Does aging matter in the impact of the minimum wage on inflation?

Majchrowska, Aleksandra and Roszkowska, Sylwia

University of Lodz, Poland, Jagiellonian University, Poland

21 January 2025

Aleksandra Majchrowska, University of Lodz, Poland, Department of Economic Mechanisms; aleksandra.majchrowska@uni.lodz.pl

Sylwia Roszkowska, Jagiellonian University, Poland, Department of Socio-Economic Analysis, sylwia.roszkowska@uj.edu.pl

Does aging matter in the impact of the minimum wage on inflation?

Abstract

We examine how demographic changes impact the transmission of minimum wage increases to inflation. The minimum wage growth can raise the prices of goods and services and accelerate inflationary processes. At the same time, a shrinking workforce and changes in its structure could lead to changes in the impact of minimum wage increases on the economy. We use the minimum wage augmented Phillips curve framework extended with the demographic variables. We employ the sample of 21 European Union countries in 2003-2023 and panel data techniques.

Our study proves that the strength of the minimum wage pass-through effects on inflation depends on demographic factors. Aging of the workforce and shrinking workforce size weakens the impact of minimum wage increase on inflation. Contrary, a lower proportion of the less educated working-age population strengthens the minimum wage pass-through effects on inflation. Our results have important implications for macroeconomic, minimum wage, and education policies.

Key words: population ageing, shrinking workforce, minimum wage, inflation.

Does aging matter in the impact of the minimum wage on inflation?

Introduction

The population of the European Union countries is ageing. In all EU countries in the last 20 years, the share of the population aged 65 and over in the total population has increased (on average by five p.p.; from 16 to 21% of the population, Eurostat data). At the same time, the share of young people (below 15 years old) has been decreasing due to the decrease in fertility rates.

As a consequence of the population ageing, the working age population's (WAP) share in the total population has decreased in most EU countries. The size of the potential workforce decreased on average by 3.6 p.p. (from 67.4% in 2003 to 63.8% in 2023 on average in the EU), but in some countries, the decrease was up to 6-7 p.p. (Eurostat data).

A consequence of the population ageing process and the lower birth rate is also a change in the age structure of the working-age population. There has been an increase in the proportion of people over 45 in the total working-age population and a decrease in the share of the working-age population aged 15-44. Changes in its educational structure have accompanied changes in the age structure of the workforce. The working-age population with at least secondary education has significantly decreased in the last 20 years.

These changes in the size and structure of the working-age population can affect labor market institutions' impact on the EU economies. The minimum wage policies could work as an example. Changes in the minimum wage primarily affect young, inexperienced, and less educated workers (see, e.g., Neumark Shirley, 2022).

In this study, we would like to draw attention to certain aspects of the impact of the minimum wage on the economy in the context of the demographic changes that are taking place. Increasing the minimum wage can raise the price of produced goods and services and thus accelerate inflationary processes.

Minimum wage growth leads to higher production costs. The companies attempt to compensate for lower profits by decreasing employment or additional benefits; they can also increase revenues through increases in product prices. Empirical studies confirm that employers try to compensate by raising the prices of their products, which is less costly for the firms than the reduction of employment (see, e.g., Majchrowska, 2022; Harasztosi and Linder; 2019, Bodnar et al., 2018).

We aim to investigate whether demographic changes impact the transmission of minimum wage increases to inflation. We pose the following research question: How do the shrinking size of the workforce and changes in the age and educational structure of the working-age population impact the minimum-wage pass-through effects on inflation? The decreasing size of the workforce and changes in its structure, which means fewer potential minimum wage workers (younger and less educated), may lead to changes in the impact of minimum wage increases on the economy.

According to our first research hypothesis, the shrinking size of the working-age population will generate more pressure on passing the increased labor costs on product prices instead of dismissing people. In countries with a lower share of the working-age population, the transmission of minimum wage increases on inflation should be higher.

Secondly, we believe that a higher proportion of working age population aged 45-64 (and a smaller share of young, potential minimum wage workers) makes it less likely that employers will make workers redundant as a result of increased labor costs, as they may have trouble finding them in the future.

They are more likely to pass on cost increases to price increases, so we expect the scarcity of the young workforce will generate higher transmission effects of minimum wage on the inflation rate. In countries with a lower share of workers aged 15-44, the impact of minimum wage on inflation will be higher.

Similarly, in our third research hypothesis, we expect the scarcity of less-educated workers to generate more pressure on the inflation rate. In EU countries with a lower share of less-educated workers (with education at the lower than secondary level), the impact of minimum wage on prices will be higher. We expect a negative relationship between the percentage of the working-age population with lower than secondary education and the strength of the transmission of minimum wage policy on inflation.

Summing up, the decreasing size of the workforce and changes in its age and educational structure will strengthen the minimum wage pass-through effects on inflation. Additionally, we expect those effects to be particularly pronounced in sectors that are labor-intensive (market services, e.g., hotels and restaurants section) which forms our fourth hypothesis.

Our study is important not only from an academic point of view but equally, if not more, significant from the point of view of macroeconomic policy, particularly monetary policy, and the need for central banks to meet the inflation target. The last 20 years have seen major changes in minimum wage policy and significant growth of minimum wages in most of the EU countries.

Analyses of the relation between minimum wage growth and inflation are particularly important for the EU countries. In 2024, 22 out of 27 EU countries have a nationally set minimum wage. *Directive 2022/2041 of the European Parliament and of the Council on adequate minimum wages in the European Union* introduces criteria based on which the minimum wage should be set and updated. These criteria are intended to help ensure the adequacy of wages to achieve a decent standard of living, reduce in-work poverty, promote social cohesion and positive convergence, and reduce the wage gap between men and women[1]. The directive indicates setting the minimum wage in member states at a decent level and linking it to the average wage or median wage. These statements increase the risk of further minimum wage growth and further risk of transmitting the growth on inflation.

A significant amount of literature examines the relationship between population aging and the inflation rate. On the one hand, ageing may weaken inflationary processes due to changing consumption preferences, possibly reducing aggregate demand in the economy. On the other hand, it may reduce the effective labor supply in the economy, leading to upward pressure on wages and prices (Yoon et al., 2014). There is also a substantial amount of research on the impact of minimum wage growth on inflation (see literature review section).

To our knowledge, this is the first study that analyses the changes in the size and structure of the working-age population and the transmission effects of the minimum wage on inflation. We use data on 21 European Union countries with minimum wage established at the national level in 2003-2023. We adopt the augmented Phillips curve approach and implement the panel data methods. We estimated both the average and marginal effects of the minimum wage growth on inflation concerning the share of working age population in total population, share of working age population aged 45-64 year old and share of working age population with lower than secondary education.

The structure of the paper is as follows. In the second part we briefly review the literature. In the third section, we present the model and data. The fourth section shows the results. The fifth section concludes.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32022L2041

Literature review

With the observed demographic changes, there is an increased interest in the impact of these demographic changes on economies. A review of the literature on the impact of population ageing on inflation points to complex relationships. Population aging has implications for both demand and supply in the economy and, thus, the inflation rate.

One of the main effects of an ageing population is a change in the structure of aggregate demand. Older people tend to consume less than younger people, as their ability to spend and their consumption preferences often decline. Research suggests that older people are more likely to save, which can reduce consumer demand in the economy. This, in turn, can affect the level of inflation, reducing demand pressures. The downward pressure of aging on prices was confirmed by research (see, e.g., Gajewski, 2015; Broniatowska, 2019). More recently, Lee et al. (2024), using recent regional data in Japan and the US, revealed a negative association between inflation and aging speed. Additionally, ageing populations are connected to lower growth expectations, which lead to significant reductions in investment. Auclert et al. (2021) indicate that population aging will increase wealth-to-GDP ratios, lower asset returns, and widen global imbalances.

Population aging may also affect inflation through monetary and fiscal policy decisions. An increased number of people of retirement age may lead to increased public spending, especially on pensions and healthcare, adversely affecting the tax bases and the structure of public revenues. Increased public spending and rising sovereign debt may lead to higher inflation (see, e.g., Bodnár and Nerlich, 2024; Honda and Miyamoto, 2021; European Commission (2021); Katagiri et al., 2020).

In addition, in response to the increasing number of people of retirement age, central banks may reduce interest rates to stimulate the economy, leading to higher inflation. Yoshino and Miyamoto (2019) found that the effectiveness of monetary policy diminishes as population aging proceeds. Leahy and Thapar (2022) confirm that the size of the working-age population matters for the effectiveness of the monetary policy. They found that all age groups become more responsive to monetary policy shocks when the proportion of the middle aged increases. Wang and Zhu (2021), using the cross-section data, find that countries with a higher proportion of old age people tend to have a lower velocity of money. Ping (2024) analyses the impact of population ageing on monetary policy transmission mechanisms and its effects on the real estate market. They underline that central banks may need to implement even more accommodative monetary policies to support fiscal expenditures. However, this could also trigger inflation and asset bubbles, undermining the long-term effects of policies.

The aging of the population also affects the supply side of the economy. Goodhart and Pradhan (2020) argue that an ageing population will lead to a higher interest rate and inflation. They emphasize that a lower labor supply will strengthen workers' bargaining power and contribute to inflationary tendency, overpowering deflationary tendency due to the rising dependency ratio. Bobeica et al. (2017) find a positive long-run relationship between inflation and the growth rate of the working-age population as a share of the total population in the euro area countries and the US and Germany. Juselius and Takáts (2021) find that a larger share of young and old in the population is associated with higher inflation; conversely, a larger share of working-age people is associated with lower inflation. Wage increases due to labor shortages may be particularly pronounced in sectors that require specialized knowledge or experience. Moreover, Hernæs et al. (2023) found that a larger share of elderly workers has a positive effect on labor productivity. Since higher productivity should be rewarded with higher wages, this is another argument pointing to a positive relationship between population aging and inflation.

Our paper aims to analyze the relationships between the changes in the size and structure of the workforce and the strength of the minimum-wage pass-through effects on inflation. Theoretical background underlines that minimum wage growth can affect inflation through several channels (e.g., Majchrowska, 2022).

First, minimum wage growth leads to higher production costs. Companies may attempt to compensate by raising the prices of their products, which is less costly for firms than reducing employment (see MaCurdy, 2015 and Harasztosi and Lindner, 2019). Second, increasing the minimum wage could affect the wages of higher-earning workers (spillover effect), leading to further growth in costs for companies and, consequently, additional price increases. The results of Garcia-Louzao and Tarasonis (2022) indicate that the minimum wage hike significantly increased the earnings of low-wage workers and had spillover effects that extended up to the median of the pre-treatment earnings distribution.

Third, an increase in the minimum wage causes a hike in household disposable income, which can lead to a growth in demand for goods and services and drive up prices. Fourth, as the minimum wage rises, the creditworthiness of the lowest-paid workers increases so that demand can rise even further. Dettling and Hsu (2021) found that higher minimum wages reduce borrowing costs and positively affect disposable income and liquidity. Fifth, other labor market institutions (e.g., severance payments for mass layoffs) are linked to the minimum wage amount, which can cause further growth in costs on the employer's side. All these channels predict a positive relation between minimum wage growth and inflation.

On the other hand, if wages of other employees do not grow at the same rate as minimum wage, the growth of prices caused by minimum wage increases reduces their purchasing power, decreasing total demand for goods and services and lowering inflationary pressure. It indicates the possible negative relation between the minimum wage growth and inflation. Moreover, the impact of minimum wage increases on the nominal wages of low-paid workers is undeniable, but the effect on real wages and overall welfare is unclear.

Most recent studies confirm, however, that minimum wage growth leads to higher product prices (e.g., Ashenfelter and Jurajda, 2021; Leung, 2020). MaCurdy (2015), however, showed that using the minimum wage to reduce poverty is counter-effective because price increases caused by wage increases are felt most by the poor. Majchrowska (2022) confirmed the statistically significant and positive impact of minimum wage growth on inflation and discovered that the effects vary across regions and in time. Minimum wage pass-through effects are higher in times of higher inflation and in regions with good labor market performance. Harasztosi and Lindner (2019) show that the costs of the minimum wage increases are borne mainly by consumers, and the transmission of minimum wage growth on prices varies across sectors. The effects are weaker in industries where passing wage costs on to consumers is more difficult (e.g., tradable, manufacturing, and exporting sectors) since firms operating in these sectors are more likely to face foreign competitors. The minimum wage growth leads to higher price growth in the non-tradable sector, where firms are required to pay the minimum wage, which means that individual firms can raise prices without losing a competitive advantage.

This is the starting point of our research. We aim to find out how demographic changes observed in the EU economies affect the minimum wage pass-through effects on inflation. We believe that the decreasing size of the workforce and changes in its structure, which means fewer potential minimum wage workers (younger and less educated), may lead to changes in the impact of minimum wage increases on the economy. To our knowledge, such research has not yet been conducted.

Model and data

In our research, we aim to explore how the changes in the size and structure of the workforce impact the minimum wage pass-through and its effects on inflation. We use the minimum wage augmented Phillips curve concept (Glover, 2019), linking it with the regional Phillips curves (see Bishop and Greenland, 2021 and Hazzel et al., 2021), adding the demographic variables. The model can be presented as follows:

$$\pi_{i,t} = \alpha_0 + \alpha_1\pi_{i,t-1} + \alpha_2 GDPG_{i,t-1} + \alpha_3 UR_{i,t-1} + \alpha_4 OIL_{i,t-1} + \alpha_5 MWG_{i,t} + \alpha_5 MW\_AW_{i,t} + \alpha_3(MWG_{i,t} * DEM_{k,i,t}) + \alpha_k DEM_{k,i,t} + \varepsilon_{i,t} \quad (1)$$

where:

$\pi_{i,t}$ ($\pi_{i,t-1}$) – is the inflation rate in country *i* at time *t* (at time *t-1*);

$GDPG_{i,t-1}$ – is the gross domestic product growth rate in country *i* at time *t-1*;

$UR_{i,t}$ – - is the unemployment rate in country *i* at time *t*;

$OIL_{i,t}$ – - is the growth rate of oil prices in country *i* at time *t*;

$MWG_{i,t}$ – is the minimum wage growth rate in country *i* at time *t*;

$MW\_AW_{i,t}$ – is the minimum-to-average wage ratio in country *i* at time *t*;

$DEM_{i,t}$ – is the set of demographic variables which includes: $WAP_{i,t}$ – share of working age population (15-64 years old) in country *i* at time *t*; $WAP\_4564_{i,t}$ – share of 45-54 years old in working age population in country *i* at time *t*; $WAP\_lowedu_{i,t}$ – share of working age population with lower than secondary education in country *i* at time *t*.

The dependent variable in our model is the inflation rate measured by Harmonized Index of Consumer Prices (HICP) published by Eurostat. In the benchmark model we use the overall inflation (HICP_total). To verify whether the effect is more pronounced in labor intensive sectors of the economy, we additionally apply inflation rate in services (HICP_services) and inflation rate in the hotels and restaurant section (HICP_hotels).

In our model, we include both demand and cost factors in line with the economic theory. Demand factors are approximated by the economic stance variables: unemployment rate (UR) and lagged by one year GDP growth rate (GDPG)[2]. The latter approximates the changes in the business cycle, and the unemployment rate shows additional pressure from the country's labor market. Data for both the unemployment rate and GDP growth come from Eurostat.

The variable that approximates the cost pressure on inflation is the lagged one-year oil prices (OIL) growth rate. Data on oil prices come from Statista[3]. We also included the time effects to account for other common factors affecting EU countries' economies and inflation rates.

[2] Similarly as Eser et al. (2020), we use four measures of economic stance: the unemployment rate ($u_{i,t}$), the actual and lagged GDP growth rate ($gy_{i,t}$ *and* $gy_{i,t-1}$), the output gap $\left(gy_{i,t} - gy_{i,t}^N\right)$ and the unemployment gap $\left(u_{i,t} - u_{i,t}^N\right)$. Therefore $u_{i,t}^N$ and $gy_{i,t}^N$ approximate the natural unemployment rate (NAWRU) and potential GDP growth in labor market *i* at time *t*. During the econometric analyses we have chosen those variables which fits most to the model: unemployment rate and lagged GDP growth rate. The calculations are available for request.

[3] https://www.statista.com/statistics/262860/uk-brent-crude-oil-price-changes-since-1976/

Our main variables of interest are concerned with minimum wages. The growth rate of the minimum wage level in national currency[4] (MWG) accounts for cost factors that may increase producer price pressure. The parameter's positive and statistically significant value would indicate that an increase in the production costs by changes in the minimum wage is being transferred to higher prices of goods and services.

To account for differences in minimum wage levels across EU countries, we introduced the minimum-to-average wage ratio (MW_AW). An increase in the ratio indicates that wages of low-educated workers increase faster than wages of more-educated workers. When the ratio is low, minimum wage growth does not harm the economy. When the ratio is high, it can be problematic for the economy and may translate into downward inflation pressure. The data on both minimum wage variables come from Eurostat.

Moreover, we introduced the variables concerned with changes in the size and structure of the workforce. Share of working age population in total population (WAP) is a measure of the size of the working age population in a given country. The sign of the relationship depends on whether demand or supply factors dominate.

To measure how the process of aging of the workforce impacts inflation, we created the share of 45-54-year-olds in the working-age population (WAP_4564). An older, more experienced, and productive workforce will demand higher wages and thus should translate into higher prices. On the contrary, a higher share of a less-educated workforce will generate lower inflation pressure. The negative sign of the parameter by the share of working age population with lower than secondary education (WAP_lowedu) is than predicted. All three above-described variables measure the direct impact of demographic changes on inflation.

And finally, we aim to determine whether the demographic processes impact the transmission of minimum wage growth on inflation. The empirical analyses postulate that minimum wage growth translates into higher inflation, especially in labor-intensive sectors of the economy.

We introduced the interactions of minimum wage growth with demographic variables. We expect that a lower working-age population will strengthen the minimum-wage pass-through effect on inflation, similarly to a higher share of the more aged workforce (45-64 years old). On the contrary, a higher share of low-educated workers should weaken the impact of minimum wage on inflation.

We take 21 European Union countries with national minimum wage[5]. The research period covers 2003-2023. The lower bond is adjusted to the inflation rate; at the beginning of the 2000s, in some New Member States, the inflation rate was still extremely high, exceeding 50% per year. Since 2003, the inflation rate in all EU countries has dropped below 20%. The availability of statistical data restricts the upper bond.

Using inflation data and a set of explanatory variables, the equation (1) parameters are estimated using both panel methods with panel-corrected standard errors (PCSE) and feasible generalized least squares (FGLS) estimation techniques (as in Rahman, Rana, Barua, 2019 or Darcillon, 2015). Both models incorporate heteroscedasticity into their estimates, allowing for differences in the variance of disturbances in different countries. Additionally, our explanatory variables are lagged by one period to address endogeneity that could bias our estimates (see Ha, Huong, Thanh, 2022). Employing FGLS, we

[4] We use the growth rate of minimum wages in national currency in purpose since minimum wage growth measured in euro may reflect changes in exchange rates.

[5] In 2023 national minimum wage was implemented in Cyprus. There are only five EU member countries without a national minimum wage legislation (Denmark, Italy, Austria, Finland, and Sweden).

treat it as robustness checks to resolve the issues of heteroscedasticity and fixed effects. As we agree to autocorrelation within panels, there is a first-order autocorrelation process.

The parameter values estimated in the model show us the average effects of individual variables on the inflation rate. What interests us, however, and what we need to verify our research hypotheses are the marginal effects of minimum wage growth on inflation associated with different levels of demographic variables included in the model (Wiliams, 2012).

Empirical results

Table 1 presents the model's results with the overall inflation rate as the dependent variable analyzed. Additionally, to verify whether the minimum wage pass-through effects on inflation are more pronounced in the labor-intensive sectors we use inflation rate in the whole services sector (Table 2) and inflation rate in the hotels and restaurant section (Table 3).

Both the demand and cost determinants of inflation are statistically significant, and signs of the parameters are in line with economic theory. Higher GDP growth rates and lower unemployment translate into higher inflation. Higher growth of oil prices leads to higher inflation. Interestingly, the impact of both GDP growth and unemployment rate is of greater importance for inflation rate in services sector and the hotels and restaurant section. On the contrary, the impact of the oil prices growth is higher in case of total inflation mainly because of high impact on food inflation (Majchrowska, 2022).

The parameter by minimum wage growth (MWG) rate is significant and positive in the case of all inflation rates used as dependent variables. The sign of the effect confirms our hypotheses that at least part of the higher production costs is being thrown to customers. Additionally, the minimum-to-average wage (MW_AW) parameter is significant and negative. The results align with our hypotheses that the relative decrease in other workers' wages negatively affects total demand and lowers the inflation pressure.

Looking at the direct impact of demographic variables, without interactions with minimum wages, we can see that the lower share of the working-age population positively affects overall inflation (Table 1). The results indicate that the supply-side factors concerned with the shrinking labor force prevail over the demand-side effects. The effects are weaker in services and hotels and restaurant section.

A higher percentage of people aged 45-64 in the working-age population increases inflation. It indicates that the older, more experienced, and more productive workforce demands higher wages, which translates to higher inflation. The effects are more pronounced in the hotels and restaurant section (see Table 3). The parameter by the share of the working age population with a lower than secondary level of education is not significant in most of the model specifications.

Our main variables of interest are interactions of minimum wage growth with demographic variables. The parameter of interactions with a share of the working-age population is either insignificant or slightly strengthens the effects of minimum wage on inflation. Contrarily, the sign of the parameter by the interaction with a share of 45-64 years in the working-age population is negative. A higher share of WAP aged 45-64 weakens the minimum wage pass-through effect on inflation. The effect is statistically significant in all specifications. Lastly, the effects of the share of the working-age population with lower than the secondary level of education on minimum wage pass-through effects on inflation are significant and negative. They indicate that a lower share of WAP with a low level of education strengthens the transmission of minimum wage growth on inflation.

The estimated parameters in the above-described model show the average impact of the explanatory variables on the inflation rate in the given sample and given period. In the next step, we calculate the marginal effects associated with different levels of demographic variables included in the model.

The marginal effects of the minimum wage growth on inflation concerning the share of the working-age population aged 45-64 are decreasing for all inflation rates (see Figures 1-3). It means that as the proportion of 45-64-year-olds increases, the impact of minimum wage increase on inflation rates weakens.

These results are contrary to our initial hypothesis. We believed that as the proportion of 45-64-year-olds increases (and the proportion of younger WAP decreases), firms would be more inclined to pass on increases in labor costs to prices rather than lay off workers as they may have difficulty finding them in the future.

However, a higher proportion of 45-64 year-olds means fewer potential minimum wage workers on the labor market, so an increase in the minimum wage may affect a smaller proportion of employers. Thus, the possible impact on the price level may be smaller. It is confirmed by the fact that the marginal effects are significant and positive when the share of the younger working-age population is high. Additionally, the results may indicate that as the workforce ages, the increased costs of employing young workers (due to minimum wage growth) cause companies to increase productivity.

The marginal effects of the minimum wage growth on inflation concerning the share of the working-age population with lower than secondary education are diminishing in the case of all inflation rates being used as dependent variables (see Figures 1-3). A lower proportion of the less educated working-age population strengthen the minimum wage pass-through effects on inflation.

The results confirm our third hypothesis. In countries with a low share of a less-educated working-age population, the minimum wage growth impacts inflation at a higher rate. A lower proportion of the less educated working-age population (a smaller share of potential minimum wage workers) makes it less likely that employers will make workers redundant due to increased labor costs by minimum wage growth, as they may have trouble finding them in the future. They are more likely to pass on cost increases to price increases, positively affecting inflation.

Interestingly, the impact of the share of less-educated workers on minimum wage growth transmission to inflation is higher in the models with HICP in the services sector and HICP in the hotels and restaurant section (see Figure 2 and Figure 3). These results confirm our fourth hypothesis.

As the percentage of less educated people increases, the positive impact of minimum wage on inflation disappears and becomes statistically insignificant. In addition, when share of people with a low level of education is high, the minimum-wage pass-through effects on inflation turns to be significant and negative. The high availability of low-skilled workers in the labor market means that employers may dismiss workers due to the increased labor costs resulting from the increase in the minimum wage, knowing that they will have no difficulty in re-employing them. Interestingly, these effects are insignificant when HICP in hotels and restaurants is the dependent variable.

The increasing marginal effects of the minimum wage growth on inflation concerning the share of the working-age population in the total population are the consequences of the above-described factors. An ageing and shrinking workforce mean the proportion of young workers affected by the minimum wage is declining, and companies are compensating for rising labor costs through increased productivity.

Conclusions

In this study, we aim to answer the question of how the shrinking size of the workforce and changes in the age and educational structure of the working-age population impact the minimum-wage pass-through effects on inflation. According to our research hypotheses, the observed decreasing size of the workforce and changes in its structure, which means fewer potential minimum wage workers (younger and less educated), may lead to changes in the impact of minimum wage increases on the economy.

Both economic theory and empirical evidence confirm that minimum wage growth affects inflation. Our study proved that the strength of the minimum wage pass-through effects on inflation depends on demographic factors. We have shown that ongoing demographic changes have and will continue to affect the transmission mechanism of minimum wage.

The results indicate that aging of the workforce weakens the impact of minimum wage increase on inflation. The marginal effects of the minimum wage growth on inflation concerning the share of the working-age population aged 45-64 are decreasing. Similarly, minimum wage pass-through effects on inflation decrease along with the shrinking size of the workforce.

Additionally, the concomitant changes in the working-age population's educational structure have been impacting inflation's minimum wage pass-through effects. A lower proportion of the less educated working-age population strengthens the minimum wage pass-through effects on inflation.

Our results have important implications for macroeconomic, minimum wage, and education policies. They provide additional guidance that should be considered by monetary policy to meet the inflation targets. They point out that, in ageing societies, further increases in the minimum wage, linked in part to the need to meet the criteria imposed by the Directive on adequate minimum wage, should not increase inflationary pressures. At the same time, the results point out, however, that the low-skilled labor market shortages observed in many countries may strengthen inflationary pressures. Thus, they provide important guidance for both educational and labor market policy.

Disclosure statement.

The authors report there are no competing interests to declare.

References

Ashenfelter, O.C., Jurajda, Š. (2021) Wages, Minimum Wages, and Price Pass-Through: The Case of McDonald's Restaurants, NBER Working Papers 28506, National Bureau of Economic Research, Inc.

Auclert, A. Malmberg, H., Martenet, F., Rognlie, M. (2021) Demographics, Wealth, and Global Imbalances in the Twenty-First Century, NBER Working Papers 29161, National Bureau of Economic Research, Inc.

Bishop, J. Greenland, E. (2021) Is the Phillips Curve Still a Curve? Evidence from the Regions, RBA Research Discussion Papers rdp2021-09, Reserve Bank of Australia.

Bodnár, K., Nerlich C. (2022) The macroeconomic and fiscal impact of population ageing, ECB Occasional Paper Series, No 296 / June 2022.

Bodnár, K., Fadejeva, L., Iordache, S., Malk, L., Paskaleva, D., Pesliakaitė, J., Todorović Jemec, N., Tóth, P., Wyszyński, R. (2018) How do firms adjust to rises in the minimum wage? Survey evidence from Central and Eastern Europe, ECB Working Paper Series, No 2122 / January 2018.

Broniatowska, P. (2019) Population Ageing and Inflation. Population Ageing 12, 179–193, https://doi.org/10.1007/s12062-017-9209-z

Dettling, L. J., Hsu, J. W. (2021). Minimum Wages and Consumer Credit: Effects on Access and Borrowing. The Review of Financial Studies, 34(5), 2549–2579. https://doi.org/10.1093/rfs/hhaa091

Eser, F., Karadi, P., Lane, P. R., Moretti, L., Osbat, Ch. (2020) The Phillips Curve at the ECB, The Manchester School, 88(S1), https://doi.org/10.1111/manc.12339

European Commission (2021) The 2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070)", Institutional Paper 148, May 2021, Brussels.

Gajewski, P. (2014). Is ageing deflationary? Some evidence from OECD countries. Applied Economics Letters, 22(11), 916–919. https://doi.org/10.1080/13504851.2014.987911

Garcia-Louzao, J. & Tarasonis, L. (2023) Wage and Employment Impact of Minimum Wage: Evidence from Lithuania, Journal of Comparative Economics, 51(2), 592-609; https://doi.org/10.1016/j.jce.2022.12.002

Glover, A. (2019). Aggregate effects of minimum wage regulation at the zero lower bound. Journal of Monetary Economics, 107, 114–128. https://doi.org/10.1016/j.jmoneco.2018.11.001

Goodhart, Ch. Pradhan, M. (2020) The Great Demographic Reversal. Ageing Societies, Waning Inequality, and an Inflation Revival, Palgrave Macmillan.

Harasztosi, P., Lindner, A. (2019). Who Pays for the Minimum Wage. American Economic Review, 109(8), 2693–2727. https://doi.org/10.1257/aer.20171445

Hazell, J. Herreño, J., Nakamura, E., Steinsson, J. (2020) The Slope of the Phillips Curve: Evidence from U.S. States, NBER Working Papers 28005, National Bureau of Economic Research, Inc.

Hernæs, E., Kornstad, T., Markussen, S., Røed, K. (2023) Ageing and labor productivity, Labour Economics, 82, https://doi.org/10.1016/j.labeco.2023.102347.

Honda, J., Miyamoto, H. (2021) How does population aging affect the effectiveness of fiscal stimulus over the business cycle?, Journal of Macroeconomics, Volume 68, https://doi.org/10.1016/j.jmacro.2021.103288

Juselius, M. Takáts, E. (2021) Inflation and demography through time, Journal of Economic Dynamics and Control, Volume 128, https://doi.org/10.1016/j.jedc.2021.104136.

Katagiri, M., Konishi, H., Ueda K. (2020) Aging and deflation from a fiscal perspective, Journal of Monetary Economics, Volume 111, pp. 1-15, https://doi.org/10.1016/j.jmoneco.2019.01.018

Leahy, J.V., Thapar, A. (2022) Age structure and the impact of monetary policy, American Economic Journal: Macroeconomics, 14.4, pp. 136-173.

Lee, J., Lee, J., Miyamoto, H. (2024) Aging and Inflation – Regional evidence from Japan and the US, Economics Letters, Volume 235, https://doi.org/10.1016/j.econlet.2024.111569

Leung, J. (2021) Minimum wage and real wage inequality: Evidence from pass-through to retail prices. The Review of Economics and Statistics, 103(4), 754–769. https://doi.org/10.1162/rest_a_00915

MaCurdy, T. (2015) How Effective Is the Minimum Wage at Supporting the Poor?, Journal of Political Economy, 123(2), pp. 497-545, https://doi.org/10.1086/679626

Majchrowska A. (2022) Does minimum wage affect inflation?, Ekonomista, 4, 417–436.

Neumark, D., Shirley, P. (2022) Myth or measurement: What does the new minimum wage research say about minimum wages and job loss in the United States?, Industrial Relations, Volume 61, Issue 4, pp. 384-417, https://doi.org/10.1111/irel.12306

Ping, Li. (2024) Research on Population Aging, Effectiveness of Monetary Policy, and Real Estate Prices, Critical Humanistic Social Theory, Vol. 1 No.4

Wang, L., Zhu T. (2021) Population aging and money demand, Economics Letters, Volume 206, https://doi.org/10.1016/j.econlet.2021.109984

Williams, R. (2012). Using the margins command to estimate and interpret adjusted predictions and marginal effects. The Stata Journal, 12(2), 308-331, https://doi.org/10.1177/1536867X1201200209

Yoshino, N., Miyamoto, H. (2019) How does population aging affect the effectiveness of monetary and fiscal policies? Asian Development Bank Institute Working Paper Series No. 1064, December 2019.

Table 1. The results of model 1 with overall HICP as dependent variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
HICP(-1)	0.494***	0.497***	0.495***	0.493***	0.499***	0.495***	0.498***	0.473***	0.450***	0.509***	0.453***	0.493***	0.476***	0.475***
GDPG	0.069**	0.078***	0.073***	0.068**	0.083***	0.076***	0.081***	0.071**	0.062**	0.069**	0.071**	0.071**	0.060**	0.067**
UR	-0.049**	-0.050**	-0.048**	-0.048**	-0.048**	-0.048**	-0.047**	-0.058***	-0.047**	-0.046**	-0.051***	-0.056***	-0.041**	-0.047**
OIL	0.297***	0.296***	0.297***	0.297***	0.296***	0.296***	0.296***	0.279***	0.279***	0.304***	0.274***	0.286***	0.290***	0.283***
MWG	0.068***	0.068***	0.068***	0.067***	0.067***	0.066***	0.066***	-1.002**	0.718***	0.099***	0.068	-1.248**	1.114***	0.254
MW_AW	-0.061***	-0.065***	-0.064***	-0.058***	-0.069***	-0.061***	-0.066***	-0.069***	-0.062***	-0.057***	-0.069***	-0.066***	-0.054***	-0.061***
WAP		-0.084*			-0.087**	-0.088**	-0.091**	-0.164***			-0.117*	-0.189***		-0.128**
WAP4564			0.046		0.055		0.049		0.142***		0.130**		0.179***	0.163***
WAP_lowedu				-0.004		-0.005	-0.004			0.002		0.006	0.013*	0.013*
MWG*WAP								0.016**			0.008	0.021***		0.010
MWG *WAP_4564									-0.021***		-0.016**		-0.030***	-0.025***
MWG *WAP_lowedu										-0.001		-0.003*	-0.004***	-0.004***
No of obs.	383	383	383	383	383	383	383	383	383	383	383	383	383	383
R-squared	0.820	0.824	0.821	0.820	0.825	0.824	0.825	0.822	0.823	0.823	0.825	0.826	0.832	0.833
Number of countries	21	21	21	21	21	21	21	21	21	21	21	21	21	21

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

Source: own estimates.

Table 2. The results of model 1 with HICP in services sector as dependent variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
HICP(-1)	0.461***	0.470***	0.463***	0.458***	0.473***	0.467***	0.469***	0.456***	0.447***	0.492***	0.454***	0.478***	0.461***	0.463***
GDPG	0.105***	0.111***	0.107***	0.103***	0.114***	0.109***	0.111***	0.107***	0.104***	0.106***	0.109***	0.106***	0.099***	0.102***
UR	-0.057***	-0.057***	-0.057***	-0.055***	-0.056***	-0.054***	-0.053***	-0.061***	-0.057***	-0.051***	-0.060***	-0.059***	-0.049**	-0.054***
OIL	0.047**	0.048**	0.047**	0.047**	0.048**	0.047**	0.047**	0.040**	0.043**	0.057***	0.040*	0.044**	0.049**	0.043**
MWG	0.070***	0.069***	0.070***	0.068***	0.069***	0.067***	0.067***	-0.520	0.292	0.157***	-0.341	-1.007**	0.888***	-0.049
MW_AW	-0.049***	-0.050***	-0.051***	-0.044***	-0.053***	-0.045***	-0.047***	-0.053***	-0.051***	-0.043***	-0.055***	-0.049***	-0.040**	-0.045**
WAP		-0.046			-0.049	-0.054	-0.055	-0.090			-0.083	-0.141**		-0.101*
WAP4564			0.026		0.031		0.021		0.059		0.045		0.114**	0.095*
WAP_lowedu				-0.008		-0.008	-0.008			0.008		0.012	0.016**	0.016**
MWG*WAP								0.009			0.007	0.018**		0.011
MWG *WAP_4564									-0.007		-0.003		-0.022***	-0.016*
MWG *WAP_lowedu										-0.004***		-0.005***	-0.006***	-0.006***
No of obs.	383	383	383	383	383	383	383	383	383	383	383	383	383	383
R-squared	0.735	0.740	0.736	0.736	0.741	0.742	0.742	0.738	0.735	0.750	0.739	0.753	0.753	0.755
Number of countries	21	21	21	21	21	21	21	21	21	21	21	21	21	21

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

Source: own estimates.

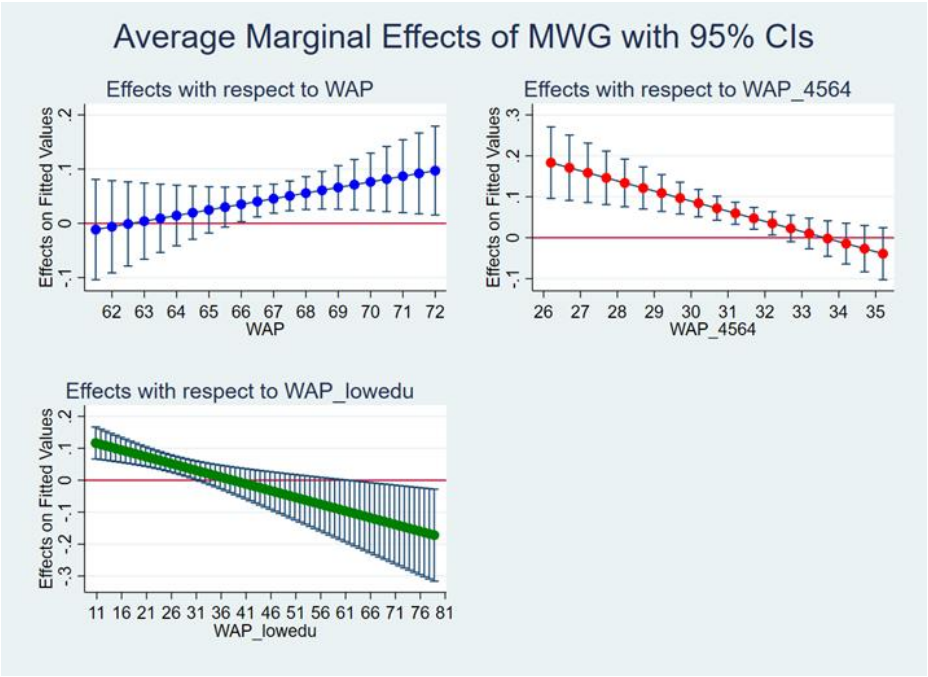
Table 3. The results of model 1 with HICP in hotels and restaurant section as dependent variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
HICP(-1)	0.442***	0.444***	0.436***	0.439***	0.439***	0.440***	0.436***	0.437***	0.423***	0.455***	0.425***	0.443***	0.428***	0.426***
GDPG	0.131***	0.140***	0.142***	0.129***	0.152***	0.137***	0.150***	0.138***	0.139***	0.130***	0.148***	0.135***	0.134***	0.142***
UR	-0.083***	-0.084***	-0.082***	-0.082***	-0.082***	-0.082***	-0.081***	-0.088***	-0.082***	-0.079***	-0.085***	-0.087***	-0.077***	-0.082***
OIL	0.166***	0.165***	0.162***	0.165***	0.161***	0.163***	0.160***	0.158***	0.155***	0.173***	0.152***	0.160***	0.160***	0.154***
MWG	0.076***	0.076***	0.076***	0.075***	0.076***	0.074***	0.075***	-0.401	0.368	0.136***	-0.057	-0.763	0.833**	0.153
MW_AW	-0.057**	-0.061**	-0.070***	-0.053**	-0.075***	-0.057**	-0.071***	-0.063**	-0.068***	-0.052**	-0.075***	-0.059**	-0.061**	-0.069***
WAP		-0.086			-0.096	-0.094	-0.101	-0.122			-0.117	-0.161*		-0.131
WAP4564			0.145*		0.153*		0.146*		0.190**		0.183*		0.234**	0.221**
WAP_lowedu				-0.007		-0.009	-0.006			0.004		0.006	0.013	0.012
MWG*WAP								0.007			0.005	0.014		0.008
MWG *WAP_4564									-0.009		-0.006		-0.021**	-0.016
MWG *WAP_lowedu										-0.003		-0.003*	-0.004**	-0.004**
No of obs.	383	383	383	383	383	383	383	383	383	383	383	383	383	383
R-squared	0.725	0.727	0.726	0.724	0.730	0.727	0.729	0.727	0.726	0.729	0.728	0.730	0.731	0.732
Number of countries	21	21	21	21	21	21	21	21	21	21	21	21	21	21

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

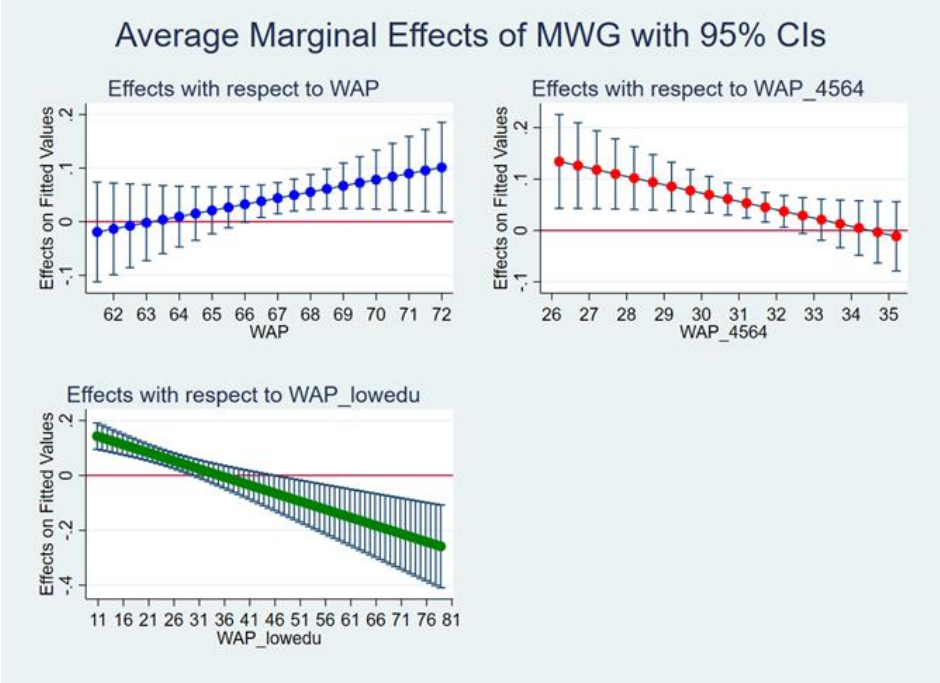
Source: own estimates.

Figure 1. Average marginal effects of the minimum wage growth on inflation with respect to share of working age population in total population (WAP), share of working age population aged 45-64 year old (WAP_4564) and share of working age population with lower than secondary education (WAP_lowedu) from the model with overall HICP as a dependent variable



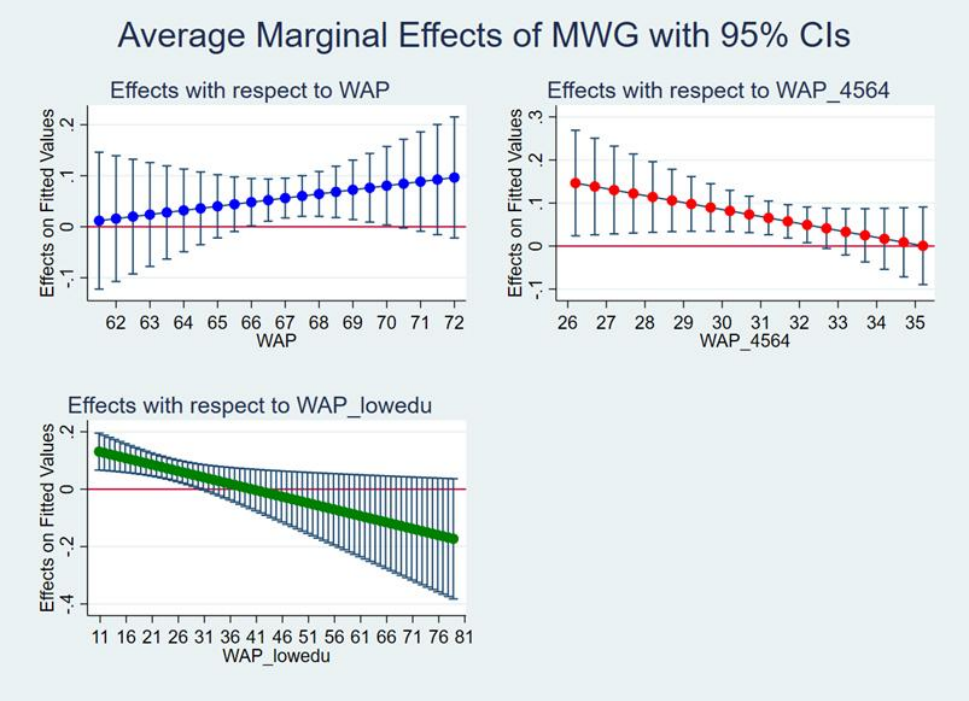
Source: own estimates.

Figure 2. Average marginal effects of the minimum wage growth on inflation with respect to share of working age population in total population (WAP), share of working age population aged 45-64 year old (WAP_4564) and share of working age population with lower than secondary education (WAP_lowedu) from the model with HICP in services as a dependent variable



Source: own estimates.

Figure 2. Average marginal effects of the minimum wage growth on inflation with respect to share of working age population in total population (WAP), share of working age population aged 45-64 year old (WAP_4564) and share of working age population with lower than secondary education (WAP_lowedu) from the model with HICP in hotels and restaurant section as a dependent variable



Source: own estimates.