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An assessment of middle-class stability through the determinants of income polarization: Evidence from a multinational panel study

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Abstract: This paper explores the factors influencing income polarization, which serves as a proxy indicator for assessing the stability of the middle class in South-East and Central-East European countries. The study employs an unbalanced panel dataset covering 16 countries over the period 1996–2022 to examine how key economic and social factors, including GDP per capita, remittances, unemployment, urbanization rate, tertiary education enrollment, and social protection expenditures, affect income polarization. Modeling the polarization index as a function of socioeconomic factors represents an innovative approach inspired by empirical frameworks that traditionally explain income inequality through the Gini index. The aim is to demonstrate that the polarization index can effectively capture the stability and strength of the middle class. The results reveal that GDP per capita and unemployment are the most significant determinants, both positively associated with income polarization. This indicates that when economic growth is not inclusive and unemployment rises, income distribution becomes more uneven, resulting in a more polarized society and a shrinking middle class. The study contributes to the literature on middle-class dynamics and income inequality, emphasizing the importance of inclusive growth and employment-oriented policies for enhancing social stability.

Keywords: *Economic growth, Income Polarization, Middle Class, Unemployment.*

1. Introduction

In recent years, the literature has increasingly emphasized the importance of the middle class in a country, highlighting its role in fostering political stability, driving economic growth, and contributing to social development. However, a key challenge that emerges from such studies is the absence of a standardized definition of the middle class, and consequently, a lack of uniform indicators for measuring its size and stability. In these circumstances, it inevitably becomes difficult to conduct further studies that analyze the impact of the middle class in a given country or to assess public policies that could contribute to strengthening this social group. Despite this, various authors have attempted to identify the middle class through empirical studies, though there is still no widely accepted model for such analyses. In this context, the present study seeks to contribute to the literature by analyzing the macro-level economic and social factors that influence the stability of the middle class in Southeast and Central and Eastern European countries. Nevertheless, studying the middle class, including in this analysis, reveals significant methodological difficulties, largely due to the absence of an international consensus on its definition and the lack of a standardized measurement framework. The literature presents various approaches to measuring the middle class, most of which rely on income-based economic definitions. However, such approaches often lack inclusiveness and fail to capture the multidimensional nature of the middle class. Alternative economic approaches, such as those based on consumption expenditure or wealth, are considered to provide a more accurate and timely classification. Still, their application is

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frequently hindered by limited data availability. Moreover, social characteristics and family background also play a critical role in determining an individual's or a household's class affiliation.

For the purposes of this analysis, the middle class is understood as the segment of the population located within the middle percentiles of the income distribution. To address the methodological challenges associated with income-based definitions of the middle class, this study uses income polarization as a proxy for middle-class stability. Specifically, it adopts the Wolfson [1], which is derived from the Gini coefficient, as presented in the formula (where P denotes Polarization):

$$P = 4 * \left(0.5 - Income\ Share\ of\ Bottom\ 50\% - \frac{Gini\ Coefficient}{2}\right) * \left(\frac{Mean\ Income}{Median\ Income}\right) \quad (1)$$

The index divides the population into two groups above and below the median income and measures the spread from the center toward the extremes. An increase in this index indicates greater divergence toward income extremes, i.e., rising income polarization, reflecting a weakening of the middle class, which typically occupies the area around the median [2]. Recent studies from authors such as Schettino and Khan [3] and evidence from OECD [4] confirmed this negative relation.

Among the analyzed countries in this paper, the level of income polarization varies considerably during the period analyzed, ranging from 0.18 to 0.50. Figure 1 illustrates this heterogeneity, showing that countries such as Kosovo, Montenegro, and North Macedonia exhibit not only higher polarization levels but also greater internal dispersion, suggesting unstable internal dynamics.

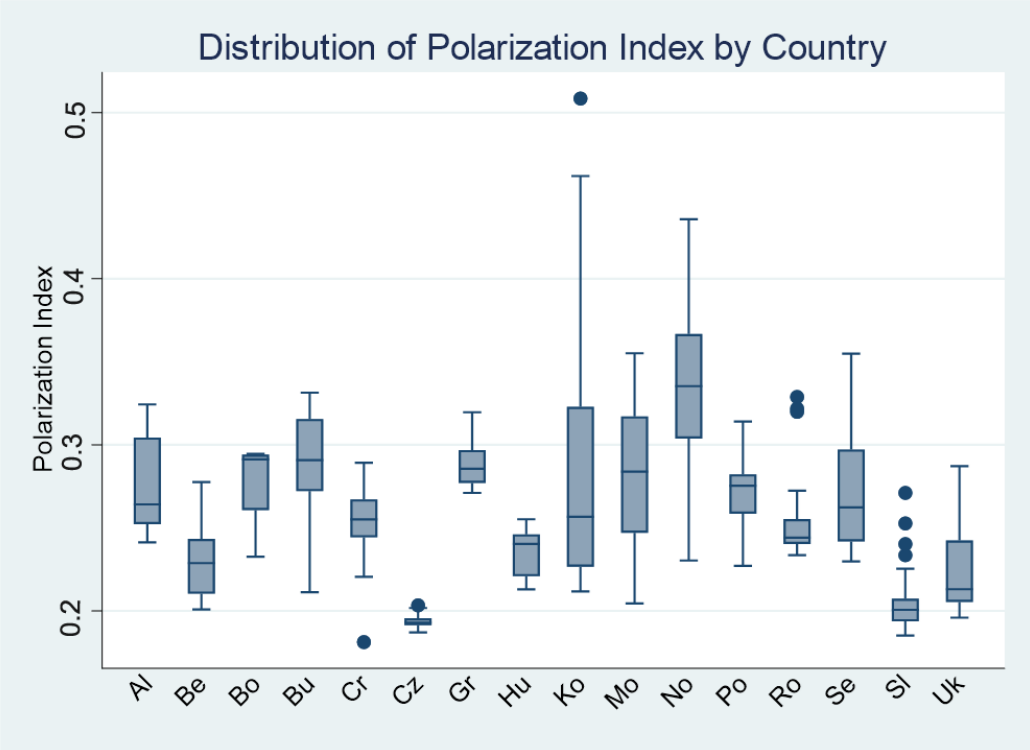

Figure 1.
Variation of Polarization index among analyzed countries, 1996-2022.

In contrast, Slovenia, Hungary, and the Czech Republic are characterized by lower and more stable polarization levels, indicating a more robust middle class. A high level of polarization, such as a value close to 0.50, suggests that income is concentrated at both extremes, reducing the size and stability of the middle class. This phenomenon is particularly relevant in transitional or unevenly developing societies. In addition to cross-country heterogeneity, there are also notable temporal dynamics. Most

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countries exhibit a declining trend in income polarization after 2015 (except for Kosovo), indicating a growing concentration of income around the median. By analyzing the economic and social factors that affect income polarization, this study seeks to offer a new approach to studying the middle class and its stability. The aim is to inform policy recommendations that support the strengthening of the middle class. The methodological framework adopted in this research may also inspire future work to identify alternative approaches for measuring the middle class in various national contexts.

2. Literature Review

Given that micro and macro level perspectives capture fundamentally different dimensions of class structure and dynamics, it is essential to clearly define the analytical focus when studying the middle class. The literature generally distinguishes between two main levels of analysis: the micro level (i.e., individual or household level) and the macro level (i.e., country level). At the individual level, key determinants of middle-class affiliation include education [5], occupation [6], marital status, and household composition, all of which shape one's class positioning. In addition to education, employment in the public sector, and the ownership of physical capital, such as family-owned property, are considered critical factors. Likewise, intra-household heterogeneity and family structure also offer insights into class identification. Findings on the influence of economic conditions on class affiliation are among the most widely documented in the literature. For instance, elements such as wealth and savings levels form the basis for an individual's social positioning within the class hierarchy [7]. However, the extent of this influence often depends on specific individual characteristics, such as professional status [8]. On the other hand, authors such as Daoudim and Bakass [9] highlight the strong heterogeneity among middle-class members, not only in terms of income levels but also in their specific professional characteristics.

At the macro level, for cross-country comparisons, economic determinants of class affiliation include economic growth, unemployment, investment, and remittances, while social factors such as the urbanization rate and educational attainment also play a significant role. Given that polarization indices, like the Gini coefficient, essentially measure income distribution, and in the absence of extensive empirical studies on the determinants of income polarization, the present study draws upon existing literature and findings that identify and model the Gini index through various economic factors. In many studies, economic growth is diagnosed as one of the most powerful drivers of middle-class expansion across different contexts. However, GDP growth does not automatically translate into reduced inequality [10]. Empirical findings also underline the role of globalization and technological advancement [11] as drivers of rising inequality within countries; the benefits of growth tend to be captured disproportionately by highly educated and skilled workers [12]. Similarly, other authors, Boršič and Podgoršek [13], emphasize that GDP growth, particularly when concentrated among the top 10% of the income distribution, contributes to increased inequality. Authors such as Bucevska [14] report evidence that unemployment, the level of economic development, and investment are significant determinants. Specific evidence on countries, such as in Asia, links the expansion of the middle class with economic growth, urbanization, increased participation in higher education, and the availability of stable and secure employment opportunities [15]. Evidence regarding the role of unemployment has been documented early on. Specifically, authors Förster and d'Ercole [16] highlight that labor market changes during the 1990s played a crucial role in increasing inequality and social fragmentation in developed countries. The Human Development Index and the unemployment rate have been mentioned in literature to increase income inequality as measured by the Gini coefficient. Other studies incorporate the impact of social policy; for instance, author Milanovic and DEC [17] include the share of social transfers in GDP to capture the social policy pursued by different countries, hypothesizing a negative relationship between inequality and social transfers. While there have been empirical efforts to identify the impact of economic growth on the middle class, other studies argue the opposite, that the middle class itself is a key determinant of a country's economic growth. In fact, findings by Ozturk [18] demonstrate that the middle class plays a significant role in avoiding the middle-income trap.

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Another factor frequently included in explanatory analyses of income polarization is remittances, which are generally believed to have a negative effect on polarization by reducing it [19]. However, their impact is not always clear-cut and may exhibit nonlinear effects [20] as remittances can be concentrated within specific population groups [21], thereby creating divisions between recipients and non-recipients.

Despite findings on the strong connection between economic position and class affiliation, the author [22] argues that class is not solely determined by economic capital, but also by cultural and social capital, reflecting a complex interaction between economic conditions and class position. Such an urbanization rate, although less frequently analyzed, has been recognized as a relevant factor in income polarization [23]. Although social protection expenditures are widely acknowledged as a core redistributive tool to mitigate income polarization and protect the middle class, recent studies suggest that their effectiveness varies depending on implementation and context [24]. Caution: the erosion of the middle class itself may compromise its very effectiveness.

Since antiquity, according to Aristotle's classical view, a broad and stable middle class plays a crucial role in maintaining social balance and political stability [25]. Following this perspective, this study aims to show that unemployment and rising income inequality are directly impacting this segment of society. The weakening of the middle class is not merely an economic issue; it carries deeper consequences that affect political and institutional structures, threatening the cohesion and long-term stability of society.

3. Methodology and Data

3.1. Description and Processing of Data

The empirical analysis is conducted on a panel consisting of 16 countries from Southeastern Europe (SEE) and Central-Eastern Europe (CEE) over the period 1996–2022 (listed in the appendices). The data include key economic and social indicators related to income polarization and the strength of the middle class. Due to limitations in data availability over the years, especially regarding the polarization index, the analysis was expanded by including additional countries from the CEE region alongside the initially targeted SEE countries. However, some variables have limited data availability across different years and countries, resulting in an unbalanced panel (see N in Table 1a in the Appendix). Besides the motivation to increase the number of observations, the selection of these countries for the joint analysis is also related to their shared history of post-communist transition, which may explain divergences in the evolution of the middle class.

The dependent variable used in the model is the Polarization Index. It measures the degree of polarization in income distribution within each country over the time period and is used as a proxy for the strength of the middle class. The higher this index, the more polarized the income distribution becomes, meaning it shifts towards the extremes, and consequently, the middle class weakens.

The explanatory variables listed below in Table 1 correspond to the hypotheses that will be tested for their expected effects on the dependent variable:

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Table 1.
Description of the Explanatory Variables in the Model.

Variable	Description	Expectation on Polarization Index
Economic growth	First difference of the logarithm of GDP per capita, used to achieve stationarity. *d_ln_GDP*	Negative, GDP growth per capita may reduce polarization by strengthening the middle class (if growth is inclusive).
Unemployment	Unemployment rate (level variable)	Unemployment increases polarization through insecurity and economic exclusion.
Remittances	First difference of remittances received, applied to ensure stationarity. *d_Remittances.* Quadratic term of first-differenced remittances. *d_Remittances2*	Negative or positive, depending on remittance structure (may support the middle class or increase dependency). Non-linear, possibly initially positive, then negative (diminishing returns effect).
Urbanization	Second difference of urban population percentage, to address non-stationarity. *dd_Urban_pop*	Urbanization can increase opportunities or worsen inequalities.
Social Protection	Logarithm of social expenditures (% of GDP) (level variable). *ln_social_perc_GDP_cofog*	Higher social spending reduces polarization through redistribution.
Education	Logarithm of tertiary education enrolment (level variable). *ln_Tertiary_enroll.*	Higher education improves opportunities and reduces polarization.

Most variables exhibit biased distributions and the presence of outliers (see Table 1a in the Appendix). Therefore, logarithmic transformations were applied to such variables, as presented in the table above. HDI was initially tested in the model but excluded due to high multicollinearity with GDP per capita (see Table 7 in the Appendix). To diagnose the potential nonlinear impact of remittances on polarization, both the level and the squared term of remittances were included and tested in the model [26].

Data for the income polarization index and the GINI coefficient were retrieved from the World Bank's Poverty and Inequality database [27]. Data on GDP per capita, urbanization, remittances, and tertiary education enrollment were sourced from the World Bank's World Development Indicators [28] database. Social expenditure data were retrieved from the [29] and [30] (for EU countries), while unemployment data were obtained from the ILO [31].

3.2. Methodology

The model evaluated in this study is not directly replicated from a specific author's methodology due to the limited empirical studies on the determinants of income polarization and the difficulties mentioned above regarding the conceptualization and measurement of the middle class. Instead, it represents an adapted model, considering that polarization indicators, such as the Gini coefficient, primarily measure income distribution. In this study, the polarization index will be modeled similarly to how other authors have modeled the Gini index. This substitution of the index is supported by the examined data, which show an almost perfect correlation (see Table 3 in the appendix).

The estimation model builds upon previous studies, where authors Doumbia and Kinda [32] and Makhlouf and Lalley [33] identify key indicators similar to those used here. However, due to data availability and the specific focus on income polarization rather than inequality, some adjustments have been made to tailor the model accordingly. The adapted model is presented in the equation below.

$$Polarization = \beta 0 + \beta 1 Remmitances + \beta 2 Remmitances^2 + \beta 3 \ln(GDP\ per\ capita) + \beta 4 Unemployment + \beta 5 Urban\ Population + \beta 6 \ln(Social\ Expenditure) + \beta 7 \ln(Terciar\ Enrollit) \quad (2)$$

In the final model, a fixed effects regression was applied using the *reghdfe* command in Stata, which absorbs country fixed effects and employs two-way clustered standard errors by country and year. This methodological approach explicitly addresses cross-country heterogeneity and potential temporal dependencies, ensuring more reliable results and statistically robust inference.

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4. Results

Prior to model selection, unit root tests for stationarity were conducted on the variables (Table 1, Appendix) using the Augmented Dickey-Fuller (ADF) test. The results confirmed that Unemployment, the log of social expenditure, and the log of tertiary enrollment were stationary at levels, whereas remittances (and their squared term) and log GDP became stationary only after first differencing. Urbanization required second differencing to achieve stationarity. Initially, before differencing and also aiming to consider possible autoregressive effects, a dynamic GMM model was applied; however, the autoregressive effect was found to be insignificant (the coefficient of L.*polarization* had a p-value of 0.648), see Table 5 (Appendix). Given these results, non-stationarity was addressed by differencing the relevant variables, and panel models with Fixed Effects, Random Effects, and Feasible Generalized Least Squares (FGLS) estimators were applied. The regression results for these panel models are presented in Table 2 below (and detailed in Tables 6, 9, and 10 in the Appendix).

Table 2.
Panel Regression Results.

Variables	FE	RE	FE (cluster 2D)	FGLS
d_Remttances	-0.002182 (0.799)	-0.0030478 (0.727)	-0.002182 (0.733)	0.0113511** (0.002)
d_Remttances2	-0.0003411 (0.851)	-0.0004078 (0.826)	-0.0003411 (0.796)	-0.0019888 * (0.07)
d_ln_GDP	0.02518** (0.040)	0.026197** (0.034)	0.02518** (0.033)	-0.0023357 (0.522)
Unemployment	0.0020768*** (0.000)	0.002404*** (0.000)	0.0020768*** (0.011)	0.0045980*** (0.000)
dd_Urban_pop_perc_tot	-0.0334332 (0.365)	-0.0336629 (0.369)	-0.0334332 (0.323)	-0.0003666 (0.291)
ln_social_perc_GDP_cofog	-0.000047 (0.998)	-0.0059615 (0.654)	-0.000047 (0.998)	-0.0134224 (0.244)
ln_Terciary_enroll	0.0011049 (0.894)	0.001725 (0.832)	0.0011049 (0.926)	0.0088886 (0.256)
_cons	0.2237736*** (0.000)	0.2396743*** (0.000)	0.2237736*** (0.001)	0.2468186 (0.000)

The Hausman test (Table 6, Appendix), with a p-value of 0.0306, indicates that the difference between the Fixed Effects (FE) and Random Effects (RE) coefficients is statistically significant. Therefore, the Fixed Effects model is more appropriate in this case. After selecting the FE model, multicollinearity was tested to identify strong correlations among explanatory variables. The Variance Inflation Factor (VIF) values were below the critical threshold, as shown in Table 7 (Appendix), confirming the absence of multicollinearity that could compromise coefficient interpretation. The next test for heteroskedasticity (Table 8) and the Modified Wald test results (chi-squared=7690.58; p=0.000) indicate the presence of heteroskedasticity among panel units. To correct for heteroskedasticity and autocorrelation within countries, the FE model with heteroskedasticity-robust standard errors was applied (Table 9 in Appendix). However, clustering standard errors only by country does not capture the complex autocorrelation in two dimensions (country and time). Therefore, the final model was estimated using the reghdfe command, allowing for two-way clustering by country and year (Table 10 in Appendix). As shown in the figures, to avoid issues arising from the small number of clusters (only 16 countries and 24 years), the Cameron et al. [34] adjustment was applied. Coefficients and standard errors changed very little compared to the simple FE model with one-way clustered standard errors by country. In both models, the results are stable, with GDP per capita and unemployment being the most significant variables. In addition to using robust standard errors, model fit was assessed by analyzing the residual distribution. As seen in Figure 1 (Appendix), there is no clear pattern or systematic behavior in the residuals, supporting the adequacy of the model's functional form. Residuals are approximately centered around zero, with only minor signs of heteroskedasticity (previously tested).

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Moreover, since standard errors are clustered by country and year, the model is robust to issues such as heteroskedasticity and autocorrelation within panel units.

The results from the fixed effects model with standard errors clustered by both country and time are more reliable, as the random effects models yield coefficients that differ in magnitude. Although the Feasible Generalized Least Squares (FGLS) model was also applied for comparison and robustness checks, as shown in Table 2, the final interpretation is based on the fixed effects model, which preserves the structural characteristics of the panel data and provides stable results after correcting for heteroskedasticity and autocorrelation.

The fixed effects (FE) model proves to be the most appropriate for the panel data, both in the variant with clustering by country and the two-dimensional clustering by country and year. The rho value (0.78) indicates a high level of autocorrelation within panels, justifying the correction of standard errors for heteroskedasticity and autocorrelation. The within R-squared remains stable across both models (0.1361), while the two-dimensional clustering model shows a better overall fit (Adjusted R-squared = 0.8062, Root MSE = 0.0188). These indicators suggest that the FE model with two-dimensional clustering provides more reliable results for empirical interpretation. Furthermore, using the fixed effects model with two-way clustered standard errors (by country and year) ensures high robustness of the results, simultaneously addressing heteroskedasticity, autocorrelation, and potential cross-panel dependence. The estimated models indicate that among all included factors, GDP per capita (in logarithmic form) and unemployment have significant and statistically robust effects in the fixed effects model with two-way clustered standard errors. Remittances and their squared term exhibit a small, concave, and insignificant effect, while other factors, such as social expenditures, urbanization, and tertiary education enrollment, do not show significant impacts according to this model.

Referring to estimation, a 1 percentage annual relative increase in GDP per capita is associated with an approximate increase of 0.00025 percentage points in the income polarization index. The hypothesis of a negative relationship between economic growth and income polarization is not supported by the results. Instead, the analysis reveals a positive and statistically significant association (p value = 0.033), suggesting that economic growth in this context is linked to increased polarization. Despite initial expectations, this result is nonetheless supported by various studies in the literature, which show that the benefits of economic growth are not distributed equally [35]. Only inclusive growth can lead to the expansion and economic empowerment of the middle class [36]. Policies that provide an enabling environment and incentives for inclusive growth typically fall within the fiscal discipline framework, including sound fiscal rules, a fair tax and redistribution system, and a business-friendly exchange rate regime. Therefore, the impact of economic growth on income polarization can be positive (potentially weakening the middle class) as long as growth is not inclusive. Another theoretical explanation for our results can be linked to a nonlinear relationship, which is also consistent with findings in the literature [37]. Moreover, in line with the historical context of the countries analyzed, many of which had not completed the post-communist transition during the study period [10], economic growth initially increases inequality due to the structural shift from an agrarian to an industrial economy. Only in the later stages of economic development do incomes become more widely distributed. However, in this particular study, the nonlinear effect was not explicitly tested in order to avoid excessively increasing the number of variables and complicating the model.

The other important determinant from the estimated model is unemployment, where an increase of 1 percentage point in the unemployment rate is associated with an increase of approximately 0.0021 percentage points in the income polarization index, indicating that higher unemployment corresponds to greater income division. This effect is statistically significant (p = 0.011) and consistent with economic theory. In line with findings from Galor and Zeira [38], the positive effect of unemployment is recognized as problematic for income distribution, especially over long-term periods.

The results from the fixed effects model with two-way clustered standard errors show that economic growth (GDP per capita) and unemployment are the most significant factors influencing income polarization in the analyzed countries. Although GDP growth is generally associated with

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improvements in well-being, in this case, it is linked to an increase in polarization, suggesting unequal benefits from growth. Unemployment also has a significant and positive impact on polarization, highlighting the connection between labor market exclusion and income concentration. Meanwhile, factors such as remittances, social expenditures, urbanization, and tertiary education enrollment do not exhibit statistically significant effects in this model.

5. Conclusion

This study contributes to the analysis of middle-class stability. Firstly, it highlights that the absence of a standardized methodology for measuring the middle class complicates the application of empirical analyses and the evaluation of potential policies aimed at influencing this social group. By using polarization measures, it presents an estimation model for middle-class stability in SEE and CEE countries.

In particular, efforts conducted in this study contribute to macroeconomic modeling by analyzing key economic and social determinants of middle-class stability at the macro level. The main objective of the analysis was to identify factors potentially influenced by public policies that could serve as instruments to strengthen this social group's stability. It suggests an alternative approach by using the polarization income level as a proxy for measuring the middle class. Future research could further elaborate on this approach, particularly in the absence of a standardized methodology for defining the middle class. Among the identified and tested factors, which have theoretical evidence of influencing the macroeconomic level, are: economic growth, remittance income, unemployment rate, level of urbanization, social protection expenditures, and educational inclusion (measured through tertiary education enrollment rates).

The results from the fixed effects model with two-way clustered standard errors indicate that economic growth (GDP per capita) and unemployment are the most significant factors influencing income polarization in the analyzed countries. More specifically, GDP per capita growth is associated with an increase in the polarization index, suggesting that the benefits of economic growth are not evenly distributed but rather concentrated among higher-income groups. This implies a shrinking middle class, as higher polarization means more individuals are positioned at the extremes of the income distribution (either poor or wealthy), with fewer in the middle. Similarly, rising unemployment significantly contributes to increasing income polarization, disproportionately affecting groups that traditionally constitute the middle class, such as workers in the public, private, or service sectors, who are more exposed to labor market insecurity. This reinforces the idea that unemployment is a key channel through which the middle class weakens and structural inequalities grow. In contrast, factors such as remittances, social expenditures, urbanization, and tertiary education enrollment do not show statistically significant effects in this model. This may indicate that their impact on the middle class and polarization is more complex, potentially delayed over time, nonlinear, or mediated by institutional factors such as the distribution of social benefits or access to quality education.

These findings highlight the importance of policies that promote inclusive economic growth and the creation of sustainable employment opportunities as essential means to support the middle class and limit the spread of income polarization in the medium and long term. These policies serve as preconditions to provide middle-class stability, but more specific measures need to be tailored according to country-specific needs. To achieve this, more in-depth analyses at the micro level by country are needed to define the characteristics exhibited by the middle class.

Limitation. Although policy-relevant factors such as social spending and higher education, as well as key socio-economic indicators like remittances and urbanization, were included in the model, they did not show statistically significant effects. Some of these expected effects may be statistically insignificant due to data limitations stemming from the unbalanced nature of the panel and the limited time coverage for the dependent variable. Therefore, the lack of statistical significance should not be interpreted as evidence of no real impact. Further research could explore interaction terms and lagged effects to better understand the role of these variables in shaping income polarization. Moreover, the relatively small

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sample size, 16 countries and 225 observations in total, may limit the statistical power of the analysis. Additionally, unbalanced panels or missing data (as in our case) may introduce bias. Future studies could expand the country coverage, potentially grouping countries by relevant characteristics. While dividing the sample into subgroups, such as South East Europe (SEE) and Central and Eastern Europe (CEE), was considered during the analysis, it was not implemented due to technical limitations. Subdividing an already small sample would have further reduced statistical power and increased the risk of substantial heterogeneity within groups in terms of economic and institutional structures, making it difficult to treat them as a single analytical unit. Future research using larger and more balanced panels could allow for more robust comparisons across country groups. Likewise, replication over longer time horizons or the application of methods that account for non-random missingness, such as advanced imputation techniques or models designed to handle missing data, could improve the reliability of the results.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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Appendix

Table 1.
Descriptive statistics.

Variable	N	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis
Polarization index	361	0.25559	0.048449	0.181213	0.508536	1.08	5.43
GDP per capita $	358	9965.987	7326.879	399.4998	31695.83	0.76	2.60
Gini index	361	0.307112	0.047823	0.227807	0.57414	1.10	5.56
Remittances in thousands $	353	2288636	2666864	6000	1.58E+07	2.18	8.48
Unemployment rate	354	11.52515	7.854609	0.785	37.32	1.32	4.27
Urban population rate	357	60.73605	10.69524	35.3	80.357	-0.13	2.17
Social expenditure in % GDP	291	15.41176	5.722319	5.688183	46.03	2.90	14.54
Human Development Index (HDI)	349	0.812665	0.056987	0.647	0.926	-0.23	2.42
Tertiary education enrolment rate	321	61.85619	22.45368	10.82717	166.6656	1.01	6.00

Note: The panel includes the 16 following countries: Albania, Belarus, Bulgaria, Croatia, Czech Republic, Greece, Hungary, Kosovo, Montenegro, North Macedonia, Poland, Romania, Serbia, Slovak Republic, Slovenia, Ukraine.

Table 2.
Descriptive statistics for variable included in the model.

Variable	N	Mean	Std. Dev.	Min.	Max.
Polarizimi	361	0.25	0.048	0.181	0.509
Δ Remittances (PBB%)	307	0.058	0.223	-0.938	1.527
Δ^2 Remittances	307	0.108	0.968	-5.320	8.015
Δ log GDP per capita	313	0.057	0.125	-0.433	0.373
Unemployment (%)	354	11.525	7.855	0.785	37.320
Δ^2 Urbanisation	290	0.008	0.040	-0.137	0.316
log Social Expenditure	291	2.685	0.303	1.738	3.829
log Tertiary Education Enrolment	321	4.056	0.387	2.382	5.116

Table 3.
Correlation through GINI index and polarization index-Stata output.

. Corr. Polarization Gini		
(obs.=361)		
	polari זר	gini
polarization	1.000	
gini	0.9673	1.000

Table 4. Fisher's Panel Unit Root Test (Pm) for Variables in Levels and First Differences

Table 4.
Fisher's Panel Unit Root Test (Pm) for Variables in Levels and First Differences.

Variable	Level	Difference
Remttances_k_std	-2.002	7.8894 ** (d)
Remttances_k_std2	-0.7695	6.3198** (d)
ln_GDP_capita_current	0.8972	12.4201** (d)
Unemployment	3.9335**	
Urban_pop_perc_tot	-0.3518	16.9728** (dd)
ln_social_perc_GDP_cofog	9.3653**	
ln_Terciary_enroll	5.2766**	

Note: ** p<0.05-Stata output
Pm (mod. inv. chi^2).

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Table 5.
Results of the GMM Model Using the Arellano-Bond Method for the Polarization Variable -Stata Output.

Group variable: Country_id	Number of obs. = 237
Time variable: Year	Number of groups = 16
Number of instruments = 233	Obs. per group: min =2
Wald chi2(8) = 54.52	avg =14.81
Prob > chi2 = 0.000	max = 24

	Corrected				
polarization	**Coefficient**	**std. err.**	**z**	**P>|z|**	**[95% conf. interval]**
Polarization L1.	0.3881872	0.849032	0.46	0.648	-1.275885 2.052259
Remttances_k_std	0.0073112	0.0043366	1.69	0.092	-0.0011885 0.0158108
Remttances_k_std2	-0.0023948	0.0013865	-1.73	0.084	-0.0051124 0.0003228
ln_GDP_capita_current	-0.0041882	0.0262918	-0.16	0.873	-0.0557191 0.0473427
Unemployment	0.0030558	0.004547	0.67	0.502	-0.0058563 0.0119678
Urban_pop_perc_tot	-0.000059	0.0006978	-0.08	0.933	-0.0014267 0.0013087
ln_social_perc_GDP_cofog	-0.0097141	0.0510681	-0.19	0.849	-0.1098058 0.0903776
ln_Terciary_enroll	0.0039655	0.0861887	0.05	0.963	-0.1649612 0.1728922
_cons	0.1743923	0.6372229	0.27	0.784	-1.074542 1.423326

Instruments for the first difference equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
L(2/26).L.polarization
Instruments for the levels equation
Standard
Remttances_k_std Remttances_k_std2 ln_GDP_capita_current Unemployment
Urban_pop_perc_tot ln_social_perc_GDP_cofog ln_Terciary_enroll _cons
GMM-type (missing=0, separate instruments for each period unless collapsed) DL.L.polarization

Arellano-Bond test for AR(1) in first differences: z = -0.82 Pr > z = 0.415
Arellano-Bond test for AR(2) in first differences: z = 0.16 Pr > z = 0.870

Sargan test of overid. restrictions: chi2(224) = 172.88 Prob > chi2 = 0.995 (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(224) = 9.53 Prob > chi2 = 1.000
(Robust, but weakened by many instruments.)
Difference-in-Hansen tests of exogeneity of instrument subsets:
GMM instruments for levels
Hansen test excluding group: chi2(202) = 9.53 Prob > chi2 = 1.000 Difference (null H = exogenous): chi2(22) = 0.00 Prob > chi2 = 1.000
iv(Remttances_k_std Remttances_k_std2 ln_GDP_capita_current Unemployment Urban_pop_perc_tot l > n_social_perc_GDP_cofog ln_Terciary_enroll, eq(level))
Hansen test excluding group: chi2(217) = 0.86 Prob > chi2=1.000
Difference (null H = exogenous): chi2(7) = 8.67 Prob > chi2 =0.277

Table 6.
Housman Specification Test Model 1 – Stata Output.

. hausman FE_diff RE_diff, sigmamore

	Coefficients			
	(b) FE_diff	**(B) RE_diff**	**(b-B) Difference**	**sqrt(diag(V_b-V_B)) Std. err.**
d_Remttances	-0.002182	-0.0030478	0.0008658	0.0005306
d_Remttanc~2	-0.0003411	-0.0004078	0.0000667	0.000136
d_ln_GDP	0.02518	0.026197	-0.001017	0.0018523
Unemployment	0.0020768	0.002404	-0.0003272	0.0001346
dd_Urban_pop	-0.0334332	-0.0336629	0.0002297	0.0032711
ln_social_~g	-0.0000477	-0.0059615	0.0059138	0.0094917
ln_Terciar~l	0.0011049	0.001725	-0.0006201	0.0022996

Note: b = Consistent under H0 and Ha; obtained from **xtreg**.

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B = Inconsistent under Ha, efficient under H0; obtained from **xtreg**. Test of H0: Difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B)
= 15.45
Prob > chi2 = 0.0306

Table 7.
Multicollinearity Diagnostics: VIF Test Results (Stata Output) (with and without HDI).

.vif		
Variable	**VIF**	**1/VIF**
ln_Terciar ~l	1.73	0.578035
ln_GDP_cap ~t	1.37	0.729927
ln_social_ ~g	1.32	0.757576
Urban_pop_ ~t	1.29	0.775194
ln_Remtta ~d2	1.26	0.793651
Unemployment	1.24	0.806452
ln_Remtta ~d	1.14	0.877193
Mean VIF	1.34	
.vif		
Variable	VIF	1/VIF
HDI	9.50	0.105224
ln_GDP_cap~t	7.71	0.129713
ln_Terciar~l	2.38	0.420569
Unemployment	1.63	0.612610
gini	1.57	0.636512
Urban_pop_~t	1.39	0.721376
ln_social_~g	1.31	0.764052
ln_Remttan~k	1.18	0.847393
Mean VIF	3.33	

Table 8.
Results of the Modified Wald Test for Heteroskedasticity in the Fixed Effects Model-Stata Output.

Fixed-effects (within) regression Number of obs = 225
Group variable: country_id Number of groups = 16
R-squared: Obs per group:
Within = 0.1361 min = 2
Between = 0.4875 avg = 14.1
Overall = 0.3769 max = 23
F(7,202) = 4.55 corr(u_i, Xb) = 0.4537 Prob > F = 0.0001

polarization	**Coefficient**	**Std. err.**	**t**	**P>|t|**	**[95% conf. interval]**	
d_Remttances	-0.002182	0.0085662	-0.25	0.799	-0.0190726	0.0147086
d_Remttances2	-0.0003411	0.0018185	-0.19	0.851	-0.0039267	0.0032445
d_ln_GDP	0.02518	0.0122109	2.06	0.040	0.0011027	0.0492572
Unemployment	0.0020768	0.0004272	4.86	0.000	0.0012344	0.0029191
dd_Urban_pop	-0.0334332	0.0368177	-0.91	0.365	-0.1060295	0.0391631
ln_social_perc_GDP_cofog	-0.0000477	0.0159906	-0.00	0.998	-0.0315776	0.0314822
ln_Terciary_enroll	0.0011049	0.0082976	0.13	0.894	-0.0152562	0.017466
_cons	0.2237736	0.0479461	4.67	0.000	0.1292346	0.3183127
sigma_u	0.0357621					
sigma_e	0.01877568					
rho	0.78391908	(fraction of variance due to u_i)				

F test that all u_i=0: F(15, 202) = 33.11 Prob > F = 0.0000

. xttest3
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model H0: sigma(i)^2 = sigma^2 for all i
chi2 (16) = 7690.58
Prob > chi2 = 0.0000

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Table 9.
Fixed Effects Model with country-level clustering-Stata output.
. xtreg polarization d_Remttances d_Remttances2 d_ln_GDP Unemployment dd_Urban_pop ln_social_pe
> rc_GDP_cofog ln_Terciary_enroll, fe vce(cluster country_id)
Fixed-effects (within) regression Number of obs = 225
Group variable: country_id Number of groups = 16
R-squared: Obs per group:
Within = 0.1361 min = 2
Between = 0.4875 avg = 14.1
Overall = 0.3769 max = 23
F (7,15) = 4.89 corr(u_i, Xb) = 0.4537 Prob > F = 0.0048
(Std. err. adjusted for 16 clusters in country_id)

	Robust				
polarization	**Coefficient**	**std. err.**	**t**	**P>|t|**	**[95% conf. interval]**
d_Remttances	-0.002182	0.0061468	-0.35	0.728	-0.0152837 0.0109197
d_Remttances2	-0.0003411	0.0011761	-0.29	0.776	-0.0028479 0.0021656
d_ln_GDP	0.02518	0.0102196	2.46	0.026	0.0033975 0.0469624
Unemployment	0.0020768	0.0007324	2.84	0.013	0.0005158 0.0036378
dd_Urban_pop	-0.0334332	0.0277282	-1.21	0.247	-0.0925344 0.025668
ln_social_perc_GDP_cofog	-0.0000477	0.0257501	-0.00	0.999	-0.0549328 0.0548374
ln_Terciary_enroll	0.0011049	0.01144	0.10	0.924	-0.0232789 0.0254888
_cons	0.2237736	0.0656571	3.41	0.004	0.0838289 0.3637184
sigma_u	0.0357621				
sigma_e	0.01877568				
rho	0.78391908 (fraction of variance due to u_i)				

Table 10.
Fixed Effects Model with Two-Way clustering and absorbed fixed effects (reghdfe Stata output).
. reghdfe polarization d_Remttances d_Remttances2 d_ln_GDP Unemployment dd_Urban_pop ln_social_
> perc_GDP_cofog ln_Terciary_enroll, absorb(country_id) vce(cluster country_id year) (MWFE estimator converged in 1 iterations)
Warning: VCV matrix was non-positive semi-definite; adjustment from Cameron, Gelbach & Miller > applied. warning: missing F statistic; dropped variables due to collinearity or too few clusters

HDFE Linear regression Number of obs. = 225 Absorbing 1 HDFE group F(7, 15) = .
Statistics robust to heteroskedasticity Prob > F = .
R-squared = 0.8252
Adj R-squared = 0.8062
Number of clusters (country_id) = 16 Within R-sq. = 0.1361
Number of clusters (year) = 24 Root MSE = 0.0188
(Std. err. adjusted for 16 clusters in country_id year)

	Robust				
polarization	**Coefficient**	**std. err.**	**t**	**P>|t|**	**[95% conf. interval]**
d_Remttances	-0.002182	0.0062886	-0.35	0.733	-0.0155858 0.0112218
d_Remttances2	-0.0003411	0.0012953	-0.26	0.796	-0.0031021 0.0024198
d_ln_GDP	0.02518	0.0107339	2.35	0.033	0.0023012 0.0480587
Unemployment	0.0020768	0.0007201	2.88	0.011	.000542 0.0036116
dd_Urban_pop	-0.0334332	0.0326972	-1.02	0.323	-0.1031257 0.0362593
ln_social_perc_GDP_cofog	-0.0000477	0.0235282	-0.00	0.998	-0.0501968 0.0501014
ln_Terciary_enroll	0.0011049	0.0117567	0.09	0.926	-0.0239538 0.0261637
_cons	0.2237736	0.0551048	4.06	0.001	0.1063205 0.3412268
Absorbed degrees of freedom:					
Absorbed FE	Categories - Redundant = Num. Coefs				
country_id	16 16 0 *				

Note: * = FE nested within cluster; treated as redundant for DoF computation.

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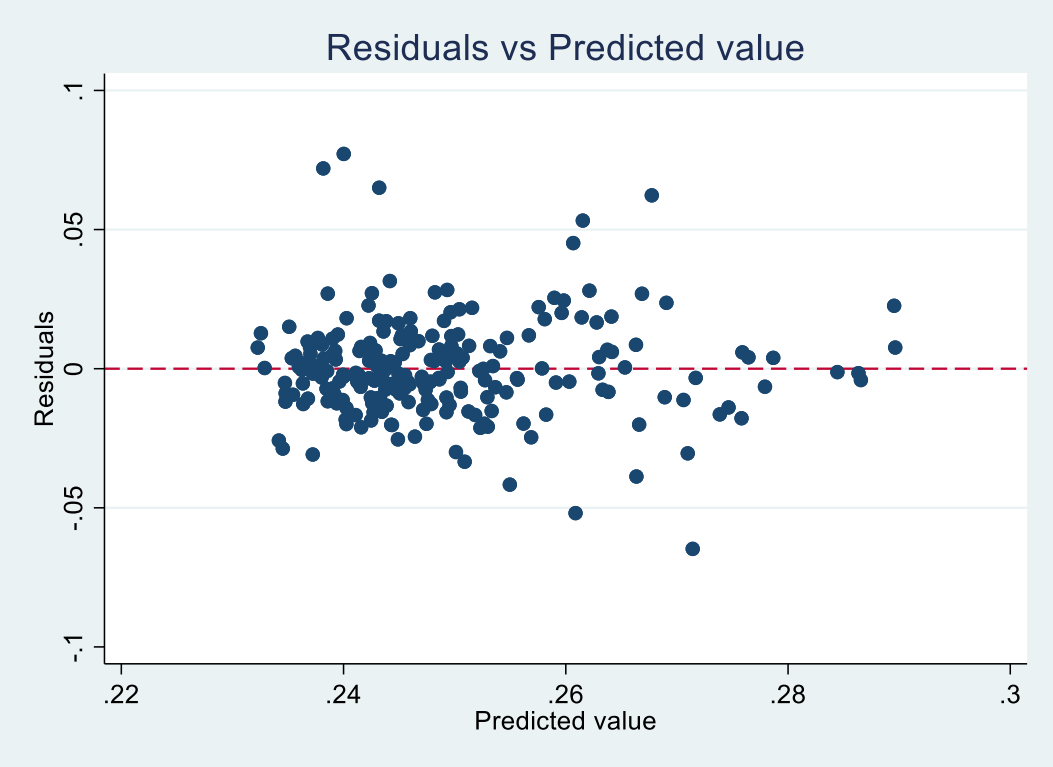

Figure 1.
Distribution of Residuals vs Fitted values-Stata output.

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