	0.9984	0.9971	0.9880	0.9938

*Note: Dependent variable: estimates of low-pay incidence (see Figure A.1 and Table 2); coefficients estimated by random effects panel regression, ***/**/* statistically significant at 1%/5%/10% levels, respectively.*

Source: Authors' calculations based on EU-SILC data 2008–2020, Eurostat, OECD/AIAS ICTWSS database, Kelmanson et al. (2021), World Bank, OECD, AMECO.

Table 5 Low-pay persistence determinants at country level: regression estimations

	WE (i)	CEE (ii)	CEE (iii)	TOTAL (iv)	WE (v)	CEE (vi)	CEE (vii)	TOTAL (viii)	WE (ix)	CEE (x)	CEE (xi)	TOTAL (xii)
Collective bargaining coverage	-0.043**	0.032***	0.01	0.003	-0.091***	0.023	0.011	-0.003	-0.078**	0.035*	0.009	-0.003
Minimum wage	-0.007	0.009	-0.037***	0.008	-0.003	0.026	-0.016	0.01**	-0.006	-0.007	-0.017	0.01**
Employment protection legislation (EPL)	1.106**	-0.594		0.325	0.668	-0.163		0.774***	0.73	0.827		0.603*
Net replacement rate	-0.004	-0.019*	0.003	-0.017*	-0.019	-0.016	-0.005	-0.015*	-0.015	-0.015	-0.004	-0.017**
Social expenditure of government	0.165*	0.051	0.163***	0.061	0.381***	0.135	0.247***	0.119**	0.406***	0.388*	0.219**	0.081
Product market regulation	-0.061	-1.72*	-1.081	-0.248	0.087	-1.469	-1.004	-0.264	-0.03	-2.528*	-1.043	-0.234
Vacancy rate	-0.071	-0.042	0.029	-0.098*	0.024	0.014	0.081	-0.111**	0.019	0.121	0.061	-0.131**
Employment in manufacturing	-0.07	0.046	0.056*	-0.018	-0.032	0.063	0.05	0.047*	-0.078	0.146**	0.049	0.047*
Employment in technology and knowledge-intensive sectors	0.067***	-0.225***	-0.101**	0.049*	0.163***	-0.2*	-0.093*	0.031*	0.172***	-0.227**	-0.085	0.029*
Trade openness	-0.008**	0.006	0.006	-0.001	-0.005	0.009	0.007	0.004*	0	0.009	0.006	0.001
Participation in education and training	-0.09***	0.009	0.011	-0.022	-0.142***	0.003	0.006	0.01	-0.155***	0.055	-0.014	0.006
Horizontal skill mismatch					0.166**	-0.035	-0.036	0.01	0.16*	-0.026	-0.045	0.011
Overqualification rate					0.034	0.043	0.065	0.039**	0.043	0.101*	0.055	0.025
Shadow economy	-0.079***	-0.111	-0.012	-0.023	-0.029	-0.07	-0.028	-0.01	-0.03	0.002	-0.012	-0.017
Immigration	-0.640**	-0.525	-1.137*	-0.500*	-0.470	-1.099	-1.434**	-0.405*	-0.565	-0.416	-1.705**	-0.434*
Emigration	-1.884	1.141**	0.868***	0.224	2.113	0.734	0.855**	0.655**	1.826	0.898	0.737*	0.732**
Relative wage level									-0.019	-0.073	0.014	0.008
CEE				0.596				-0.128				0.012
Constant	0.862	13.527**	2.73*	-1.419	-9.133	7.81	1.134	-5.81***	-9.094	4.079	0.782	-4.503**
Observations	49	32	39	81	43	29	34	72	43	29	34	72
Wald chi2	59.82	74.62	55.22	30.64	54.45	57.51	43.87	65.11	54.09	67.97	42.78	66.14
Prob > chi2	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hausman test p-value	0.999	0.196	0.115	0.576	0.999	0.374	0.633	0.514	1.000	0.508	0.707	0.103
R-squared:	0.638	0.815	0.688	0.284	0.677	0.827	0.709	0.547	0.684	0.861	0.716	0.555
Within	0.348	0.633	0.484	0.320	0.454	0.618	0.476	0.204	0.468	0.691	0.481	0.200
Between	0.984	0.994	0.906	0.406	0.996	0.994	0.945	0.913	0.990	0.998	0.944	0.943

*Note: Dependent variable: estimates of the low-pay persistence in each year calculated from estimates of coefficients by past low-pay status interacted with survey years (see Table A.9 and methodology); coefficients estimated by random effects panel regression, ***/**/* statistically significant at 1%/5%/10% levels, respectively.*
Source: Authors' calculations based on EU-SILC data 2008-2020, Eurostat, OECD/AIAS ICTWSS database, Kelmanson et al. (2021), World Bank, OECD, AMECO.

The relative size of immigration flows from non-EU countries has a positive association with low-wage employment in the total sample of countries. This may be because immigrants often find jobs in the low-paid secondary sector of the labour market, increasing the pool of the low-paid.[47] Consequently, larger inflow of low-paid labour increases the supply in this segment, potentially limiting the pressure on wage growth. The relationship between the incidence of low pay and relative size of emigration flow is positive in WE Member States, suggesting that countries with greater migration outflows have more widespread low-wage employment. The effect is not significant in CEE, which may indicate that migration outflows from CEE often skew towards skilled workers, who are less likely to be low-paid (Holland et al., 2011). Finally, relative wage levels seem to have a positive association with low-pay incidence in CEE countries, meaning that countries with higher wage levels tend to have greater pools of low-paid workers. That may mean that wage convergence in CEE Member States is accompanied by increasing inequality in terms of low-paid employment.

Some of the other variables show significant relationships in several specifications, but these are not robust across the sub-samples and specifications and should be read with caution. These are the degree of collective bargaining coverage (negative association with low-pay incidence, limited to CEE countries, not robust) and product market regulation (positive relationship in CEE region, not robust). The estimated size of the shadow economy exerts some positive effect in several model specifications, indicating that the magnitude of informal employment and low-wage employment may go hand-in-hand. This effect may reflect that formally employed low-paid workers often engage in informal employment as well to boost their low incomes (Williams, 2009). Finally, the share of employment in the manufacturing sector tends to be negatively connected with low-pay incidence in CEE countries in some of the specifications. The negative (and insignificant) association may mean that the overall manufacturing industry is not the primary source of low wages in these economies.[48] Consequently, potential headwinds in the manufacturing sector may not represent a major threat for low-wage employees in these countries. The effects of other variables are insignificant.

Table 5 presents similar estimates analysing low-pay persistence. On the effect of labour market institutions, the degree of collective bargaining coverage appears to have a negative relationship to low-pay persistence, albeit limited to WE Member States. This suggests that more widespread collective

[47] ILO (2020) shows that migrants in high-income countries are more likely to work in low-paid occupations demanding lower skills, including migrant workers with higher education. Migrant workers earn significantly lower wages than nationals, on average.

[48] The sectoral structure of low-wage employment is not available in EU-SILC, but SES data offer some insights. While low-wage employment accounted for 16.9% of total employment in manufacturing in CEE countries in 2018, it was less than the average for the total business economy (19%). An above-average share of low-paid employment was notable in Accommodation and food service activities, Administrative and support service activities (both around 40%), Other service activities (35%), and Construction, Wholesale and retail trade and Real estate activities (all more than 20%). Unfortunately, SES data do not cover employment in small business (<10 employees), which are more prone to pay low wages and accounted for 32.5% of total employment in the CEE region (29.6% in WE region) (see Gerlach and Schmidt (1990) for a survey of literature documenting positive relationship between employee wages and size of company; Eurostat Annual enterprise statistics by size class for special aggregates of activities [SBS_SC_SCA]). The sectors with highest shares of low-paid employment also show very high shares of employment in small firms, which may bias the information from SES data considerably (Eurostat Annual enterprise statistics by size class for special aggregates of activities [SBS_SC_SCA]).

bargaining is related to lower inertia of low pay in WE, but not in CEE countries. Again, this may be due to generally lower trade union power in the CEE region. Among other macroeconomic and structural country characteristics, estimated coefficients of the vacancy rate indicate a significant negative relationship to low-pay persistence in the total sample of countries. This suggests that tight labour markets connected to wage pressures may also translate into lower persistence in low pay, i.e. labour market tightness may push up wage growth, particularly among low-paid workers, thereby reducing wage inequality. Indeed, Duval et al. (2022) reported that wages in low-pay industries are more responsive to labour market tightness. Consequently, increasing wages in low-paid segments may attract more inactive people back to the labour force, easing labour market pressures.

Employment in technology and knowledge-intensive sectors shows opposite relationships in CEE and WE countries. In WE countries, larger shares of workers working in these technologically advanced sectors tend to be connected to higher low-pay persistence, but the opposite seems to be the case for CEE Member States. Here, the association is negative, meaning that greater employment in technologically advanced sectors is linked to lower inertia in low-wage employment. Technology and knowledge-intensive sectors account for a lower share of employment in the CEE region. It could be argued that these sectors still have greater ability to soak employees from other sectors of the economy, representing an opportunity for a wage rise in CEE countries, while such mechanism may be already weakened in WE. There is no empirical evidence for such an effect, however.

Greater horizontal skill mismatch is connected to higher low-pay persistence, while participation in education and training is connected with lower low-pay persistence, but both only in WE countries – both relationships are insignificant in CEE countries. Participation in education and training only refers to the adult population (aged 25-64) and is very low in CEE countries. Potentially, such low levels may not be enough to significantly drive up earnings of low-wage workers and, thus, the main effect of education on low-paid employment in CEE Member States takes place in formal education at primary/secondary/tertiary level in youth rather than in adulthood.

Again, some of the variables show significant relationships that are not robust across sub-samples and specifications and should therefore be read with caution. The strictness of employment protection legislation suggests a positive association with low-pay persistence across several model specifications. That may indicate that more rigid employment protection tends to limit wage mobility and, consequently, reduce flows from low-wage employment into better-paid jobs. The relative size of government social expenditure shows a positive relationship as well, indicating that more generous social policy programmes may be related to higher persistence of low pay across countries. However, net replacement rates in unemployment appear to have a negative relationship in some of the specifications, indicating that more generous unemployment benefits are generally associated with lower low-pay persistence. The relative size of immigration flows from non-EU countries shows a negative association with low-pay persistence in several specifications, suggesting that migration inflows are lower in countries where it is more difficult to escape low pay. The relationship between the persistence of

low pay and relative size of emigration flows is positive in several specifications, suggesting greater migration outflows in countries where it is more difficult to escape low pay. The estimates by other variables do not show consistent outcomes.

These outcomes are often sensitive to model specification and, in some cases, to inclusion of particular variables. Their significance is often not robust, particularly for low-pay persistence. The degree of low-pay incidence and persistence may be somewhat related to a country's labour market institutional framework, similar to other labour market outcomes. However, the relationships identified between labour market institutions and other country characteristics and economic outcomes in distribution of wages should be interpreted with caution. The outcomes of regression analyses do not investigate the nature of the causality and should be considered evidence of correlation or a description of the 'stylised facts', rather than an explanation of the underlying causality of the observed patterns. The approach cannot rule out other potential explanations and factors driving the differences in low-wage employment in EU Member States. One such driver may be the composition of the workforce and distribution of both observed and unobserved workers' characteristics in each country, including distribution of skills (Lucifora, 1999), or the structure of the economy. A more fundamental criticism of the approach applied here (and in other studies examining the role of labour market institutions in determining labour market outcomes) is that the institutional environment may be the result, rather than the cause, of economic outcomes. In other words, labour market institutions may be endogenously determined by citizens' preferences, driven by the degree of low-pay incidence or persistence in the country. Finally, the results are based on a limited sample of countries and observations and come from aggregate data. All of these limitations should be borne in mind when considering and interpreting the findings.

CONCLUSION

CEE countries have larger shares of workers earning low wages (i.e. wages lower than two-thirds of the national wage median) compared to WE countries. Among WE countries, Mediterranean countries show relatively higher rates of low-paid work. A crucial concern when looking at the consequences of low pay is whether it is a temporary or lasting situation for workers. The findings presented here reveal that in the EU, a significant portion of low-wage jobs can be considered long-term and persistent, which can have especially strong effects on specific groups of workers and can have negative consequences for both individuals and society.

In countries where low pay is more widespread, it is generally harder for workers to move out of low-wage jobs and secure higher-paying positions. If a worker holds a low-paid job, it increases their chances of remaining in the low-wage category in the future. On average, this effect is about 16.9 pp in CEE and 5.9 pp in WE countries. However, the magnitude of the relationship varies considerably from one country to another. Essentially, this means that individuals who are in low-paid jobs are more likely to continue to be in such jobs in the future, regardless of their personal characteristics or the nature of their job.

The main individual factors influencing the likelihood of earning low wages and becoming stuck in low-paid jobs are gender, age, and education. However, there are notable differences in how these factors play out in CEE compared to WE Member States.

In both CEE and WE countries, women have a higher chance of earning low wages and remaining in that situation for an extended period. However, when it comes to age, the patterns differ: in WE countries, younger workers are more likely to experience low pay compared to those in their prime working years or older, while in CEE countries, both younger and older workers are more prone to low pay. Providing training and support for young workers to transition into more stable, well-paying jobs, and creating opportunities for re-skilling and continued employment for older workers can help to mitigate this issue.

The impact of education on low pay is significant. Having a higher level of education is linked to reduced likelihood of experiencing low pay, especially in CEE countries. Tertiary-educated workers have a notably lower chance of facing persistent low pay compared to those with secondary education in both regions, with the effect more pronounced in CEE countries. However, the effect of secondary education compared to primary education is not as strong in CEE as in WE countries. Given the significant association between education and lower persistence of low-wage employment, creating opportunities for ongoing skill development and adult learning remains important.

Having a temporary contract contributes to a higher likelihood of earning low wages for individuals in many countries, with a more pronounced effect in CEE countries. This implies that temporary work

has a precarious character and is associated with lower wages, especially in CEE countries. Additionally, low-pay is more widespread among workers who experience gaps in their work history and who do not work consistently throughout the year. This suggests the existence of a cycle where low-paid workers frequently alternate between low-pay/no-pay situations, impacting both their employment stability and earning potential.

Panel regressions show that various factors related to a country's labour market institutions, economy, and structural characteristics are linked to a reduced likelihood of both low-pay incidence and persistence. However, while there are significant connections between low-pay incidence and several factors, similar associations with low-pay persistence are not as straightforward.

Looking at labour market institutions, collective bargaining and minimum wages interact with the incidence and persistence of low-paid employment, although the relationships may differ between WE and CEE countries. In WE, a higher extent of collective bargaining coverage is linked to a lower persistence of low wages and higher minimum wages are associated with a lower proportion of workers earning low wages. However, neither relationship is significant in CEE countries. Thus, the potential effects of higher minimum wages on employment should be considered when setting the minimum wages in each country. The Directive on Adequate Minimum Wages in the EU promotes collective bargaining in wage-setting and requires the consideration of national productivity levels and developments as a criterion when setting and updating statutory minimum wages. This can help to factor-in the consequences of higher minimum wages for competitiveness and employment.

Countries with larger government spending on social policies, including unemployment benefits, tend to have a lower incidence of low-paid employment. In other words, when governments allocate more resources to social support, the incidence of low pay tends to be lower across countries. Higher net replacement rates in unemployment are connected to a higher low-pay incidence, particularly in CEE countries.

The results indicate that when labour markets are tight, with more unfilled vacancies and sustained labour shortages, the proportion of low-paid workers tends to be lower and low-wage employment has less persistence across Member States. This is likely because the increased pressure on wages in such conditions helps to reduce the number of low-paid workers and allows for more wage flexibility at the lower end of the wage distribution.

Having a higher proportion of employment in technology and knowledge-intensive industries is associated with a lower incidence of low-wage employment in the Member States. A greater orientation in the economy towards higher-value added and technologically advanced production may enable higher wages and help to reduce the pool of low-paid labour. However, the relationship between employment in these advanced sectors and low-wage persistence differs between CEE and WE countries. In WE countries, having a larger share of workers in these sectors is linked to higher persistence of low-wage employment, suggesting that even these industries might contribute to ongoing low pay.

By contrast, in CEE countries, higher employment in technologically advanced sectors is connected to lower persistence of low-wage employment, suggesting that these sectors may help to break the cycle of low pay.

Several factors related to education and skills, particularly training participation, skill mismatch, and overqualification, may play a role in the incidence and persistence of low-paid employment, with some variations between WE and CEE countries. Firstly, a higher proportion of adults participating in education and training is linked to a lower persistence of low-wage employment in WE countries. This suggests that ongoing education and skill development can help people to escape low pay. However, this relationship is not evident in CEE. Secondly, having a larger horizontal skill mismatch is related to reduced shares of low-paid workers, but is also associated with higher persistence of low-wage employment. In other words, while this flexibility might help to reduce initial low pay, it becomes harder for workers to move up the wage ladder once they are stuck in low-paid positions, particularly in countries where workers often work in fields unrelated to their formal qualifications. Thirdly, when the workforce includes a higher proportion of overqualified individuals, it is related to higher shares of low-paid workers, but only in WE countries. This suggests that underutilising workers' skills and education may result in a higher incidence of low-paid employment.

Finally, Member States with more widespread low-wage employment tend to experience larger flows of international migration in both directions. In cases of increased immigration, this might be due to immigrants often finding work in the low-paid secondary sector of the labour market. This can contribute to a larger pool of low-paid workers. Additionally, a greater inflow of low-paid labour can lead to increased supply in this segment, potentially reducing pressure for wage growth. By contrast, emigration could be a consequence of widespread low pay, as individuals might seek better-paying opportunities abroad. This connection between low pay and emigration is primarily observed in WE Member States.

The limitation of the findings presented here need to be considered when understanding their broader implications. Firstly, the data used (EU-SILC) has certain limitations, especially in measuring wages through household surveys. Different data sources can provide varied wage information and the results should be interpreted with care. Analysing part-time work introduces further potential bias, as details about hours worked are often unavailable and wages for part-timers might not be accurately represented. The analysis of intermittent work, where workers have breaks during the year, can also affect the accuracy of reported wage data. Secondly, the estimates of factors influencing low-wage incidence and persistence should be seen as correlations or descriptions of ‘stylised facts’, rather than explanations of underlying causality. The results are sensitive to the model specification and often lack robustness, especially concerning low-wage persistence.

In conclusion, when low-wage employment is not a temporary state in workers’ careers and the persistence of low pay is high, a comprehensive approach must be taken to improving the prospects of low-paid workers in the labour market. This could involve several key actions. Firstly, a lifelong focus

on education and training can empower workers in wage negotiations and increase their chances of securing higher-paying jobs. Secondly, ALMPs can enhance job-search strategies, making it easier for workers to access better-paying jobs in higher-wage companies. Finally, promoting a 'high road' strategy for businesses can benefit low-paid workers, whereby, instead of relying on cost-cutting through cheap labour, businesses reorganise their work processes, provide more training opportunities, and leverage technological advancements to create better-paying jobs and improve overall productivity. This approach not only benefits workers but boosts productivity and may reduce turnover. Promoting such a strategy can be a valuable part of policy efforts to improve the situation of low-paid workers. Policy interventions should be tailored to the specific context of each country and consider the interactions between various factors.

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LIST OF ABBREVIATIONS

ALMP	Active labour market policies
APE	Average partial effect
AMECO database	Annual Macro-economic database of the European Commission's Directorate-General for Economic and Financial Affairs (DG ECFIN)
AT	Austria
BE	Belgium
BG	Bulgaria
CBC	Collective bargaining coverage
CEE	Central and Eastern European Member States
CY	Cyprus
CZ	Czechia
DK	Denmark
ECHP	European Community Household Panel
EE	Estonia
EL	Greece
EPL	Employment protection legislation
ES	Spain
EU-SILC	European Union – Statistics on Income and Living Conditions
FI	Finland
FR	France
GDP	Gross Domestic Product
HU	Hungary
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
NL	the Netherlands
NRR	Net replacement rate
OECD	Organisation for Economic Co-operation and Development
PL	Poland
pp	Percentage point
PPS	Purchasing power standard
PT	Portugal
RO	Romania
SE	Sweden
SES	Structure of Earnings Survey
SI	Slovenia
SK	Slovakia
TUD	Trade union density
WE	Western European Member States

APPENDIX

Table A.1 Sample sizes for different samples of workers

	Full-time full-year employees	Full-time and part-time full-year employees	All employees
AT	20,200	26,605	32,400
BE	22,679	31,122	36,671
BG	27,468	28,334	35,903
CY	21,927	22,830	29,317
CZ	46,204	47,259	52,912
DK	14,854	16,808	18,285
EE	20,200	21,027	27,195
EL	25,952	28,504	35,653
ES	42,277	49,375	62,099
FI	19,086	20,159	29,215
FR	94,226	112,878	135,642
HU	33,925	35,445	44,905
IT	60,083	70,830	81,344
LT	16,197	16,969	20,370
LU	22,664	27,775	34,120
LV	17,423	18,720	23,097
NL	17,241	32,566	39,392
PL	63,170	66,641	81,490
PT	36,421	38,343	43,653
RO	37,490	37,686	38,594
SE	7,870	9,401	11,854
SI	28,275	28,721	34,640
SK	38,624	39,534	44,101
CEE	350,903	363,166	432,524
WE	383,553	464,366	560,328

Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.2 Missing and zero values of longitudinal weights in analysed samples

	Baseline sample Full-time full-year employees			Full-time and part-time full-year employees			All employees		
	Zero weight	Missing weight	Missing or zero weight as a share on total cases (%)	Zero weight	Missing weight	Missing or zero weight as a share on total cases (%)	Zero weight	Missing weight	Missing or zero weight as a share on total cases (%)
AT	4		0.013	4		0.010	4		0.008
BE	7		0.020	7		0.015	8		0.015
BG	189		0.389	190		0.379	248		0.401
CY	4		0.012	4		0.012	4		0.009
CZ	135		0.192	141		0.195	162		0.203
DK	3		0.013	3		0.012	4		0.015
EE		4	0.011		4	0.011	3	4	0.015
EL	8	923	2.342	11	993	2.296	16	1240	2.339
FI		1834	6.187		1952	6.187		2700	6.243
FR	4364	302	3.313	4826	353	3.040	5829	464	3.172
IT	25		0.027	32		0.029	35		0.028
LT	30		0.106	30		0.100	36		0.103
LU	780	822	4.732	870	946	4.353	1118	1181	4.722
LV		2	0.006		4	0.012		4	0.010
PL	36		0.038	37		0.037	47		0.039
SE		1214	9.362		1500	9.659		1826	9.774
SK	16		0.028	16		0.027	22		0.034

Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.3 Transition probabilities of low pay

	Full-time full-year employees, not weighted		Full-time and part-time full-year employees, weighted		All employees, weighted	
	Low-pay incidence $Pr(LP_t = 1)$ (a)	Low pay in successive years $Pr(LP_t = 1 \mid LP_{t-1} = 1)$ (b)	Low-pay incidence $Pr(LP_t = 1)$ (a)'	Low pay in successive years $Pr(LP_t = 1 \mid LP_{t-1} = 1)$ (b)'	Low-pay incidence $Pr(LP_t = 1)$ (a)''	Low pay in successive $Pr(LP_t = 1 \mid LP_{t-1} = 1)$ (b)''
AT	12.1	66.2	15.2	63.3	18.1	60.3
BE	8.6	52.6	9.9	55.2	12.9	53.4
BG	22.9	66.0	17.4	59.9	20.6	59.6
CY	18.6	82.1	13.8	77.4	18.8	73.9
CZ	16.4	76.2	15.1	75.3	17.5	74.3
DK	4.8	62.2	9.2	60.9	10.9	55.3
EE	29.0	77.0	23.3	74.0	25.8	70.8
EL	14.1	72.1	14.1	65.7	18.2	64.7
ES	17.3	70.0	17.4	62.6	21.0	60.6
FI	7.6	63.5	6.8	55.6	12.4	50.0
FR	8.9	66.9	11.4	67.8	13.9	62.8
HU	18.7	60.5	14.5	53.2	18.8	55.9
IT	13.8	66.3	15.3	63.5	17.4	61.5
LT	28.0	76.7	25.1	72.4	28.0	70.6
LU	30.2	83.2	22.0	76.2	25.6	76.4
LV	29.1	74.3	25.1	69.1	28.0	68.2
NL	7.6	77.4	15.0	77.3	17.9	72.1
PL	20.2	67.5	17.0	64.3	20.5	63.0
PT	15.5	59.4	12.2	53.8	14.5	52.7
RO	15.6	74.9	15.3	74.6	15.6	74.5
SE	7.4	43.9	9.2	43.2	14.0	46.5
SI	15.8	67.7	11.9	59.4	16.5	56.5
SK	13.2	65.0	12.8	63.0	14.2	61.3
CEE	19.6	71.0	16.3	66.8	19.1	65.4
WE	12.7	68.6	13.7	64.2	16.5	61.2

Note: low-pay incidence (a) was calculated as a share of low-wage earners in t.; low pay in successive years (b) was calculated as a share of the low paid in t, and who were also low paid in t – 1, from the total number of those who were low paid in t – 1.; low pay is defined as a wage lower than two-thirds of the sample's median gross wage, referring to sample as given in column headings; figures in columns (a)', (b)', (a)'' and (b)'' weighted by longitudinal weights.

Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.4 Differences in low-pay incidence, statistics from EU-SILC minus statistics from SES (pp)

	Full-time full-year employees			Full-time and part-time full-year employees			All employees		
	2010	2014	2018	2010	2014	2018	2010	2014	2018
AT	-0.5	1.6	-0.3	-1.4	1.9	0.0	2.0	4.9	3.1
BE	1.4	4.8	-1.1	1.2	6.1	-1.0	5.0	8.7	3.0
BG	-4.6	-4.3	6.7	-6.4	-5.1	2.3	-3.4	-1.9	4.7
CY	-5.5	1.4	-1.1	-9.0	-4.8	-6.6	-4.7	1.6	-0.9
CZ	-2.0	-2.1	1.5	-3.3	-4.4	0.6	-1.2	-2.0	2.5
DK	1.5	-1.5	1.8	1.5	-0.8	3.8	3.0	1.7	4.9
EE	1.5	4.7	2.7	-1.5	1.9	2.4	0.9	5.9	5.1
EL	1.4	-4.5	-6.4	-1.6	-6.4	-6.7	2.2	-1.6	-3.8
ES	5.5	6.0	7.9	4.0	4.0	7.4	6.6	8.5	9.8
FI	3.3	2.9	2.6	1.1	1.7	1.4	7.5	7.4	7.4
FR	3.3	1.1	0.6	4.8	2.8	2.2	7.2	4.6	4.9
HU	-1.0	-1.5	8.6	-5.5	-5.2	8.8	0.2	0.0	10.5
IT	1.4	6.3	10.0	1.1	7.0	10.6	4.1	9.2	12.3
LT	1.6	2.3	5.5	-2.3	0.5	3.9	1.5	2.3	6.5
LU	12.7	13.2	14.6	10.0	8.8	11.7	13.5	13.2	14.4
LV	-2.2	-0.2	-0.3	-7.3	-2.8	-1.6	-2.5	-0.3	0.7
NL	-6.7	-5.7	-7.9	-2.8	-3.8	-4.4	0.5	0.5	-2.9
PL	-4.3	-5.9	-4.8	-5.8	-7.1	-6.6	-1.9	-4.1	-4.1
PT	-5.7	6.4	10.9	-6.1	0.7	9.3	-3.3	3.0	11.0
RO	-7.7	-13.4	1.1	-8.0	-13.3	1.0	-7.6	-13.1	1.3
SE	4.4	6.4	3.9	6.3	7.7	5.5	11.3	13.2	7.7
SI	0.2	-1.4	-4.5	-3.8	-8.9	-8.8	0.2	-2.8	-3.1
SK	-3.2	-13.6	-4.6	-4.7	-13.5	-5.0	-3.2	-12.5	-4.8

Source: Authors' calculations based on EU-SILC data 2008–2020, Eurostat SES.

Official Eurostat low pay statistics drawn from SES is available for comparison with EU-SILC estimates for several years. The comparison of low-pay incidence from these two data sources is presented in Table A.4 for all three samples of workers used here. While SES works with wages on hourly basis, it enables straightforward inclusion of part-timers without potentially biasing their wage information. SES completely omits the agricultural and public sectors, as well as small businesses with fewer than 10 employees. This means that the data from these two sources offer slightly different perspectives on low-pay incidence and do not necessarily have to be equal. This is also the case for many countries, as indicated in Table A.4. The largest differences are recorded in Luxembourg, where EU-SILC figures exceeded those from SES by more than 10 pp in almost all years available. Substantial (positive) differences are also evident in Sweden. Italy, Hungary, Portugal and Spain, mostly in 2018. Large differences in the opposite direction (i.e. EU-SILC figures below those of SES) were recorded in Slovakia and Romania, and partly in Slovenia, Poland and the Netherlands.

Figure A.1Low-pay incidence, development by country, 2005-2019

Note: low-pay incidence (a) calculated as a share of low-wage earners in t.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.5 Explanatory variables used in analysis of low-pay incidence and persistence

Variable	Description of variable	Source
Minimum wage (MW)	Monthly minimum wage as a proportion of the mean gross monthly earnings in industry and services, except public administration and community services; activities of households and extra-territorial organisations (%)	*Eurostat*
Trade union density (TUD)	Employees who are members of trade unions, percentage of all employees (%)	*OECD/AIAS ICTWSS database*
Collective bargaining coverage (CBC)	Employees who are covered by collectively bargained contracts, percentage of all employees (%)	*OECD/AIAS ICTWSS database*
Employment protection legislation (EPL2)	Strictness of employment protection – individual and collective dismissals (regular contracts). The effect of employment protection legislation is covered in a composite index summarising hiring and firing regulations and conditions concerning the protection of regular employment, temporary employment and collective dismissals (OECD, 1999). Version 2 of the index is used	*OECD*
Net replacement rates in unemployment (NRR)	Net replacement rate in unemployment for a single person without children at 67% of the average wage, unemployment duration three months	*OECD*
Government social protection expenditure (GEXS)	Total general government expenditure on social protection, percentage of GDP. Covers expenditure in areas of sickness and disability; old age; survivors; family and children; unemployment; housing; research and development; social protection and social exclusion n.e.c.	*Eurostat*
Product market regulation (PMR)	OECD Product Market Regulation index (economy-wide). As the index is only available for 2003, 2008, 2013 and 2018, the available values of the index for the whole five-year period after the respective year is employed (2003 value used for 2003-2007 etc.)	*OECD*
Job vacancy rate (VCRT)	Proportion of total vacant posts, expressed as a percentage of total job vacancies divided by the sum of job vacancies and occupied posts in the business economy - industry and services (except public administration and community services; activities of households and extra-territorial organisations)	*Eurostat*
Employment in manufacturing (MAN)	Proportion of employees in manufacturing industry of total employment in the economy, aged 15-64	*Eurostat*
Employment in technology	Employment in technology and knowledge-intensive sectors: high and medium high-technology manufacturing and	*Eurostat*

Variable	Description of variable	Source
and knowledge-intensive sectors (HMK)	total knowledge-intensive services, percentage of total employment	
Trade openness (TROP)	Trade as the sum of exports and imports of goods and services measured as a share of gross domestic product (%)	*World Bank national accounts data, and OECD National Accounts data files*
Participation of adult population in education and training (PRED)	Participation in formal and non-formal education and training in last four weeks, percentage of total population, 25-64 years	*Eurostat*
Horizontal skills mismatch (HSM)	Rate of skills mismatch by field of education is defined as the discrepancy between a person's current occupation and their field of education related to the highest level of education attained. Age group 25-34, total economy	*Eurostat*
Overqualification rate (OQ)	Overqualification rate as a proportion of people aged 20-64 with tertiary education and working in ISCO 4-9 (%) (i.e. work in occupations below their formal qualification)	*Eurostat*
Shadow economy (SHEC)	Size of shadow economy estimated by MIMIC model, percentage of GDP	*Kelmanson et al., 2021*
International migration: emigration (EMG)	Total emigration, citizens of the reporting country, percentage of total population of the country	*Eurostat*
International migration: immigration (IMG)	Total immigration from non-EU-28 countries or reporting country, percentage of total population of receiving country	*Eurostat*
GDP per capita (GDP)	GDP at market prices, total per capita, percentage of EU-27, based on PPS, current prices	*Eurostat*
Relative wage level (AW)	Nominal compensation per employee, relative to aggregate of EU-27, in PPS, EU-27 = 100	*AMECO*

Table A.6 Explanatory variables used in analysis of low-pay incidence and persistence: descriptive statistics

	MW	TUD	CBC	EPL2	NRR	GEXS	PMR	VCRT	MAN	HMK	TROP	PRED	HSM	OQ	SHEC	IMG	EMG	GDP	AW
AT	0.00	28.99	98.00	2.56	68.38	20.62	1.38	2.37	16.56	41.29	100.86	13.91	31.29	25.74	9.39	0.58	0.20	129.1	104.9
	(16)	*(16)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(13)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
BE	44.69	52.88	96.00	2.70	86.75	18.70	1.53	2.96	14.40	49.77	154.79	7.59	22.99	21.00	21.58	0.54	0.31	119.9	128.9
	(16)	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(14)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(14)*	*(16)*	*(16)*
BG	41.09	15.90	31.45	.	76.33	11.96	1.68	0.59	21.25	31.77	117.65	1.81	27.39	22.63	37.00	0.17	0.32	45.16	35.84
	(16)	*(3)*	*(4)*	*(0)*	*(12)*	*(16)*	*(7)*	*(15)*	*(16)*	*(15)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(9)*	*(16)*	*(16)*
CY	0.00	52.19	52.19	.	60.57	12.03	1.69	1.83	8.53	35.26	123.19	7.51	29.14	33.25	30.13	0.94	0.16	95.44	77.08
	(16)	*(13)*	*(13)*	*(0)*	*(7)*	*(16)*	*(7)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(11)*	*(16)*	*(16)*
CZ	35.72	15.23	36.13	3.01	59.94	12.76	1.54	2.97	27.31	40.43	136.91	8.26	25.72	12.14	19.14	0.28	0.10	86.28	63.64
	(16)	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
DK	0.00	68.72	83.59	1.92	85.06	23.13	1.29	1.54	13.23	52.54	99.50	29.24	23.23	13.53	18.06	0.50	0.31	128.0	102.6
	(16)	*(16)*	*(9)*	*(16)*	*(16)*	*(16)*	*(16)*	*(10)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
EE	35.43	6.63	12.60	2.17	55.07	11.81	1.32	1.70	20.05	36.86	146.07	11.82	28.84	24.43	32.93	0.34	0.42	71.96	58.75
	(16)	*(16)*	*(4)*	*(12)*	*(15)*	*(16)*	*(12)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
EL	48.30	22.20	69.13	2.79	43.63	18.56	2.06	1.54	10.72	33.74	61.29	3.18	29.24	26.00	29.62	0.45	0.43	80.44	73.59
	(8)	*(5)*	*(14)*	*(16)*	*(16)*	*(16)*	*(16)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(12)*	*(16)*	*(16)*
ES	37.24	15.82	79.88	2.47	77.56	15.86	1.53	0.57	13.66	36.91	59.60	10.25	29.20	35.40	20.06	0.70	0.12	95.93	91.81
	(16)	*(16)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
FI	0.00	68.25	89.46	1.96	68.13	22.69	1.37	2.03	15.27	48.90	76.77	24.69	24.08	18.39	19.50	0.30	0.18	116.0	98.71
	(16)	*(16)*	*(5)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
FR	46.64	10.70	97.94	2.72	69.56	23.28	1.57	.	13.55	47.46	58.39	11.42	26.41	21.23	14.92	0.29	0.36	108.3	109.9
	(13)	*(6)*	*(5)*	*(16)*	*(16)*	*(16)*	*(16)*	*(0)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(14)*	*(16)*	*(16)*
HU	41.50	13.07	25.65	2.30	69.06	15.79	1.59	1.39	21.83	41.79	156.40	4.31	24.60	13.52	26.13	0.32	0.15	66.83	55.44
	(16)	*(7)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
IT	0.00	34.20	100.0	3.14	72.06	19.56	1.49	1.20	19.42	39.53	54.28	6.83	30.60	18.59	26.74	0.37	0.14	103.9	96.48
	(16)	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(4)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(12)*	*(16)*	*(16)*
LT	44.71	8.65	9.27	2.58	71.40	12.79	1.42	1.19	16.39	33.28	133.97	5.64	30.79	19.84	34.45	0.31	1.27	67.97	54.21
	(16)	*(14)*	*(14)*	*(6)*	*(15)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
LU	48.44	35.91	57.78	2.63	83.81	17.11	2.51	0.98	5.88	51.63	317.51	13.51	17.63	4.42	9.59	1.37	0.36	270.4	142.8
	(16)	*(16)*	*(4)*	*(12)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(15)*	*(16)*	*(16)*
LV	41.34	13.98	31.65	3.23	82.87	11.18	1.51	1.53	14.07	34.04	111.76	6.76	27.26	19.15	28.60	0.21	0.83	60.01	49.57
	(16)	*(13)*	*(4)*	*(8)*	*(15)*	*(16)*	*(7)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(9)*	*(16)*	*(16)*
NL	43.92	18.91	82.49	3.25	68.81	16.09	1.10	2.29	10.45	47.56	140.39	17.57	30.93	15.26	13.09	0.49	0.33	135.3	108.9
	(16)	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
PL	41.46	17.31	17.53	2.48	70.13	16.24	1.94	1.02	20.06	34.16	87.32	4.58	34.05	18.68	27.33	0.19	0.38	62.81	56.29
	(16)	*(12)*	*(7)*	*(16)*	*(16)*	*(16)*	*(16)*	*(13)*	*(16)*	*(15)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(15)*	*(16)*	*(16)*
PT	43.46	19.18	77.77	3.31	75.94	17.01	1.63	0.73	18.04	33.18	74.42	7.84	27.04	13.40	24.16	0.16	0.33	80.03	69.84
	(16)	*(8)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(12)*	*(16)*	*(16)*
RO	37.18	27.92	77.26	.	47.08	11.44	1.74	0.91	20.25	24.02	73.98	1.46	27.18	15.08	34.22	0.27	1.03	52.90	44.51
	(16)	*(5)*	*(10)*	*(0)*	*(12)*	*(16)*	*(7)*	*(15)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(12)*	*(16)*	*(16)*
SE	0.00	68.91	88.56	2.60	71.56	20.48	1.87	1.77	12.31	55.84	85.27	25.99	27.25	15.72	18.49	0.92	0.25	126.9	94.46
	(16)	*(16)*	*(14)*	*(16)*	*(16)*	*(16)*	*(16)*	*(15)*	*(16)*	*(15)*	*(16)*	*(15)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
SI	49.28	31.92	80.18	2.72	82.73	17.87	1.71	1.44	25.60	40.89	138.45	13.74	31.12	12.09	27.81	0.70	0.28	86.03	82.51
	(16)	*(12)*	*(9)*	*(12)*	*(15)*	*(16)*	*(12)*	*(16)*	*(16)*	*(15)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(16)*	*(16)*	*(16)*
SK	36.20	16.07	34.85	2.94	62.06	14.34	1.64	0.78	24.98	40.19	168.70	3.60	33.36	17.44	18.03	0.02	0.05	71.69	56.43
	(16)	*(15)*	*(4)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(16)*	*(6)*	*(12)*	*(16)*	*(7)*	*(12)*	*(16)*	*(16)*
CEE	36.72	19.41	38.18	2.66	67.52	13.47	1.63	1.39	20.03	35.70	126.76	6.32	29.04	18.93	28.71	0.34	0.45	69.73	57.66
	(176)	*(125)*	*(101)*	*(102)*	*(155)*	*(176)*	*(123)*	*(167)*	*(176)*	*(173)*	*(176)*	*(176)*	*(66)*	*(132)*	*(176)*	*(77)*	*(148)*	*(176)*	*(176)*
WE	24.73	40.55	86.24	2.67	72.60	19.42	1.61	1.64	13.63	44.80	106.92	14.27	26.66	19.06	18.77	0.56	0.27	124.5	101.9
	(181)	*(163)*	*(144)*	*(188)*	*(192)*	*(192)*	*(192)*	*(150)*	*(192)*	*(191)*	*(192)*	*(191)*	*(72)*	*(144)*	*(192)*	*(84)*	*(175)*	*(192)*	*(192)*

Note: Values refer to mean values of variables in the respective country; values in parentheses state number of observations in given country.
Source: see Table A.5.

Table A.7 Low-pay probability: results of dynamic random effects probit model with unobserved heterogeneity, full-time full-year employees

	AT	BE	BG	CY	CZ	DK	EE	EL	ES	FI	FR
Low paid t-1	0.087***	0.027***	0.245***	0.214***	0.154***	0.085**	0.214***	0.193***	0.082***	0.051***	0.064***
Male	-0.027***	-0.021***	-0.047***	-0.039***	-0.06***	-0.007***	-0.092***	-0.015***	-0.034***	-0.012***	-0.021***
Age 20-24	0.013**	0.023***	0.034**	0.008	0.012*	0.012***	-0.008	0.041***	0.012	0.002	0.012***
Age 25-29	0.008	0.016***	0.024*	-0.003	-0.002	0.009***	-0.015	0.028***	0.004	0.004	0.013***
Age 30-34	0.001	0.007*	0.014	0.000	-0.009	0.004	-0.006	0.019***	0.003	0.003	0.007***
Age 35-39	0.008*	0.002	-0.022**	0.005	-0.003	0.003	0.005	0.011**	0.006	0.002	0.002
Age 45-49	-0.009*	-0.012***	-0.02**	-0.002	-0.006	0.000	0.03**	-0.005	-0.009**	0.001	0.000
Age 50-54	-0.012**	-0.011**	-0.029***	-0.014*	0.007	-0.002	0.025*	-0.014***	-0.015***	0.002	0.002
Age 55-59	-0.012**	-0.016***	-0.027***	-0.009	0.002	0.002	0.074***	-0.017***	-0.031***	0.001	0.003
Age 60-64	-0.005	-0.005	0.02*	-0.001	0.02***	0.005**	0.084***	-0.005	-0.014**	0.007*	0.007**
Married	0.014	-0.008	-0.079**	0.004	-0.02	0.009	0.057	0.005	0.015	-0.001	-0.013**
Single with spouse	-0.006	-0.006	-0.044	0.028	-0.001	0.008	-0.014	0.011	-0.002	-0.008	-0.01**
Children in household	0.013	0.03***	0.014	0.013	0.021**	0.008**	0.026	0.005	0.009	0.008	0.009**
Primary education	0.029***	0.017***	0.079***	0.022***	0.051***	0.003*	0.074***	0.026***	0.028***	0.002	0.02***
Tertiary education	-0.025***	-0.033***	-0.149***	-0.037***	-0.09***	-0.009***	-0.135***	-0.032***	-0.032***	-0.016***	-0.026***
Densely pop. area	0.013	-0.018	-0.073	-0.016	-0.034	-0.007	-0.007	-0.005	0.003	-0.005	0.001
Medium pop. area	-0.008	-0.007	0.056	-0.01	0.009	-0.003	0.000***	-0.009**	0.014	-0.006	-0.002
Temporary contract	0.004	0.017**	-0.039	0.009	0.017**	0.000	0.022	-0.002	0.01	0.006	0.009**
Unemployment rate	-0.063**	-0.010	-0.082***	-0.006	0.012*	0.008***	0.049*	-0.002	0.004**	0.008	0.014*
Observations	20,200	22,679	27,468	21,927	46,204	14,854	20,200	25,952	42,277	19,086	94,226
Log likelihood	-2863	-3279	-10081	-2821	-8813	-917.9	-6457	-4106	-7647	-1681	-12191
Wald chi2	1379	1091	4477	1923	4943	502.7	2935	2842	2791	663.9	4920
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	HU	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK
Low paid t-1	0.14***	0.092***	0.247***	0.056***	0.19***	0.105***	0.21***	0.109***	0.189***	0.049**	0.14***	0.154***
Male	-0.031***	-0.017***	-0.047***	-0.059***	-0.065***	-0.006***	-0.052***	-0.05***	-0.049***	-0.005**	-0.034***	-0.047***
Age 20-24	0.018*	0.009*	0.021	0.061***	-0.041*	-0.003	0.013	0.029***	0.036***	0.005	0.017	0.023***
Age 25-29	0.013	0.012***	0.061***	0.036***	-0.018	-0.006*	0.019***	0.027***	0.019***	0.009**	0.043***	0.023***
Age 30-34	0.003	0.003	0.036**	0.001	-0.017	-0.001	0.012**	0.019***	0.015**	0.016***	0.019***	0.007
Age 35-39	0.006	0.002	0.033**	0.012	-0.018	0.000	0.003	0.008	0.006	0.006	0.013**	0.005
Age 45-49	0.003	-0.006**	-0.005	-0.014	0.012	0.000	-0.01*	-0.009*	0.004	0.003	-0.002	0.012***
Age 50-54	-0.002	-0.014***	0.003	-0.01	0.017	-0.002	-0.004	-0.006	-0.004	0.001	-0.009	0.022***
Age 55-59	0.008	-0.019***	0.033**	0.004	0.031**	0.001	0.002	-0.007	0.01	0.007*	0.016**	0.023***
Age 60-64	0.015	-0.006	0.039**	-0.012	0.031*	0.006*	0.008	-0.003	-0.021*	0.007	0.028**	0.023***
Married	0.006	-0.023**	-0.006	0.067**	-0.024	-0.006	0.008	-0.002	-0.006	0.015**	0.014	-0.014
Single with spouse	0.022	-0.017	-0.005	-0.033	-0.041	-0.001	-0.008	0.011	0.007	-0.003	0.005	0.028
Children in household	0.019	-0.005	0.027	0.029	-0.019	0.009	0.021**	0.009	0.018	0.026***	0.009	0.026***
Primary education	0.054***	0.029***	0.019	0.094***	0.078***	0.011***	0.017***	0.05***	0.041***	0.004	0.043***	0.046***
Tertiary education	-0.107***	-0.029***	-0.132***	-0.107***	-0.181***	-0.011***	-0.092***	-0.077***	-0.118***	-0.006***	-0.058***	-0.064***
Densely pop. area	0.023	0.002	0.004	0.044	-0.125	0.000***	0.005	0.039	-0.034***	-0.008	0.000***	0.083
Medium pop. area	0.038***	0.007	0.101**	0.036	0.000	0.000***	-0.009	0.017	-0.015***	-0.004	0.000***	0.095*
Temporary contract	0.04***	0.015***	0.089**	0.033	0.094**	-0.005	0.009	0.016**	0.015	0.002	-0.009	0.003
Unemployment rate	-0.002	0.01***	0.03***	-0.153***	-0.064	-0.011	0.012***	-0.048***	-0.033***	0.002	-0.088**	0.008***
Observations	33,925	60,083	16,197	22,664	17,423	17,241	63,170	36,421	37,490	7,870	28,275	38,624
Log likelihood	-9457	-9863	-4836	-4999	-5531	-1190	-16875	-8864	-8791	-625.7	-5995	-7869
Wald chi2	4366	4064	2457	1755	2404	669.5	9041	3692	4676	213.1	2803	4273
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*Note: Dependent variable: low-pay status in period t; low-paid status of an individual defined by the threshold set at two-thirds of the country sample's median wage as a dependent variable; marginal effects at means reported, ***/**/* statistically significant at 1%/5%/10% levels, respectively; model allows for correlation between explanatory variables and unobserved heterogeneity by covering the initial period values and within-unit averages of time-variant explanatory variables, as well as the initial period value of the dependent variable (not reported for brevity).*

Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.8 Low-pay probability: results of a dynamic random effects probit model with unobserved heterogeneity, comparison on all samples

	Full-time full-year employees		Full-time and part-time full-year employees		All employees	
	WE	CEE	WE	CEE	WE	CEE
Low paid t-1	0.077***	0.192***	0.072***	0.168***	0.075***	0.16***
Male	-0.023***	-0.054***	-0.02***	-0.046***	-0.03***	-0.057***
Age 20-24	0.017***	0.015***	0.019***	0.016***	0.043***	0.023***
Age 25-29	0.016***	0.013***	0.016***	0.01***	0.03***	0.012***
Age 30-34	0.01***	0.005*	0.01***	0.005**	0.019***	0.007***
Age 35-39	0.006***	0.001	0.005***	0.002	0.008***	0.001
Age 45-49	-0.005***	0.000	-0.005***	0.001	-0.006***	0.001
Age 50-54	-0.008***	0.001	-0.006***	0.002	-0.009***	0.005**
Age 55-59	-0.010***	0.011***	-0.006***	0.012***	-0.007***	0.017***
Age 60-64	-0.003*	0.027***	0.003*	0.024***	0.004*	0.03***
Married	0.000	-0.006	-0.007**	-0.007	-0.007*	-0.006
Single with spouse	-0.007**	-0.001	-0.007**	-0.002	-0.007**	0.000
Children in household	0.011***	0.018***	0.012***	0.022***	0.019***	0.027***
Primary education	0.029***	0.047***	0.027***	0.041***	0.041***	0.056***
Tertiary education	-0.033***	-0.095***	-0.033***	-0.084***	-0.048***	-0.104***
Densely pop. area	0.002	0.000	0.001	0.006	0.004	0.001
Medium pop. area	0.001	0.018**	-0.003	0.011	-0.002	0.001
Temporary contract	0.009***	0.015***	0.009***	0.012***	0.013***	0.018***
Part-time			-0.136***	-0.195***	-0.131***	-0.163***
Unemployment rate	0.002***	0.002***	0.002***	0.000	0.003***	0.001*
Observations	383,553	350,903	464,366	363,166	560,328	432,524
Log likelihood	-60247	-91171	-75706	-91092	-124758	-130178
Wald chi2	25837	46701	30935	43979	48708	56183
p-value	0.000	0.000	0.000	0.000	0.000	0.000

*Note: Dependent variable: low-pay status in period t.; low-paid status of an individual defined by the threshold set at two-thirds of the country sample's median wage as a dependent variable; marginal effects at means reported, ***/**/* statistically significant at 1%/5%/10% levels, respectively; model allows for correlation between explanatory variables and unobserved heterogeneity by covering the initial period values and within-unit averages of time-variant explanatory variables, as well as the initial period value of the dependent variable (not reported for brevity).*

Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.9 Low-pay probability: results of dynamic random effects probit model and interaction between low-pay status and year, full-time and full-year employees

	LP t-1	LP t-1 * 2005	LP t-1 * 2006	LP t-1 * 2008	LP t-1 * 2009	LP t-1 * 2010	LP t-1 * 2011	LP t-1 * 2012	LP t-1 * 2013	LP t-1 * 2014	LP t-1 * 2015	LP t-1 * 2016	LP t-1 * 2017	LP t-1 * 2018	LP t-1 * 2019	Con-stant	Obs.	Log likeli-hood	Wald chi2	p-value
AT	-	1.844**	0.15	0.492**	1.170***	1.717***	1.535***	1.842***	1.910***	1.608***	1.384***	1.634***	1.875***	0.778***	1.602***	6.519**	20,20	-1956	999.7	0
BE	-0.049	0.812*	-0.285	-	-0.073	-0.004	-0.224	0.23	0.369	0.442	0.286	0.07	0.444*	-0.527**	1.153***	-	22,67	-2409	1111	0
BG	0.761***			-	-0.326	-0.263	-	-0.071	-0.117	-0.321	-	-	-	-	0.216	-0.184	27,46	-7109	3356	0
CY	1.175***	0.322	-0.425	-0.443	-0.3	0.077	-0.148	-0.15	-0.541**	-0.638**	-0.141	-0.18	-0.327	-	-	-	21,92	-1895	1153	0
CZ	0.141	1.051**	0.034	-0.093	0.337**	0.115	0.717***	0.507***	1.127***	0.487***	0.316**	0.541***	0.145	0.116	0.343	-	46,20	-6363	3484	0
DK	0.333	1.182	-0.005	-0.192	-0.765	-0.303	0.271	0.115	0.636	1.318*	-0.201	-0.129	-0.809	-0.25	-1.467*	-	14,85	-594.7	221	0
EE	0.028	1.058**	0.351*	0.094	0.319*	0.449**	0.209	0.691***	0.019	0.146	0.08	0.402**	0.185	-0.143	0.904***	-	20,20	-4587	2278	0
EL	1.916***			-	-	-	-	-	-	-	-	-	-	-	-	-	25,95	-2885	1554	0
ES	0.907***			-	-	-	-	-	-0.513**	-0.335*	-	-	-	-	-	-	42,27	-4784	2122	0
FI	0.064	6.437	1.289**	0.252	-0.276	-0.043	0.441	0.437	0.229	0.355	0.114	0.448	0.323	0.167	-1.199**	-5.964*	19,08	-1048	424.5	0
FR	1.121***			-	-	-	-	-	-	-	-	-	-	-	-0.744**	-	94,22	-8180	3879	0
H	0.177*	0.804**	-0.124	0.065	0.019	0.081	0.376***	-0.299**	-0.230*	-0.16	-0.214	-	-0.254*	-	-	-	33,92	-6972	3616	0
IT	1.303***			-	-	-	-	-	-	-	-	-	-	-	-	-	60,08	-6565	2915	0
LT	-0.179	1.491**	0.593**	0.612***	-0.09	0.655***	-0.046	1.249***	0.642***	0.745***	0.485**	0.469**	0.278	0.566**	0.532	-	16,19	-3332	2564	0
LU	1.181***			-0.405	-0.609**	-	-0.528**	-0.497*	-0.682**	-0.387	-	-	-	-	0.068	-	22,66	-3729	2237	0
LV	0.892***			-	-	-	-	-	-	-	-	-	-	-	-	-	17,42	-3618	1738	0
NL	0.840**	6.737	-0.626	-0.515	-0.217	-0.871*	0.446	0.035	0.392	0.718	-0.141	-0.001	0.19	0.269	-0.712	-2.606	17,24	-784.1	380.5	0
PL	0.147**	0.854**	0.319**	0.092	0.225**	0.372***	0.424***	0.565***	0.453***	0.334***	0.222**	-0.026	0.220**	-0.207*	0.108	-	63,17	-	6807	0
PT	0.939***			-	0.251	-	-	-	-	-0.373*	-	-	-0.353*	-	-	2.718***	36,42	-6731	3394	0
RO	1.202***			-	-	-0.012	-0.197	-0.048	-0.218	-0.530**	-	-	-	-	-0.263	-	37,49	-6973	3912	0
SE	-0.102	1.611	0.739	-0.06	-0.334	-0.952*	1.229	-0.036	-0.167	0.145	0.401	-0.057	1.177	0.99	0.7	-4.179**	7,870	-348.2	136.2	0
SI	0.267**	1.021**	0.064	0.115	0.125	-0.199	-0.08	-0.104	-0.135	-0.153	0.405**	0.167	-0.137	-0.406*	0.006	-0.075	28,27	-4238	2014	0
SK	0.168	0.628**	-0.004	-0.248*	-0.03	0.106	0.395***	0.471***	0.794***	-	1.039***	0.706***	0.252*	-0.096	0.106	-	38,62	-5813	3062	0

*Note: Dependent variable: low-pay status in period t (Eq. 2); low-pay threshold defined as two-thirds of country sample median wage. Coefficients reported, ***/**/* statistically significant at 1%/5%/10% levels, respectively; model allows for correlation between explanatory variables and unobserved heterogeneity by covering the initial period values and within-unit averages of time-variant explanatory variables, as well as the initial period value of the dependent variable; only coefficients by lagged dependent variable and interaction coefficients are reported, for brevity.*

Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.10 Average partial effect: estimation of state dependence in low pay for specific profiles, full-time full-year employees

	Total sample	Gender		Age									Education		
		male	female	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	primary	secondary	tertiary
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
AT	0.070	0.058	0.098	0.088	0.080	0.071	0.080	0.073	0.061	0.058	0.057	0.063	0.117	0.077	0.049
BE	0.021	0.018	0.029	0.036	0.029	0.024	0.022	0.022	0.017	0.017	0.016	0.019	0.029	0.029	0.014
BG	0.238	0.225	0.256	0.260	0.252	0.247	0.226	0.245	0.227	0.222	0.222	0.250	0.284	0.270	0.159
CY	0.167	0.148	0.212	0.180	0.164	0.167	0.174	0.172	0.165	0.151	0.157	0.167	0.198	0.195	0.143
CZ	0.127	0.105	0.173	0.138	0.125	0.120	0.124	0.126	0.122	0.133	0.129	0.145	0.186	0.143	0.068
DK	0.072	0.048	0.102	0.214	0.162	0.106	0.093	0.059	0.069	0.059	0.083	0.112	0.092	0.098	0.038
EE	0.177	0.164	0.204	0.173	0.171	0.174	0.179	0.169	0.187	0.186	0.206	0.212	0.208	0.210	0.149
EL	0.176	0.162	0.197	0.279	0.243	0.215	0.197	0.175	0.167	0.150	0.143	0.164	0.232	0.202	0.136
ES	0.063	0.057	0.076	0.069	0.065	0.064	0.066	0.066	0.060	0.057	0.051	0.057	0.074	0.067	0.055
FI	0.036	0.029	0.044	0.039	0.041	0.039	0.038	0.034	0.037	0.038	0.037	0.045	0.038	0.047	0.025
FR	0.044	0.038	0.057	0.056	0.056	0.050	0.046	0.042	0.045	0.046	0.046	0.051	0.062	0.049	0.032
HU	0.131	0.121	0.144	0.144	0.140	0.133	0.135	0.127	0.133	0.130	0.136	0.142	0.171	0.150	0.071
IT	0.069	0.063	0.081	0.077	0.081	0.072	0.071	0.073	0.064	0.059	0.055	0.063	0.091	0.065	0.049
LT	0.211	0.200	0.226	0.223	0.244	0.230	0.228	0.202	0.209	0.213	0.226	0.231	0.222	0.258	0.173
LU	0.023	0.025	0.022	0.022	0.022	0.023	0.023	0.024	0.024	0.024	0.023	0.024	0.023	0.031	0.034
LV	0.162	0.151	0.177	0.147	0.155	0.156	0.156	0.160	0.166	0.167	0.173	0.173	0.193	0.209	0.116
NL	0.079	0.074	0.103	0.066	0.061	0.074	0.079	0.079	0.077	0.072	0.082	0.105	0.130	0.092	0.054
PL	0.195	0.171	0.228	0.208	0.213	0.206	0.198	0.192	0.186	0.192	0.197	0.203	0.212	0.227	0.125
PT	0.105	0.083	0.132	0.133	0.130	0.122	0.111	0.103	0.098	0.100	0.099	0.102	0.126	0.090	0.051
RO	0.170	0.149	0.207	0.213	0.192	0.187	0.177	0.164	0.174	0.167	0.181	0.148	0.217	0.199	0.074
SE	0.039	0.033	0.049	0.058	0.076	0.123	0.061	0.022	0.050	0.042	0.063	0.066	0.051	0.048	0.028
SI	0.117	0.103	0.139	0.135	0.165	0.136	0.129	0.110	0.115	0.110	0.132	0.149	0.164	0.133	0.078
SK	0.144	0.112	0.186	0.179	0.177	0.153	0.150	0.125	0.159	0.173	0.176	0.179	0.219	0.166	0.078
CEE	**0.169**	**0.149**	**0.200**	**0.183**	**0.180**	**0.173**	**0.170**	**0.164**	**0.169**	**0.170**	**0.178**	**0.193**	**0.213**	**0.197**	**0.110**
WE	**0.059**	**0.053**	**0.071**	**0.073**	**0.072**	**0.066**	**0.062**	**0.059**	**0.056**	**0.054**	**0.053**	**0.057**	**0.079**	**0.062**	**0.044**

Note: Estimates of APE (Eq. 3) based on results of dynamic random effects probit model with unobserved heterogeneity; baseline estimations are reported in Table A.7, Table A.8, Figure 4; low-paid status of an individual defined by the threshold set at two-thirds of the sample's median wage as a dependent variable.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.11 Average partial effect: estimation of state dependence in low pay for specific profiles, alternative definitions of low-wage employment, full-time full-year employees

	Total sample	Gender		Age									Education		
		male	female	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	pri-mary	second-ary	tertiary
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
low-pay status defined as the lowest quartile of the wage distribution															
CEE	0.189	0.172	0.219	0.202	0.199	0.194	0.190	0.186	0.188	0.188	0.195	0.206	0.226	0.223	0.132
WE	0.087	0.083	0.101	0.104	0.098	0.094	0.090	0.087	0.085	0.084	0.084	0.087	0.102	0.098	0.076
low-pay status defined as the lowest three deciles of the wage distribution															
CEE	0.221	0.208	0.249	0.232	0.229	0.225	0.222	0.219	0.219	0.220	0.226	0.236	0.251	0.259	0.169
WE	0.100	0.099	0.112	0.117	0.109	0.105	0.103	0.102	0.099	0.098	0.098	0.101	0.113	0.114	0.095
low-pay threshold defined as half of the median wage															
CEE	0.046	0.036	0.059	0.056	0.054	0.053	0.049	0.041	0.048	0.049	0.055	0.073	0.075	0.052	0.026
WE	0.024	0.019	0.032	0.034	0.029	0.028	0.026	0.024	0.022	0.020	0.020	0.024	0.035	0.024	0.016

Note: Estimates of APE (Eq. 3) based on results of dynamic random effects probit model with unobserved heterogeneity.
Source: Authors' calculations based on EU-SILC data 2008–2020.

Table A.12 Low-pay incidence under alternative low-pay thresholds

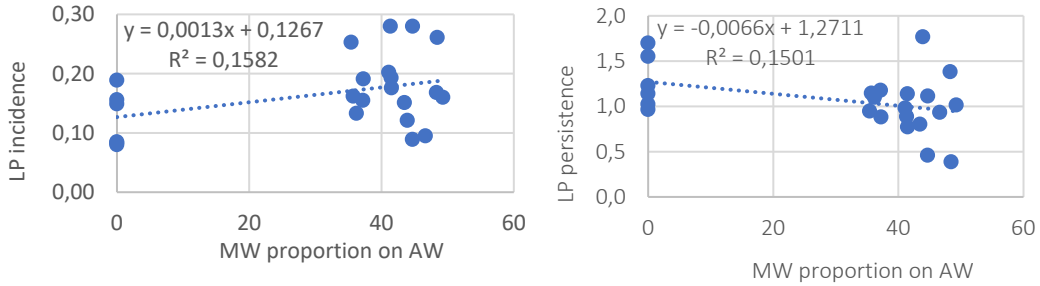
	AT	BE	BG	CY	CZ	DK	EE	EL	ES	FI	FR	HU
2/3 sample wage median	0.156	0.089	0.202	0.189	0.162	0.080	0.253	0.168	0.191	0.085	0.095	0.176
1/2 sample wage median	0.063	0.020	0.063	0.070	0.045	0.033	0.131	0.044	0.091	0.019	0.038	0.045

	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK	CEE	WE
2/3 sample wage median	0.149	0.280	0.261	0.280	0.121	0.193	0.151	0.155	0.083	0.160	0.133	0.181	0.135
1/2 sample wage median	0.079	0.122	0.093	0.132	0.031	0.047	0.024	0.028	0.045	0.030	0.030	0.048	0.058

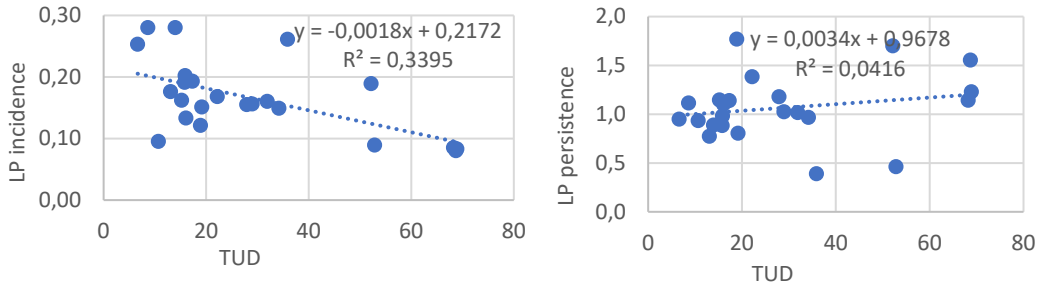
Note: Low-pay incidence calculated as a share of low-wage earners under different low-pay thresholds, referring to full-time, full-year employees only; data weighted by longitudinal weights.
Source: Authors' calculations based on EU-SILC 2008-2020.

Figure A.2 Institutional, macroeconomic and structural characteristics of countries and low-pay incidence and persistence, average values, 2005-2019

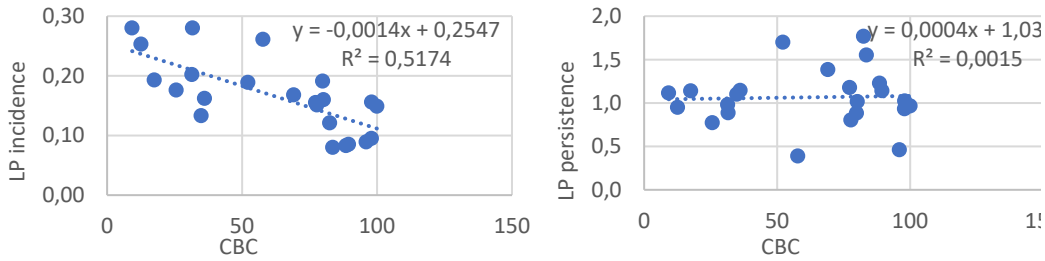
a. Minimum wage as % of average wage in business economy



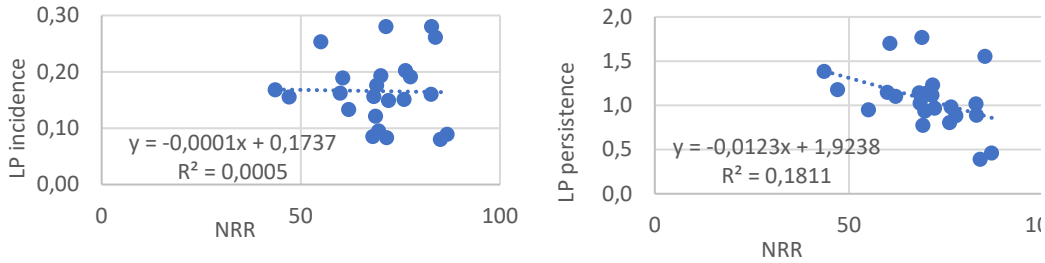
b. Trade union density (%)



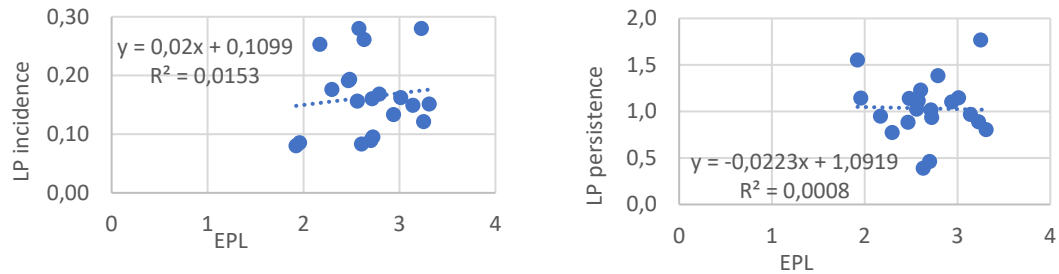
c. Collective bargaining coverage (%)



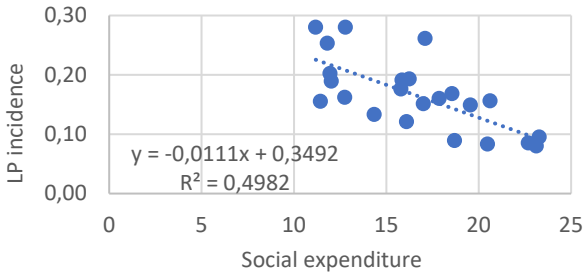
d. Net replacement rate (%)

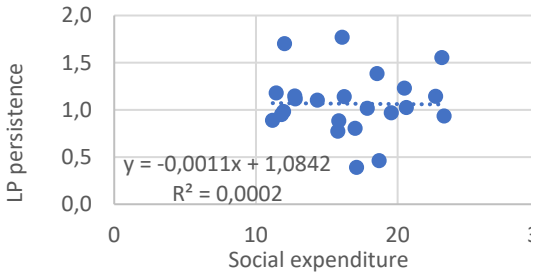


e. Employment protection legislation (EPL2 index)

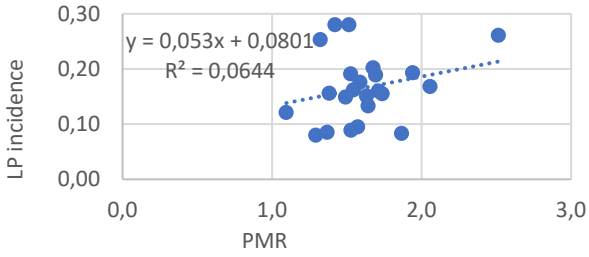


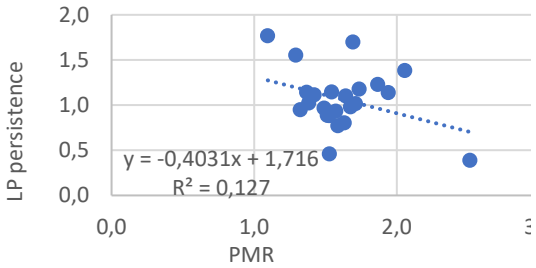
f. Social expenditure of the government, % GDP



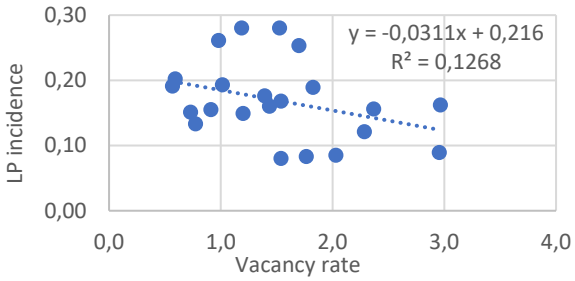


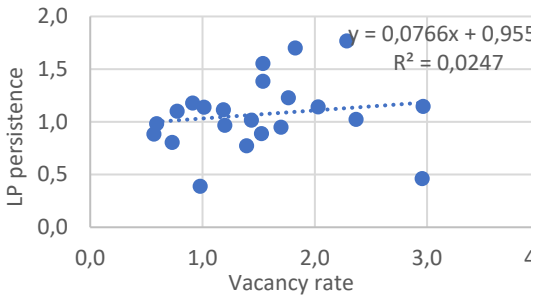
g. Product market regulation index



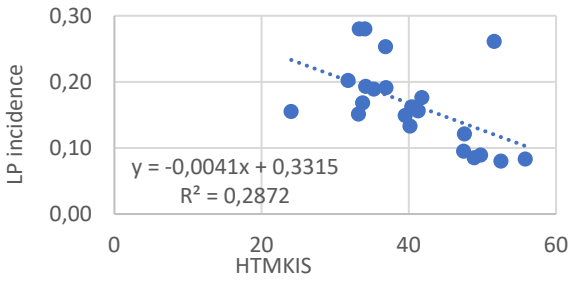


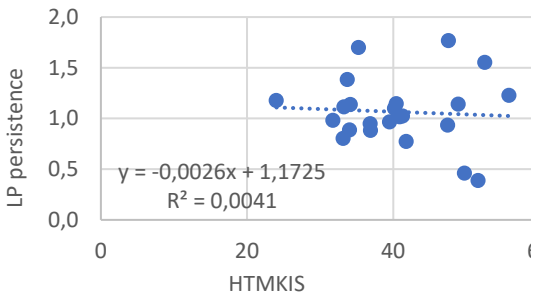
h. Vacancy rate (%)



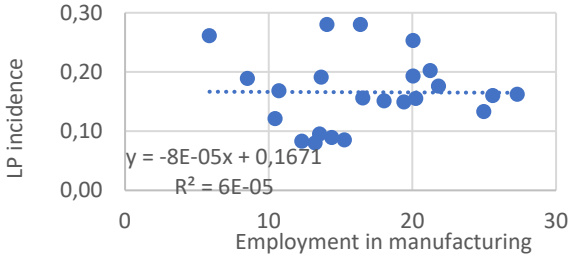


i. Employment in technology and knowledge intensive sectors (HTMKIS), % of total employment

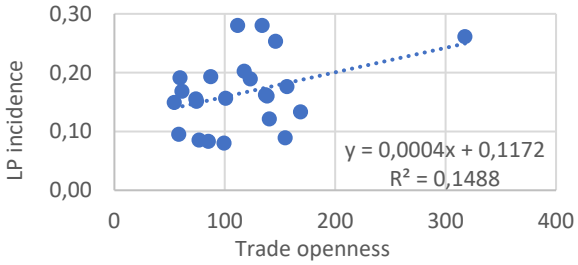


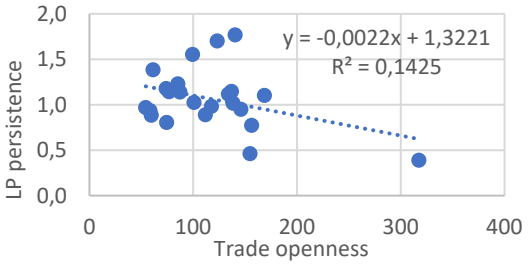


j. Employment in manufacturing (% total employment)

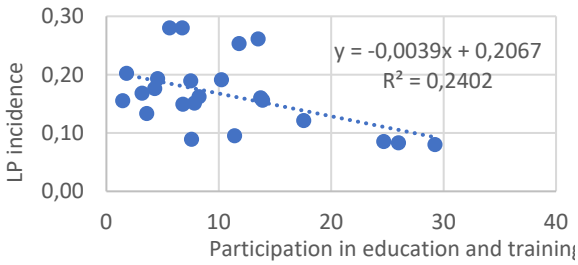


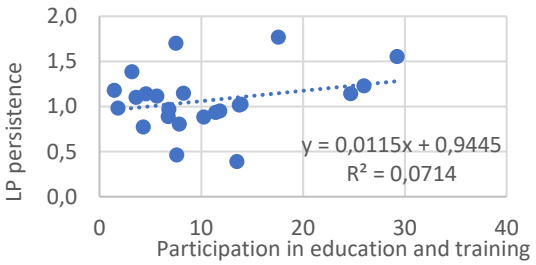
k. *Trade openness (export and import as % of GDP)*



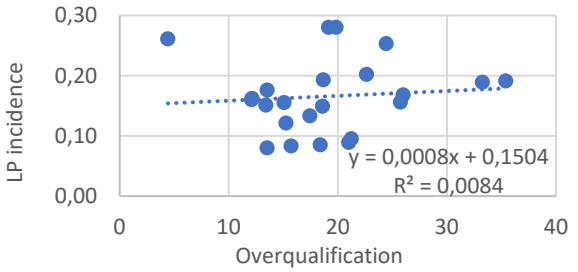


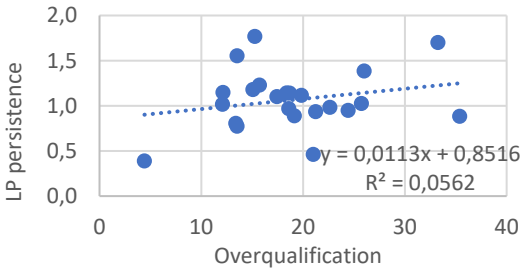
l. *Participation in education and training (% of population 15-64)*



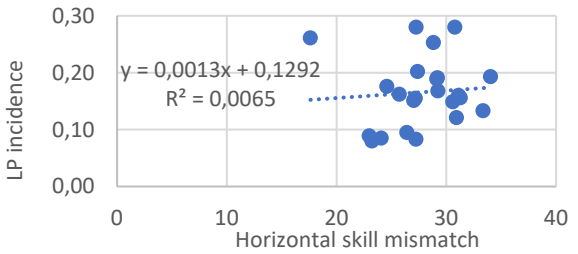


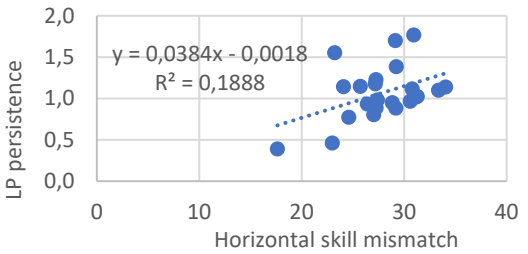
m. *Overqualification rate (%)*



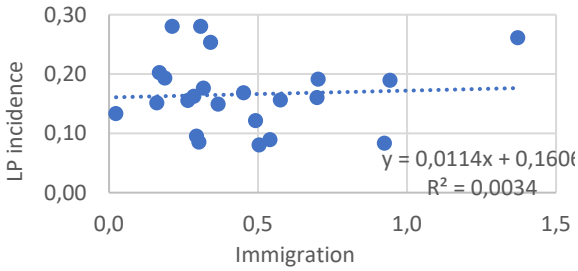


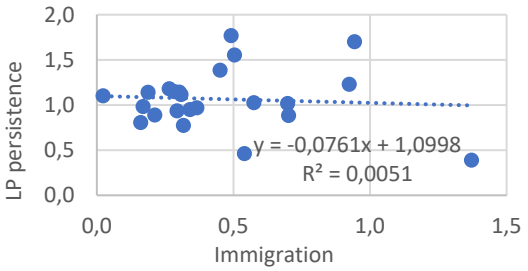
n. *Horizontal skill mismatch (%)*



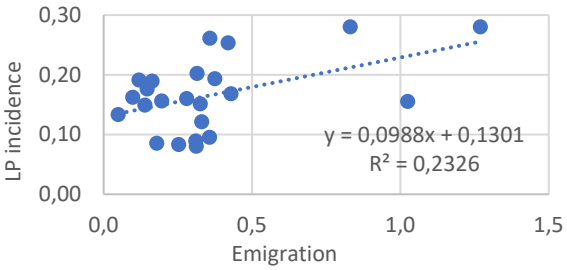


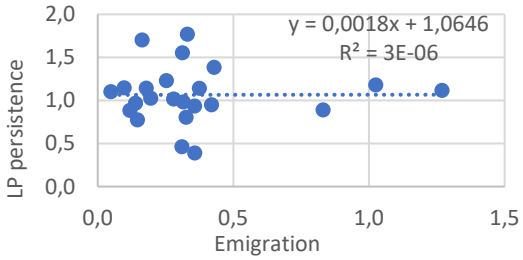
o. *Immigration from non-EU countries, % of total population of receiving country*



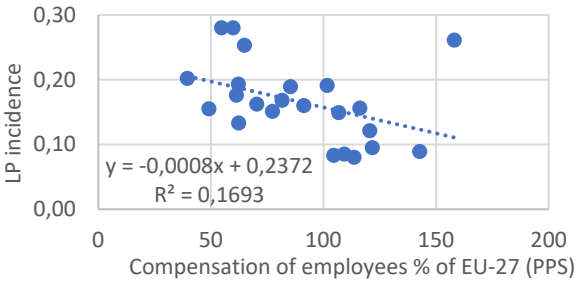


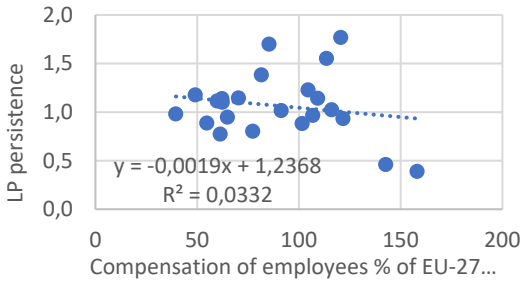
p. Emigration, total citizens of reporting country, % of total population of reporting country



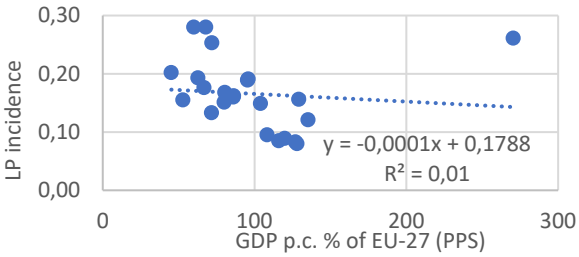


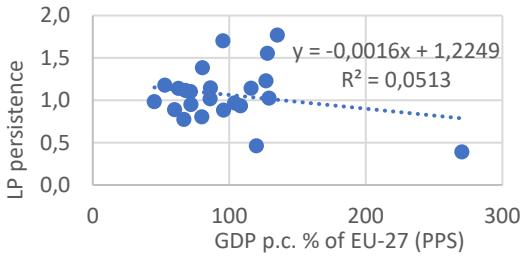
q. Compensation of employees (% EU-27, PPS)



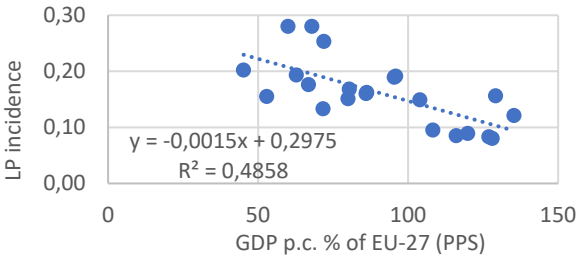


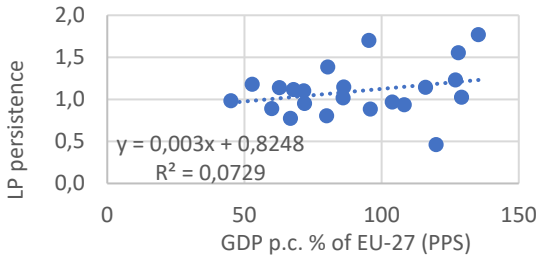
r. GDP p.c. (% EU-27, PPS)



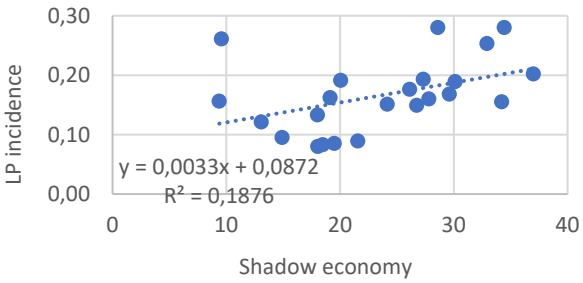


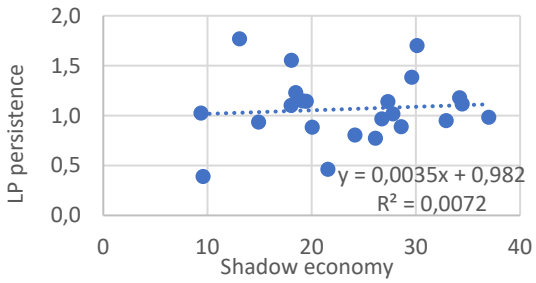
s. GDP p.c. (% EU-27, PPS), Luxembourg excluded





t. Shadow economy (% GDP)





Note: Low-pay incidence - average values of raw probabilities of low pay Pr (LPt = 1) for period 2005-2019, weighted, full-time full-year employees; low-pay persistence – coefficients γ estimated by dynamic probit regression of (Eq. 1) for 2005-2019 for full-time full-year employees (see Table A.5 for definitions of other variables).
Source: Authors' calculations based on EU-SILC data 2008–2020; see Table A.5.

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