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Two Europes, two saving behaviours. An analysis of structural differences between EU-15 and CEE households

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 Ionuț-Andrei Pricop²

Abstract

The aim of the article is to examine structural differences in household saving behaviour across European countries, arguing that European integration has not led to convergence in saving patterns. Using data from 27 EU Member States (1996–2023), it compares the EU-15 with post-2004 members through Lasso variable selection and fixed-effects panel models. By combining machine learning-based variable selection with panel regression, the study offers a novel analytical perspective on the determinants of household savings. The findings reveal significant structural differences between the two groups: taxation and monetary freedom show stronger associations with household saving in post-2004 member states, whereas education-related factors are more prominent in the EU15. These results suggest that policies should strengthen precautionary saving mechanisms and promote financial education to encourage household saving.

Keywords

- household savings
- economic freedom
- employment
- education
- saving behaviour

JEL codes: E21, E22, R20.

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Introduction

Understanding the determinants of household savings is important for designing policies that support financial stability and economic growth, particularly in a European context characterised by structural differences between Member States. Research on saving behaviour has long been central to economic theory. Keynes (1936) highlighted the relationship between income, consumption, and savings, while Modigliani and Brumberg's life-cycle hypothesis (1954) suggests that individuals save to smooth consumption over their lifetime. Friedman (1957) emphasised the role of permanent versus temporary income, while Kuznets (1946) observed that rising income may increase the propensity to save. Finally, Duesenberry's relative income hypothesis (1949) links consumption behaviour to social comparisons within society.

Household saving capacity evolves in response to economic, social (Băsu, 2023), political (Aaberge et al., 2017; Li, 2021), and technological factors (Thaariq et al., 2021). Korzeniowska (2023) further shows that saving behaviour changes across economic conditions and crises. Against this background, the present study examines the determinants of household saving across European countries, including the effects associated with the 2008 financial crisis, the COVID-19 pandemic, and the post-2022 energy crisis. Panel data models are combined with economic freedom indicators and gender- and education-specific labour market variables to provide a broader perspective on differences in saving behaviour across European economies.

1. Literature review

1.1. Theoretical framework and hypothesis development

Household economic security has received substantial attention because of its implications for individual welfare and macroeconomic stability. Previous research has identified significant regional differences in the determinants of household saving (Niculescu-Aron & Mihăescu, 2012). In Western Europe, household saving rates were found to be less responsive to economic growth, whereas in Eastern Europe, economic growth was associated with declining saving rates. Similar structural differences between Western European and post-2004 EU economies have been reported by Schrooten and Stephan (2003), Arıç and Siok (2021), and Skoblar (2024).

The structural differences between the EU-15 countries and the post-2004 countries have deep-rooted causes. Financial development varies mainly due

to the different histories of these two groups of countries; Western Europe benefited from decades of capitalism and support for free enterprise following World War II, while Eastern Europe (which includes all post-2004 countries) found itself within the Soviet sphere of influence, marked by forced collectivisation, and the suppression of freedom of expression. Differences are also highlighted in institutional quality, given that the transition period from an authoritarian and undemocratic regime to new democracies was not without challenges related to combating corruption and adapting institutions to Western European standards. Of course, such historical developments have also shaped the propensity to save, the demographic gap, and the migration of citizens from post-2004 countries to the EU-15. Differences between the two groups may reflect distinct historical trajectories (Pollack, 2009; Schimmelfennig, 2008) as well as differences in economic freedom (Osińska et al., 2025). Accordingly, the first hypothesis is formulated as follows:

H1: There are structural differences between EU15 and post-2004 countries in savings decisions.

In this sense, the novelty of the present study lies in highlighting the structural differences in the predisposition of European households towards saving by correlating it with economic freedom variables. The study contributes to the literature by addressing the relatively underexplored relationship between household saving and economic freedom. The potential of the Heritage Foundation's Index of Economic Freedom lies in the fact that the numerous variables in the indicator cover macroeconomic phenomena (e.g., Monetary Freedom tracks inflationary trends, price stability and a strong national currency, while Government Integrity covers corruption problems). Thus, the index provides complementary measures of broader institutional and economic conditions that may not be fully captured by conventional macroeconomic indicators. While previous studies have examined household saving using indicators such as inflation (Mierzejewski & Szczurek, 2025) and unemployment (Delestre & Waters, 2026), the present study adopts the Heritage Index to capture broader institutional and economic conditions. Many studies using the Heritage Index and linear regressions focused on the relationship between economic freedom and economic growth (Brkić et al., 2020; Hung et al., 2024), thereby emphasising how economic freedom is closely and positively correlated with economic growth (Bajrami et al., 2025; Dekkiche & Leila, 2024). Other recent studies focused on the relationship between economic freedom and unemployment (Cervelló-Royo et al., 2023), quality of life (Akinlo & Okunlola, 2022), or foreign direct investment attraction (Štilić et al., 2023). This underexplored relationship defines the study's research gap.

Education is also an important determinant of household saving (Bollinger et al., 2022; Lusardi, 2008; Pham et al., 2024). Beckmann et al. (2013) identify education and income as important predictors of saving, while Fredriksson

and Staal (2021) report a positive relationship between labour market participation and household saving.

On the other hand, different authors have also contextualised the determinants of household savings in the context of crisis. Borowski and Jaworski (2023) concluded that during the COVID-19 pandemic households were forced to save, considering that the volatility of savings depended largely on the intensity of government-imposed restrictions or the number of deaths involving COVID-19. The study by Bohdalová and Pažický (2019) showed that the Global Financial Crisis marked a significant turning point in the saving habits of European households. The analysis highlights that the wealthier a country is, the less its households rely on marginal income to meet consumption needs. In richer countries, households are more likely to allocate additional disposable income toward saving and investment rather than immediate consumption.

Kukk and Staehr (2017) revealed how changes in the macroeconomic environment affect the saving rates in both households and corporate sectors, with some differences in the output gap, the real interest rate, the inflation rate, and the current account balance. Vanlaer et al. (2020), using data from 18 EU countries, showed how confidence in the household financial situation has a greater effect on household saving than confidence in the general economic situation, while Klopocka and Gorska (2021) affirmed that the Consumer Confidence Indicator and most of its component questions reliably predict household saving rates. Šubová et al. (2023) also examined the relationship between household saving and GDP in the V4 countries. Their results highlighted short-run Granger causality from real GDP to household savings rates, and from household savings rates to real GDP, in both the Czech Republic and Hungary. Accordingly, the second hypothesis is formulated as follows:

H2: The influence of education on savings is heterogeneous, being overshadowed by economic constraints in emerging economies.

Recent studies have also proposed alternative approaches to household saving. Ptak-Chmielewska and Grzywińska-Rąpca (2026) used PCA to construct a simplified six-variable consumer confidence indicator related to household saving, while Horioka and Ventura (2025) highlighted cross-country differences in saving motives, including retirement and precautionary saving. The present study retains conventional saving-related variables. Similarly, Mierzejewski and Szczurek (2025) show that saving tends to increase at the onset of crises before subsequently declining, although this pattern varies across countries.

Household saving is shaped by education, economic confidence, age, income, and labour market participation (Bollinger et al., 2022; Fredriksson & Staal, 2021; Horioka & Ventura, 2025; Klopocka & Gorska, 2021; Lusardi, 2008; Vanlaer et al., 2020). Saving behaviour is also affected by crises (Mierzejewski & Szczurek, 2025) and by institutional and historical factors (Kukk & Staehr, 2017; Šubová et al., 2023).

1.2. Variable selection and theoretical justification

Variable selection captures structural differences between EU15 and post-2004 economies beyond conventional income-consumption models. Potential determinants were grouped into three dimensions (institutional/fiscal factors, human capital, and macroeconomic constraints) based on the Life Cycle Hypothesis (Modigliani & Brumberg, 1954) and Buffer-Stock Theory (Carroll, 1997). This multidimensional framework allows saving behaviour to be examined in relation to both short-term economic constraints and longer-term financial planning. The first dimension captures the role of the state through Tax Burden (TAX) and Government Spending (GOVS).

Ricardian equivalence suggests that public spending may affect private saving, while higher taxation can reduce disposable income and saving capacity (Tanzi & Zee, 1998). Government Integrity (GOVI) and Monetary Freedom (MON) are included as proxies for institutional conditions, as stronger institutions may reduce precautionary saving. The second dimension captures human capital through education-related factors.

Following Lusardi (2008), higher educational attainment is expected to be associated with stronger long-term financial planning. Disaggregated employment rates by education level (Tertiary – MT/FT and Lower Secondary – MP/FP) are used to assess whether saving is associated with highly skilled employment or economic necessity among lower-income groups.

To capture immediate economic pressures, indicators of liquidity constraints and living standards are included. Gross Real Income (GIR) and Final Consumption (FC) reflect the household budget constraint, while the At-risk-of-poverty rate (RPR) captures vulnerability in post-2004 economies, where saving often depends on the narrow margin between income and subsistence consumption.

2. Methodology

2.1. Data used

The analysis uses panel data for the 27 EU Member States over 1996–2023, covering three dimensions: institutional framework (government integrity, tax burden, spending efficiency, monetary and trade freedom), financial and poverty indicators (gross income, final consumption, investment, poverty risk), and labour market dynamics (GDP per capita and employment by gender and education). To account for structural heterogeneity, the sample is divided into EU15

economies (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and Sweden) and post-2004 members (Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia). The panel is unbalanced due to missing observations in the early years (Table 1).

Table 1. Variables utilised

Variable	Abbreviation	Source
Households; non-profit institutions serving households saving rate (percentage)	HSR	Eurostat
Government integrity	GOVI	Heritage
Tax burden	TAX	
Government spending	GOVS	
Monetary freedom	MON	
Trade freedom	TRADE	
Households; non-profit institutions serving households' gross nominal income (percentage change on previous period)	GIN	Eurostat
Households; non-profit institutions serving households' gross real income (percentage change on previous period)	GIR	
Households; non-profit institutions serving households' final consumption (percentage change on previous period)	FC	
Households; non-profit institutions serving households' investment rate (percentage)	HIR	
At risk of poverty rate (cut-off point: 60% of median equivalised income after social transfers)	RPR	
Employment rate: Males less than primary and lower secondary education	MP	
Employment rate: Males upper secondary	MS	
Employment rate: Males tertiary	MT	
Employment rate: Females less than primary and lower secondary education	FP	
Employment rate: Females upper secondary	FS	
Employment rate: Females tertiary	FT	
Household debt including non-profit institutions serving households, consolidated	HDEB	
Median age	MAGE	

Source: own elaboration.

Descriptive statistics focus on two perspectives. Firstly, choropleth maps are constructed for the years 1996, 2004 and 2023, showing the spatial distribution of HSR across European countries. These maps allow visual inspection of regional patterns and long-run changes in saving behaviour. Secondly, the time evolution of HSR is plotted separately for the EU15 group, the post-2004 group and the EU average. Annual group means are computed and displayed in a line chart, which highlights common shocks (such as the 2008–2010 financial crisis and the 2020 COVID-19 pandemic) and persistent differences between developed and emerging economies.

2.2. Variable selection

Given the large number of potential determinants, LASSO (Least Absolute Shrinkage and Selection Operator) linear regression is applied as a preliminary variable selection technique to identify the most relevant predictors of HSR. The procedure is conducted separately for the two country groups and is applied to the pooled data, without explicitly modelling the time dimension. This approach reduces model complexity and limits overfitting while providing a data-driven screening step before fixed-effects estimation.

Let HSR_i denote the household saving rate in country i , and let $x_i = (x_{1,i}, x_{2,i}, \dots, x_{p,i})$ be the vector of p potential explanatory variables (tax burden, income, consumption, employment rates by education, governance indicators, etc.). For each group $g \in \{EU15, Post2004\}$, the linear model with LASSO correction considers the following linear specification:

$$HSR_i = \beta_0 + \sum_{j=1}^p \beta_j \cdot x_{j,i} + \varepsilon \quad (1)$$

Instead of estimating the coefficients by ordinary least squares, LASSO minimises a penalised sum of squares using:

$$\hat{\beta}(\lambda) = \min_{\beta} \left\{ \frac{1}{N} \sum_{i=1}^N (HSR_i - \beta_0 - x_i \beta)^2 + \lambda \sum_{j=1}^p |\beta_j| \right\} \quad (2)$$

where:

- the first term is the mean squared error,
- the second term is an $L1$ penalty that shrinks coefficients,
- $\lambda \geq 0$ controls the strength of penalisation.

For a large λ , some coefficients are forced exactly to zero, giving LASSO its variable selection property.

The LASSO procedure is not intended to produce causal estimates. Instead, it serves as a data-driven mechanism for selecting informative predictors, reducing multicollinearity, and filtering variables before fixed-effects estimation.

tion. For descriptive purposes, relative LASSO weights were calculated from the absolute non-zero penalized coefficients and expressed as percentages of their total absolute value (Caughlin, 2024).

2.3. Fixed-effects panel models

In the second stage, two-way fixed-effects (FE) models are estimated separately for each country group using the selected predictors and GDP per capita. The general specification is:

$$HSR_{it} = \alpha_i + \lambda_t + \beta' X_{it} + u_{it} \quad (3)$$

where:

- HSR_{it} denotes the household saving rate in country i at time t ,
- α_i are country fixed effects capturing time-invariant heterogeneity (institutional structure, culture, long-run preferences),
- λ_t are year fixed effects capturing common shocks (global crises, EU-wide policy changes),
- X_{it} is the vector of selected independent variables,
- u_{it} is the error term.

Models are estimated using the within estimator (plm package in *R*) with country and year fixed effects. The Hausman test (Wooldridge, 2002) consistently supports the fixed-effects specification for both groups, while model fit is assessed the within R^2 (Gao, 2023). Given typical macro-panel issues, residual diagnostics include tests for serial correlation (Breusch–Godfrey / Wooldridge), heteroscedasticity (Breusch–Pagan), and cross-sectional dependence (Pesaran CD). The F -test confirms the joint relevance of two-way fixed effects, and the Shapiro–Wilk test is reported as an indicative check of normality, though less important in large samples.

For both country groups, diagnostics indicate serial correlation, heteroscedasticity, and cross-sectional dependence. To ensure valid inference, all models are re-estimated using Driscoll–Kraay standard errors, which are robust to these issues in large- T panels, while significance is assessed with robust t -statistics and p -values. Finally, the two groups are compared by combining the fixed-effects results into a common dataset and presenting them in a forest plot, which highlights coefficient magnitude, confidence intervals, and structural differences in saving behaviour between mature and emerging economies.

To assess potential endogeneity, Durbin–Wu–Hausman tests (Patrick, 2020) were performed using an instrumental variable framework, where lagged values of final consumption and gross real income were used as instruments for the respective models.

3. Results

3.1. Descriptive results

The evolution of the household saving rate (HSR) in 1996, 2004, and 2023 (Figure 1) reveals clear cross-country differences between EU15 and post-2004 members. In 1996, Central and Northern countries such as Austria, Germany, Finland, and Sweden recorded high saving rates, reflecting institutional stability and mature financial systems, while Southern countries (Greece, Italy, Portugal) showed lower levels, consistent with stronger consumption pressures and structural vulnerabilities, as also noted by Le Blanc et al. (2013). By 2004, enlargement brought a more nuanced picture: several post-2004 countries (Poland, Czech Republic, Hungary) displayed moderate to high saving rates, reflecting prudent behaviour during the economic transition, whereas Southern Europe maintained structurally lower levels. Overall, Northern and Central Europe preserved robust saving patterns throughout the period.

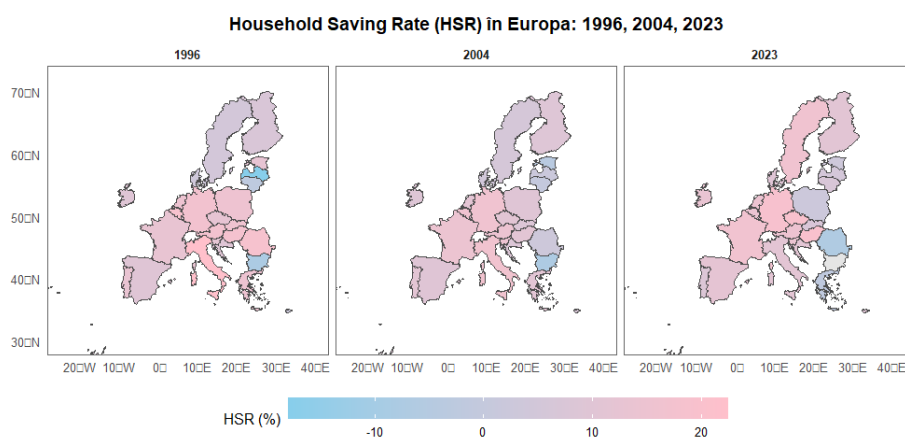


Figure 1. Household saving rate in selected years

Source: own elaboration in RStudio.

In 2023, regional disparities persist. Central European countries (Austria, Germany, Czech Republic, Slovakia) maintain high saving rates, reflecting long-term stability, while Baltic and Eastern states display moderate levels, suggesting gradual post-accession consolidation. In contrast, Southern countries (Greece, Portugal, Spain) remain at the lower end, confirming persistent structural and social constraints on saving capacity (Le Blanc et al., 2013). Overall, saving patterns remain stronger and more stable in Central and Northern Europe, while Southern economies continue to face structural vulnerabilities.

According to Figure 2, EU15 countries, the saving rate remained relatively stable around 10–11%, with slight declines in the 2000s, a temporary rise during the 2008–2010 financial crisis, and a clear peak in 2020 due to forced savings during the COVID-19 pandemic (Borowski & Jaworski, 2023). In contrast, post-2004 countries generally recorded lower rates, often below 7%, with sharper fluctuations, reflecting lower incomes and higher consumption pressures. Although they also experienced a pandemic-related peak in 2020, this was followed by a sharp decline.



Figure 2. Evolution of household saving rate

Source: own elaboration in RStudio.

The EU average follows an intermediate path, influenced by the stability of the EU15 and the volatility of emerging members. Overall, the results confirm a structural polarisation between developed and emerging economies, with the latter displaying lower and more unstable saving patterns (Niculescu-Aron & Mihăescu, 2012).

3.2. Linear regression with Lasso correction

The LASSO penalised regression highlights differences in the determinants of household saving rates between EU15 and post-2004 countries (Figure 3). The method selects relevant predictors through coefficient shrinkage, providing an exploratory overview of the economic, fiscal, and social variables associated with saving behaviour.

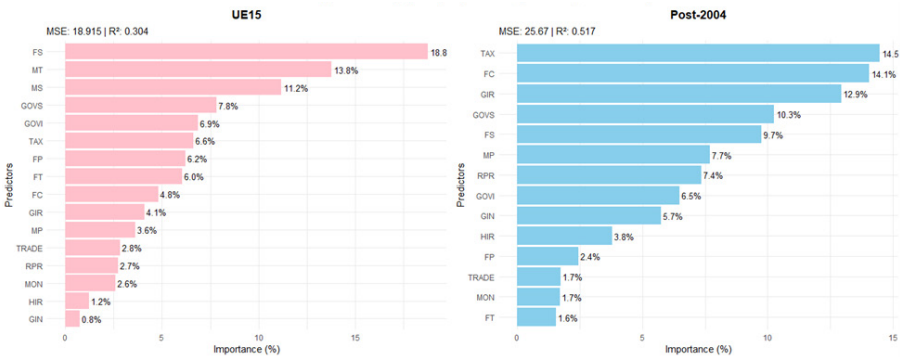


Figure 3. Linear regression analysis results

Note: Variable abbreviations are defined in Table 1.
Source: own elaboration in RStudio.

For mature EU15 economies, the model explains about 30% of the variation in HSR ($R^2 = 0.304$). The predictors with the largest penalised coefficients are FS, MT, and MS, indicating the prominence of medium- and highly educated employment in the exploratory screening, a finding consistent with that of Korzeniowska and Ulman (2023). GOVS, GOVI, and TAX also receive non-zero penalised coefficients, whereas FC, GIR, MP, TRADE, and MON display relatively smaller coefficients. Overall, the exploratory screening suggests greater prominence of structural and occupational variables in the EU15 group.

For post-2004 countries, the LASSO model yields an R^2 of 0.517. TAX, FC, and GIR are among the most prominently selected predictors, with relative weights of approximately 12%–15% (Al Mamun et al., 2025). GOVS and FS show smaller relative penalised coefficients, while RPR (7%) is more prominent in the post-2004 group than in the EU15. Overall, the LASSO screening suggests greater prominence of fiscal and social variables, particularly taxation, income changes, and budgetary conditions (Skoblar, 2024).

The LASSO results indicate different patterns of variable selection across the two groups, with greater prominence of structural and occupational variables in the EU15 and fiscal and social variables in post-2004 economies.

Figure 4 illustrates the direction of the penalised LASSO coefficients. In the EU15, positive coefficients are mainly associated with occupational factors, with FS and MT displaying the largest penalised coefficients, consistent with the relevance of skilled labour market participation for saving behaviour reported by Almudi et al. (2023). GOVS and GIR also show positive penalised coefficients, while TAX, GOVI, and lower-education employment variables (FP, FT, MS) display negative signs, a pattern that is consistent with the potential relevance of fiscal conditions and labour market disparities for household saving (Tanzi & Zee, 1998). In post-2004 countries, the pattern is more strongly associated with fiscal and social variables: GIR, FS, and GOVI display positive

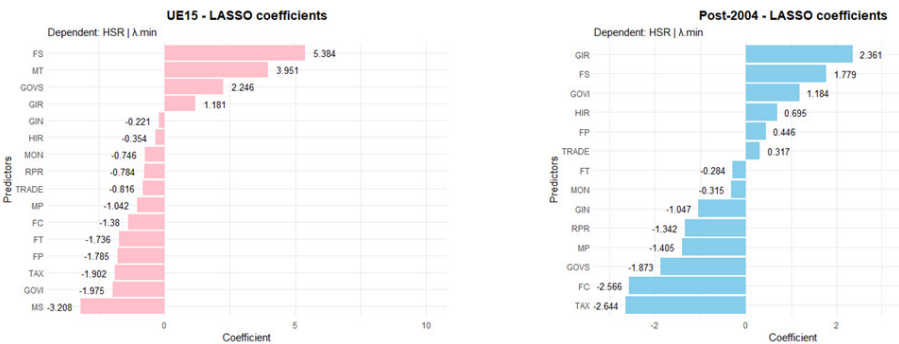


Figure 4. Lasso coefficients by groups

Note: Variable abbreviations are defined in Table 1.
Source: own elaboration in RStudio.

penalised coefficients, consistent with Almudi et al. (2023), whereas TAX, FC, GOVS, RPR, and MP show negative coefficients. Overall, the exploratory LASSO results indicate distinct patterns of variable selection across the two groups, with greater prominence of occupational and institutional variables in the EU15 and fiscal and socio-economic variables in post-2004 economies.

3.3. Fixed effects models

3.3.1. EU15 countries

The variance inflation factor (VIF) results presented in Table 2 indicate that multicollinearity is not a serious concern in the EU15 model. All VIF values remain below the conventional threshold of 10, which suggests that the explanatory variables do not exhibit excessive linear correlation. The highest values are observed for FT (6.16) and FS (5.24), reflecting some expected correlation between labour market indicators related to educational attainment. However, these values remain within acceptable limits and do not compromise the stability of the coefficient estimates (Kim, 2019). Overall, the results confirm that the model does not suffer from problematic multicollinearity and that the estimated relationships can be interpreted reliably.

Table 2. Variance Inflation Factor (VIF) diagnostics – EU15 model

FS	MT	GOVS	TAX	GDP_Capita	FP	FT	FC
5.24	3.27	2.35	1.96	1.52	2.04	6.16	1.12

Note: Variable abbreviations are defined in Table 1.
Source: own calculations in RStudio.

Table 3 presents the two-way fixed effects results for EU15 countries, controlling for country-specific characteristics and common time effects. The model is statistically significant ($F = 40.42$, $p < 0.001$) and explains 48.7% of the within-country variation in HSR (within $R^2 = 0.487$). Employment among highly educated men (MT) has a strong positive effect (0.522 , $p < 0.001$), while GDP per capita (0.00014 , $p < 0.001$) and government efficiency ($GOVS$: 0.103 , $p < 0.001$) also stimulate savings, supporting classical theories that link income growth and macroeconomic stability to higher saving capacity. In contrast, taxation (TAX : -0.107 , $p < 0.01$) and final consumption (FC : -0.389 , $p < 0.001$) significantly reduce savings, consistent with the traditional view that higher fiscal pressure and current expenditure crowd out saving. Female employment with low and medium education (FP : -0.192 , $p < 0.001$; FS : -0.185 , $p < 0.01$) is negatively associated with HSR, while highly educated female employment (FT : 0.179 , $p = 0.07$) shows a positive effect. Overall, in EU15 economies, savings are mainly driven by income, human capital, and institutional quality.

Table 3. Fixed-effects results for the EU15

Variable	Estimate	Standard error	<i>t</i> -value	$Pr(> t)$
FS	-0.18528	0.062404	-2.969	0.0032**
MT	0.522473	0.098644	5.2966	2.12E-07***
GOVS	0.102666	0.017344	5.9193	7.9E-09***
TAX	-0.10749	0.035198	-3.0539	0.002437**
GDP_Capita	0.000143	2.8E-05	5.0967	5.75E-07***
FP	-0.19155	0.046061	-4.1585	4.06E-05***
FT	0.17898	0.099051	1.8069	0.071654
FC	-0.38903	0.077056	-5.0487	7.27E-07***

Note: Variable abbreviations are defined in Table 1.

Source: own elaboration in RStudio.

The results show that both economic and structural factors influence the household savings rate in EU15 economies. Higher education (MT) and government efficiency ($GOVS$) have a positive and significant effect, while taxation (TAX), final consumption (FC), and lower-skilled employment (FP , FS) reduce savings. Overall, in these relatively stable economies, savings are supported by income growth and effective governance but constrained by fiscal pressure and occupational disparities.

Diagnostic tests support the use of the two-way fixed effects model for the EU15 group (Table 4). The Hausman test rejects the random effects specification in favour of fixed effects. The Breusch–Godfrey (1978) and Wooldridge

Table 4. Diagnostic tests for the EU15 model

Test	Statistic	<i>df</i>	<i>p</i> -value
Hausman	$\chi^2 = 50.638$	7	1.083e-08
Breusch–Godfrey	$\chi^2 = 173.11$	27	< 2.2e-16
Wooldridge	$F = 340.02$	1, 373	< 2.2e-16
Breusch–Pagan	$\chi^2 = 1751.1$	1	< 2.2e-16
Pesaran CD Test	$z = -3.5252$	–	0.0004231
<i>F</i> -test for two-way fixed effects	$F = 23.622$	40, 340	< 2.2e-16
Shapiro–Wilk	$W = 0.99342$	–	0.0882

Source: own elaboration in RStudio.

(2002) tests indicate serial autocorrelation, while the Breusch–Pagan (1979) test reveals heteroscedasticity. In addition, the Pesaran CD (2015) test confirms cross-sectional dependence, suggesting that economic shocks in one country affect others within the panel.

The results indicate that the standard fixed effects model violates error structure assumptions, requiring robust standard errors; therefore, Driscoll–Kraay corrections are applied. The *F* test confirms the need for country and year fixed effects to control for unobserved heterogeneity. The Shapiro–Wilk test (1965) does not show serious deviations from residual normality, although this assumption is less relevant in large panels. Overall, the tests justify the fixed effects specification with robust corrections to ensure reliable inference. The robust estimation results for the EU15 group are presented in Table 5. As shown in the Table, both economic and structural factors are significantly associated with the household savings rate in the EU15 group.

Table 5. Robust estimation for the EU15 group

Variable	Estimate	Standard error	<i>t</i> -value	<i>Pr</i> (> <i>t</i>)
FS	–0.18528	0.07006	–2.6446	0.008558 **
MT	0.52247	0.1355	3.856	0.000138 ***
GOVS	0.10267	0.017705	5.7986	1.53E-08 ***
TAX	–0.10749	0.041969	–2.5612	0.010861 *
GDP_Capita	0.000143	4.27E-05	3.3366	0.000942 ***
FP	–0.19155	0.062622	–3.0587	0.002399 **
FT	0.17898	0.12385	1.4452	0.149333
FC	–0.38903	0.10027	–3.8798	0.000126 ***

Note: Variable abbreviations are defined in Table 1.

Source: own elaboration in RStudio.

3.3.2. Countries post-2004 accession

Table 6 presents the variance inflation factor (VIF) values for the explanatory variables included in the post-2004 model. All VIF values are well below the commonly accepted threshold of 10, indicating the absence of problematic multicollinearity among the independent variables.

Table 6. Variance Inflation Factor (VIF) diagnostics – post-2004 model

GIR	TAX	FC	GDP_Capita	FP	MON
2.15	1.27	2.16	1.47	1.19	1.53

Source: own calculations in RStudio.

Table 7 presents the fixed-effects results for post-2004 countries. The model explains approximately 43% of the within-country variation in household saving rates (within $R^2 = 0.434$).

Table 7. Panel results for the post-2004 group

Variable	Estimate	Standard error	t-value	$Pr(> t)$
GIR	0.396591	0.065095	6.0925	3.57E-09 ***
TAX	-0.0963	0.037892	-2.5416	0.01156 *
FC	-0.57335	0.069986	-8.1924	8.54E-15 ***
GDP_Capita	0.000215	0.000127	1.6883	0.09244
FP	0.322646	0.043726	7.3788	1.73E-12 ***
MON	-0.13962	0.028362	-4.9227	1.44E-06 ***

Note: Variable abbreviations are defined in Table 1.

Source: own elaboration in RStudio.

In post-2004 countries, gross real income (GIR) has a strong positive effect (0.3966, $p < 0.001$), indicating high income elasticity of savings: as real income rises, households save more. In contrast, final consumption (FC: -0.573, $p < 0.001$) reduces savings, suggesting that current expenditure still dominates saving formation. Female employment with low education (FP: 0.323, $p < 0.001$) positively influences HSR, reflecting improved labour-market integration and additional household income, a result that differs from the EU15 and can be interpreted in line with Keynesian consumption theory, where a higher income affects both consumption and saving behaviour. Taxation (TAX: -0.096, $p < 0.05$) negatively impacts savings, confirming the direct effect of fiscal pressure on disposable income, while monetary free-

dom ($MON: -0.1396, p < 0.001$) suggests that easier access to credit reduces saving. GDP per capita shows a positive association that is significant at the 10% level, consistent with the income-saving relationship.

Table 8 shows that the two-way fixed effects specification is appropriate for post-2004 countries. The Hausman test favours fixed effects, while the Breusch–Godfrey and Wooldridge tests indicate serial autocorrelation. The Breusch–Pagan tests confirm heteroscedasticity, and the Pesaran CD test reveals significant cross-sectional dependence, suggesting that shocks in one country affect others in the group. The F -test supports the inclusion of both country and year effects to control for unobserved heterogeneity. Although the Shapiro–Wilk test points to slight deviations from normality, this is not important in large panels.

Table 8. Diagnostic tests for the post-2004 model

Test	Statistic	df	p -value
Hausman	$\chi^2 = 73.879$	6	6.528e-14
Breusch–Godfrey	$\chi^2 = 188.46$	22	< 2.2e-16
Wooldridge	$F = 398.83$	1, 318	< 2.2e-16
Breusch–Pagan (studentised)	$BP = 15.581$	6	0.01619
Breusch–Pagan LM (plmtest)	$\chi^2 = 680.59$	1	< 2.2e-16
Pesaran CD	$z = -3.4669$	-	0.0005265
F -test for two-way FE	$F = 12.182$	37, 287	< 2.2e-16
Shapiro–Wilk normality	$W = 0.99138$	-	0.04909

Source: own elaboration in RStudio.

Table 9 reports the coefficient estimates with Driscoll–Kraay standard errors, providing inference robust to the previously identified error dependence.

Table 9. Robust estimation for the post-2004 group

Variable	Estimate	Standard error	t -value	$Pr(> t)$
GIR	0.396591	0.063519	6.2437	1.53E-09 ***
TAX	-0.0963	0.049846	-1.9321	0.05434
FC	-0.57335	0.078845	-7.2719	3.38E-12 ***
GDP_Capita	0.000215	0.000144	1.4964	0.13565
FP	0.322646	0.045796	7.0453	1.38E-11 ***
MON	-0.13962	0.059941	-2.3292	0.02054 *

Note: Variable abbreviations are defined in Table 1.

Source: own elaboration in RStudio.

Figure 5 compares the estimated coefficients for the two country groups. Points represent coefficient estimates, while intervals indicate statistical uncertainty.

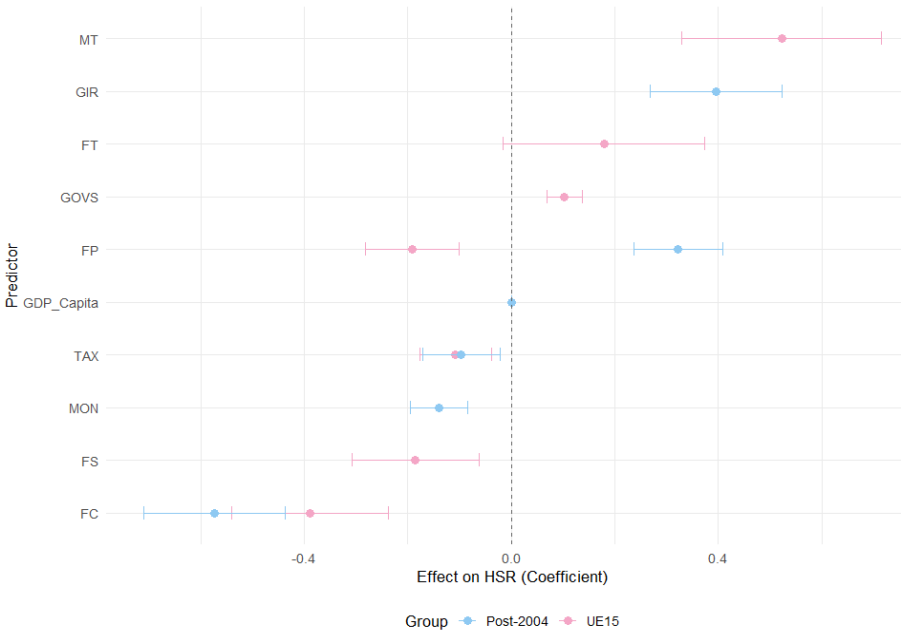


Figure 5. Forest plot comparison

Note: Variable abbreviations are defined in Table 1.
Source: own elaboration in RStudio.

The differences between the two groups are evident. In the EU15, savings are mainly driven by high human capital (MT, FT) and institutional efficiency (GOVS). In post-2004 countries, savings rely more on real income (GIR) and labour market integration, including lower-educated workers (FP). Final consumption (FC) reduces savings in both groups, but more strongly in post-2004 economies. Monetary freedom (MON) is relevant only in post-2004 countries, while taxation negatively affects savings in both groups, with a stronger impact in the EU15. These results show that EU15 countries have a savings profile based on qualifications and institutional stability, while post-2004 countries have an income-oriented profile that is vulnerable to consumption and monetary conditions. Privatisation played a key role in the differences between Central and Eastern European countries, given that social, cultural, and economic legacies played a fundamental role in the transition periods in those countries (Socioliuc (Guriță) et al., 2021).

3.3.3. Assessing potential endogeneity

The results reported in Table 10 indicate different endogeneity patterns across the two country groups. For the EU15 model, the Wu–Hausman test strongly rejects the null hypothesis of exogeneity ($p < 0.001$), thereby indicating that final consumption is endogenous in the saving equation. This finding is consistent with the accounting relationship between consumption and savings in national income identities. In contrast, the same test does not detect endogeneity for gross real income in the post-2004 model ($p = 0.501$), suggesting that income dynamics can be treated as exogenous in this specification. In both models, the Sargan test does not reject the validity of the instruments, while the weak instruments test suggests relatively modest instrument strength. Such differences are due to the different dynamics between the two groups of countries and the resulting correlations.

Table 10. Endogeneity diagnostics for the EU15 and post-2004 models

Test	EU15 (FC instrumented)	Post-2004 (GIR instrumented)
Weak instruments test	5.084 ($p = 0.0067$)	2.997 ($p = 0.0513$)
Wu–Hausman test	16.19 ($p = 0.00007$) ***	0.454 ($p = 0.5007$)
Sargan test	1.177 ($p = 0.278$)	0.100 ($p = 0.752$)

Notes: *** $p < 0.001$. Lagged variables are used as instruments (FC_{t-1} , FC_{t-2} for EU15 and GIR_{t-1} , GIR_{t-2} for Post-2004).

Source: own calculations in RStudio.

The endogeneity diagnostics therefore suggest that caution is required when interpreting the EU15 estimates, particularly the coefficient associated with final consumption. Although a dynamic System GMM estimator could, in principle, provide an alternative framework for addressing endogeneity through internal instruments, it was not adopted as the main estimator in the present study. This choice reflects both the research objective and the structure of the dataset. The primary aim of the analysis is to identify structural differences in the correlates of household saving behaviour between the EU15 and post-2004 countries, rather than to estimate a dynamic adjustment process in household savings. Moreover, the two subsamples contain a relatively small number of cross-sectional units (14 EU15 and 13 post-2004 countries) observed over a comparatively long time period. System GMM estimators are primarily designed for panels characterised by a large number of cross-sectional units and a relatively short time dimension (Roodman, 2009). In the present setting, the limited number of countries would make GMM estimation and instrument-based specification tests potentially sensitive to the choice and number of instruments.

Accordingly, the two-way fixed-effects specification is retained as the main analytical framework because it directly controls for unobserved time-invariant country heterogeneity and common year-specific shocks, while Driscoll–Kraay standard errors provide inference robust to the serial correlation, heteroscedasticity, and cross-sectional dependence identified in the diagnostic tests. Nevertheless, fixed effects do not eliminate simultaneity or reverse causality arising from time-varying endogenous regressors. Therefore, the coefficient estimates, particularly that of final consumption in the EU15 model, should be interpreted as conditional within-country associations rather than strict causal effects. The development of a fully dynamic specification, including lagged household savings and appropriately restricted internal instruments within a System GMM framework, is left for future research.

4. Discussion

The theoretical framework is integrated with the empirical findings, with the two country groups discussed separately. The analysis first considers the EU15 countries and then examines the post-2004 accession countries.

Figure 3 shows that in the exploratory LASSO screening, education-related variables (*FS*, *MT*, *MS*) are among the most prominently selected predictors for EU15 countries, followed by government spending and government integrity. Given the shrinkage imposed by LASSO, these relative coefficient patterns are used only to identify potentially relevant predictors and should not be interpreted as measures of absolute economic effect size.

These results are confirmed in Table 5. *FS* and *FP* show negative associations with savings, while *MT* associations positively, highlighting the role of educational attainment in saving behaviour. In addition, the positive association of *GOVS* and the negative effect of *TAX* support H2. Final consumption (*FC*) is negatively associated with saving, which is consistent with the consumption–saving trade-off (Keynes, 1936). Government spending (*GOVS*) may support saving through public resource management (Feldstein & Elmendorf, 1990; Röhn, 2010), while higher taxation (*TAX*) is associated with lower saving. Conversely, higher government spending may also increase household consumption (Chairassamee et al., 2025).

Figure 3 shows that in post-2004 countries, the exploratory LASSO screening selects a different set of prominent predictors, with *TAX*, *FC*, *GIR*, and *GOVS* receiving relatively larger penalised coefficients than the education-related variables. These patterns indicate differences in variable selection between the two groups, but their magnitudes should not be interpreted as absolute economic effects because LASSO coefficients are subject to shrinkage. The

subsequent fixed-effects models are therefore used for the substantive interpretation of the selected relationships.

The endogeneity diagnostics reveal a structural difference between the two groups of countries. In the EU15 model, the Wu–Hausman test indicates that final consumption is endogenous, suggesting simultaneity between consumption and household saving behaviour. This reflects the close relationship between consumption and savings in more developed economies, where households adjust both decisions simultaneously. In contrast, the post-2004 model does not detect endogeneity for gross real income, thus indicating that income dynamics can be treated as largely exogenous in explaining savings. These findings confirm that household saving behaviour differs structurally between EU-15 and CEE economies, reflecting persistent differences in financial maturity and post-transition institutional legacies.

The findings are broadly consistent with previous research highlighting the relevance of labour market conditions and education for household saving behaviour (Almudi et al., 2023), as well as the role of economic freedom (Bajrami et al., 2025). The negative associations observed for some economic freedom indicators should, however, be interpreted cautiously. Rather than implying a direct adverse effect on saving, they may reflect broader macroeconomic conditions in which stronger economic activity is accompanied by higher household consumption and a lower propensity to save (Brkić et al., 2020). There are also divergent trends in saving within EU countries (Mierzejewski & Szczurek, 2025; Niculescu-Aron & Mihăescu, 2012). The findings are consistent with previous studies reporting divergent saving behaviour across the EU (Ariç & Siok, 2021; Schrooten & Stephan, 2003) and the multidimensional nature of saving determinants (Horioka & Ventura, 2025). Thus, the similarities with other studies are: geographical differences, the role of education in saving decisions, and the classic consumption-saving dichotomy. However, the main differences from other studies stem precisely from the use of economic freedom variables, which have not been used previously. Consequently, this makes these differences difficult to quantify.

Conclusions

Building on classical saving theories, this study examines household saving behaviour across European countries over 1996–2023. To capture persistent structural differences, the sample is divided into EU15 and post-2004 accession countries.

The analysis first examines the evolution of household saving across European countries, revealing substantial cross-country heterogeneity and changes associated with the 2008 financial crisis and the COVID-19 pandem-

ic. Regression results further indicate structural differences between the two groups. In the EU15, saving is more closely associated with occupational and institutional factors, whereas in post-2004 economies, income and fiscal conditions play a stronger role. From an institutional perspective, the EU exhibits distinct patterns of household saving behaviour, with financial maturity and post-transition legacies constituting the primary factors distinguishing the EU-15 from Central and Eastern European (CEE) economies.

The results suggest different policy priorities across the two regions. For EU-15 economies, the positive link between education and savings indicates that policies promoting financial literacy could further strengthen household financial resilience. In contrast, for post-2004 countries, savings remain closely linked to real income growth and taxation, implying that policies reducing the tax burden on labour or stabilising inflation may have a stronger impact on household saving behaviour. The findings support the idea that governments can encourage saving by improving the incentive structure of the private sector, as suggested by Bebczuk et al. (2015). In addition, strengthening precautionary saving mechanisms through institutional design, such as automatic pension enrolment, matched savings accounts, or tax-advantaged long-term deposits, could help households accumulate savings even in more volatile economic environments.

This study has several limitations. First of all, the use of aggregated macroeconomic data may mask within-country household heterogeneity, while the unbalanced panel may affect long-term comparability. Endogeneity is also a concern, particularly for final consumption in the EU15 model; therefore, the estimated coefficients should be interpreted as conditional associations rather than causal effects. The Two-Way Fixed Effects specification was retained because the study focuses on structural within-country differences and the subsamples contain relatively few countries observed over a comparatively long period, whereas System GMM is primarily suited to large- N , small- T panels (Roodman, 2009). Dynamic modelling, including lagged saving rates and System GMM where appropriate, therefore represents an important avenue for future research. Future studies could also incorporate household-level, behavioural, and cultural factors.

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