The puzzle of household savings in the European Union: tracing influences across time and space

ANA SKOBLAR, MA, MSc*

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Ana SKOBLAR
Croatian National Bank, Trg hrvatskih velikana 3, 10000 Zagreb, Croatia
e-mail: ana.skoblar@hnb.hr
ORCiD: 0009-0001-7690-3105

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Abstract

This paper uses dynamic panel data estimations based on annual data from 26 European Union countries to evaluate the driving factors of household savings dynamics. Alongside conventional determinants, such as household income and age dependency, the study also includes a less traditional variable, consumer confidence, which is often neglected in existing findings. This research extends previous empirical studies in three dimensions. First, it conducts sensitivity analysis using several estimation techniques to support the robustness of baseline results. Second, the investigation is expanded by including an extended set of potential savings drivers. Lastly, it explores variations in saving behaviour among different country groups (Euro Area, Central and Eastern European countries, and Croatia) as well as the crisis periods (Global Financial Crisis and Covid-19 pandemic). The findings highlight the importance of overlooked determinants, shed light on the ambiguous effect of classic variables, and partially confirm earlier research.

Keywords: household saving, GMM, dynamic panel analysis, macroeconomic variables

"The art is not in making money, but in keeping it."
– proverb

1 INTRODUCTION

In a time characterized by considerable economic volatility, highlighted by the recent pandemic, unravelling the factors influencing household saving behaviours has become more crucial than ever. Some questions arise regarding the nature of savings, such as the main drivers behind household savings and what motivates households to put their money aside relative to different country groups and challenging times. Furthermore, it is also interesting to investigate how savings differ structurally during crisis periods or if they are more similar than they seem.

Even with the growth of empirical research on this topic in recent years, few studies have answered these questions, especially those examining the factors influencing household savings rates within various EU country groups. This is mainly the result of inadequate research into the dynamics of household savings within these different groups and how they adjust over time to different economic difficulties. Moreover, empirical studies frequently find that essential factors have contradictory effects on savings, not always confirming theoretical predictions. This can be ascribed to the unique traits of individual countries or regions and the significance of the specific time periods under examination. For instance, the research of Hernando et al. (2018) and Loayza, Schmidt-Hebbel and Servén (2000a) show different effects of GDP growth on savings, indicating that the impact is very dependent on the larger economic environment and its main drivers. Rocher and Stierle (2015) also emphasize the complex relationship between inflation and savings, wherein inflation's dual effects can either encourage

cautious savings or reduce the actual value of current savings, resulting in different behaviours. The rate of return's intricate impact on savings is revealed in studies by Kukk and Staehr (2015) and Grigoli, Herman and Schmidt-Hebbel (2014), which are influenced by factors like investor confidence and the availability of other investment options. These results stress the need to consider different influences and particular economic conditions across different regions or countries to grasp the elements that influence household savings.

With a focus on Euro Area (EA) and Central and Eastern European (CEE) countries – with special attention to Croatia – this study investigates the factors influencing household savings inside the EU in the context of varied economic landscapes moulded by various crisis periods. At the core of this work is an analysis of conventional saving determinants, such as income levels, demographic shifts, and financial conditions, against the background of fiscal policies and macroeconomic uncertainties. A basic structure for this empirical investigation is provided by the dynamic character of these elements, as described by influential theorists such as Friedman (1957) on the permanent income hypothesis, Keynes (1936) on consumption, and Modigliani and Brumberg (1954) on the life-cycle hypothesis. Building on the vast empirical literature that identifies these common variables as important savings determinants, this study also includes consumer confidence as a crucial factor – a variable that is frequently disregarded in savings analyses. By integrating consumer confidence into the analysis, new insights are provided into saving decisions' psychological underpinnings, extending the existing literature. Using dynamic panel analysis, the study analyses saving patterns in the European Union between 2000 and 2021, a period of major economic upheavals, including the Global Financial Crisis (GFC), the sovereign debt crisis, and the Covid-19 pandemic. Additionally, this study includes a large number of extra variables, extending the sensitivity analysis to enhance the robustness of the baseline determinants in terms of their significance, signs, and magnitude. Accordingly, it clarifies the different saving habits observed throughout the EU and explains how economic downturns affect household financial resilience.

According to Loayza, Schmidt-Hebbel and Servén (2000a), the significant impact of the lagged dependent variable indicates the persistence of savings behaviour and emphasises the impact of past saving patterns on present decisions. In line with the research of Edwards (1996) and Masson, Bayoumi and Samiei (1995), the study confirms the basic economic tenet that wealth increases saving capacity by showing that real GDP growth and household disposable income have a positive and significant impact on saving rates. The terms of trade and age dependency's nuanced effects, alongside the positive relationship between real interest rates and savings, mirror the mixed outcomes in the literature, indicating regional peculiarities or deviations from traditional models within the EU context (Kessler, Perelman and Pestieau, 1993; Hernando et al., 2018). The negative relationship between savings rates and consumer confidence adds a new angle by implying that psychological aspects are important in saving decisions – a topic that has not

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been thoroughly examined in the current body of research. Together with the observed impact of household debt and government fiscal balance, this insight deepens our understanding of the complex nature of household savings behaviour, particularly in the face of economic ups and downs, and enhances the conversation started by researchers such as Edwards (1995) and Rocher and Stierle (2015).

The structure of the paper is as follows: after this introductory section, an examination of the theoretical and empirical underpinnings of the factors that influence household savings is presented. The empirical approach and variable selection are elaborated upon in the following section, focusing on incorporating consumer confidence in conjunction with conventional economic indicators during the baseline estimation. The empirical results are presented by including baseline and alternative specifications for various periods and EU country groups. In the concluding section, the findings are consolidated, their ramifications for policy and subsequent investigations are examined, and the study's distinctive contributions to the body of knowledge on household savings are underscored.

2 HOUSEHOLD SAVING DETERMINANTS AND EMPIRICAL FINDINGS

Numerous established theories that have received substantial empirical support underpin the investigation into the factors influencing household savings. These theories, influenced by economic policies, measures, and instruments such as taxation systems, provide a framework for understanding saving behaviours. The fundamental theoretical frameworks comprise the absolute income hypothesis, first postulated by Keynes in 1936, which posits that an individual's present income predominantly dictates their level of consumption. In contrast, the relative income hypothesis, first proposed by Duesenberry in 1949, suggests that it is an individual's income level in relation to others that impacts their consumption decisions. Additional insights are provided by Friedman's (1957) permanent income hypothesis and Modigliani and Brumberg's (1954) life cycle hypothesis, which posit that individuals strategise their savings and consumption by their anticipated lifetime income and savings requirements, respectively. In conclusion, Barro's (1974) refinement of the Ricardian equivalence hypothesis posits that the impact of government borrowing on aggregate consumption is negligible; instead, it causes a modification in the timing of taxation. Every one of these hypotheses enhances our comprehension of saving behaviours more intricately by accounting for various variables, including present economic conditions, anticipated future income, and social comparisons.

A critical factor often scrutinised in the exploration of household savings is the relationship between savings and income levels or the income growth rate. This line of inquiry is deeply rooted in the foundational work of Keynes (1936), who significantly advanced modern economic analysis by linking the consumption function directly to current income. By developing the absolute income hypothesis (AIH), Keynes posited that savings are the remainder of income after consumption expenditures. According to this hypothesis, consumers allocate a proportion of their income towards consumption, classifying any unspent earnings as savings. This

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theory has been extensively discussed and analysed in the literature, with various scholars elaborating on, critiquing, and building upon Keynes' original concepts. Notably, Hernando et al. (2018) provide a contemporary examination of the AIH, reaffirming its relevance in understanding consumer behaviour. In a comparable vein, additional investigations conducted by Friedman (1957) and Modigliani and Brumberg (1954) regarding the permanent income hypothesis and the life cycle hypothesis, respectively, have served to situate Keynes' theories within more extensive conceptual frameworks, thereby underscoring their lasting impact on empirical studies concerning savings behaviour and economic thought.

Duessenberry's (1949) relative income hypothesis (RIH) posits that a consumer's behaviour is influenced by the actions of others. This theory suggests that a consumer's spending and saving habits, relative to others and their own past behaviour, tend to remain stable over time (Lovrinčević, 2000). Essentially, individuals often increase their consumption at the expense of savings to maintain or improve their standard of living. This drive is fuelled by a constant desire for a higher level of consumption and a reluctance to reduce previous spending habits (Pojatina, 2000).

Given that Keynes' theory of absolute income ignores the influence of interest rates and future income in making decisions about savings and consumption, economic analysts' reflections led to the development of an intertemporal approach to consumption and savings (Hernando et al., 2018). Under this approach, the permanent income hypothesis (Friedman, 1957) and the life cycle hypothesis (Modigliani and Brumberg, 1954) were developed, introducing heterogeneity with respect to consumer age groups.

In 1957, Friedman presented his *permanent income hypothesis* (PIH), which established the relationship between consumption and both present and future income. Thus, Friedman divides income and consumption into permanent and transitory parts (Ozcan, Gunay and Ertac, 2003). Permanent income is that which can be spent without a change in the size of the wealth, i.e., permanent income represents the present value of lifetime income, while the transitory part of income represents the difference between current and permanent income. Loayza, Schmidt-Hebbel and Servén (2000b) stated that this hypothesis predicts that higher future income (higher income growth rate in the future) reduces today's savings.

The *life cycle hypothesis* (LCH) was originally explained by Modigliani and Brumberg (1954) and then presented in more detail in the works of Ando and Modigliani (1963), Modigliani (1986) and Modigliani and Brumberg (1990). According to this hypothesis, an individual strategizes his savings and consumption throughout his life cycle to guarantee an adequate level of consumption during his adulthood and later years. This hypothesis emphasizes the importance of pension savings accumulation. Proximity to retirement increases the propensity to save during the active working years. The individual will begin to utilize the earned income, or the net funds accumulated during their years of employment, upon retirement. Household

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income growth is age-dependent, and savings decline precipitously and become negative after retirement (Koski, 2016). As a result, an individual's consumption is constrained by the resources available to them at a particular moment. Furthermore, their consumption pattern can be described as bell-shaped: they anticipate amassing greater savings during their working years, but lower levels of savings during their youth and old age (Ozcan, Gunay and Ertac, 2003).

Barro-Ricardo's equality hypothesis (or *Ricardian equivalence hypothesis*, REH) was originally developed by Ricardo (1821) and was later supplemented with the help of Barro (1974). This hypothesis establishes a connection between public and private costs. According to this theory, agents plan their economic behaviour depending on their expectations about the future moves of the government (Koski, 2016). For example, if the government implements an expansionary fiscal policy that includes debt-financed tax cuts, households are assumed to redirect the increase in disposable income into consumption. According to this theory, households are aware that the government has taken on debt and expect a future tax increase (Koski, 2016).

Empirical research does not always support the conclusions of the stated theories. Hernando et al. (2018) state that in the case of insolvent households, consumer decisions are guided by current and not permanent income as dictated by the theory of permanent income. It is precisely for this reason that the assumptions of the mentioned models and theories were improved by introducing additional determinants that influence the decisions of the population, such as consumption habits, the substitution effect between private and public consumption, various forms of uncertainty (such as inflation or GDP volatility) that encourage savings for risk insurance, then consumer heterogeneity and financial imperfections.

The following section draws on theoretical and empirical studies to present a concise overview of key savings determinants and explain their mechanisms.

The positive effect of **income** increases on household savings is notable, with richer individuals tending to save more, as observed by Kolasa and Liberda (2014). This phenomenon is particularly evident in poorer countries where significant income rises enable individuals who previously couldn't afford necessities to balance their consumption curve through savings accumulation. Additionally, analysis of higher-income countries reveals a tendency for the population to save more, as Edwards (1996) noted.

Regarding the impact of the **income or productivity growth rate**, the life cycle model suggests that increases in this factor are more likely to influence the behaviour of actively employed individuals than that of retirees. Kolasa and Liberda (2014) stress that productivity growth can positively affect household savings by enabling individuals to save larger amounts. However, if the growth in income or productivity sets the expectation for higher future income, it might lead to a

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decrease in savings among employed individuals, according to Hernando et al. (2018). This expectation could also lead to increased debt among these individuals, resulting in lower overall savings.

An improvement in the **terms of trade**, characterised by an increase in the relative price of goods exports versus goods imports, leads to a bolstered trade balance. This can be viewed as an influx of foreign money positively impacting income. Hernando et al. (2018) suggest that a permanent change in this area could shift the potential positive effect on savings towards consumption. Nonetheless, a rise in savings might be anticipated in the face of an economic shock. Grigoli, Herman and Schmidt-Hebbel (2016) find that improved terms of trade correlate with heightened savings, particularly when the improvement pertains to the transitory component of income. Additionally, the Harberger-Laursen-Metzler effect indicates that a worsening of the terms of trade can reduce savings due to a fall in disposable income, especially if the marginal propensity to consume is below one, as Kolasa and Liberda (2014) noted.

In the realm of **demography**, various determinants have been identified as significant in prior research, including the proportions of the elderly and young populations, life expectancy, and urbanization rates. According to life cycle models of consumer behaviour, savings are markedly lower among the relatively young and the elderly, the shares of the younger and older population thus having a negative effect on overall household savings. However, Modigliani (1986) notes that the actual life cycle behaviour patterns derived from micro-level data often deviate from the standard model's predictions and vary widely across different countries. Generally, an increase in the proportion of young and elderly individuals tends to diminish the portion of financial assets used to sustain consumption levels, thereby reducing savings, as observed by Hernando et al. (2018). However, a rise in life expectancy tends to boost savings at all ages due to precautionary motives, as shown by Bloom, Canning and Graham (2003). Conversely, heightened urbanization may lead to lower savings through two pathways: by broadening consumer choices and by diminishing the necessity for precautionary savings.

The real interest rate, or **rate of return**, has a multifaceted impact on savings, mediated through several distinct channels. The substitution effect suggests that when interest rates rise, the cost of current consumption increases relative to future consumption, thus incentivizing individuals to save more. This effect is counterbalanced by the income effect, which diminishes the urge to save by allowing individuals to save less today yet still achieve the same future value due to increased interest earnings. The overall influence of interest rates on savings is therefore complex and ambiguous, a finding echoed in a variety of empirical studies, including those by Loayza, Schmidt-Hebbel and Servén (2000b), Grigoli, Herman and Schmidt-Hebbel (2014), Hernando et al. (2018), and Aghion et al. (2016), which also highlighted the often statistically insignificant relationship between interest rates and savings in certain contexts.

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Financial development, or the liberalization of financial markets, presents a nuanced picture regarding its effects on private savings. Edwards (1995) and Jappelli and Pagano (1994) argue that financial integration can expand saving opportunities, yet simultaneously diminish the need for precautionary savings by providing more effective insurance mechanisms. The impact of financial liberalization is not uniform, as evidenced by studies such as Loayza, Schmidt-Hebbel and Servén (2000a) and Beck, Demirgüç-Kunt and Levine (2007), which show that the easing of credit constraints may lead to a decrease in savings rates. Key indicators used to assess the impact of financial development on savings include the private sector's indebtedness (% of GDP) and the monetary aggregate M2 (% of GDP), where a negative coefficient suggests a reduced need for savings.

The effects of **fiscal policy** on savings are informed by the anticipation of future tax obligations due to current government borrowing, as postulated by Ricardo's equivalence hypothesis. This perspective is supported by research from Schrooten and Stephan (2004) and Rocher and Stierle (2015), which indicates that public sector savings can substantially offset private savings in both the short and long term. Additionally, a fiscal deficit's negative influence on savings, where an increase in the deficit due to tax cuts or higher government spending encourages individuals to save rather than spend, is corroborated by studies from Afonso and Jalles (2013) and Bernheim (1989). This body of research underscores the complex interplay between fiscal policy and private savings behaviour.

Uncertainty plays a pivotal role in shaping the saving decisions of individuals, often assessed through indicators such as inflation and unemployment rates. Inflationary conditions typically prompt individuals to increase their savings as a precautionary measure to safeguard their future financial well-being, leading to a widely observed positive correlation between inflation and savings levels, as evidenced by studies like Aizenman and Marion (1993) and Bandiera et al. (2000). Similarly, the unemployment rate serves as another barometer of economic uncertainty. An uptick in unemployment can initially lead to a surge in savings as individuals curtail consumption to buffer against potential job loss, a phenomenon explored in depth by Lusardi, Schneider and Tufano (2011) and Mody, Ohnsorge and Sandri (2012). However, this boost in savings may proveshort-lived over the long haul. Extended periods of unemployment might force individuals to deplete their savings to meet essential living costs, a scenario detailed in Pitonakova (2017) and further analysed by Chetty and Szeidl (2007).

In recent years, researchers have made significant efforts to contribute to a better understanding of the determinants of saving. Thus, numerous studies have been conducted on the determinants that influence savings at the level of individual countries or at the level of groups of countries. The table 1 presents a summary of individual determinants, examples of specific indicators, the sources from which they were taken, as well as the expected mode of action.

Table 1
Determinants of household savings in empirical findings

Category	Determinant	Expected sign	Empirical findings
Income	Disposable income: level	+	(0) 5, 6; (+) 1, 2, 3, 7, 12, 13, 15, 16, 17, 19
	Disposable income: temporary/permanent	+/0 or -/0	(0) 7, 15 / (0) 7 (+) 15
	GDP/disposable income growth	Ambiguous	(-) 11, 13, 16; (0) 5, 6; (+) 2, 3, 4, 7, 10, 12, 15, 19, 22
	Terms of trade index: level	Ambiguous	(0) 15, 16; (+) 2, 6, 7, 8, 17, 19, 22
	Terms of trade index: temporary/permanent	+/0 or -/0	(+) 7, 15 / (+) 7, 15
	Income inequality	Ambiguous	(0) 3, 15
	Tourism revenues	Ambiguous	
	Personal remittances	Ambiguous	(0) 16
Wealth	Household wealth	-	(0) 2, 6; (-) 17
	Home ownership	-	(0) 16
Rate of return	Real interest rate	Ambiguous	(-) 7, 8; (0) 1, 2, 4, 5, 6, 9, 14, 19; (+) 11, 15, 18
	Government bond yield	Ambiguous	(-) 16
Uncertainty	Inflation	Ambiguous	(-) 16; (0) 1, 2, 3, 8; 14, 16, 19; (+) 4, 7, 11, 13, 15, 17, 18
	Unemployment rate	+	(0) 18; (+) 13, 16, 21
	GDP volatility	+	(0) 17
	Real oil price	-	(-) 15; (0) 19
	Consumer confidence	-	(-) 23
Financial liberalization	Loans to households	-	(-) 3, 5, 7, 9, 12, 17, 19; (0) 15
	Market capitalization	Ambiguous	
	Flow of loans to households	-	(-) 15
Foreign borrowing constraints	Capital account deficit	-	(-) 1, 2, 3, 10; (+) 18
	Capital flow restrictions	+	(0) 7, 15
Demography	Young age dependency (a)	-	(-) 7, 12
	Old age dependency (b)	-	(-) 4, 7, 13, 14, 15, 19, 20; (0) 8, 11, 12, 21
	Age dependency (a+b)	-	(-) 2, 3, 10; (0) 5, 6, 16
	Prime savers	+	
	Urbanization rate	-	(-) 3, 7, 11, 12, 15; (0) 19; (+) 17
	Life expectancy	+	(0) 16; (+) 19
	Participation of +65 in labour market	-	(+) 21

Category	Determinant	Expected sign	Empirical findings
Fiscal policy	Budget balance	-	(-) 2, 5, 6, 13, 16, 18, 19, 22
	Public saving	-	(-) 1, 3, 4, 7, 8, 10, 14, 17; (0) 15
	Public debt	-	(-) 2, 6, 13, 16
Government expenditure	Welfare expenditures	Ambiguous	(-) 2, 6, 13, 16
	Health expenditures	Ambiguous	(-) 19; (0) 15
	Education expenditures	Ambiguous	(0) 15
	Social protection expenditures	Ambiguous	(-) 3, 4, 5, 16, 21

Notes: (1) Corbo and Schmidt-Hebbel (1991), (2) Masson, Bayoumi and Samiei (1995), (3) Edwards (1996), (4) Callen and Thimann (1997), (5) Baillu and Reisen (1998), (6) Haque, Pesaran and Sharma (1999), (7) Loayza, Schmidt-Hebbel and Servén (2000), (8) de Serres and Pelgrin (2003), (9) Bandiera et al. (2000), (10) Schrooten and Stephan (2005), (11) Niculescu-Aron and Mihaescu (2012), (12) Samwick (2000), (13) Kessler, Perelman and Pestieau (1993), (14) OECD (2001), (15) Grigoli, Herman and Schmidt-Hebbel (2014), (16) Rocher and Stierle (2015), (17) Kolasa and Liberda (2015), (18) Kukk and Staehr (2015), (19) Hernando et al. (2018), (20) Kharazi et al. (2022), (21) Fredriksson and Staal (2021), (22) Oinonen and Viren (2022), (23) Vanlaer, Bielen and Marneffe (2020).

3 EMPIRICAL STRATEGY

Empirical analysis of the determinants of household savings was conducted on a panel dataset of 26[1] EU member states covering the period from 2000 to 2021 based on annual data. The approach based on the reduced form of linear equations allows for a wider range of savings determinants. Thus, the balanced set of panel data consists of 535 observations.

3.1 DATA AND STYLIZED FACTS

The household savings rate, serving as the dependent variable in the cross-country panel analysis, is defined in accordance with Eurostat's standards to ensure international comparability. According to this definition, gross household savings are identified as the excess of gross disposable income over final consumption expenditure, with adjustments made for variations in households' net equity in pension fund reserves. Consequently, the household savings rate is derived by calculating the proportion of these gross savings to the adjusted gross disposable income, incorporating adjustments for changes in the net equity of households in pension fund reserves[2].

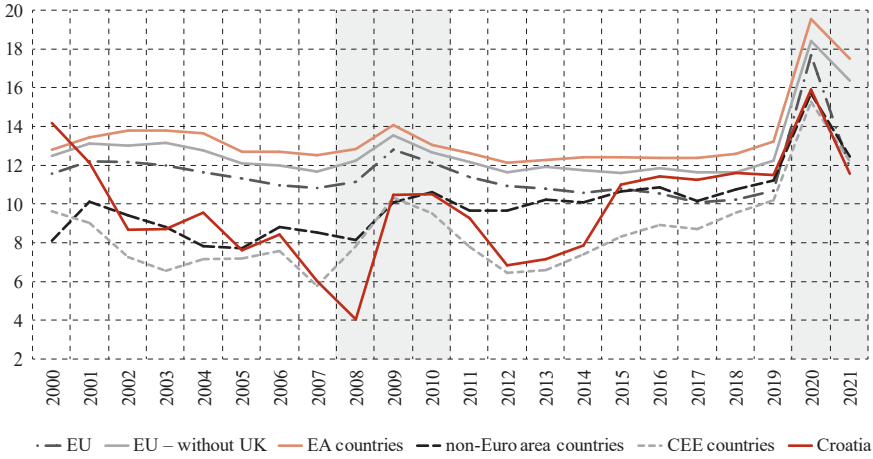
While a standardised definition of household savings is employed to facilitate comparison, notable differences across countries may persist, largely attributed to institutional variations. Such disparities can mask the fundamental similarities in savings behaviour across nations, leading to significantly divergent savings rates. Key institutional factors contributing to these differences include the scale of the shadow economy, variances in pension systems, the provision of social services in kind, and the flow of remittances.

[1] EU member states that are not included in the panel analysis are Cyprus and Malta due to the limited and insufficient data for most of the variables included in the empirical analysis. Despite Brexit, the United Kingdom is included in the performed estimation given the fact that the UK was, for the most part of the considered time frame, the EU member state. The same estimation was performed, excluding the UK, and the results did not differ much from the ones presented in this paper. Analysis without the UK is available upon request.
[2] Since the national accounts correct gross household savings for the net equity changes in pension fund reserves, the latter is added to the denominator of the household saving rate.

Figure 1 illustrates the household saving trends across various country groups and at an aggregate level. It is generally observed that nations or groups characterised by a higher disposable income per capita tend to exhibit greater levels of savings. The observed discrepancy in savings rates between the EA and the wider EU, with CEE countries demonstrating the lowest rate of savings, can be elucidated through the interaction between institutional factors and levels of disposable income. Increased disposable income, which acts as a buffer during periods of economic difficulty, could potentially account for the more significant fluctuations in the savings rate that are observed in CEE countries and Croatia.

Figure 1

Household savings (in % of household disposable income)



Note: The periods marked in light grey indicate periods of structural changes in household savings (periods of financial crisis and pandemics).

Source: Eurostat, author's calculations.

Following the Global Financial Crisis, saving rates markedly changed, including a notable increase in savings accumulation triggered by the pandemic. These trends reflect the long-lasting influence of the financial uncertainty that began in 2008. In the EU and EA, the rebound from the GFC was evident by 2010, with household savings reverting to levels seen before the crisis. However, in CEE countries and Croatia, the repercussions of the GFC persisted longer, with savings rates not returning to their pre-crisis state until 2012.

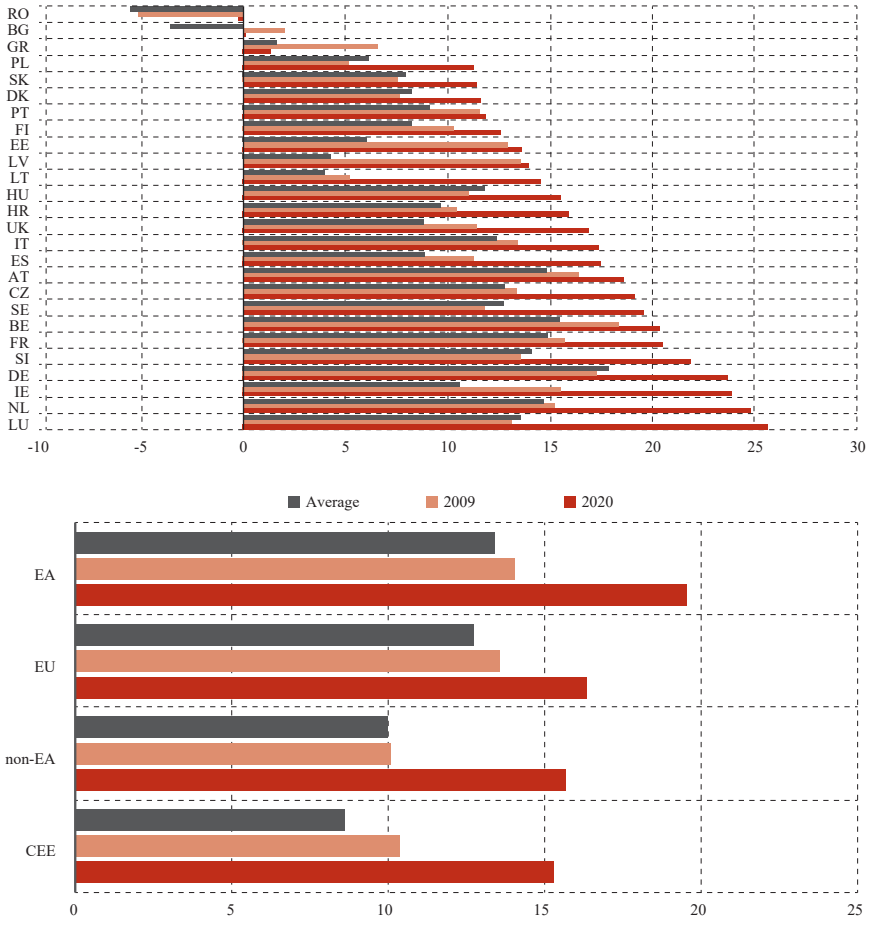
The motivations behind the increase in savings during the pandemic differed significantly from those observed during the GFC, where precautionary saving was predominant. During the pandemic, lockdowns and restrictions on movement, coupled with limited access to goods and services due to stringent epidemiological measures, reduced household consumption. At the same time, fiscal support measures effectively sustained household incomes. As a result, the notable rise in savings during this period was primarily due to "forced" savings, driven by constraints on spending opportunities rather than purely by precautionary motives.

Over the period from 2000 to 2021, households in the EU saved, on average, 12.7% of their disposable income. In the wake of the financial crisis in 2009, this saving rate saw an uptick of 0.8 percentage points, with households in CEE experiencing a more excessive increase of 1.7 percentage points. This variation largely stems from the differing effects of the GFC, which exacerbated the financial pressures on households in regions with lower disposable incomes and higher unemployment rates, particularly in comparison to those in higher-income areas.

The onset of the pandemic marked a significant turning point, leading to a widespread surge in savings across all the regions under study. This increase, depicted in figure 2, amounted to approximately 5.5 percentage points of disposable income, reflecting the broad economic impact of the pandemic on household saving behaviours.

FIGURE 2

Household savings rate across countries and country groups (in % of household disposable income)



Notes: Average refers to the average household saving rate for the time period from 2000 until 2021.
Source: Eurostat, author's calculations.

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The core explanatory variables chosen for the empirical analysis cover the main determinants that seem to be most prevalent in savings literature. Thus, the baseline specification includes nine variables that cover various categories of saving determinants: *income*, *demographics*, *financial variables*, *macroeconomic uncertainty* and *fiscal policy*. Given the importance of income in determining savings, there are three variables from the income category – namely, real disposable income ("household disposable income"), real income growth (proxied by "real GDP growth") and the terms of trade index. Age dependency over working age population (including both young and old-age dependency) represents the demographic factor in explaining households' motives to save. A financial sector development factor is reflected in the stock of domestic credit to the household sector as a proportion of GDP ("loans to households"), while the real interest rate on deposits ("real interest rate") presents the rate of return category. Government surplus as a share of GDP ("budget balance") represents the fiscal policy measure to check for the Ricardian equivalence. Considering recent trends in saving rates, two variables are specifically included to address macroeconomic uncertainty: inflation, serving as a conventional indicator of macroeconomic instability, and consumer confidence, an underexplored variable that captures a critical aspect of household savings behaviour. Both variables are assessed as deviations from their long-term averages to gauge their impact on savings.

Table 2 showcases the pairwise correlations among these fundamental determinants of household savings, providing an empirical foundation for analysing the intricate relationships influencing savings behaviours.

The model's initial core variables are expanded to encompass a wider range of factors that influence household savings, addressing the complexity of savings behaviour and the ambiguous or underexplored effects identified in prior research. The baseline model now integrates novel variables such as the Chinn-Ito index, market capitalisation, and the proportion of prime savers, which have not traditionally been analysed in savings studies.

Table 2

Correlation matrix of core household saving determinants

	Household saving	Household disposable income	Real GDP growth	Terms of trade index	Age dependency	Real interest rate	Loans to households	Budget balance	Inflation	Consumer confidence
Household saving	1.00	0.54	-0.43	0.51	0.10	0.20	0.38	0.12	-0.41	0.25
Household disposable income	0.45	1.00	-0.29	0.36	0.36	0.11	0.33	0.25	-0.54	-0.05
Real GDP growth	-0.30	-0.39	1.00	-0.34	-0.17	-0.30	-0.39	0.12	0.41	0.24
Terms of trade index	0.43	0.42	-0.18	1.00	-0.14	0.10	0.08	0.08	-0.32	0.40
Age dependency	0.11	0.29	-0.05	0.02	1.00	-0.08	0.48	0.18	-0.01	-0.14
Real interest rate	0.06	-0.22	-0.28	-0.15	-0.17	1.00	0.03	-0.32	-0.31	0.00
Loans to households	0.31	0.42	-0.38	0.11	0.31	-0.03	1.00	0.25	-0.43	-0.24
Budget balance	-0.09	0.07	0.32	0.01	0.07	-0.18	0.00	1.00	0.05	0.21
Inflation	-0.05	-0.17	0.04	-0.20	-0.08	0.06	-0.09	0.10	1.00	-0.15
Consumer confidence	-0.08	-0.01	0.54	0.00	0.08	-0.28	-0.15	0.43	-0.04	1.00

Note: Panel sample in lower triangle, cross section in upper triangle. Household saving refers to household saving in % of household disposable income. Household disposable income and real GDP growth as per capita. Loans to households and governments' budget balance in % of GDP.

Further dissection of key baseline variables enriches the understanding of savings dynamics. Real household disposable income and the terms of trade index, for example, are segmented into permanent and temporary components, as suggested by Grigoli, Herman and Schmidt-Hebbel (2014). The age dependency ratio is refined to include separate measures for young (ages 15-24) and old-age (ages 65+) dependency, in addition to the proportion of prime savers (ages 45-65), offering a more nuanced view of demographic impacts on savings. The analysis extends to additional income-related variables, including personal remittances, tourism revenue, the Gini index, and net changes in pension funds, acknowledging income's pivotal role in savings. The exploration of wealth effects incorporates variables like household net wealth and home ownership. The yield on government bonds is examined as another aspect of the rate of return category. Uncertainty's influence on savings is probed through the unemployment rate, GDP volatility, and real oil price fluctuations. Financial variables, critical to savings theories, are examined from various perspectives, including domestic and foreign borrowing constraints, financial liberalization, and market depth. This leads to credit flows being included in households and market capitalization alongside the baseline's domestic credit stock. International financial integration is assessed through the capital account balance and Chin-Ito and Quinn indices. Demographic structure variables, such as urbanization rate, life expectancy, and the participation rate of the +65 population, are also considered for their potential impact on savings changes. Finally, the model examines additional fiscal policy variables, including public savings, public debt, and expenditures on education, healthcare, social protection, and overall welfare spending, to provide a comprehensive view of the multifaceted determinants of household savings.

For a full list of variables included in the empirical analysis, along with their definitions, measures, descriptive statistics, and sources, see table A1 in appendix.

3.2 MODEL AND ESTIMATION METHODOLOGY

This section presents the estimation strategy and reasoning behind the choice of the estimator in which the saving rate of household sector is regressed on its lagged value, explanatory variables (both endogenous and exogenous) discussed in previous section as well as time and country fixed effects. Given the theory on personal savings and the characteristics of the variables entering the model it is important to keep in mind several specifications that a model needs to address among which are (i) persistence of the dependent variable of interest (household saving rate), and (ii) endogeneity present among couple of regressors.

Since it is a dynamic panel model, the dependent variable with a lag of one or more time periods (lagged dependent variable) depends on the properties of the dependent variable itself. The use of internal instruments controls common endogeneity, that is, the instrumental variables of the endogenous variables are the same endogenous variables but with a time shift. A dynamic panel containing a dependent variable with one time lag has the form:

$$y_{i,t} = \gamma y_{i,t-1} + \beta X_{i,t} + \delta Z_{i,t} + c_i + \tau_t + u_{it} \qquad (1)$$

where $y_{i,t-1}$ is a lagged dependent variable, $X_{i,t}$ is a covariance matrix of endogenous (as well as predetermined) variables while $Z_{i,t}$ presents a matrix of strictly exogenous variables for country i at time t. $u_{i,t}$ implies relational errors of independently and identically distributed random variables. Key variables such as real disposable income per capita, real GDP growth per capita, real interest rate, household loans, government budget balance, and consumer confidence form the matrix of endogenous variables $X_{i,t}$, while variables like age dependency, terms of trade, and inflation are considered strictly exogenous. Given the potential simultaneous determination of certain explanatory variables with the dependent variable, the model includes the dimension of common endogeneity among regressors. Furthermore, the model accounts for possible unobserved country-specific (c_i) and time effects (τ_t) correlated with the regressors.

The model, as presented in equation (1), adopts a framework akin to those in the studies by Loayza, Schmidt-Hebbel and Servén (2000a), Grigoli, Herman and Schmidt-Hebbel (2014), and Kukk and Staehr (2015), utilizing the differenced Arellano-Bond generalized method of moments (AB GMM) estimation strategy, originally formulated by Arellano and Bond (1991). This estimator is particularly valued, as noted by Roodman (2006), for its efficacy in dynamic panel models, which are often characterized by a limited number of time periods and an extensive number of observational units. The AB GMM estimator is adept at addressing several econometric challenges inherent in such models, such as endogeneity, serial correlation, panel specificity and dynamic dependencies. As for endogeneity, it effectively handles endogenous regressors by using lagged values of the variables as instruments, thus mitigating bias that arises from the correlation between the regressors and the error term. The estimator is designed to counteract the issue of serial correlation in the error terms, a common problem in time series data, ensuring that the estimations remain consistent. Furthermore, it accommodates the panel nature of the data, acknowledging the individual heterogeneity across cross-sectional units by differencing, which helps in eliminating unobserved fixed effects that could confound the model's estimations. Lastly, the method is particularly suited for models where current outcomes are influenced by past values, allowing for the inclusion of lagged dependent variables as regressors while addressing the potential biases they introduce. By employing this methodology, the model is robustly equipped to navigate the complexities and intricacies associated with dynamic panel data analysis, providing reliable and insightful results that contribute to our understanding of the underlying phenomena.

On the other hand, as Kukk and Staehr (2015) note, the AB GMM estimator and other GMM estimators developed for dynamic panels may provide biased coefficient estimates in panels with a small number of cross-sections. The differenced AB GMM estimator is as a result supplemented with standard fixed effect estimations (LSDV) as well as with the bias-corrected LSDV estimations. However, these supplemented estimators do not address the problems highlighted in the beginning of this section. Namely, the inclusion of the lagged dependent variable as a regressor means that the estimators with fixed effects least squares could

potentially suffer from the Nickell bias which can result in the coefficient of the lagged dependent variable being downward bias (Nickell, 1981). Secondly, there is a possible reverse causality in which personal savings may affect other determinants entering the model, leading to a rising complexity in the identification of cause and effect. As a result, these alternative specifications are part of the robustness and sensitivity check.

With the aim of investigating household savings' determinants during specific periods of time or for selected groups of countries in comparison with a model based on a complete sample, the specified equation under (1) can be expanded as follows:

$$y_{i,t} = \gamma y_{i,t-1} + \beta X_{i,t} + \delta Z_{i,t} + \xi D_{i,t} y_{i,t-1} + \varphi D_{i,t} X_{i,t} + \omega D_{i,t} Z_{i,t} + c_i + \tau_i + u_{it} \quad (2)$$

where ξ, φ i ω represent coefficients of interactive effects. Dummy variable, $D_{i,t}$, is not included as a specific independent variable since it would be perfectly correlated with time fixed effects τ_i or with country fixed effects (c_i).

Observing the effect of variable $X_{i,t}$ from a specific time period or country group $D_{i,t}$, on the dependent variable $y_{i,t}$, involves considering the combined influence of coefficients β and φ. Similarly, incorporating the impact of variable $Z_{i,t}$ within the $D_{i,t}$ group on the dependent variable entails examining the aggregate effect of δ and ω.

4 ESTIMATION RESULTS

4.1 BASELINE SPECIFICATION

This section presents the results of estimations in which the saving rate of the household sector is regressed on its lagged value, explanatory macroeconomic variables (both endogenous and exogenous) discussed in section 3.1 as well as time and country fixed effects.

Table 3 gives the results of various estimators. In all regressions, the dependent variable is the household saving rate as defined in section 3.1. Thus, columns (1) and (2) present estimations of OLS with fixed effects (or LSDV), while columns (3), (4) and (5) are the result of three types of the bias-corrected LSDV (or LSDVc) – Arellano-Bond, Anderson-Hsiao and Blundell-Bond. Finally, column (6) is the preferred baseline specification performed with AB GMM estimator. As elaborated in the previous section, the differenced AB GMM estimator should be preferred since it allows dynamic panel specification with addressed endogeneity issues.

Results are robust across different estimation methodologies. The introduction of fixed-time effects has not resulted in significant alterations. All statistically significant variables show the same signs of coefficients across estimations. Moreover, most variables show similar coefficient magnitudes as well.

TABLE 3

Determinants of household saving; different estimators

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS FE		LSDVc			GMM
	with country effects	with time and country effects	Arellano-Bond	Anderson-Hsiao	Blundell-Bond	Arellano-Bond GMM
Lag dependent variable	0.605***	0.726***	0.647***	0.649***	0.675***	0.569***
	(-0.060)	(-0.057)	(-0.034)	(-0.037)	(-0.032)	(-0.055)
Household disposable income	0.073***	0.057***	0.071***	0.075***	0.070***	0.072***
	(-0.086)	(-0.013)	(-0.079)	(-0.091)	(-0.076)	(-0.094)
Real GDP growth	0.407***	0.473***	0.415***	0.418***	0.425***	0.377***
	(-0.042)	(-0.040)	(-0.043)	(-0.047)	(-0.040)	(-0.044)
Terms of trade index	0.021	0.019	0.013	0.009	0.017	0.026
	(-0.027)	(-0.019)	(-0.028)	(-0.031)	(-0.027)	(-0.029)
Age dependency	0.067	-0.034	0.061	0.065	0.053	0.072
	(-0.046)	(-0.042)	(-0.041)	(-0.048)	(-0.040)	(-0.049)
Real interest rate	0.360***	0.396***	0.356***	0.360***	0.360***	0.337***
	(-0.064)	(-0.056)	(-0.050)	(-0.054)	(-0.047)	(-0.063)
Loans to households	-0.052**	-0.023**	-0.048***	-0.054***	-0.049***	-0.055***
	(-0.019)	(-0.015)	(-0.013)	(-0.014)	(-0.012)	(-0.019)
Budget balance	-0.254***	-0.107***	-0.241***	-0.243***	-0.237***	-0.285***
	(-0.059)	(-0.036)	(-0.040)	(-0.044)	(-0.038)	(-0.061)
Inflation	-0.424	-0.560	-0.467	-0.289	-0.333	-0.293
	(-0.020)	(-0.014)	(-0.015)	(-0.012)	(-0.011)	(-0.012)
Consumer confidence	-0.071***	-0.067***	-0.072***	-0.072***	-0.074***	-0.068***
	(-0.019)	(-0.016)	(-0.015)	(-0.017)	(-0.014)	(-0.020)
Time fixed effects	No	Yes	No	No	No	No
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	535	535	535	535	535	509
r2	0.674	0.793	.	.	.	.

*Notes: Standard errors in parentheses are corrected for heteroskedasticity and autocorrelation of error effects. These estimations include the Windmeijer's correction of the covariance matrix. All estimates include a constant effect. ***, **, * next to the coefficients indicate a 1, 5 and 10% significance level. The lagged dependent variable (i.e., household saving rate) refers to the lagged rate by one time period (year). Coefficients of log-transformed variables (household disposable income, terms of trade index, inflation and consumer confidence) have already been divided by 100.*

In the preferred analysis detailed in column (6), the model examines nine variables, identifying seven with significant effects at the one per cent level, resonating with established savings behaviour literature. The persistence of the lagged savings rate, with a coefficient of 0.57, underscores its enduring impact, echoing findings by Loayza, Grigoli, and Kukk, and highlighting a gradual adjustment in household savings accumulation. The role of income is pronounced; a one percentage point increase in real household disposable income per capita leads to a 0.07 percentage point rise in the savings rate, a finding that aligns with the research of Corbo and Schmidt-Hebbel (1991) and Edwards (1996), among others. Similarly, real GDP growth's positive impact on savings rates, increasing them by 0.38 percentage points for every percentage point rise, supports the conclusions of Oinonen and Viren (2022) and contrasts with the views of Niculescu-Aron and Mihaescu (2012).

While real interest rates often yield ambiguous results in literature, in this model, a one percentage point increase translates to a 0.34 percentage point increase in the savings rate, aligning with the positive findings of Grigoli, Herman and Schmidt-Hebbel (2014) and diverging from the typical consensus of insignificance noted by Bandiera et al. (2000). The negative impact of household loans, decreasing savings rates by 0.06 percentage points per percentage point increase, and the positive effect of government budget balance, enhancing savings rates by 0.29 percentage points per percentage point increase, are consistent with broader empirical evidence, albeit with magnitudes that challenge the rational expectations hypothesis. Consumer confidence reduces the savings rate by 0.07 percentage points per percentage point increase, which highlights the precautionary saving motive in uncertain times, in alignment with the findings of Vanlaer, Bielen and Marneffe (2020).

4.2 ADDITIONAL HOUSEHOLD SAVING DETERMINANTS

Delving deeper into the determinants of savings, as discussed in section 3.1, the analysis further dissects core variables to uncover the primary factors influencing savings behaviour.[3] Thus, the differentiation between permanent and temporary components in income and terms of trade provides an insightful lens through which to understand savings behaviours. According to the permanent income hypothesis (PIH) and life cycle hypothesis (LCH), individuals treat income perceived as permanent differently from temporary income fluctuations. The tendency to consume rather than save from permanent increases in income and terms of trade is rooted in the PIH, which posits that consumers plan their consumption based on their long-term income expectations. This theory is exemplified by the work of Corbo and Schmidt-Hebbel (1991), who found that households are more likely to adjust their consumption patterns rather than their savings in response to permanent income changes. Similarly, the LCH suggests that individuals aim to smooth consumption over their lifetime, leading to higher consumption from permanent income increases, as supported by Loayza, Schmidt-Hebbel and Servén (2000).

[3] Complete results of all estimations with additional determinants are available upon request.

On the other hand, the propensity to save temporary fluctuations in these variables aligns with precautionary saving motives, where individuals save temporary income boosts to hedge against future uncertainties. This behaviour is consistent with Edwards (1996) and Hernando et al. (2018), who observed an increase in savings rates in response to temporary income changes, reflecting a safeguard against future income volatility.

Tourism revenues and personal remittances offer unique insights into the dynamics of savings. The negative impact of tourism revenues on savings rates may be attributed to the perception of tourism as a stable, permanent source of income for economies heavily reliant on this sector, encouraging more consumption as posited by the PIH. Conversely, personal remittances often represent a temporary, albeit substantial, boost to household income in recipient countries. This temporary nature likely encourages saving, as households may view remittances as non-recurring windfalls to be saved for future needs or investment opportunities, an observation that finds resonance in the analysis by Rocher and Stierle (2015) regarding remittance behaviours.

The "wealth effect," as confirmed within the wealth category, reflects a fundamental economic principle where increased wealth leads to higher consumption. This effect is grounded in both the PIH and LCH, as wealthier households are presumed to have reached a level of financial security that enables higher current consumption, sacrificing savings in the process. The empirical findings by Rocher and Stierle (2015) further substantiate this, highlighting how wealth accumulation influences saving and consumption decisions.

Macroeconomic uncertainty's significant role in influencing savings behaviour underscores the importance of precautionary savings in economic theory. The positive relationship between unemployment rate, GDP volatility, and savings rates can be explained by the precautionary saving motive, where individuals increase their savings in response to economic uncertainty to protect against potential future income losses or adverse economic conditions. This behaviour is emblematically illustrated in the works of Kessler, Perelman and Pestieau (1993) and Kukk and Staehr (2015), which delve into how uncertainty propels individuals towards more conservative financial behaviours, notably increased savings. Conversely, a rise in real oil prices, serving as a proxy for global events, tends to lower savings rates, possibly due to households utilising savings to stabilise consumption, which aligns with results found in Grigoli, Herman and Schmidt-Hebbel (2014).

The Chinn-Ito index, indicative of a country's openness to international financial transactions, positively influences savings rates by enhancing domestic financial market efficiency and broadening access to diverse investment opportunities. Greater capital account openness can lead to potentially higher and more stable investment returns, encouraging individuals to save more. This openness also facilitates the global exchange of financial knowledge and practices, potentially fostering a savings-oriented culture domestically.

While age dependency did not significantly impact the baseline model, a deeper analysis reveals intricate dynamics. Consistent with the life cycle hypothesis (LCH), which posits that individuals accumulate savings primarily during their working years to fund retirement, an increase in the proportion of prime-age savers (typically defined as those in their most productive working years) positively influences the overall savings rate. This observation aligns with empirical findings from Samwick (2000), who highlighted the critical role of working-age populations in national savings rates. Conversely, a larger elderly population, particularly of the over-65s, tends to reduce personal savings rates, reflecting the consumption phase of the LCH where retirees spend their accumulated savings. However, interestingly, an extension in life expectancy at 65 and higher labour market participation among the elderly positively contribute to savings rates.

Transitioning to fiscal policy impacts, the interplay between public savings, government debt, and personal savings rates presents a complex picture. As noted earlier, the theory of Ricardian equivalence suggests that individuals perceive public savings and government debt as future tax liabilities, leading to an offset in private savings as individuals save less in anticipation of future tax burdens. This nuanced relationship is evidenced by the partial offset seen with changes in government budget balances, a phenomenon explored in the research of Masson, Bayoumi and Samiei (1995), who discuss the intricate effects of fiscal policy on private saving behaviours.

Furthermore, the influence of government spending, particularly on welfare, illustrates the multifaceted role of fiscal policy in shaping savings rates. An increase in welfare expenditure, especially on education, can decrease personal savings rates by reducing precautionary saving motives. This is in line with the Permanent Income Hypothesis (PIH), where individuals adjust their savings based on expected future income, which, in this case, is influenced by government spending patterns. The decrease in savings in response to increased welfare spending, driven by educational expenditures, resonates with the findings of Edwards (1996), who delves into the impact of government expenditure on consumer savings and spending behaviours, highlighting the significant role of social welfare policies in shaping economic outcomes at the household level.

4.3 TIME AND COUNTRY GROUP INTERACTIVE EFFECTS

In this section, differential effects in households' savings behaviour across diverse country groups and time periods are analysed. As explained in section 3.2, this is done by generating interaction terms between a dummy variable indicating a specific country group or time period and core variables from the baseline specification.

As highlighted earlier, it is important to investigate the driving force behind savings during the crisis's times. Although these challenging times might display similar levels of heightened uncertainty, loss of consumer confidence and overall

rising need for precautionary savings, the GFC and the pandemic crisis are, in fact, much more different than they may look at first glance. Moreover, even when the focus is solely on Covid-19, the years 2020 and 2021 show different saving effects.

The results in table 4 suggest that the 2008-2010 period of the GFC had a significant impact on some coefficients of household saving determinants. For instance, the persistence of the lagged dependent variable fell with a point estimate reduced from 0.57 to 0.52. According to Grigoli, Herman and Schmidt-Hebbel (2014) this could reflect a temporary decline in consumption and saving inertia. Along with that, the effect of the income level, GDP growth, and real interest rate fell significantly during the GFC period. At the same time, the terms of trade index and age dependency are significant in the crisis period compared to the non-crisis times, while consumer confidence and, especially, government budget balance increased their effect on the savings rate. For comparison, a one pp increase in government budget balance led to an increase in the savings rate of 0.48 during 2008-2010, as against the 0.35 during the non-crisis times. At the same time, the worsening of consumer confidence led to an increase of 0.14 pp in saving rate (compared to 0.06 during the non-crisis times).

During the Covid-19 pandemic, i.e. 2020-2021, the lagged household rate's persistence fell significantly to a point estimate of 0.42. At the same time, the positive impact of disposable income fell slightly by 0.05. The government budget balance increased its magnitude to a point estimate of -0.19 as against the non-pandemic time's estimated -0.17, reflecting the fiscal stimulus support to the economy, which, however, was not as great as that provided during the GFC. However, looking solely at 2020, it is possible to see that the effect of government support was, in fact, much closer to that provided during the GFC (point estimate of -0.47). Inflation also gained significance during this period, where a one-pp increase in inflation led to a 0.05 pp decrease in the savings rate. Looking at the further breakdown, it is notable that inflation started to make an impact during 2021 when there was an overlap of supply bottleneck disruptions and increased consumption. Out of other variables, it is important to emphasise the significance of consumer confidence, whose magnitude reached a point estimate of -0.13 (compared to -0.05 in other years), the effect of which was also noticeable during the aggregate period of 2020-2021.

Moving on to country groups, EA countries show an increased positive impact on household disposable income and real GDP growth. Thus, in EA countries, one pp increase in income level leads to a 0.1 pp increase in the saving rate (compared to the point estimate of 0.08 pp in non-EA countries). Additionally, a one pp increase in GDP growth results in 0.48 pp increase in saving rate (compared to 0.36 pp increase in non-EA). Given the higher income levels and more stable GDP growth rates in Euro area, these results are as expected.

In the CEE region, the persistence of the lagged saving rate is notably lower (with a point estimate of 0.53) compared to non-CEE countries (0.65), suggesting a more flexible savings behaviour, potentially due to varying economic structures or fiscal policies (Schrooten and Stephan, 2004). A substantial impact of the real interest rate on savings indicates a strong response of household saving rates to changes in returns on deposits, with a one percentage point increase in the real deposit interest rate corresponding to a 0.45 percentage point increase in the saving rate, compared to just 0.10 in non-CEE countries. This pronounced effect may be associated with the less developed financial markets in CEE countries, where savings predominantly take the form of bank deposits (Grigoli, Herman and Schmidt-Hebbel, 2014). Furthermore, age dependency has a marked positive effect (0.18 percentage points) on the saving rate in CEE, which could reflect the socioeconomic challenges posed by an ageing population (Ostry and Reinhardt, 1992). The higher sensitivity to macroeconomic uncertainty in CEE is evidenced by the more substantial negative impact of enhanced inflation and consumer confidence on savings rates. A one percentage point increase in inflation and consumer confidence leads to a decrease in the household saving rate by 0.06 and 0.11 percentage points, respectively, underlining the importance of stable macroeconomic conditions for household financial behaviour in these countries (Oinonen and Viren, 2022; Ozcan, Gunay and Ertac, 2003).

Lastly, Croatia has many similarities with CEE countries. As is the case in CEE, the persistence of the lagged dependent variable is somewhat lower (0.51) than in the other countries (0.57). This could indicate a more volatile savings behaviour among Croatian households. This volatility might suggest that Croatian households are quicker to adjust their savings in response to economic changes, which could be due to several factors such as a less stable income environment, greater reliance on tourism, which is seasonal, or less confidence in long-term financial planning. Despite this, there is a still notable persistence in savings, in line with findings by Bađun and Franić (2015). Contrary to Dumičić and Čibarić (2010), the real interest rate indicates that bank deposits have been the major form of saving, with its point estimate increasing up to 0.41 (compared to 0.33 in other countries, which finds a negative correlation between real interest rate and bank deposits). Both inflation and consumer confidence play an important role in household saving in Croatia, where one pp increase in those variables negatively affects saving rates by 0.07 and 0.13 pp, respectively. This shows that in the Croatian case, the uncertainty has a stronger effect than in the case of CEE. This larger negative effect of inflation and consumer confidence on savings could imply a higher sensitivity to economic uncertainty, possibly exacerbated by Croatia's tourism-dependent economy. Another driver that is significant in the case of Croatia is the terms of trade index, which has a positive impact on the savings rate (0.07 pp), indicating a prevailing temporary component of the index. Given Croatia's high tourism dependence, this result is not surprising.

Table 4

Alternative estimations including interactive effects for defined crisis times (GFC and Covid-19) and country groups (EA, CEE and Croatia)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline	**X=2020**	**X=2021**	**X=2020-2021**	**X=2008-2010**	**X=EA**	**X=CEE**	**X=Croatia**
Lag dependent variable	0.569***	0.693***	0.637***	0.682***	0.592***	0.507***	0.645***	0.574***
	(-0.055)	(-0.051)	(-0.062)	(-0.052)	(-0.054)	(-0.102)	(-0.076)	(-0.056)
Disposable household income	0.072***	0.058***	0.076***	0.063***	0.074***	0.075***	0.071***	0.072***
	(-0.094)	(-0.077)	(-0.083)	(-0.070)	(-0.093)	(-0.247)	(-0.177)	(-0.194)
Real growth of GDP	0.377***	0.415***	0.427***	0.422***	0.419***	0.363***	0.414***	0.385***
	(-0.044)	(-0.050)	(-0.050)	(-0.053)	(-0.064)	(-0.069)	(-0.081)	(-0.044)
Terms of trade index	0.026	0.013	0.037	0.014	0.010	-0.042	0.082	0.025
	(-0.029)	(-0.020)	(-0.033)	(-0.021)	(-0.027)	(-0.061)	(-0.050)	(-0.030)
Age dependency	0.072	-0.003	0.135***	0.015	0.049	0.144	-0.037	0.072
	(-0.049)	(-0.038)	(-0.050)	(-0.040)	(-0.052)	(-0.100)	(-0.069)	(-0.048)
Real interest rate	0.337***	0.383***	0.342***	0.391***	0.339***	0.373***	0.096***	0.333***
	(-0.063)	(-0.059)	(-0.059)	(-0.061)	(-0.077)	(-0.124)	(-0.103)	(-0.063)
Loans to households	-0.055***	-0.027*	-0.055***	-0.034**	-0.059***	-0.016	-0.059***	-0.055***
	(-0.019)	(-0.016)	(-0.017)	(-0.014)	(-0.017)	(-0.043)	(-0.019)	(-0.019)
Budget balance	-0.285***	-0.141***	-0.312***	-0.168***	-0.347***	-0.394***	-0.272***	-0.285***
	(-0.061)	(-0.038)	(-0.069)	(-0.044)	(-0.050)	(-0.073)	(-0.062)	(-0.062)
Inflation	-0.003	0.018	0.008	0.019***	-0.012	-0.033***	-0.014**	-0.016**
	(-0.011)	(-0.011)	(-0.012)	(-0.012)	(-0.012)	(-0.018)	(-0.008)	(-0.003)
Consumer confidence	-0.068***	-0.052***	-0.069***	-0.053***	-0.064***	-0.063**	-0.069***	-0.076***
	(-0.197)	(-0.167)	(-0.208)	(-0.163)	(-0.181)	(-0.254)	(-0.228)	(-0.197)
X*Lag dependent variable		-0.065*		-0.262***	-0.070***	0.09	-0.117***	-0.061***
		(-0.035)		(-0.065)	(-0.023)	(-0.118)	(-0.106)	(-0.056)

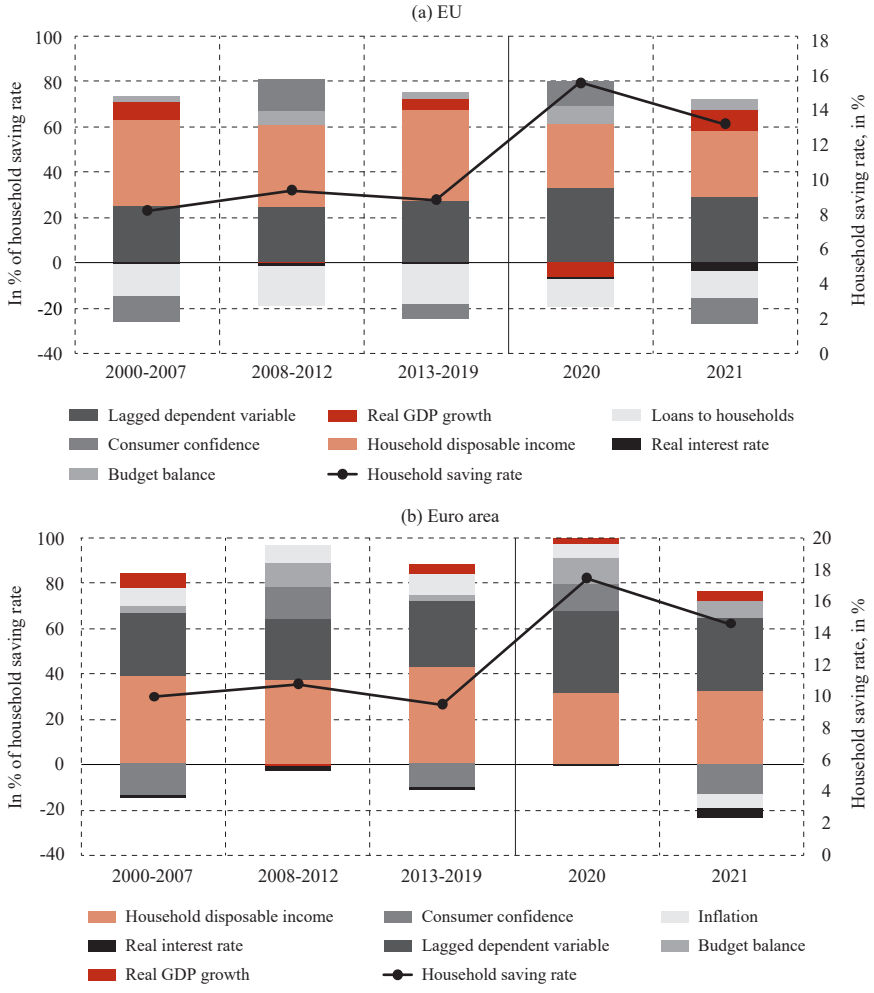
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline	**X=2020**	**X=2021**	**X=2020-2021**	**X=2008-2010**	**X=EA**	**X=CEE**	**X=Croatia**
X*Disposable household income		0.004	0.024	0.0547***	-0.053***	0.023***	0.006	0.065
		(-0.024)	(-0.027)	(-0.021)	(-0.008)	(-0.026)	(-0.020)	(-0.009)
X*Real growth of GDP		0.132	0.008	-0.225	-0.162**	0.059***	-0.005	-0.005
		(-0.225)	(-0.216)	(-0.204)	(-0.082)	(-0.092)	(-0.104)	(-0.044)
X*Terms of trade index		0.365	-0.119	-0.014	0.095***	0.132	-0.077	0.067***
		(-0.209)	(-0.111)	(-0.083)	(-0.033)	(-0.083)	(-0.060)	(-0.030)
X*Age dependency		-0.078	-0.115	-0.072	0.186***	-0.112	0.182**	0.164***
		(-0.072)	(-0.061)	(-0.063)	(-0.043)	(-0.116)	(-0.081)	(-0.048)
X*Real interest rate		0.079	-0.072	0.217	-0.218***	-0.028	0.353***	0.028***
		(-0.451)	(-0.257)	(-0.273)	(-0.076)	(-0.143)	(-0.129)	(-0.063)
X*Loans to households		0.016	0.001	-0.024	0.006	-0.045	0.045	-0.078
		(-0.037)	(-0.024)	(-0.027)	(-0.008)	(-0.047)	(-0.037)	(-0.019)
X*Budget balance		-0.305***	0.149	-0.017***	-0.133***	0.134	0.031	-0.037
		(-0.174)	(-0.149)	(-0.143)	(-0.076)	(-0.099)	(-0.090)	(-0.062)
X*Inflation		-0.061	-0.006***	-0.064***	0.001	0.036	-0.046***	-0.055***
		(-0.076)	(-0.084)	(-0.056)	(-0.033)	(-0.025)	(-0.026)	(-0.011)
X*Consumer confidence		-0.075***	0.014	-0.017***	-0.080***	-0.082	-0.043***	-0.049***
		(-0.094)	(-0.074)	(-0.057)	(-0.023)	(-0.037)	(-0.038)	(-0.097)
Observations	509	509	509	509	509	509	509	509
AR(1) *p*-val	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) *p*-val	0.354	0.405	0.400	0.364	0.231	0.325	0.398	0.351
Sargan *p*-val	0.436	0.447	0.277	0.362	0.370	0.309	0.350	0.320

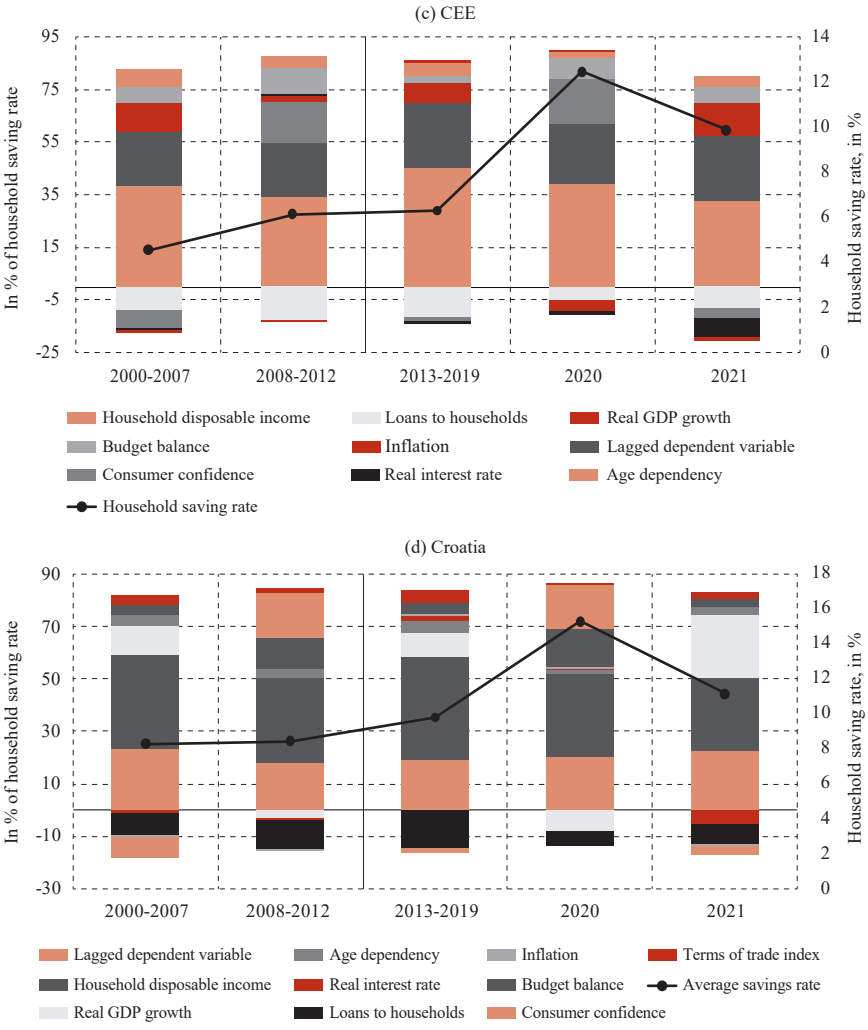
*Notes: Standard errors in parentheses are corrected for heteroskedasticity and autocorrelation of error effects. These estimations include the Windmeijer's correction of the covariance matrix. All estimates include a constant effect. ***, **, * next to the coefficients indicate a 1, 5 and 10% significance level. The lagged dependent variable (i.e., household saving rate) refers to the lagged rate by one time period (year). Coefficients of log-transformed variables (household disposable income, terms of trade index, inflation and consumer confidence) have already been divided by 100.*

Figure 3 shows the contributions to the fitted values of significant variables in the preferred specifications for the household saving rate of EU (table 3, column 6), as well as for EA, CEE and Croatia (table 4, columns 6-8). One of the most notable changes that took place across time periods is consumer confidence, which contributed negatively during 2000-2007, 2013-2019 and 2021 but positively during the crisis periods of GFC and the first year of the breakout of a pandemic. Another interesting impact is the notion of the government's budget balance, whose increased spending contributed to supporting the savings.

FIGURE 3

Average contributions to the fitted values





Source: Author's calculations.

In summarising the findings, it is evident that the conventional determinants influencing household savings behaviours retain their significance and warrant careful consideration. However, an in-depth analysis reveals that certain variables, initially deemed negligible within the baseline model, like age dependency, the terms of trade index, and inflation, may play roles different than previously thought. By dissecting income into its permanent and temporary components and scrutinising various age demographics within the dependency ratios, subtle yet potentially impactful factors emerge. Although statistically subtle, the influence of prime savers and the old-age dependency ratio may significantly affect savings trends. This shows the complexity of savings determinants, suggesting that even insignificant variables can have underlying influences worthy of further exploration. Beyond these conventional factors, consumer confidence has emerged as a crucial element, underscoring

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its substantial impact on savings behaviours. Moreover, it highlights the importance of psychological and behavioural factors in shaping savings decisions, adding a rich layer of complexity to the traditional economic perspective on savings. This comprehensive view encourages a broader consideration of both established and emerging factors in understanding and influencing household savings habits.

5 FINAL COMMENTS

The paper analyses the household savings drivers in EU countries. The determinants of savings are defined according to economic theory and available empirical research. Thus, the main factors of savings can be divided into income variables, demographic variables, financial variables, and variables of fiscal policy and macroeconomic uncertainty. Alongside these conventional variables, consumer confidence enters the baseline model as a less traditional determinant.

The paper uses annual panel data from 2000 to 2021, thus covering two periods of prominent structural changes that took place (GFC and the recent breakout of Covid-19). The household saving rate is regressed on its lagged value, dummies and several key macroeconomic variables. To add to the robustness check, the analyses are carried out using Arellano-Bond GMM estimation, LSDV estimation and bias-corrected LSDV estimation. However, the results are, in almost all cases, quite similar across the three performed estimation methods.

The baseline analysis includes a selection of important determinants that have been repeatedly found in empirical research and are relevant to consumption theory in order to identify a wide range of factors influencing household savings behaviour. This initial model finds statistically significant effects on the household savings rate for seven of the nine theoretically informed variables. It emphasises how the real GDP growth rate, real household disposable income, and lagged savings rate all favourably impact savings. These conclusions are consistent with the larger empirical storyline supported by studies such as those by Edwards (1996) and Corbo and Schmidt-Hebbel (1991), who also emphasised the importance of income and economic growth factors. On the other hand, household loans, government budget balance, and consumer confidence are seen to detract from savings accumulation, a dynamic reflected in the cautious saving behaviours during uncertain times noted by Vanlaer, Bielen and Marneffe (2020).

As against the widely held assumption that real interest rates have little effect on savings, as Bandiera et al. (2000) and Baillu and Reisen (1998) proposed, this study shows a substantial beneficial effect. This result suggests a reevaluation of the real interest rate's impact on household savings and is consistent with the more positive results noted by Niculescu-Aron and Mihaescu (2012), Grigoli, Herman and Schmidt-Hebbel (2014), and Kukk and Staehr (2015).

The terms of trade index, which is a variable expected to have a significant positive influence based on much of the existing literature, did not exhibit

notable effects in this model. This presented a departure from expectations raised by studies such as those by Hernando et al. (2018) and Oinonen and Viren (2022). Age dependency is often expected to have a detrimental effect on savings but, this study found no significant impact, opposing earlier findings by Masson, Bayoumi and Samiei (1995), Edwards (1996), and Schrooten and Stephan (2005). These results support the viewpoints of Rocher and Stierle (2015), which point to a more complex interaction between age dependency and savings than previously thought.

The extended empirical analysis looked at twenty-four more variables and broke down the concepts of age dependency and trade index into more detailed components. Adding to the many specifications of the baseline model, this thorough sensitivity analysis examined variables individually. Reminiscent of results by Corbo and Schmidt-Hebbel (1991) and Loayza, Schmidt-Hebbel and Servén (2000a; 2000b), the different effects of permanent and temporary income components, in line with the permanent income hypothesis (PIH) and life cycle hypothesis (LCH), provide insights into savings dynamics. Personal remittances boost savings, reflecting their temporary nature, a phenomenon supported by Rocher and Stierle (2015), whereas tourism revenues, often seen as stable, lead to higher consumption. Additionally, in line with their findings, the "wealth effect" is clearly visible in the negative correlation between household wealth, home ownership and savings. Savings as preventive measures are usually increased by the unemployment rate and GDP volatility, but, as Grigoli, Herman and Schmidt-Hebbel (2014) found, an increase in real oil prices dampens savings because of higher living expenses. Market capitalization and the Chinn-Ito index, which measure financial development and international integration, increase investment opportunities and so enrich savings. Reflecting the complex dynamics investigated in the studies by Masson, Bayoumi and Samiei (1995) and Edwards (1996), this overview emphasizes the intricate interaction of economic conditions, demographic trends, and fiscal policies affecting savings.

The study unveiled distinct savings behaviour patterns across different EU regions and during periods of economic turmoil (GFC and Covid-19). Consumer confidence and the government budget balance became more prominent savings drivers during the financial and pandemic crises. On the other hand, the impact of savings persistence, disposable income and real interest rates declined. Economic stability was indicated by a stronger correlation between income, GDP growth, and savings in EA countries. Conversely, the CEE region demonstrated a flexible stance towards savings that was significantly impacted by fluctuations in real interest rates; this indicates that the influence of less developed financial markets was perceived. Like the CEE countries, Croatia demonstrated a heightened vulnerability to economic uncertainties, including inflation and consumer confidence. This vulnerability was further intensified by the nation's economy being predominantly dependent on tourism.

The findings show the resilience and adaptability of household saving behaviours in response to varying economic climates. It also highlights key areas for policy intervention and household financial planning. The impact of disposable income and GDP growth on savings highlights the potential of pro-growth and income-enhancing policies, such as labour market improvements and wage growth support, to boost savings rates. Financial advisors could use these insights to offer products that align with savers' needs, recognising the positive influence of real interest rates on savings by potentially offering more attractive rates on savings accounts. The study also suggests that consumer confidence affects saving behaviours, indicating a demand for financial products that ensure security, especially during economic downturns. The research underscores the need to adjust saving strategies based on economic conditions, emphasising the importance of saving during growth and downturns to build financial resilience for the general population.

Although this research makes significant contributions to the understanding of the factors that influence household savings throughout the EU, it is crucial to acknowledge certain constraints. To begin with, while the analysis is exhaustive, it may obscure more subtle economic fluctuations that can potentially influence savings behaviour. Another potential limitation is the presumption that the determinants of savings are uniform throughout various EU regions. This may lead to a failure to consider unique cultural or economic elements that are prevalent in specific countries.

There is still more room for additional research, even though this study aims to analyse persistent differences in household saving rates among EU nations. Future research could address the earlier limitations by incorporating more high-frequency data to capture short-term economic dynamics. Furthermore, using machine learning methods to find non-linear correlations between variables might yield important information. Knowledge of household financial behaviour may also be enhanced by looking into the influence of individual psychological factors and cultural variations in saving decisions. Moreover, the conduct of long-term studies would make it possible to examine how economic policies affect savings rates over time, giving more information about successful policy changes. Future studies may expand on the results of this study to provide a more sophisticated understanding of household savings behaviour, guiding more focused and successful economic and financial policies by addressing these limitations and investigating the suggested areas.

Disclosure statement

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APPENDIX

TABLE A1

Descriptive statistics, definitions and sources of variables

Category	Variable	Description	No. of observations	Mean	St. dev.	Min	Max	Main source for variable construction
Dependent variable	Household saving rate	Household saving to disposable income adjusted for pension funds	572	9.1	6.6	-20.7	25.2	Eurostat; estimate for Croatia
Income	Household disposable income	Real household disposable income (in PPS) per capita	572	17,724.5	6,128.5	4,137.8	35,607.4	Eurostat; estimate for Croatia
	Real GDP growth	Real GDP per capita growth rate	572	2.2	3.6	-13.8	18.2	Eurostat
	Terms of trade	Terms of trade index	572	98.6	5.3	64.4	113.8	Ameco
	Gini index	Index of the distribution of income across a population	504	29.7	4.1	20.9	40.8	Eurostat
	Tourism	Contribution of tourism to the GDP (% of GDP)	572	9.9	4.5	1.2	25.0	WTTC
	Remittances	Personal remittances from abroad (% of GDP)	520	1.3	1.4	0.1	8.2	World Bank
	Pension	Net equity changes in pension fund reserves	572	1.0	1.3	-0.3	5.0	Eurostat
Wealth	Household wealth	Net household wealth (% of GDP)	571	106.0	58.9	20.4	325.0	Eurostat; calculations
	Home ownership	Percentage of population owning a home	425	75.7	10.6	49.5	97.6	Eurostat
Rate of return	Real interest rate	Real short term interest rate on deposits adjusted with GDP deflator	561	-0.3	2.8	-9.5	25.2	Ameco
	Bond yield	The yield spread of the government bond and 10-year German bond	551	1.3	1.9	-4.0	21.0	Eurostat; calculations
Uncertainty	Inflation	Deviation of inflation in relation to the historical average	572	100.0	9.8	79.6	132.8	Eurostat; calculations
	Unemployment rate	Unemployment rate in % of the total labour force; ILO	572	8.6	4.4	1.8	27.5	World Bank
	GDP volatility	Volatility of real GDP growth using the GARCH method	569	0.0	1.0	-3.7	3.1	Eurostat; calculations
	Real oil price	The real price of oil as a proxy of global events	572	78.8	31.8	37.2	136.6	EIA
	Consumer confidence	Deviation of consumer confidence in relation to the historical average	572	98.2	16.4	70.0	125.2	DG ECFIN survey; calculations

Category	Variable	Description	No. of observations	Mean	St. dev.	Min	Max	Main source for variable construction
Financial liberalization	Loans to households	Share of domestic credit to households (% of GDP)	572	49.2	29.2	0.9	141.6	Eurostat
	Flow of credit to households	Household loans based on transactions (% of GDP)	572	2.7	3.3	-5.9	18.3	Eurostat
	Market capitalization	Share of market capitalization (% of GDP)	572	49.9	43.6	0.6	326.4	World Bank, World Foreign Exchanges
International financial integration	Capital account balance	Capital account balance (% of GDP)	544	-0.8	5.6	-23.9	14.4	World Bank
	Chinn-Ito index	A measure of financial openness	569	0.9	0.2	0.2	1.0	Portland State University[1]
	Quinn index	Capital account openness index	520	0.1	0.2	0.0	1.0	Columbia University[2]
Demographics	Young-age dependency ratio	Share of young people aged 15-24 relative to working population (a)	569	12.2	1.7	8.8	17.1	Eurostat; calculations
	Old-age dependency ratio	Share of +65 aged relative to working population (b)	572	31.5	5.2	10.8	44.7	Eurostat; calculations
	Prime savers	Share of the population aged 45-54 in relation to the total population	572	26.2	2.1	20.7	30.5	Eurostat; calculations
	Age dependency	a+b	572	64.4	5.8	52.3	80.4	Eurostat
	Participation of +65	Share of the population over 65 years of age that is in labour market	559	5.6	4.0	0.9	34.1	Eurostat; calculations
	Life expectancy	Life expectancy at 65 years of age	565	15.4	6.0	2.0	22.0	Eurostat
	Urbanization rate	Share of the population living in urban areas of the country	572	71.8	12.2	50.8	98.1	World Bank
Fiscal policy	Budget balance	Government surplus/deficit (% of GDP)	572	-2.6	3.6	-32.1	6.9	Eurostat
	Public saving	Public savings (% of GDP)	571	1.6	3.2	-10.0	10.4	Eurostat
	Public debt	Consolidated gross government debt (% of GDP)	570	58.9	35.9	3.8	206.3	Eurostat
	Welfare	Government expenditures for social protection, education and health (% of GDP)	526	27.8	5.4	16.6	41.8	Eurostat; calculations
	Public health expenditure	Government expenditures for healthcare (% of GDP)	526	6.2	1.3	3.2	10.1	Eurostat
	Public education expenditure	Government expenditures for education (% of GDP)	526	5.1	1.0	2.8	7.1	Eurostat
	Social protection	Government expenditures for social protection (% of GDP)	565	17.0	4.4	7.9	28.6	Eurostat

[1] *Chinn and Ito (2006).*

[2] *Fernandez et al. (2016).*