

E-Commerce, Financial Infrastructure, and Responsible Consumption: Empirical Evidence from European Households

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Abstract

This study examines the effects of e-commerce live marketing, financial infrastructure, income, and education on household online purchasing behavior in selected European economies from 2005 to 2020. Consistent with the title, responsible consumption is treated as a policy-relevant interpretation of household purchasing behavior in digital markets rather than as a direct psychological diagnosis. The analysis distinguishes between urban household purchasing behavior and towns/suburbs household purchasing behavior. Using panel data for 12 European economies, the study applies OLS, 2SLS, and dynamic panel GMM estimators. E-commerce live marketing is operationalized through internet purchases by individuals. The results show that e-commerce live marketing has a positive and statistically significant effect on both urban and towns/suburbs household purchasing behavior across all estimation methods. Financial infrastructure also has a positive and significant effect in all models. Income positively affects urban household purchasing behavior, while its effect on towns/suburbs household purchasing behavior is significant only in the OLS specification. Education generally supports household purchasing behavior, particularly in the 2SLS and GMM models. The findings suggest that e-commerce activity, financial access infrastructure, income, and education are important drivers of digital household consumption and can inform policies aimed at inclusive and responsible consumption in European economies.

Keywords: E-commerce, Financial infrastructure, Responsible consumption, Household purchasing behavior, Consumer behavior, Europe.

JEL Classification: D12, L81, M31, O33

Article history: Received: January 2026; Accepted: May 2026; Published: October 2026

1 INTRODUCTION

E-commerce live marketing in this study refers to digitally mediated purchasing activity through online channels, operationalized by internet purchases by individuals. The term is therefore used in a broad e-commerce sense rather than as a narrow measure of livestream shopping. Online purchasing requires access to digital devices, internet connectivity, and reliable payment channels (Niranjanamurthy et al., 2013). The advancement of the internet, digital selling platforms, and electronic purchasing methods has strengthened e-retail activity across economies (Zheng, Li, & Na, 2022). However, access to online channels may remain constrained when information diffusion, payment infrastructure, consumer trust, and digital skills are limited (Parvin et al., 2017). A clear description of products, reliable platform links, reasonable loading time, procurement dependability, and easy navigation are therefore important for improving online shopping experience (Pal et al., 2021). Local-language interfaces can further improve customer reach (Stubbs, 2014), while online consumers are often more educated, digitally skilled, and frequent users of the internet (Rose et al., 2011). Several factors can influence consumers' final online purchasing decisions, including trust, perceived risk, information quality, and problem recognition (Meskaran et al., 2013).

E-commerce has altered consumer behavior because it changes how households search for information, compare products, make payments, and complete purchases. In this study, responsible consumption is understood as household purchasing behavior shaped by digital access, financial infrastructure, income, and education. The Theory of Planned Behavior suggests that behavior is influenced by attitudes, perceived social norms, and perceived behavioral control (Ajzen, 1991). In the present context, e-commerce activity captures the digital opportunity to purchase, financial infrastructure captures the payment and access environment, income reflects purchasing capacity, and education reflects the capability to use online information more effectively. Consumer behavior is also affected by internal and external factors, including demographics, socioeconomic conditions, knowledge, public policy, values, marketing stimuli, and relationship-based motives (Rajagopal, 2025; Sheth & Parvatiyar, 1995; Wagner, 2002).

Although online and offline shopping are similar in some respects, they differ in convenience, search costs, product inspection, and transaction experience. Online shopping allows consumers to purchase goods and services from home with greater ease (Pham & Sun, 2020), whereas offline shopping provides physical product inspection and real-time experience (Rita et al.,

2019). Offline social interaction can also affect online shopping demand, showing that consumer behavior is shaped by both digital and physical environments (Kim et al., 2019). Retailers in both channels attempt to improve consumer experience through better service quality. Offline retailers improve parking, billing facilities, and store accessibility, while online platforms use 3D techniques, live videos, detailed product descriptions, and user reviews to improve the consumer decision process (Lee et al., 2019).

One of the major causes behind the popularity of e-commerce live marketing is the convenient and time-saving shopping experience it provides (Kumar et al., 2022). E-commerce allows households to shop at any time and from any place, reducing travel time, transport costs, and waiting time associated with physical stores (Sarkar & Das, 2017). E-commerce also reduces reliance on face-to-face salesperson interaction, although consumers differ in the extent to which they desire salesperson contact during e-shopping (Lee, 2017). At the same time, easier access to online products can increase unplanned purchasing, which makes the responsible consumption dimension important for policy and consumer welfare.

Drawing on cognitive emotion theory and the emotion-action tendency framework, Cuong (2024) showed that sales promotions, hedonic shopping motivation, and personalization can positively influence consumers' emotions, which subsequently shape purchase intention and behavior. Among these factors, sales promotion appears to be a strong determinant of positive emotions, confirming that emotional engagement is one channel through which e-commerce platforms stimulate purchasing activity. Beyond emotions, trust and perceived risk remain central determinants of online decision-making. Handoyo (2024) showed that perceived risk moderates the relationship between trust and purchasing behavior, indicating that online retailers must reduce uncertainty and transactional risk.

Supporting these findings, Ingriana (2024) reviewed the e-trust literature and showed that trust can reduce perceived risk, enhance perceived value, and strengthen online purchase intention. Secure website design, reliable user reviews, security certifications, and transparent communication are important trust-building mechanisms. Online reviews and information quality also influence consumer behavior across different stages of the e-commerce decision process. Pu et al. (2026) showed that product ratings and review volume increase consumers' likelihood of clicking on products, while review information quality becomes particularly influential at the purchase stage.

Technological development has significantly improved the shopping experience of online customers. Firms increasingly use digital technologies, including virtual reality and interactive platforms, to improve product presentation and customer engagement (Tokar et al., 2021). Digital technologies also improve the availability and presentation of online product information, which can shape consumers' purchase decisions (Yu et al., 2020). Secure online payment systems are also important because they reduce transaction frictions and increase consumer confidence. Given the rise of e-commerce live marketing and its potential influence on household purchasing behavior, this study examines whether e-commerce activity, financial infrastructure, income, and education shape household purchasing behavior in selected European economies. The proposed research model is presented in Figure 1 and is informed by the Theory of Planned Behavior (Ajzen, 1991).

This study contributes to the literature in three ways. First, it links e-commerce activity with household purchasing behavior in European economies using a country-level panel framework. Second, it distinguishes between urban households and households in towns and suburbs, allowing the analysis to capture differences across settlement types. Third, it examines the role of financial infrastructure, income, and education as enabling conditions for digital household consumption, thereby connecting e-commerce behavior with the broader policy discussion on responsible consumption.

Hypothesis H1a: E-commerce live marketing (LM) is positively related to urban household purchasing behavior (UHP).

Hypothesis H1b: E-commerce live marketing (LM) is positively related to towns and suburbs household purchasing behavior (TSHP).

Hypothesis H2a: Financial infrastructure is positively related to UHP.

Hypothesis H2b: Financial infrastructure is positively related to TSHP.

Hypothesis H3a: Income has a positive influence on UHP.

Hypothesis H3b: Income has a positive influence on TSHP.

Hypothesis H4a: Education has a positive influence on UHP.

Hypothesis H4b: Education has a positive influence on TSHP.

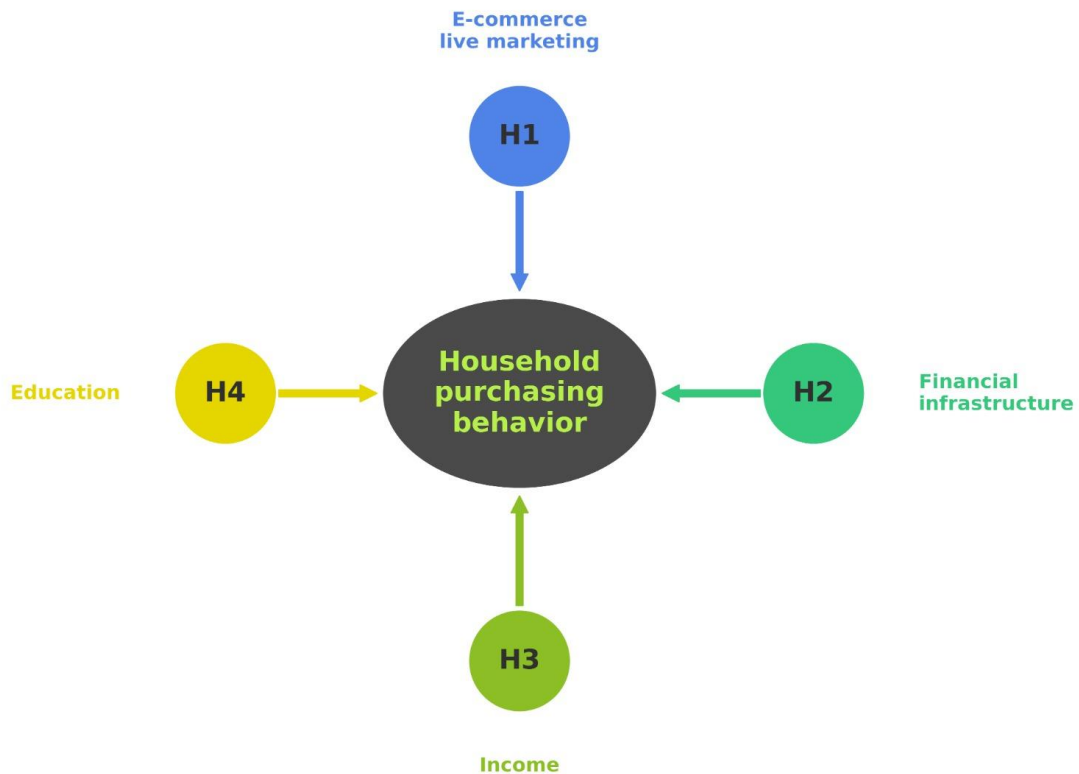


Fig. 1 – Proposed research model. Source: authors' illustration

Therefore, this study investigates the impact of e-commerce live marketing on household purchasing behavior in Europe. The European region is an appropriate setting because digital commerce and financial infrastructure are well developed, while purchasing behavior still varies across urban, town, and suburban areas. The study uses OLS, two-stage least squares (2SLS), and generalized method of moments (GMM) estimators to examine the robustness of the relationship between e-commerce activity, financial infrastructure, income, education, and household purchasing behavior.

2 MODEL, METHODOLOGY AND DATA

From the theoretical framework (Koyuncu & Lien, 2003; Hernández et al., 2010), we calculate the following econometric model with financial infrastructure, income, and education serving as control variables:

$$CPB_it = \varphi_0 + \varphi_1 LM_it + \varphi_2 DF_it + \varphi_3 Income_it + \varphi_4 Education_it + \alpha_i + \varepsilon_it \quad (1)$$

Where CPB_it represents household purchasing behavior, estimated separately as urban household purchasing behavior (UHP) and towns/suburbs household purchasing behavior (TSHP). LM_it denotes e-commerce live marketing, operationalized through internet purchases by individuals. DF_it denotes financial infrastructure, Income_it denotes income level, and Education_it refers to educational attainment in country i and year t. The term μ_i represents economy-specific effects that control for time-invariant cross-country differences, while ε_{it} is the random error term. The key aim is to estimate the association between e-commerce activity, financial infrastructure, income, education, and household purchasing behavior in European economies.

This study uses OLS, 2SLS, and GMM estimation techniques. OLS provides baseline estimates of the relationship between e-commerce activity and household purchasing behavior. However, OLS may be affected by endogeneity arising from omitted variables, simultaneity, or measurement error (Semadeni et al., 2014). Therefore, 2SLS is used as a robustness estimator to address potential endogeneity. In the 2SLS specification, potentially endogenous regressors are instrumented using their lagged values, and the Sargan test is used to assess the validity of the instruments. This approach helps determine whether the estimated relationship remains stable after accounting for possible reverse causality and omitted-variable bias.

Additionally, this study employs the GMM estimator for dynamic panel analysis. The method developed by Arellano and Bond (1991) and extended by Blundell and Bond (1998) is appropriate when the dependent variable is persistent and when regressors may be endogenous. Although the panel has a moderate time dimension, GMM is used as a robustness estimator to control for unobserved heterogeneity, dynamic persistence, and potential endogeneity in household purchasing behavior. The model includes lagged values of the dependent variable as explanatory variables and uses internal instruments derived from the model structure (Roodman, 2009). Using these three estimators allows the analysis to compare baseline associations, endogeneity-adjusted estimates, and dynamic panel estimates, thereby improving confidence in the robustness of the findings.

$$CPB_{it} = \varphi_0 + \lambda_1 CPB_{i,t-1} + \varphi_1 LM_{it} + \varphi_2 DF_{it} + \varphi_3 Income_{it} + \varphi_4 Education_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

To ensure reliable GMM estimation results, two key diagnostic conditions are assessed. First, the Arellano-Bond AR(2) test is used to examine whether second-order serial correlation is absent in the differenced residuals. Second, the Sargan test is used to evaluate the validity of

the instruments. Failure to reject these tests supports the reliability of the dynamic panel estimates.

To examine the impact of e-commerce live marketing on household purchasing behavior, data are collected for Belgium, Germany, Spain, France, Italy, the Netherlands, Austria, Poland, Sweden, the United Kingdom, Denmark, and Norway over the period 2005-2020. The sample is selected based on data availability. These countries provide a balanced panel with consistent information on household online purchasing behavior, financial infrastructure, income, and education over the study period. The sample therefore allows a comparable cross-country assessment of digital household purchasing behavior in Europe.

The information about data sources, symbols, and variable definitions is provided in Table 1. Urban household purchasing behavior, towns/suburbs household purchasing behavior, and internet purchases by individuals were obtained from Eurostat's ICT usage in households and by individuals database (Eurostat, 2024a, 2024b). Financial infrastructure, measured by ATMs per 100,000 adults, was obtained from the World Bank Global Financial Development Database (World Bank, 2022). GDP per capita at constant 2015 US dollars and secondary-school enrollment were obtained from the World Development Indicators (World Bank, 2025).

Tab. 1 – Definitions and data sources. Source: authors' compilation

Variables	Symbol	Definitions	Sources
Urban household purchasing behavior	UHP	Urban household goods purchases (% of individuals)	Eurostat
Towns and suburbs household purchasing behavior	TSHP	Towns and suburbs household goods purchases (% of individuals)	Eurostat
E-commerce live marketing	LM	Internet purchases by individuals	Eurostat
Financial Infrastructure	DF	ATMs per 100,000 adults	GFDD
GDP per capita	Income	GDP per capita (constant 2015 US\$)	World Bank
Education	Education	School enrollment, secondary (% gross)	World Bank

3 EMPIRICAL ANALYSIS

3.1 Descriptive results

Table 2 reports the descriptive statistics for the variables used in this study, including UHP, TSHP, LM, DF, Income, and Education. The average values of all variables are positive. The mean value of UHP is 20.67, with a maximum of 62.00 and a minimum of 0.000. The mean value of TSHP is 19.45, with a maximum of 63.00 and a minimum of 1.000. The mean value of LM is 4.356, while the mean values of DF, income, and education are 4.376, 10.55, and 4.743, respectively. The Jarque-Bera probabilities indicate that the null hypothesis of normality is rejected for the variables, suggesting non-normal distributional features. This supports the use of robust estimation approaches. Table 3 reports the VIF results, and all VIF values are below 10, indicating that severe multicollinearity is not a concern in the estimated models.

Tab. 2 – Descriptive statistics. Source: authors' calculations

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
UHP	20.67	19.00	62.00	0.000	13.58	0.607	2.686	12.57	0.002
TSHP	19.45	18.00	63.00	1.000	13.37	0.776	3.139	19.41	0.000
LM	4.356	4.428	4.585	3.555	0.213	-1.503	4.927	102.0	0.000
DF	4.376	4.511	5.228	3.317	0.461	-0.376	2.102	10.97	0.004
Income	10.55	10.65	11.23	9.056	0.443	-1.440	5.440	113.9	0.000
Education	4.743	4.717	5.099	4.517	0.149	0.835	2.770	22.72	0.000

Tab. 3 – Variance inflation factor (VIF) results. Source: authors' calculations

	UHP		TSHP	
Variable	VIF	1/VIF	VIF	1/VIF
LM	1.660	0.603	1.660	0.603
DF	1.090	0.914	1.090	0.914
Income	1.560	0.640	1.560	0.640
Education	1.170	0.853	1.170	0.853
Mean VIF	1.370		1.370	

3.2 Empirical results

Table 4 reports the results for urban household purchasing behavior (UHP) using OLS, 2SLS, and GMM. The coefficient of LM is positive and statistically significant in all three models, supporting H1a. This indicates that higher e-commerce live marketing activity is associated with stronger urban household purchasing behavior in the sample economies. A one-unit increase in log e-commerce activity is associated with a 2.379 percentage-point increase in UHP in the OLS model, a 1.557 percentage-point increase in the 2SLS model, and a 2.154 percentage-point increase in the GMM model. The coefficients of DF are also positive and significant across the three models, supporting H2a and suggesting that financial infrastructure facilitates online purchasing by making payment and transaction processes easier. Income has a positive and significant effect on UHP in all specifications, supporting H3a. Education is positive and significant in the 2SLS and GMM models, supporting H4a in the more robust specifications, although it is not statistically significant in the OLS model. Overall, the findings suggest that e-commerce activity, financial infrastructure, income, and education contribute to urban household purchasing behavior.

Tab. 4 – Urban household purchasing behavior estimates (OLS, 2SLS, and GMM). Source: authors' calculations

	OLS		2SLS		GMM	
	Coef.	t-stat	Coef.	z-stat	Coef.	z-stat
L1.UHP					0.885***	7.758
LM	2.379***	11.50	1.557***	3.654	2.154**	2.132
DF	2.093***	7.750	1.899***	7.254	1.354**	1.988
Income	2.769***	5.265	2.099**	2.352	1.945*	1.759
Education	1.759	0.958	1.752***	4.325	1.956***	2.865
C	6.948***	6.255	5.248***	3.655	2.325*	1.891
R-squared	0.245					
Sargan test			0.129		0.157	
AR(2)					0.178	
Number of Country	12		12		12	

Note: *** p < 0.01; ** p < 0.05; * p < 0.10. Sargan and AR(2) entries are reported as p-values.

Table 5 reports the results for towns and suburbs household purchasing behavior (TSHP) using OLS, 2SLS, and GMM. The LM coefficients are positive and statistically significant in all three models, supporting H1b and indicating that e-commerce live marketing activity is associated with higher purchasing behavior among households in towns and suburbs. A one-unit increase in log e-commerce activity is associated with a 1.769 percentage-point increase in TSHP in the OLS model, a 1.335 percentage-point increase in the 2SLS model, and a 1.840 percentage-point increase in the GMM model. The DF coefficients are also positive and significant across all models, supporting H2b and confirming the importance of financial infrastructure for household purchasing behavior. Income is positive and significant only in the OLS model, so H3b receives limited support. Education is positive and significant across all three models, supporting H4b. These results show that e-commerce activity, financial infrastructure, and education are consistent determinants of towns and suburbs household purchasing behavior, while the role of income is less robust across estimation methods.

Tab. 5 – Towns and suburbs household purchasing behavior estimates (OLS, 2SLS, and GMM).

Source: authors' calculations

	OLS		2SLS		GMM	
	Coef.	t-stat	Coef.	z-stat	Coef.	z-stat
L1.TSHP					0.912***	3.518
LM	1.769***	11.20	1.335***	3.230	1.840*	1.690
DF	2.014***	4.587	1.825***	7.060	1.555**	2.150
Income	1.359***	3.654	1.655	1.380	1.749	1.300
Education	1.417***	5.325	1.855***	3.710	1.889**	2.450
C	6.175***	6.356	5.320***	6.018	3.340**	2.060
R-squared	0.278					
Sargan test			0.178		0.201	
AR(2)					0.234	
Number of Country	12		12		12	

Note: *** p < 0.01; ** p < 0.05; * p < 0.10. Sargan and AR(2) entries are reported as p-values.

3.3 Results discussion

The study's main findings indicate that e-commerce live marketing is positively associated with household purchasing behavior in European economies. This result is consistent with the view that e-commerce creates a link between digital platforms and consumers, lowers search and transaction costs, and increases the convenience of purchasing. Online shopping attitudes and digital communication have been shown to influence consumer buying decisions (Huseynov & Yıldırım, 2016; Samson, Mehta, & Chandani, 2014; Teo, 2002). The rapid growth of live e-commerce has also been associated with impulsive purchasing behavior in prior studies (B. Chen et al., 2022; Zhang et al., 2022). In the context of this study, the findings should be interpreted as evidence that e-commerce activity expands household purchasing participation, not as direct evidence of irrational or compulsive buying.

The findings also align with consumer behavior theory. E-commerce can affect purchasing behavior by shaping attitudes toward online transactions, perceived convenience, trust, and perceived behavioral control. Under the Theory of Planned Behavior, consumers are more likely to engage in a behavior when they perceive it as useful, socially acceptable, and easy to perform (Ajzen, 1991). Digital platforms reduce search costs and provide product information, while reviews and payment security can reduce perceived risk. These mechanisms help explain why e-commerce activity is positively related to both urban and towns/suburbs household purchasing behavior.

Financial infrastructure also plays an important role in household purchasing behavior. The digitalization of the financial sector involves the increasing use of digital technologies in financial products, services, communication, and transactions (Gomber et al., 2017). Financial infrastructure, such as ATMs and payment access, can reduce transaction frictions and improve consumers' ability to participate in e-commerce. Digital infrastructure has also been associated with household financial access and purchasing-related decisions (Lyons, Grable, & Zeng, 2017). From a responsible consumption perspective, the expansion of e-commerce should therefore be accompanied by consumer protection, financial literacy, secure payment systems, and transparent online information. Consumer empowerment in the digital economy is also important for sustainable purchasing decisions (Gazzola et al., 2017). Related studies on digital financial inclusion, financial efficiency, and infrastructure emphasize that financial and digital systems can shape broader sustainability outcomes (Chen, Rojniruttikul, Kun, & Ullah, 2022; Hafeez et al., 2022; Ozturk & Ullah, 2022). From a responsible consumption perspective, the

positive effect of e-commerce should not be interpreted simply as higher consumption being desirable. Instead, the result suggests that digital access expands household participation in online markets. Whether this participation supports responsible consumption depends on consumer protection, transparent product information, sustainable product choices, digital literacy, and secure payment systems.

4 CONCLUSION AND SUGGESTIONS

Information and communication technologies have transformed household consumption by making purchasing more digital, convenient, and information-intensive. Online transactions, digital payments, and e-commerce platforms have expanded the range of goods and services available to households. At the same time, easier access to online purchasing can increase unplanned consumption if consumers lack information, trust, financial literacy, or protection. Therefore, the relationship between e-commerce and responsible consumption should be understood carefully. E-commerce can support household welfare when it is accompanied by reliable financial infrastructure, transparent information, secure payment systems, and consumer education.

The empirical analysis uses OLS, 2SLS, and GMM estimators for 12 European economies over the period 2005-2020. The results show that e-commerce live marketing has a positive and significant effect on urban household purchasing behavior and towns/suburbs household purchasing behavior across all estimation methods. Financial infrastructure is also positive and significant in all models. Income positively affects urban household purchasing behavior, while its effect on towns/suburbs household purchasing behavior is significant only in the OLS model. Education generally supports household purchasing behavior, particularly in the 2SLS and GMM estimates. These findings suggest that e-commerce activity, financial infrastructure, income, and education are important factors shaping household purchasing behavior in European economies.

These results provide several policy implications. Policymakers should support secure, inclusive, and responsible e-commerce ecosystems by improving digital payment infrastructure, financial access, consumer protection, and digital literacy. Expanding e-commerce alone is not sufficient; households also need trustworthy platforms, transparent product information, secure payment channels, and the skills needed to make informed decisions. Financial infrastructure

can facilitate e-commerce participation, but it should be accompanied by policies that reduce fraud, protect consumers, and encourage responsible purchasing behavior.

The study has several limitations. First, the analysis uses country-level panel data, so it cannot directly measure individual psychological motives such as impulse buying, compulsive buying, or irrational purchasing. Second, e-commerce live marketing is proxied by internet purchases by individuals, which captures online purchasing activity but does not directly measure livestream marketing. Third, the study uses financial infrastructure, income, and education as control variables, while future research may include internet subscriptions, mobile phone use, financial inclusion, digital payment adoption, consumer protection indicators, and environmental awareness. Future studies may also use household-level survey data to examine whether e-commerce promotes responsible consumption or encourages excessive purchasing.

Funding: This study is supported by project PID2022-143254OB-I00, funded by the Spanish Ministry of Science and Innovation, and the European Union project 101157151.

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