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The minimum wage in Poland and its connection to unemployment: Evaluating causality

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Abstract: The paper's primary goal is the evaluation of the relationship between minimum wage, employment, and unemployment in Poland in the past two decades. It presents an overview of theoretical aspects of minimum wages, the main motivations behind its implementation, as well as potential negative consequences. The minimum wage in Poland is presented in comparison to other European Union countries. Finally, using a Toda-Yamamoto approach and quarterly data covering the years 2002–2019, the Granger causality between the Kaitz index and selected labour market indicators is examined. The results indicate the presence of unidirectional Granger causality between the Kaitz index and the general unemployment rate. It does not indicate similar relationships for other examined indicators, including employment rate and youth unemployment rate.

Keywords: labour market, causality, Granger causality, Toda-Yamamoto approach, minimum wage

1. Introduction

The first statutory minimum wage (abbr.: MW) dates back to 1894 New Zealand. After more than 120 years, minimum wages are present in the legislation of most countries in the world. In Poland, the subject of its economic effects gained much importance at the end of 2019, when the government declared a relatively rapid increase in the minimum wage for the following years (Cieślak-Wróblewska and Roguski, 2019). Furthermore, in 2020 the European Commission issued a proposal for a directive on adequate minimum wages in the EU, proceeded by two-phase consultations with social actors (European Commission, 2020).

Main concerns about MW involve its possible, negative impact on jobs and employment. Since it is a type of a price floor, in a competitive environment it creates excess supply, what corresponds to excess unemployment. In a standard ne-

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oclassical model, where workers receive value of their marginal product, rising the wages further leads to the layoffs (Stigler, 1946). However, conclusions from other labour market models, mainly monopsony model, are more ambiguous and sometimes may even suggest a positive employment effects (Holtemöller and Pohle, 2020). Rising MW reduces job creation and the demand for unskilled labour (Chu, Kou and Wang, 2021); however, at the same time it can reduce companies selectivity, encourage increased job search (Gavrel, Lebon and Rebière, 2010) or increase employees productivity (Ovens and Kagel, 2010). The employment effects of MW may also be reduced because of the adjustments, and dispersing wage increases costs over various channels (Schmitt, 2013).

The relationship of MW and employment is one of the most frequently discussed topics in economics (Schmitt, 2013). Research methods in this field have undergone massive changes in the past three decades. Time series methods have been often criticized, as many studies did not account for endogeneity, non-stationarity and dynamic specification (Williams and Mills, 2001). As Lee and Suardi (2011) point out, a number of different approaches has been proposed, including tests for structural breaks, applying an ARCH model (Park and Ratti, 1998), or vector autoregression (Williams and Mills, 2001); however micro-level data, panel data analysis and case studies became much more widespread. An overview and discussion on modern-day econometric approaches is provided by David Neumark (2018), as well as Belman and Wolfson (2014).

In this paper aggregated time series are applied, however not in order to estimate employment elasticities. The study verifies whether MW in Poland forms a causal relationship with employment and unemployment indicators. The paper is divided into 6 sections: (1) Introduction, (2) Theoretical perspective, (3) Minimum wage in Poland other EU countries, (4) Methods and data, (5) Results, (6) Conclusions.

2. Theoretical perspective

2.1. Definition and motivations behind minimum wages

The minimum wage may be defined as:

> The minimum sum payable to a worker for work performed or services rendered, within a given period, whether calculated on the basis of time or output, which may not be reduced either by individual or collective agreement, which is guaranteed by law and which may be fixed in such a way as to cover the minimum needs of the worker and his or her family, in the light of national economic and social conditions (ILO, 2014, p. 19).

This definition does not state who fixes the rate: while in most countries it is set by policy-makers, in some the system is based on collective agreements within industries. An important aspect of MW is its binding nature, as it is enforced by the state and cannot be lowered even when an employee agrees.

Quoted definition points to one of the fundamental premises for applying MW, which is a problem of in-work poverty. The ethical question of what constitutes a decent wage is much

older than MW. For Thomas Aquinas wages not meeting needs of a worker to support himself and his family (*status personae*) diminished their chance of a virtuous life and as so were unjust (Zając, 2005). Adam Smith pointed to the advantage that employers usually had over employees when setting wages. He argued that the employee's wage should always be sufficient to support oneself and, usually, also enable to start a family (Smith, 2007). However, as Werner and Lim suggest, it is uncertain whether Smith would favour solutions imposed by the state here (Werner and Lim, 2016). It is important to distinguish between concepts of MW and living wage, as the first one may be seen as a tool (effective, or not) to achieve the second. John Rawls, the author of *Theory of justice*, believed that the fairness of distributive shares depended on the allocation of wages and other income by background institutions, finding MW less effective than providing an adequate minimum in the form of transfers (Rawls, 2009).

Sometimes MW is seen as a tool to reduce income inequality and poverty, especially in-work poverty (Detragiache et al., 2020). Raising MW may impact general wage distribution, and because of spillover effects, it can affect more people than only those receiving it (Redmond, Doorley and McGuinness, 2020). Still, it is worth noticing that MW earners may be students or secondary earners in non-poor households, and not all poor households have members working at MW (Detragiache et al., 2020). Moreover, a rise in other wages, as a result of MW increase may amplify its negative effect on employment (Cahuc and Michel, 1996).

The role of the minimum wage in stimulating the productivity of enterprises is also suggested. Higher labour costs may induce companies to use more capital-intensive forms of production, implement organizational changes, or invest more in training (Riley and Bondibene, 2017). In addition, falling demand for low-skilled labour can encourage workers to build up human capital and increase the productivity of their work (Cahuc and Michel, 1996).

2.2. Employment effects

According to Belman and Wolfson (2014), there are three primary labour market models used in the MW research: (1) Competitive, (2) Monopsony and (3) Search Models.

In a simple neoclassical model of the labour market, wages and employment result from supply and demand in a fully competitive market (Vercherand, 2014). One's salary is the value of the marginal product contributed by one's labour (Card and Krueger, 1995). The establishment of a MW makes the work of people earning so far less than that no longer profitable. According to Stigler, an effective MW must therefore lead to the dismissal of the least productive workers or, less likely, improve their productivity (Stigler, 1946).

Such a model is based on several assumptions. First of all, the number of competing companies and relatively homogeneous employees must be so large that the decisions of individuals do not affect wages (Broniatowska, Majchrowska and Żółkiewski, 2013). Workers must have complete information about their wages and wages in other companies; they must also be ready to change jobs to better-paid jobs whenever possible. Labour is treated like any other mean of production (Card and Krueger, 1995).

In contrast, in the monopsony model, there is only one firm in the labour market, at least in the most literal sense. Often, when speaking of the labour market, monopsony is understood more broadly as any model with a positively sloping labour supply curve for an individual firm (Boal and Ransom, 1997). It may sometimes include search models as well. With sloping labour supply, the employer may pay employees below their marginal productivity and not lose existing workers right away (Manning, 2020). In the market with a monopsony advantage, companies operate with a shortage of employees as raising wages to encourage new employees would also involve raising the wages for currently employed (Card and Krueger, 1995). The employment effect of a modest minimum wage could be positive.

Search models point to the costs of job searching, especially information. Two key variables are (1) contact rate and (2) distribution of wage offers (Belman and Wolfson, 2014). The conclusions are highly dependent on individual model specification.

The other issue is that employers often disperse the costs of MW across multiple channels. John Schmitt (2013) points to 11 possible channels: reduction in hours, reductions in non-wage benefits, reduction in training, changes in employment composition, increasing prices, efficiency improvements, efficiency responses from workers, wage compression, reduction in profits, increases in demand and reduced turnover (Schmitt, 2013). Harasztosi and Linder (2019), examining the significant increase in the minimum wage in Hungary at the beginning of the twenty-first century, showed that 75% of the costs were paid by consumers and only 25% by the firm owners.

Most empirical studies around the world indicate a small, though negative, impact on employment (Jiménez Martínez and Jiménez Martínez, 2021). M. Martínez and M. Martínez (2021), authors of meta-analysis covering over 588 studies from the last 120 years, indicate also possible negative publication bias in developed countries. In high-income countries, most studies find employment effects too small to be observable in aggregate employment statistics (ILO, n.d.). A 2018 EU panel data study covering 18 countries found an elasticity of around –0.05 among the overall working-age population (European Comission, 2018).

In Poland, Małgorzata Fic (2010), using a model based on the neoclassical production function with a non-linear variable, estimated that in the years 1996–2007 the MW had a negative impact on employment when exceeding 41% of the mean wage. Majchrowska and Żółkiewski (2012), using panel data of NUTS2 regions in Poland, analyzed the period 1999–2010, concluding that the MW has a negative impact on employment in Poland, in particular with regard to young workers. Barbara Dańska-Borsiak (2014) used the Granger test to investigate the causality between the MW and the number of young working people. She found that in the years 1990 a 2013, both MW nominal levels and its ratio to the average wage (Kaitz index) were causes, in Granger sense, for the number of employed aged 15–29. According to the variant analysis from the study, the MW was optimal for youth employment at 40% of the average wage.

3. Minimum wage in Poland and other EU countries

The minimum wage has existed in Poland since 1956, although until 1990 its role in the wage system varied (Raczkowska, 2007). Since 2002, the national minimum wage system is legally based on the *Act of 10 October 2002 on the minimum remuneration for work* (Dz.U.

2002 No. 200, item 1679). Since 2017 an hourly rate has been introduced alongside the monthly rate. By the Law, the MW is agreed every year by the Social Dialogue Council, and the Prime Minister announces it by the 15th of September. If no agreement is reached, it is determined by the governmental decree. The change takes place following year, 1st of January.

In the European Union, there are statutory minimum wages in 21 out of 27 countries. In Austria, Denmark, Finland, Italy and Sweden minimum wages are set by collective agreements and vary from industry to industry. In Cyprus, there are statutory rates, although they are not uniform and differ for individual professions (Eurofund, 2021).

Figure 1. Minimum wages in the EU countries in January 2021 (PPS)

S o u r c e: Author's own elaboration based on Eurostat.

Figure 1 shows the minimum monthly wage in the EU countries in January 2021, expressed in purchasing power standard (PPS). The differences between the EU countries are considerable. In theory, the minimum wage allows a citizen of Luxembourg to buy more than 2.6 times more goods than a citizen of Bulgaria. In Poland the minimum wage expressed in PPS is 5% higher than the EU average.

Broniatowska et al. (2013) mention three criteria used to determine the MW in Europe: (1) workers needs, (2) comparable income, (3) percentage of the average wage. In Poland, under the current legislation, annual valorization should not be smaller than the forecasted consumer price index. Additionally, if the MW in a given year is lower than half of the average wage, it increases by two-thirds of the projected real GDP growth in the next year.

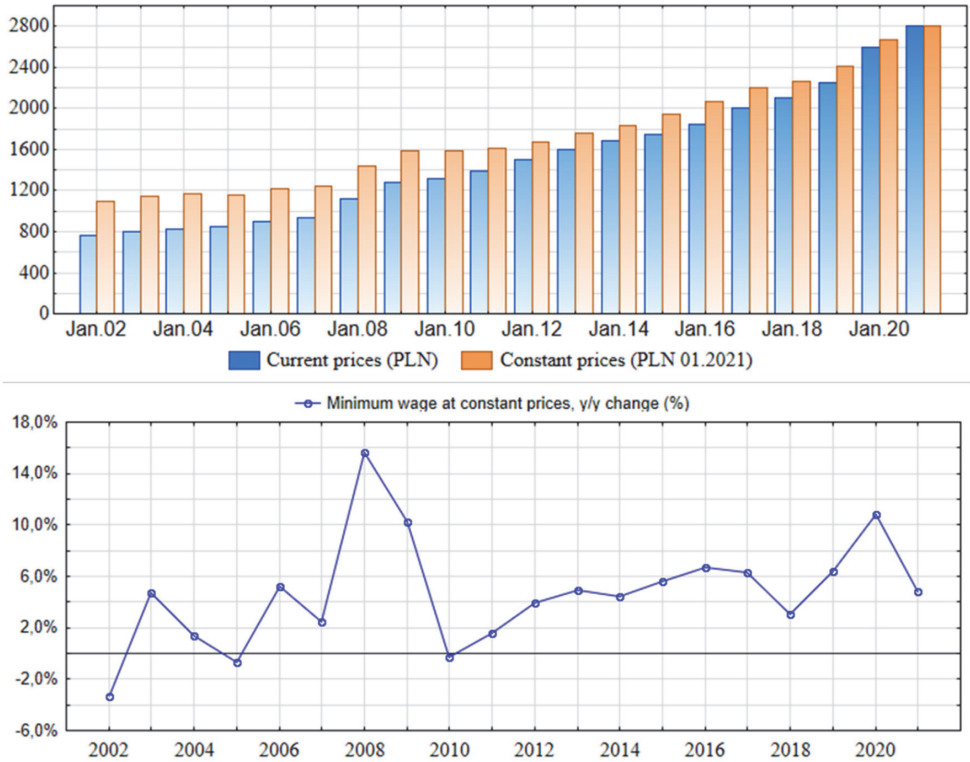

Figure 2. The minimum monthly gross salary in Poland in the years 2002–2021

S o u r c e: Author's own elaboration based on Eurostat.

Figure 2 shows the minimum monthly wage in Poland in 2002–2021 in the current prices and at constant prices (PLN, January 2021), as well as the dynamics of the constant prices MW. As it can be seen on the chart, only in 2002, before the current minimum wage act, the value of the minimum wage decreased significantly. That year nominal wage has not increased at all. After 2002, the dynamics of the real minimum wage varied significantly, but only in 2004, 2005 and 2010 it was around zero. The real value of the minimum wage in Poland grew every other year, the fastest in 2008, 2009 and 2020, when its year-on-year increase exceeded 10%. In 2021, the minimum wage in Poland was raised to 2,800 PLN.

In 2020, the European Commission presented a draft EU directive obliging the member states to introduce transparent and stable criteria for determining and updating the minimum wage. The directive leaves the determination and the decision to have a MW to the Member States, although the document states that a hypothetical increase in the MW to 60% of the median gross wage could improve its "adequacy" in half of the countries (European Commission, 2020).

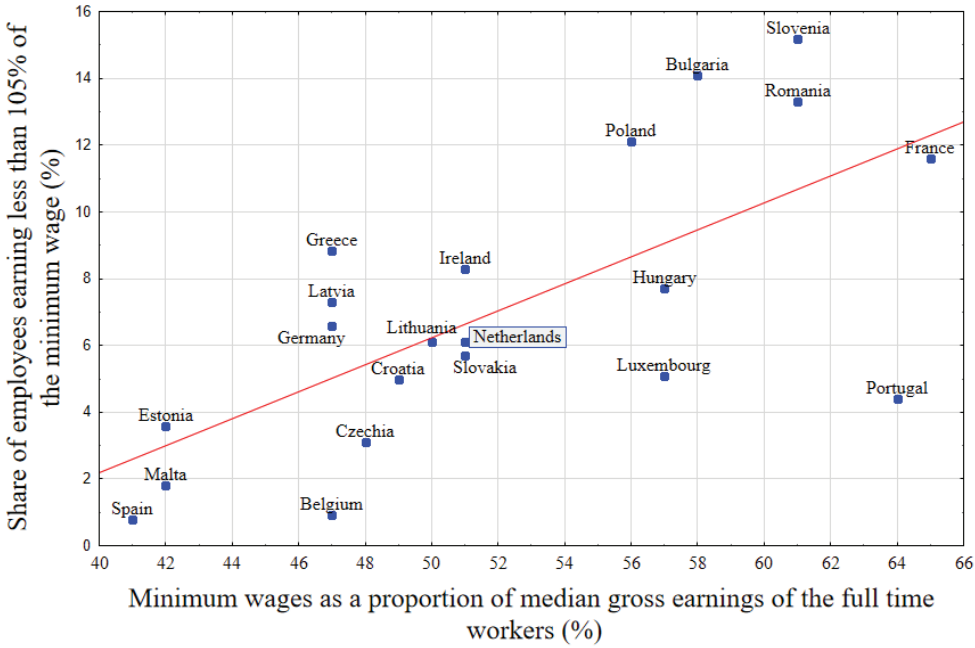

Figure 3. Ratio of the minimum wage to the median wage of the full time workers (%, x-axis) and share of employees earning less than 105% of the minimum wage in the EU countries (%, y-axis)

S o u r c e: Author's own elaboration based on Eurostat.

Figure 3 is a dispersion chart consisting of the ratio of the MW to the median wage of the full-time workers (x-axis) and the share of full-time workers earning less than 105% of the minimum wage (y-axis) in the EU countries in 2018. There is a visible correlation between those values, as countries with higher MW tend to have more people covered by them. The ratio of the MW to the median ranged from 41% in Spain to 65% in France. Only in four countries the minimum wage was higher than 60% of the median wage. In Poland, it was 56% in 2018, putting it at the eighth place in the EU. In five countries (Slovenia, Bulgaria, Romania, Poland and France) over 10% of full-time workers earned near the MW. In Poland, it was 12%, which put it in the fourth place in EU. In countries such as Malta, Belgium and Spain it was less than 2%.

It could be hypothesized that increasing MW may have sharper consequences in countries such as France, Slovenia or Poland than in Spain or Malta, although a comprehensive study encompassing all of these countries would be needed to confirm. It may also be worth examining, how their general institutional environment impacts MW effects on the economy. Within European countries, it is possible to classify groups with clusters of distinctive features that are significant to the labour markets (Mierzejewski and Chlebisz, 2019).

4. Methods and data

The study examines causal relationships, in the Granger sense, between minimum wage and selected labour market indicators in Poland between the years 2002 and 2019. The period considered does not cover 2020 because of significant external disruptions to the labour market, resulting from the pandemic, lockdowns and extensive governmental interventions.

The variable "x" is a Granger cause for "y" if and only if the future values of "y" can be better predicted using present and past "x" values. It does not necessarily mean any literal causation, yet, statistically, it gives evidence of constant conjunctions and suggests a relationship that is useful for predictions (Kirchgassner, Wolters and Hassler, 2013). As mentioned before, many studies from high-income countries imply that MW effects may be too small to be observable in aggregate statistics. The causality test may indicate whether one variable holds statistically significant information about future values of the other, in this case, whether Kaitz can be useful in predictions of employment and unemployment.

Instead of the standard Granger causality test, a modified approach, introduced by Toda and Yamamoto, is used. The Toda and Yamamoto procedure allows for causality testing even if the processes are integrated or cointegrated of an arbitrary order (Toda and Yamamoto, 1995).

The procedure consists of creating a VAR(k) model for both variables, where k is the maximum order of delay, and then estimating the VAR(k+d_{max}) model, where d_{max} is the maximum level of integration suspected in *x* and *y* processes. The estimated model can be written as:

$$y_{t=\alpha_{10}+\sum_{i=1}^{k+d}\beta_{1i}y_{t-i}+\sum_{i=1}^{k+d}\gamma_{1i}x_{t-i}+\epsilon_{1t}} \quad (1)$$

$$x_{t=\alpha_{20}+\sum_{i=1}^{k+d}\beta_{2i}x_{t-i}+\sum_{i=1}^{k+d}\gamma_{2i}y_{t-i}+\epsilon_{1t}} \quad (2)$$

In the next step, Wald's test is performed with imposed and zero restrictions on the initial parameters of VAR(k) model. Additional delays are not restricted (Czapla, 2009).

The null hypotheses are as follows:

$$H_0: \beta_{1i} = 0, i \leq k \text{—for the first equation}$$

$$H_0: \beta_{2i} = 0, i \leq k \text{—for the second equation}$$

Rejecting the null hypothesis means that there is Granger causality between the variables (Czapla, 2009).

A ratio of the nominal minimum wage to the median wage (Kaitz index) has been chosen as a measure of MW. Seasonality from this data series has been adjusted by Census II method, using Statistica software. Adjusting seasonality is necessary because of the natural labour market cycles. Even though the minimum wage in Poland changes the same month every year, adjustments should not cover its effects, as there is a significant variance between the changes. All the variables consist of 72 quarterly observations from the 2002Q1–2019Q4 period. The variables used in the study are:

- **MWR**—The ratio of the minimum wage to the average wage. Seasonally adjusted.
- **lnE**—Logarithm of the seasonally adjusted number of employees.
- **lnE15_24**—Logarithm of the seasonally adjusted number of youth employees (15–24 y.o.).
- **ER**—Employment rate. Seasonally adjusted.
- **ER15_24**—Youth (15–24 y.o.) employment rate. Seasonally adjusted.

– **UR**—Unemployment rate. Seasonally adjusted.
– **UR15_24**—Youth (15–24 y.o.) unemployment rate. Seasonally adjusted.

MWR dataset was created via own calculations, based on Statistics Poland (GUS) quarterly data on average wages, and ZUS data on minimum wage past values. Other variables were sourced from ILOSTAT Short-term labour force statistics (STLFS) database.

5. Results

To use the maximum integration degrees, it is necessary to perform unit root tests. Two tests were performed: the Augmented Dickey-Fuller Test (ADF) (Dickey and Fuller, 1979) and the KPSS test (Kwiatkowski and Phillips, 1992). In the former, the null hypothesis states the unit root presence (no stationarity). In the latter, the null hypothesis posits the process is stationary. The results of both tests and determined integration degrees are presented in Table 1.

With the *MWR*, *lnE15_24*, *ER15_24* and *UR*, both tests visibly indicate integration in the first degree, within a confidence level of 0.05. "*" marks the series for which the ADF and KPSS test results differed. For *ΔlnE* and *ΔER*, the p-value of the ADF test was less than 0.1, which means that at a slightly higher level of confidence the results would be consistent with KPSS. At *ΔUR15_24*, the p-value of the ADF test was 0.14, so the unit root hypothesis was not rejected, even though KPSS indicates that the series could be stationary.

Table 1. ADF and KPSS unit root tests

X	ADF: H0: the unit root is present		KPSS:	H0: the variable is stationary		Degree of integration of the variable, I (d)
Variable	t-Stat	p-value	KPSS	1%	10%	
MWR	–0.68508	0.8433	1.061713	0.739	0.347	I (1)
lnE	–1.05751	0.7281	0.951651	0.739	0.347	I (1) *
lnE15_24	–0.94448	0.7683	0.751522	0.739	0.347	I (1)
ER	–1.9852	0.2926	1.026479	0.739	0.347	I (1) *
ER15_24	0.288195	0.9761	0.825337	0.739	0.347	I (1)
UR	–1.9948	0.2885	0.907418	0.739	0.347	I (1)
UR15_24	–1.99474	0.2885	0.826139	0.739	0.347	I (2) *
ΔMWR	–9.03271	0	0.103459	0.739	0.347	X
ΔlnE	–2.80895	0.0623	0.128146	0.739	0.347	X
ΔlnE15_24	–8.08653	0	0.140757	0.739	0.347	X
ΔER	–2.83598	0.0586	0.089184	0.739	0.347	X
ΔER15_24	–7.89399	0	0.21667	0.739	0.347	X
ΔUR	–3.66869	0.0067	0.101186	0.739	0.347	X
ΔUR15_24	–2.39934	0.1457	0.103315	0.739	0.347	X

A d n o t a t i o n: "Δ" signifies the first differences.

S o u r c e: Author's own elaboration.

In the next step, the VAR(k) model was estimated using the levels (not the first differences). The optimal levels of lags were established based on information criteria, the autocorrelation of residuals and roots of the characteristic polynomial. The delays indicated by the information criteria are presented in Table 2. For the lnE variable, although most of the criteria indi-

cated a delay k=1, the delay k=4 (indicated by the AIC and FPE criteria) was chosen due to the model stability. The variable *ER15_24* was discarded from further analysis, as all information criteria point to lag 1, but the VAR model does not meet the stability criteria.

Table 2. Lag length selection

X	Delays indicated by the information criterion					X
Model	LR	FPE	AIC	S.C.	HQ	Decision
MWR/ lnE	1	4	4	1	1	4
MWR/ lnE15_24	1	1	1	1	1	1
MWR/ ER	4	4	4	1	4	4
MWR/ ER15_24	1	1	1	1	1	-
MWR/ UR	5	6	6	2	5	5
MWR/ UR15_24	4	4	4	2	2	4

S o u r c e: Author's own elaboration.

After estimating the VAR($k+d_{max}$) models with additional delays, a causality test was performed. The modified Wald test is consistent with the asymptotic Chi-square ($\chi 2$) distribution and the degrees of freedom equal to the number of lags ($k+d_{max}$). The null hypothesis is that there is no Granger causality between *x* and *y.* Test results are presented in Table 3.

Table 3. Toda-Yamamoto causality (modified WALD) test result

Null hypothesis	Chi-sq	Prob.	Granger causality
MWR does not granger cause LNE	6.207131	0.1842	No causality
LNE does not granger cause MWR	7.136222	0.1289	No causality
MWR does not granger cause UR	37.94636	0	Unidirectional Causality MWR→UR
UR does not granger cause MWR	6.008497	0.3054	No causality
MWR does not granger cause ER	4.926215	0.295	No causality
ER does not granger cause MWR	7.246875	0.1234	No causality
MWR does not granger cause LNE15_24	0.845128	0.3579	No causality
LNE15_24does not granger cause MWR	0.796914	0.372	No causality
MWR does not granger cause UR15_24	7,797165	0.0993	No causality
UR15_24 does not granger cause MWR	0.853252	0.9312	No causality

S o u r c e: Author's own elaboration.

The test rejected the hypothesis that the ratio of the minimum wage to the average wage is not a Granger cause for the unemployment rate (p-value=0). There is no basis to reject the hypothesis that there is no causality for the remaining variables. None of the analyzed variables is a Granger cause for the Kaitz index, while the Kaitz index is a Granger cause only for the unemployment rate.

6. Conclusions, limitations and further research

Over the last two decades, the real minimum wage in Poland has increased almost 2.5 times. The purchasing power of the Polish minimum wage in 2021 is slightly higher than the EU average. Poland is also among the countries with the highest minimum wage to median wage ratio and one of the countries with the highest share of people earning close to the minimum wage.

An effective minimum wage does not necessarily lead to a decline in employment. Most empirical studies point, however, to small, but negative effects. It should be remembered that the negative effects of the minimum wage may be distributed in a different way among individual social groups and some studies point to the harsher employment effects among people with low income.

The results obtained in the study indicate that in Poland, in the years 2002–2019 there was a causal relationship, in the Granger sense, between the Kaitz index and the unemployment rate. No such relationship was proven between the Kaitz index and the rest of the analyzed indicators.

Further, detailed studies are needed to estimate specific elasticities. Although it gives some solid ground for further analysis, the Granger causality approach is limited regarding the scope of conclusions drawn directly from it. It may also be desirable to apply a broader macroeconomic perspective to the minimum wage study. Relatively high economic growth might have been a contributing factor to the lower minimum wage employment effects, as well as recent lowering the retirement age, putting more people out of the labour force. The study ends in 2019, just before the Covid-19 pandemic. The global economic crisis, as well as extensive governmental interventions, will probably be a defining factor for the labour market in the coming years.

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Płaca minimalna w Polsce a bezrobocie i zatrudnienie. Ocena przyczynowości

Abstrakt: Celem artykułu jest ocena zależności między wynagrodzeniem minimalnym, zatrudnieniem i bezrobociem w Polsce. Przedstawiono przegląd teoretycznych aspektów płacy minimalnej, głównych motywacji za jej stosowaniem, a także potencjalnych negatywnych konsekwencji. Płaca minimalna w Polsce zostaje przedstawiona na tle innych krajów Unii Europejskiej. Wykorzystując metodę Toda-Yamamoto oraz dane kwartalne GUS i ILOSTAT obejmujące lata 2002–2019, zbadano przyczynowość Grangera między indeksem Kaitza a wybranymi wskaźnikami rynku pracy. Wyniki wskazują na istnienie jednokierunkowej przyczynowości Grangera między wskaźnikiem Kaitza a ogólną stopą bezrobocia. Nie wykryto podobnych zależności w przypadku pozostałych badanych wskaźników, w tym między innymi stopy zatrudnienia i stopy bezrobocia wśród osób młodych.

Słowa kluczowe: rynek pracy, przyczynowość, przyczynowość Grangera, Toda-Yamamoto, płaca minimalna