The Impact of Minimum Wages on Consumption in EU Countries

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Abstract: - In this paper, we investigate the significance of the relationship between minimum wages and consumption in EU countries between 1999 and 2021 using panel regression and cluster analysis. We can show a statistically significant effect of the minimum wage on consumption, in a negative direction. For Eastern European countries, the short-term effect of minimum wage growth on consumption is positive, but in the long term, the overall effect is negative. The results of the paper are supported by the outputs of other authors on the effects of minimum wages on employment and consumer prices.

Key-Words: - consumption, EU countries, low-wage workers, minimum wage, panel data model, personal income.

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1 Introduction

Consumption theory has evolved over time and different authors used various approaches to understand consumption expenditure better. Classical economic theory suggests that consumption is determined mainly by changes in interest rates. A decrease in interest rates reduces the incentive for households to save and thereby increases consumption expenditure, [1].

Work [2], argues that income is irrelevant because the consumer can borrow or lend money, and therefore current consumption depends on lifetime income and not on current income. In contrast, Keynes presents three pertinent points. Firstly, the level of consumption spending primarily relies on absolute income; secondly, consumption expenditure is directly dependent on the absolute amount of present income; and thirdly, an increased income in a given period will lead to greater consumption during that same period, [3].

Research [4], however, proposed another theory, whereby the current amount of consumption is not solely determined by the current levels of absolute and relative income; it is also influenced by previous patterns of consumption. In [5], authors attempted to solve the paradox of consumption. This research builds on [2] and adds that people want to have steady consumption over their lifetime. Therefore, people do not react to predictable changes in income but only to unpredictable ones. To sum up, everything that has been stated so far, most theories agree that income is a key factor for consumer spending.

Certainly, income is formed by wages mainly in the case of low-wage employees. These are affected by the minimum wage setting, so it is possible to consider a link between the minimum wage and income for at least certain groups of employees. However, the effect of an increase in the minimum wage on total income is not straightforward. Work [6], employs data from the United Kingdom and uses difference-in-difference estimation to show that the magnitude of the minimum wage hike has a major impact on whether the actual wage growth of low-wage workers will increase significantly. It is argued that these results are in accordance with the fact that employers comply with the statutory minimum wage but withhold or offset the wage growth that they could have provided in periods of relatively low minimum wage uprating. The authors of [7], found evidence that low-wage workers in the USA are strongly affected by an increase in the minimum wage. The wages that workers initially earn close to the minimum wage rise, but their hours and employment decline. This combination results in a lower total income after the increase in the minimum wage. In [8], the authors present the results of a similar investigation in Brazil, where for a short lag in a minimum wage increase there are modest positive effects on the incomes of low-income families. However, the estimated effects of a longer lag in the increase of the minimum wage had a negative effect on total income. Overall, the

authors found no evidence that the minimum wage in Brazil produces positive distributional outcomes for low-income households. The paper [9], focused on low-income families in the USA and observed that immediately following a minimum wage increase, both household income and spending rose for households with minimum wage workers. The authors also point to the fact that elevated expenditure levels are funded by rises in collateralized debt.

The authors of [10], gathered evidence from the United Kingdom suggesting that there is a not very substantial change in the spending patterns of households after an increase in the minimum wage. The explanation could be that the changes in the minimum wage were so small that they were not reflected in consumption. On the contrary, in [11], the authors dealt with income effect and consumption response. Their study concentrated on China and found that a relationship between consumption expenditure and the minimum wage does exist. Their research considered the fact that the amount of the minimum wage also depends on the number of people earning the minimum wage in the household. Their work provided evidence for a positive response in consumption after a change in the minimum wage. This beneficial impact was supported by substantial spending on healthcare and schooling for household members. A full income effect cannot be attributed solely to the increase in wages because their increase was frequently accompanied by other social advantages. The positive side is that the data provided no evidence of any significant adverse employment effects. This observation may be explained by the low minimum wage level compared to the median wage. The authors claim that the effect of the minimum wage will also depend on the type of households prevailing in the country. Poor childless households tend to save more than households with children. Households with at least one child are the primary drivers of the substantial marginal propensity to consume. Note that an increase in income may not simply mean an increase in consumption, but also changes in the consumption basket, e.g., a shift towards organic food consumption, [12].

Another study for Canada, [13], shows that a one percentage point increase in the actual minimum wage causes a 0.5 percentage point increase in the real retail trade. Their investigations showed that a rise in the minimum wage boosts consumption and hence economic growth. More recent research was performed in India, [14]. This study confirmed an increase in consumption after an increase in the minimum wage with no evidence of a corresponding negative effect on employment. However, the results of their study are tempered by India's non-compliance with minimum wage levels. Many developing countries, including India, have significant differences in their *de jure* and *de facto* regulations. The positive impact of minimum wage increases on wages and consumption is reduced in regions with low compliance rates. According to [15], the minimum wage in both low-wage and high-wage provinces in Canada has a positive impact on household consumption in the long term more than in the short term.

Interesting research was conducted by the authors of [16], who examined the impact of local minimum wage increases on price dynamics at local grocery stores in the USA between 2001 and 2012. They found that minimum wage increases have a significant influence on grocery store prices. Their results suggest that the costs of minimum wage increases are borne by consumers rather than companies. The authors also conclude that price effects diminish the effectiveness of the minimum wage as an instrument to reduce poverty. At the macroeconomic level, it is possible to observe, for example, a significant impact of the minimum wage on exports, [17], which should again have a positive effect on the living conditions of the population.

Research [18], examined the response of consumption to changes in the minimum wage within the USA. Like in [16], he used retail sales data as a reasonable measure of nondurable consumption. In [18], the author uses a panel data framework in his paper and considers employment, population, gross state product, and house prices as additional regressors. As for the minimum wage as an anti-poverty tool, this work came to a different conclusion than, [16]. According to [18], the minimum wage is an e-ective policy that modestly supports aggregate demand and helps fight poverty. It is suggested that redistribution in favor of low-wage workers may lead to a consequent increase in aggregate consumption. Wage differentials between countries compounded by differences in minimum wages, unemployment rates, and the quality of the education system, among other factors, determine emigration motivated by the desire for higher consumption, including phenomena such as 'brain drain', [19].

The authors of [20], use comparative statics to analyze the long-term outcomes resulting from the imposition of a binding minimum wage. They compare equilibrium values in a perfectly competitive economy and a minimum wage economy. In doing so, it has been necessary to make a distinction between the government-imposed

minimum wage per unit of labor time as an exogenous variable and the market-determined wage rate per effective unit of work as an endogenous variable. For these two situations, the authors introduce multi-equation models that naturally include consumption. When a government-imposed minimum wage is applied, the authors show the direct effect of the minimum wage on consumption under certain settings of the parameters of the economy.

The minimum wage varies across the European Union. Some countries have had a minimum wage for years, whereas some have yet to establish a minimum wage. This means that the minimum wage in the European Union ranges from zero to thousands of Euros. The percentage of people earning a minimum wage also varies. Therefore, households in some countries may be more insistent on a minimum wage than in others. The continuing importance of the nominal minimum wage is reflected in the ongoing debates among politicians. The Directive on Adequate Minimum Wages in the European Union has just entered into force, [21]. In assessing the adequacy of statutory minimum wages, Member States are required to follow indicative reference values such as 60% of the gross median wage and 50% of the gross average wage.

The minimum wage may be seen as the cornerstone upon which the majority of sustainable development objectives are built, [15]. Minimum wages can be set in countries in two ways. They are either government-legislated or the product of collective bargaining agreements. The proponents of minimum wage argue that the minimum wage raises the prosperity of all workers, lowers income inequality, [22], and improves the overall performance of the economy, [23].

A change in the minimum wage alone, even a relatively large one, may not lead to a change in other economic quantities, because the level of the minimum wage may be unimportant relative to the overall level of wages. One way to show the importance of a set minimum wage is the so-called Kaitz index, the ratio of the minimum wage to the median wage, published for example by the International Labour Office, [24]. The closer the Kaitz index is to one, the more strongly the level of the minimum wage affects actors in each sector, [25]. Based on the link between income and consumption, it may be assumed that an increase in the Kaitz index will be accompanied by an increase in consumption.

The influence of the minimum wage on employment has been studied many times. According to [26], data suggest only a muted effect of the minimum wage on employment, while it significantly increases the earnings of low-paid workers. The authors of [7], appeal to policymakers to consider a trade-off in the increase in unemployment with an increase in the minimum wage. Higher unemployment is naturally perceived as a negative effect in society, while an increase in consumption expenditure is usually viewed as a positive effect and can be used at least as a positive externality of an increase in the minimum wage.

It is also worth mentioning that higher minimum wages imply higher costs for employers and can be reflected in higher prices. This may also influence the pattern of consumer demand. The paper [11], highlighted four reasons why an increase in minimum wages may not lead to higher consumption levels. Initially, a higher minimum wage could only replace other social benefits, thus reducing the actual increase in income boost substantially. Many social benefit systems are based on income limits, which makes it practically difficult to assess the cumulative impact of ineligibility. In addition, the short-term nature of the increase in disposable income from higher minimum wages could be perceived, particularly in developing countries with elevated inflation rates. This could lead to only a slight improvement in welfare due to efforts to stabilize consumption. Furthermore, a rise in the minimum wage might heighten the risk of unemployment, prompting households to save more cautiously, thereby diminishing the impact on consumption. Lastly, the increased occurrence of unemployment could leave certain households considerably poorer than under the former political framework. Overall, it can be argued that the value of consumption expenditure cannot be understood as a product of unemployment and income alone. The simultaneous effect of the minimum wage on both of these components affects consumption expenditure and it is therefore important to examine the direct impact of the minimum wage on consumption.

There are not many studies examining the direct effect of the minimum wage on consumption at the national level. The theoretical impact of a minimum wage increase on consumption is not unambiguous and it is therefore meaningful to examine the current situation in real economies. The aim of this study is to assess the significance and direction of the impact of the minimum wage on consumption in European Union (EU) countries between 1999 and 2021.

2 Material and Methods

Based on the findings of the literature review, consumption expenditure (Y) is dependent on lagged consumption expenditure, the national minimum wage (X_1), and a lagged national minimum wage, GDP (X_2), and possibly a dummy variable (D) that reflects the presence ($D = 0$) or absence ($D = 1$) of a minimum wage, ϵ_t represents random error:

$$Y_t = \beta_1 Y_{t-1} + \beta_2 X_{1,t} + \beta_3 X_{1,t-1} + \beta_4 X_{2,t} + \beta_5 D_t + \epsilon_t.$$

The models assume that minimum wage growth directly affects the growth of the dependent variable. The statistical relevance of lagged consumption expenditure and the lagged minimum wage as explanatory variables is assumed due to the slower adjustment of households to new income. For GDP, both GDP and GDP per capita (GDP_{pc}) are used, and the same applies to consumption expenditure. For countries without a minimum wage, the variable X_1 is set to 0 (case NMW_0) or takes the smallest value of the minimum wage in the reference year (case NMW_{lowest}). An overview of the estimated models with different compositions of variables is given in Table 1.

Table 1. Summary of the estimated models

	X_1	D
(M1), (M5), (M9)	NMW_0	absent
(M2), (M6), (M10)	NMW_0	present
(M3), (M7), (M11)	NMW_{lowest}	absent
(M4), (M8), (M12)	NMW_{lowest}	present

Note: In models (M1)–(M8) total consumption expenditure is used, in models (M9)–(M12) consumption expenditure per capita is considered. In models (M1)–(M4), total GDP is considered, in models (M5)–(M12), GDP per capita is used.

The whole dataset was taken from Eurostat. The data provided on the Eurostat website for the minimum wage begins with the year 1999; therefore, the time series from 1999 to 2021 is used. During the period under review, not all countries had established a minimum wage. For this research, two approaches were used. In the first case, for countries with no established minimum wage or set one in the period under review, zeros were added in place of blind spots. In the second case, the lowest minimum wage that appeared in a given year among all the countries studied was used in place of blind spots. To assess whether or not a country introduced a minimum wage, a dummy variable was added. The dummy variable indicates the absence of a minimum wage for the selected country in the selected year.

National minimum wage data from Eurostat were captured bi-annually. For this article, semi-annual data were converted into annual data using an average. Final consumption expenditure (CE) and gross domestic product were collected yearly in millions of Euros at current prices. To obtain per capita variables, the aggregated annual values were divided by the population of each country in the given year.

As living standards still vary across EU countries, a cluster analysis based on consumption expenditure per capita and GDP per capita was used to create groups of comparable countries. The cluster analysis was performed for the years 1999, 2010, and 2021. The use of standardized Euclidean metrics and Ward's distance proved to be the most appropriate. Regression analysis of panel data (for all the countries as well as for detected clusters) was used to estimate the possible dependency of consumption on the minimum wage. The significance test of the variables in this model is performed using t-tests. When modeling macroeconomic data, regression results may suffer from the so-called spurious regression effect, which is particularly difficult to rule out in the case of panel data. For this reason, the Im-Pesaran-Shin test was used to assess the stationarity of residuals for all the estimated models. Models with fixed effects and random effects were estimated and the final model was selected by the Hausman test. The significance level was set to 0.05, and all calculations were performed in MATLAB R2023b and Gretl 2023c software.

3 Results

As an introductory step, a cluster analysis was performed to create relatively compact groups of countries concerning the consumption and income levels of the countries. Based on dendrograms from the cluster analysis (for the results from 2010, see Figure 1), it is possible to observe the different behavior of Luxembourg, as this country has considerably higher GDP per capita and consumption expenditure per capita than the other countries. Therefore, this country was excluded from the further analyses.

A regression analysis of panel data was performed for all the EU countries (excluding Luxembourg), so total consumption is modeled for 26 countries, with a time series range of 23 (years 1999–2021). The Hausman test indicated the appropriateness of the fixed effects models in all cases, and the Im-Pesaran-Shin test ruled out any spurious regression. The estimated models had a very high coefficient of determination, significant GDP or GDP per capita, and lagged consumption in

the expected direction. The indicator *D* was not significant in any of the models. At least one variable expressing the minimum wage was always significant, but there was no uniform direction of the effect on consumption. A negative effect was detected in models (M1), (M3), (M9), and (M11), and a positive effect in models (M5) and (M7). Therefore, the results of the cluster analysis were used in further analyses, and a regression analysis was performed for the EU countries separately for each cluster. Classification of the EU countries into clusters is shown in Table 2. Figure 2 presents the time series of per capita consumption, GDP per capita, and national minimum wage of the selected country for each cluster. Specifically, these are France (Cluster 1), Spain (Cluster 2), and Poland (Cluster 3).

The characteristics of the individual clusters are shown in Table 3. Luxembourg, which forms a separate cluster, is characterized by significantly higher GDP_{pc}, $CE_{pc,}$ and NMW than the other countries and is therefore rightly excluded from further analyses. Cluster 1 has almost twice the GDP_{pc} of Cluster 2, and CE_{pc} is about half as high. The minimum wage is also twice that of Cluster 2. It should be noted here that only 4 out of 10 countries in Cluster 1 have established a minimum wage, but the countries lacking a minimum wage have well-developed union and collective bargaining systems. Cluster 3 has both GDP_{pc} and CE_{pc} roughly half the values of Cluster 2, but the NMW here is almost three times smaller.

Panel models (M1)–(M12) were estimated individually for each cluster. A common feature of the models across the clusters is the rejection of random-effects models using the Hausman test, and the results for the fixed-effects models are presented below. The only exceptions are the models with a dummy variable (M2), (M4), (M6), (M8), (M10), and (M12) in Cluster 2, which could not be constructed due to collinearity. In this case, random effects with Nerlove transformations were employed. In all cases, the Im-Pesaran-Shin test ruled out spurious regression. All the models are of high quality with a coefficient of determination above 0.94.

Table 2. Classification of the EU countries into clusters

Cluster 1	Cluster 2	Cluster 3
Austria	Greece	Bulgaria
Belgium	Malta	Croatia
Cyprus	Portugal	Czech Republic
Denmark	Slovenia	Estonia
Finland	Spain	Hungary
France		Latvia
Germany		Lithuania
Ireland		Poland
Italy		Romania
Netherlands		Slovakia
Sweden		

Source: Own determination

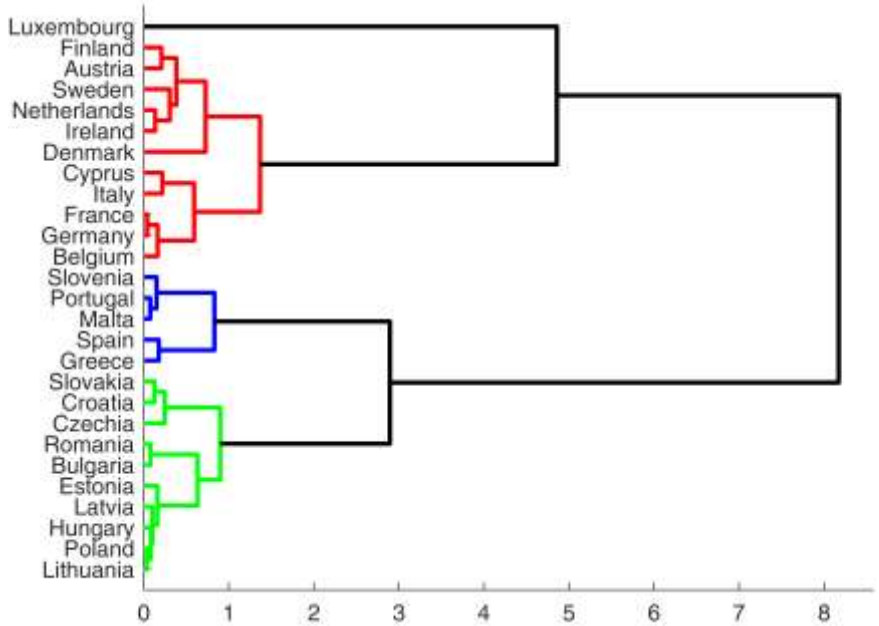

Fig. 1: Dendrogram of the cluster analysis of EU countries for 2010 concerning consumption expenditure per capita and GDP per capita

Source: Own calculation

Table 3. Characteristics of determined clusters for the year 2010. Means of GDP, consumption, national minimum wage, and counts of countries with set NMW

	GDP_{pc} [EUR]	CE_{pc} [EUR]	GDP [bil. EUR]	CE [bil. EUR]	NMW [EUR]	Countries with NMW	Number of countries
Cluster 1	34238	17359	769	408	1401	4	11
Cluster 2	18889	12067	304	188	696	5	5
Cluster 3	9766	5752	96	57	261	10	10
Luxembourg	84456	30255	42	15	1704	1	1

Source: Own calculation

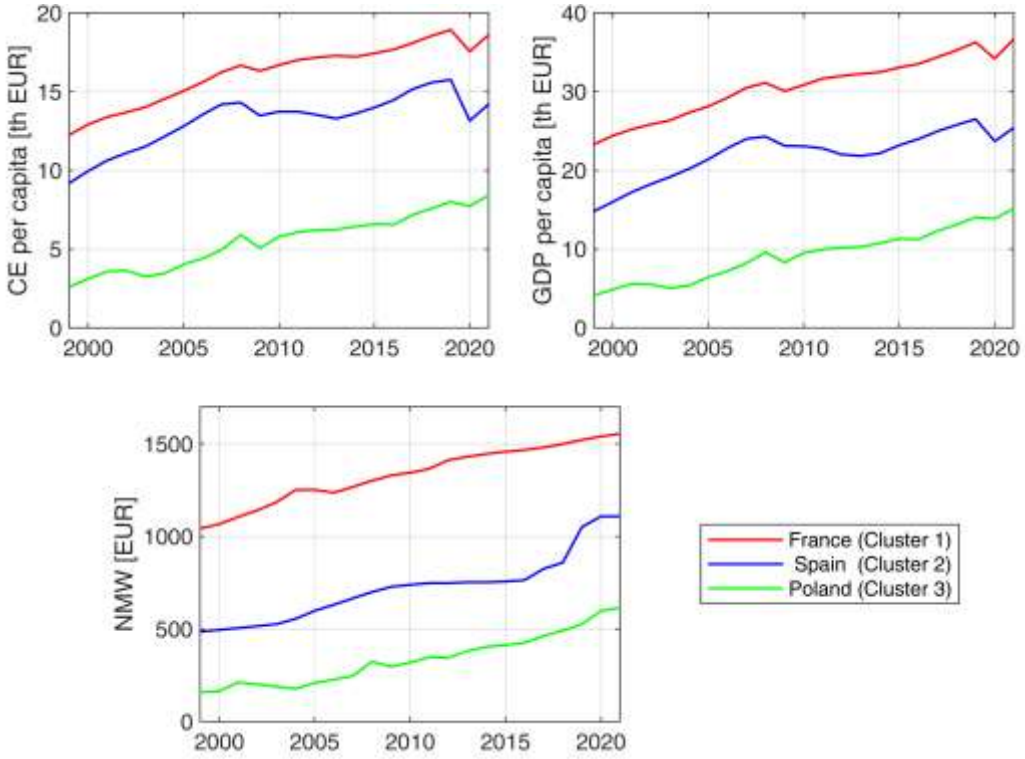

Fig. 2: Time series of per capita consumption (CE per capita), GDP per capita, and national minimum wage (NMW) of the selected countries
Source of data Eurostat, own processing

The results for Cluster 1 and the obtained parameter signs showing the direction of possible dependency and corresponding *p*-values are shown in Table 4. Models (M2), (M4), and (M6) has an insignificant dummy variable indicating the absence of nominal minimum wage and therefore the relevance of these models disappears compared to the initial models (M1), (M3), and (M5). For models (M5) and (M7), the estimates are distorted by the statistical insignificance of GDP, which is inconsistent with theoretical models of consumption.

Models (M1), (M2), (M9), and (M11) report at least one significant variable with minimum wage, with a negative sign of the parameter. In model (M8), neither variable expressing the minimum wage is significant. The significant variable *D* points to a systematically lower level of total consumption in countries without a minimum wage. However, this finding is not substantial, as the countries without a minimum wage mainly include large countries (Germany for the majority of years, Italy). Models (M10) and (M12) have both insignificant current and lagged minimum wages, but once the lagged variable is removed, the current minimum wage becomes statistically significant. In the case of the model (M12), the same can be claimed when removing the current minimum wage and keeping the lagged one. Overall, for models in which at least one variable expressing the minimum wage is significant, the negative effect on consumption dominates. Regarding Cluster 2, the obtained signs of the parameters indicating the direction of potential dependence and the associated *p*-values are shown in Table 5.

Table 4. Estimated models for Cluster 1 countries

Model	*const*	CE_{lagged}	NMW_0	NMW_{lowest}	$NMW_{0,\ lagged}$	$NMW_{lowest,\ lagged}$	*GDP*	GDP_{pc}	*D*
(M1)	<0.001	<0.001 (+)	0,018 (−)	×	0.039 (−)	×	<0.001 (+)	×	×
(M2)	<0.001	<0.001 (+)	0.019 (−)	×	0.099 (−)	×	<0.001 (+)	×	0.304 (−)
(M3)	<0.001	<0.001 (+)	×	0.013 (−)	×	0.055 (−)	<0.001 (+)	×	×
(M4)	<0.001	<0.001 (+)	×	0.052 (−)	×	0.070 (−)	<0.001 (+)	×	0.922 (−)
(M5)	<0.001	<0.001 (+)	0.022 (+)	×	0.372 (−)	×	×	0.124 (+)	×
(M6)	<0.001	<0.001 (+)	0.988 (−)	×	0.695 (−)	×	×	0.028 (+)	0.086 (−)
(M7)	<0.001	<0.001 (+)	×	0.027 (+)	×	0.425 (−)	×	0.340 (+)	×
(M8)	<0.001	<0.001 (+)	×	0.639 (−)	×	0.758 (−)	×	0.032 (+)	0.037 (−)
(M9)	<0.001	<0.001 (+)	0.151 (+)	×	0.045 (−)	×	×	<0.001 (+)	×
(M10)	<0.001	<0.001 (+)	0.149 (−)	×	0.228 (−)	×	×	<0.001 (+)	0.006 (−)
(M11)	<0.001	<0.001 (+)	×	0.114 (+)	×	0.046 (−)	×	<0.001 (+)	×
(M12)	<0.001	<0.001 (+)	×	0.288 (−)	×	0.151 (−)	×	<0.001 (+)	0.028 (−)

Notes: For each model, the sign of the parameters and the associated p-values are given. The term "lagged" in the subscript of the variable name refers to the value of this variable in the previous year.
Source: Own calculation

In models (M1), (M3), (M4), and (M8) – (M12) the minimum wage appears statistically insignificant, and removing the current or lagged minimum wage does not lead to the significance of one of them. In the case of models (M2), (M5), (M6), and (M7), removing one of the variables representing the minimum wage results in a model where the remaining variable – lagged minimum wage in the case of models (M5), (M7) and current minimum wage in the case of models (M2), (M6), (M7) – is statistically significant with the negative sign of the parameter.

In Cluster 3 (Table 6), the dummy variable turns out to be insignificant in models (M2), (M4), (M6), and (M8). Therefore, the relevance of these models disappears in favour of the initial models without the dummy variable. All the models without a dummy variable, (M1), (M3), (M5), (M7), (M9), and (M11), have both statistically significant minimum wage variables. The parameter for the current minimum wage always has a positive sign and for the delayed minimum wage a negative sign. The negative parameter for the lagged minimum wage in absolute value is always larger than the positive parameter for the non-lagged minimum wage, so the overall effect of a minimum wage increase on consumption is negative. This can be interpreted that the income raised by the minimum wage increase has a short-term effect on consumption growth; however, in the long term, the increase in the minimum wage causes consumption to fall, presumably due to the loss of income of workers laid off due to rising wage costs. The current minimum wage, unlike the lagged one, appears statistically insignificant in models (M10) and (M12). Removing either the current or lagged minimum wage results in a model in which the remaining minimum wage is significant with a negative sign of the parameter.

Table 5. Estimated models for Cluster 2 countries

Model	*const*	CE_{lagged}	NMW_0	NMW_{lowest}	$NMW_{0,\ lagged}$	$NMW_{lowest,\ lagged}$	*GDP*	GDP_{pc}	*D*
(M1)	<0.001	0.024 (+)	0,335 (−)	×	0.478 (+)	×	<0.001 (+)	×	×
(M2)	0.015	0.019 (+)	0.230 (−)	×	0.396 (+)	×	<0.001 (+)	×	0.335 (−)
(M3)	<0.001	0.025 (+)	×	0.369 (−)	×	0.502 (+)	<0.001 (+)	×	×
(M4)	0.017	0.020 (+)	×	0.261 (−)	×	0.419 (+)	<0.001 (+)	×	0.392 (−)
(M5)	0.013	<0.001 (+)	0.612 (+)	×	0.261 (−)	×	×	0.006 (+)	×
(M6)	0.254	<0.001 (+)	0.725 (+)	×	0.288 (−)	×	×	0.004 (+)	0.304 (−)
(M7)	0.017	<0.001 (+)	×	0.701 (+)	×	0.265 (−)	×	0.003 (+)	×
(M8)	0.267	<0.001 (+)	×	0.817 (+)	×	0.291 (−)	×	0.002 (+)	0.304 (−)
(M9)	<0.001	<0.001 (+)	0.321 (+)	×	0.534 (−)	×	×	<0.001 (+)	×
(M10)	<0.001	<0.001 (+)	0.330 (+)	×	0.539 (−)	×	×	<0.001 (+)	0.105 (+)
(M11)	<0.001	<0.001 (+)	×	0.269 (+)	×	0.487 (−)	×	<0.001 (+)	×
(M12)	<0.001	<0.001 (+)	×	0.279 (+)	×	0.492 (−)	×	<0.001 (+)	0.106 (+)

Notes: For each model, the sign of the parameters and the associated p-values are given. The term "lagged" in the subscript of the variable name refers to the value of this variable in the previous year.
Source: Own calculation

4 Discussion

The models for the given clusters of countries are plausible and show a significant and unambiguous effect of the minimum wage on consumption, except for models (M5) to (M8). These models are specific in that total consumption is explained by GDP per capita. Evidently, the use of GDP per capita causes problems in such models. For the group of EU countries excluding Luxembourg, these models show a positive effect of the minimum wage, contrary to the other models, while for the Cluster 1 countries the GDP per capita variable is insignificant. GDP per capita may undoubtedly be considered an indicator of economic performance affecting total consumption, but it is not appropriate for modeling total consumption. For Cluster 2, due to the insignificance of the minimum wage effect, a subgroup of only countries with a minimum wage was formed. This approach also did not provide satisfactory results in the form of a usable model. All the considered models were also assessed in terms of the differences in the variables used. The results obtained may be interpreted as analogous for the models in levels due to the significance and direction of the effect of the minimum wage, so we do not present them in this paper. These results support the statement that the reported models in levels are not affected by spurious regression.

To better understand the effects of the minimum wage on consumption, the Kaitz index was also introduced in the models instead of the minimum wage and the lagged minimum wage. In this case, the data related to countries without an established minimum wage were not relevant to the models and were eliminated. The models were based on the same findings with the use of consumption expenditure as a dependent variable and lagged consumption expenditure, gross domestic product, and the Kaitz index as independent variables. The use of a dummy variable was not relevant once countries without an implemented minimum wage were excluded.

Table 6. Estimated models for Cluster 3 countries

Model	*const*	CE_{lagged}	NMW_0	NMW_{lowest}	$NMW_{0,\ lagged}$	$NMW_{lowest,\ lagged}$	*GDP*	GDP_{pc}	*D*
(M1)	<0.001	<0.001 (+)	0,049 (+)	×	0.032 (−)	×	<0.001 (+)	×	×
(M2)	<0.001	<0.001 (+)	0.129 (+)	×	0.041 (−)	×	<0.001 (+)	×	0.096 (−)
(M3)	<0.001	<0.001 (+)	×	0.026 (+)	×	0.016 (−)	<0.001 (+)	×	×
(M4)	<0.001	<0.001 (+)	×	0.052 (+)	×	0.017 (−)	<0.001 (+)	×	0.087 (−)
(M5)	0.113	<0.001 (+)	0.032 (+)	×	0.002 (−)	×	×	0.024 (+)	×
(M6)	0.122	<0.001 (+)	0.074 (+)	×	0.002 (−)	×	×	0.102 (+)	0.988 (−)
(M7)	0.134	<0.001 (+)	×	0.009 (+)	×	<0.001 (−)	×	0.029 (+)	×
(M8)	0.145	<0.001 (+)	×	0.021 (+)	×	<0.001 (−)	×	0.081 (+)	0.930 (−)
(M9)	<0.001	<0.001 (+)	0.008 (+)	×	0.002 (−)	×	×	<0.001 (+)	×
(M10)	<0.001	<0.001 (+)	0.430 (+)	×	0.002 (−)	×	×	<0.001 (+)	0.003 (−)
(M11)	<0.001	<0.001 (+)	×	0.004 (+)	×	<0.001 (−)	×	<0.001 (+)	×
(M12)	<0.001	<0.001 (+)	×	0.139 (+)	×	<0.001 (−)	×	<0.001 (+)	0.003 (−)

Notes: For each model, the sign of the parameters and the associated p-values are given. The term "lagged" in the subscript of the variable name refers to the value of this variable in the previous year.
Source: Own calculation

In the resulting models, the Kaitz index was never significant. This result may be explained by the fact that the movements of average wages and minimum wages are independent and the evolution of the Kaitz index varies considerably across countries. Given the harmonization imposed by the Directive, [21], the Kaitz index may be expected to perform better in the future, not only in consumption models.

No corresponding studies are available for a direct comparison of the results obtained. The authors of [7], investigated how low-wage workers can be affected by a minimum wage increase in the USA. These workers initially earn more after the minimum wage rises, but their employment decreases, which leads to an overall lower total income and consequently to lower total consumption after the minimum wage increase. The paper [8], obtained similar results for Brazil, where the short-term response to the increase in the minimum wage was an increase in family income, but in the long term, there was a decline in total family income and hence in consumption. These results, although not from a European environment, are consistent with our study, especially for Cluster 3 countries. There are also papers available on the impact of the minimum wage on variables that affect consumption indirectly. The studies [27], [28], deal with OECD countries and find evidence that collective bargaining, coordinated wage setting, and minimum wages lower youth employment. The authors of [29], used company-level variation comparing low and high-wage companies and found a modest disemployment effect of the minimum wage setting in Germany. In [30], the authors provide a comprehensive evaluation of a rapid increase in the minimum wage in Hungary, which went from 35% to 55% of the median wage of full-time workers over a two-year period, using a variety of methods. They found a small negative effect on employment and a substantial increase in consumer prices. This is in line with the research of [16], whose authors found that a minimum wage increase has a significant effect on the increase in grocery store prices. These results support our findings in the sense that the negative effect of a minimum wage increase on consumption may be due to both an increase in unemployment and consumer prices.

5 Conclusion

In our work, we were able to demonstrate a statistically significant relationship between the level of the minimum wage and consumption. The methodology of empirical verification of this relationship is based on a theoretical model of consumption, where the autoregression of consumption and the inclusion of GDP as a proxy for a country's income level leaves little room for truly significant variables with a relatively small impact on consumption. This is also the reason why our results may be considered plausible. To increase robustness, we separately analyzed clusters of countries with different economic levels. For the cluster of countries mainly from Western and Northern Europe and Italy, we obtained a purely negative relationship, with an increase in the minimum wage causing a decrease in consumption. The cluster of Central and Eastern European countries showed a positive response of consumption to an increase in the minimum wage in the short term, but a negative response in the long term, and the overall effect of the minimum wage increase was negative. It is possible to conclude that in these countries there is room for the deployment of the minimum wage as a consumption-enhancing instrument (in the context of low-wage workers, a tool to remove material deprivation), but the positive effect must be supported by other interventions to retain employment. The last cluster analyzed was the Southern European countries, where the effects of a minimum wage increase on consumption were insignificant. This is probably due both to the nature of the countries included here (the small island states of Malta and Cyprus) and to the significant interventions and regulations in the settings of the economy, including minimum wages (economic adjustment program in Portugal, reforms in Greece accompanied by a significant fall in the minimum wage). Another research direction on the theme may be the use of microdata from questionnaire surveys involving the consumption and wages of respondents in relation to the minimum wage setting of the respondent's country.

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Conflict of Interest

The authors have no conflicts of interest to declare.