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Persistence in Consumption Across Europe: Evidence Using Fractional Integration

This paper employs fractional integration methods to investigate the degree of persistence in consumption in a group of 33 European countries using data on annual final consumption expenditure of households and non-profit institutions serving households for the period 1960-2021. The results show no evidence of mean reversion in consumption levels over time, as all the series are fractionally integrated. This indicates very high levels of persistence. Special attention should be paid to several southern European countries, which present some of the highest degrees of integration. This suggests that shocks or changes in the consumption levels in these economies, whether positive or negative, tend to have a more enduring impact compared to other parts of Europe.

Understanding the dynamics of consumption behaviour is of paramount importance for policymakers, economists and researchers aiming to unravel the complexities of macroeconomic fluctuations and long-term economic growth. Consumption, as a key component of aggregate demand, not only reflects households' purchasing power but also plays a pivotal role in shaping the overall economic performance of a country or region. Exploring the persistence of consumption patterns becomes crucial in capturing the underlying dynamics and identifying potential drivers of economic fluctuations (Christiano et al., 2018; Sergi, 2020).

This article investigates the persistence of consumption across Europe, a region characterised by diverse socioeconomic conditions, cultural influences and policy frameworks. By employing fractional integration techniques, we aim to shed light on the long-memory properties of consumption behaviour, providing valuable insights into the dynamics of household spending over time.

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To achieve comprehensive coverage and comparative analysis, we examine a vast dataset encompassing 33 European countries. The countries under examination are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom as well as the European Union as a whole.

This extensive coverage enables us to capture a wide range of economic structures, cultural characteristics and policy environments, providing a rich empirical basis for investigating consumption persistence across the region. We can explore potential variations in consumption behaviour driven by country-specific factors, such as income levels, social preferences and institutional frameworks.

The concept of consumption is intrinsic to human nature. Since the beginning of commerce when goods were exchanged and valued, it has been emblematic of power and quality of life. Nowadays, it is no different. Purchasing power provides a reference in society and the economy, influencing policies (Workie et al., 2020). It is also related to savings: how much, how much more and how long the population can keep its earnings affect many other aspects of the market (Cox et al., 2019). Nationally, it is an important data point, but internationally it is also relevant because commerce and daily life are becoming more and

more global (Provornaya et al., 2020; Tacon, 2020; Xu et al., 2020).

The findings from our research carry significant implications for policymakers, as they provide insights into the durability and responsiveness of consumption patterns across Europe, and the effectiveness of policy interventions aimed at stimulating economic growth, addressing income inequality and fostering sustainable development (Rodrik, 2005; De Haan et al., 2006). Our goal is to understand possible future changes in consumption in Europe and whether there is persistence in the series under investigation.

Fractional integration

The utilisation of fractional integration, a statistical method that extends the traditional notion of stationarity, enables us to capture the inherent persistence embedded within consumption data. Traditional approaches assume that economic variables revert to a constant mean level, implying stationary behaviour. However, fractional integration accounts for the possibility of slowly decaying shocks and allows for more accurate modelling of long-term dependencies, common in economic time series data.

Fractional integration belongs to a broader class of long-memory models, so named because of the strong dependence between observations which are very distant in time. We say that a process is fractionally integrated or integrated of order d, and denoted as I(d), if it can be represented as:

$$(1 - B)^d x(t) = u(t), \qquad t = 0, \pm 1, \ldots, \qquad (1)$$

where B represents the backshift operator, i.e., Bx(t) = x(t-1) and with u(t) displaying a short memory or integrated of order 0 (I(0)) pattern described by:

$$\sum_{u=-\infty}^{u=\infty} | \gamma(u) | < \infty ,$$

where γ(u) refers to the autocovariance function of a stationary process, i.e. γ(u) = E[(x(t) - Ex(t)) (x(t+u) - Ex(t))]. In this context, the differencing parameter, d, becomes crucial since it indicates the degree of persistence or dependence in the data, as the higher its value is, the higher the level of association is between observations far apart in time. Moreover, it allows us to consider a large degree of flexibility in the dynamic specification of the model, including the specification of the following processes:

- anti-persistence, if d < 0
- short memory or I(0) behaviour, if d = 0
- covariance stationary long memory and mean reversion, if 0 < d < 0.5
- non stationarity though mean reverting processes, if 0.5 ≤ d < 1
- unit roots or I(1) processes, if d = 1
- I(d) processes, with d > 1.

Note that based on this specification in (1), if d < 1, it implies mean reversion while d ≥ 1 implies the lack of it. To see this, note that the polynomial on the left-hand side in Equation (1) can be expressed for any real value d in its Mc Laurin's form:

$$(1 - B)^d = \sum_{j=0}^{\infty} \binom{d}{j} (-1)^j B^j = 1 - dB + \frac{d(d-1)}{2} B^2 - \ldots,$$

and then, x(t) can be expressed in terms of both infinite autoregressive and moving average processes, in the latter case with the coefficients decaying hyperbolically to zero.

In the empirical application, the estimation is conducted via the Whittle function in the frequency domain, using a testing procedure developed by Robinson (1994) and widely used in empirical applications of the present model.

Data

The data used in this analysis refer to the final consumption expenditure of households and non-profit institutions serving households (NPISH), measured in current US dollars, sourced from the World Bank (2022). Households refer to groups of individuals living together and sharing a common residence, typically undertaking various economic and social activities as a collective unit. In the context of economics and demographics, households are fundamental units of analysis to understand consumption, savings, labour supply and other socio-economic behaviours.

Understanding households and their characteristics, such as income levels, expenditure patterns, demographic composition and socio-economic status, is important for policymakers, researchers and businesses in various fields, including economics, sociology, marketing and public policy.

NPISHs are entities that provide goods or services to households or communities. They are distinct from government organisations and for-profit businesses. Exam-

ples of NPISHs include non-governmental organisations (NGOs), charities, foundations, religious institutions, community centres and volunteer organisations. NPISHs play an important role in addressing social needs, promoting welfare and supporting community development.

Final consumption expenditure refers to the total spending by households on goods and services for their own use, encompassing various categories such as food, housing, transportation, healthcare, education and recreation. The expenditure is measured in US dollars and represents the value at current prices, meaning it is not adjusted for inflation or changes in purchasing power over time. The data provides an overview of household consumption patterns and expenditure trends across European Union countries, allowing for analysis of changes in consumer behaviour, economic growth and the overall well-being of households over the specified time period. The timeframe of the data collected stretches from 1960 to 2021. Some countries do not have data going back as far as 1960 and this is detailed in Table 1.

Results for consumption in Europe

The model examined is the following one:

$$\gamma_t = \beta_0 + \beta_1 t + x_t, \qquad (1 - L)^d x_t = u_t, \qquad t = 1, 2, \ldots$$

where γ_t refers to the observed time series; β_0 and β_1 are the coefficients corresponding respectively to the intercept and a linear time trend, and x_t is supposed to be I(d), where d is another parameter that is also estimated from the data; finally, u_t is a white noise process.

Table 2 shows the values of the differencing parameter, d, and their 95% confidence bands under the three classical assumptions in the unit root literature of: i) no deterministic terms, ii) an intercept and iii) an intercept with a linear time trend, with the selected model for each series presented in bold in the table. Table 3 reports the estimated coefficients for the selected specification for each series. The first thing we observe in this table is that the time trend is required in the majority of the cases. In fact, there are only five countries where the time trend coefficient is found to be statistically insignificant. These are Croatia, Greece, Hungary, Romania, Russia and Latvia. Focussing on the trend coefficient for the rest of the countries, the highest values are obtained for Spain (0.0394), followed by Cyprus (0.0365), Luxembourg (0.0365) and Portugal (0.0354).

All of the estimated values of d are high, implying high levels of persistence. In fact, all countries can be grouped into two categories: those where the unit root null hypothesis cannot be rejected (18) and those where this hypothesis is rejected in favour of d > 1 (16). Within the first group, there are four countries where the orders of integration are smaller than 1 (Serbia, 0.60; Bulgaria, 0.88; Slovenia, 0.93; Poland, 0.96); however, in the four countries the unit root null cannot be rejected. The same evidence of d = 1 is found in Czechia (1.05), Malta (1.11), Cyprus (1.14), Island (1.16), Lithuania (1.17), Romania (1.20), Russia (1.21), Hun-

Table 1
Descriptive statistics

Series	Start date	Max.	Min.	Mean	Std. dev.
Austria	1970	11.379	9.929	10.934	0.405
Belgium	1970	11.463	10.135	11.030	0.364
Bulgaria	1980	10.690	9.772	10.208	0.288
Croatia	1995	10.630	10.133	10.422	0.169
Cyprus	1975	10.269	8.600	9.699	0.493
Czechia	1990	11.107	10.151	10.751	0.297
Denmark	1966	11.259	9.840	10.760	0.423
Estonia	1993	10.253	9.369	9.857	0.305
Finland	1970	11.181	9.791	10.729	0.392
France	1960	12.203	10.552	11.625	0.519
Germany	1970	12.322	11.079	11.955	0.347
Greece	1960	11.380	9.506	10.634	0.568
Hungary	1991	10.944	10.281	10.674	0.226
Iceland	1970	10.121	8.500	9.563	0.425
Ireland	1970	11.125	9.486	10.511	0.491
Italy	1970	12.156	10.825	11.725	0.389
Latvia	1995	10.357	9.579	10.048	0.274
Lithuania	1995	10.588	9.701	10.235	0.292
Luxembourg	1970	10.413	8.837	9.828	0.449
Malta	1970	9.870	8.299	9.257	0.470
Netherlands	1969	11.638	10.260	11.197	0.388
Norway	1970	11.322	9.824	10.792	0.420
Poland	1995	11.583	10.926	11.320	0.218
Portugal	1970	11.242	9.727	10.72	0.445
Romania	1990	11.248	10.198	10.769	0.359
Russia	1988	12.086	11.021	11.593	0.330
Serbia	1995	10.619	9.721	10.367	0.223
Slovakia	1990	10.824	9.848	10.449	0.321
Slovenia	1990	10.499	9.851	10.242	0.209
Spain	1970	11.972	10.419	11.456	0.435
Sweden	1960	11.446	9.946	10.887	0.460
Switzerland	1970	11.602	10.133	11.127	0.398
UK	1960	12.297	10.735	11.680	0.533
EU	1970	12.952	11.612	12.524	0.381

Source: Authors' elaboration.

Table 2
Estimates of d under three different scenarios, logged series

Series	No terms	With an intercept	With a time trend
Austria	0.94 (0.76, 1.19)	1.33 (1.09, 1.66)	1.25 (1.07, 1.53)
Belgium	0.94 (0.76, 1.19)	1.40 (1.12, 1.80)	1.32 (1.09, 1.68)
Bulgaria	0.90 (0.70, 1.20)	0.90 (0.76, 1.13)	0.88 (0.71, 1.13)
Croatia	0.85 (0.56, 1.25)	1.30 (0.97, 1.86)	1.28 (0.98, 1.83)
Cyprus	0.93 (0.72, 1.20)	1.19 (0.93, 1.50)	1.14 (0.97, 1.40)
Czechia	0.86 (0.60, 1.22)	1.09 (0.84, 1.62)	1.05 (0.76, 1.72)
Denmark	0.94 (0.77, 1.18)	1.31 (1.08, 1.65)	1.26 (1.06, 1.59)
Estonia	0.86 (0.56, 1.24)	1.29 (0.93, 1.91)	1.25 (0.93, 1.87)
Finland	0.93 (0.76, 1.19)	1.37 (1.09, 1.82)	1.29 (1.06, 1.71)
France	0.94 (0.78, 1.17)	1.29 (1.09, 1.58)	1.24 (1.07, 1.51)
Germany	0.94 (0.76, 1.19)	1.32 (1.07, 1.67)	1.25 (1.05, 1.56)
Greece	0.94 (0.77, 1.17)	1.48 (1.28, 1.80)	1.43 (1.23, 1.75)
Hungary	0.88 (0.62, 1.24)	1.25 (0.90, 1.79)	1.23 (0.94, 1.72)
Iceland	0.95 (0.77, 1.20)	1.21 (0.84, 1.68)	1.16 (0.94, 1.56)
Ireland	0.93 (0.75, 1.19)	1.33 (1.04, 1.75)	1.25 (1.03, 1.62)
Italy	0.92 (0.75, 1.19)	1.24 (1.02, 1.61)	1.19 (1.02, 1.48)
Latvia	0.85 (0.55, 1.25)	1.35 (0.95, 2.07)	1.29 (0.96, 2.00)
Lithuania	0.85 (0.56, 1.25)	1.22 (0.83, 1.79)	1.17 (0.92, 1.66)
Luxembourg	0.94 (0.76, 1.19)	1.38 (1.06, 1.81)	1.29 (1.05, 1.68)
Malta	0.93 (0.75, 1.19)	1.17 (0.84, 1.51)	1.11 (0.93, 1.39)
Netherlands	0.94 (0.76, 1.19)	1.33 (1.09, 1.68)	1.26 (1.07, 1.58)
Norway	0.94 (0.76, 1.18)	1.35 (1.09, 1.76)	1.25 (1.07, 1.57)
Poland	0.86 (0.56, 1.25)	0.93 (0.68, 1.36)	0.96 (0.74, 1.30)
Portugal	0.94 (0.76, 1.19)	1.39 (1.12, 1.78)	1.31 (1.09, 1.67)
Romania	0.86 (0.60, 1.21)	1.20 (0.92, 1.68)	1.20 (0.84, 1.78)
Russia	0.87 (0.62, 1.21)	1.21 (0.98, 1.58)	1.21 (0.98, 1.58)
Serbia	0.86 (0.56, 1.26)	0.65 (0.46, 1.04)	0.60 (0.29, 1.04)
Slovakia	0.88 (0.62, 1.23)	1.38 (1.08, 1.34)	1.31 (1.06, 1.77)
Slovenia	0.87 (0.62, 1.22)	0.97 (0.72, 1.50)	0.93 (0.61, 1.53)
Spain	0.94 (0.76, 1.19)	1.45 (1.18, 1.87)	1.37 (1.14, 1.75)
Sweden	0.94 (0.75, 1.18)	1.27 (1.02, 1.67)	1.23 (1.02, 1.61)
Switzerland	0.94 (0.74, 1.19)	1.28 (1.03, 1.62)	1.21 (1.03, 1.58)
UK	0.94 (0.77, 1.17)	1.29 (1.05, 1.72)	1.25 (1.04, 1.66)
EU	0.93 (0.76, 1.19)	1.33 (1.07, 1.70)	1.26 (1.05, 1.58)

Notes: The values in parenthesis are the 95% confidence intervals and those marked in green refer to the selected specification for each country.

Source: Authors' elaboration.

Table 3
Estimated coefficients for the selected specifications in Table 2

Series	d	Intercept (tvalue)	Time trend (tvalue)
Austria	1.25 (1.07, 1.53)	9.879 (234.15)	0.0333 (2.32)
Belgium	1.32 (1.09, 1.68)	10.089 (240.27)	0.0335 (1.84)
Bulgaria	0.88 (0.71, 1.13)	10.008 (124.64)	0.0162 (1.92)
Croatia	1.30 (0.97, 1.86)	10.168 (255.40)	---
Cyprus	1.14 (0.97, 1.40)	8.554 (161.33)	0.0365 (288)
Czechia	1.05 (0.76, 1.72)	10.283 (184.11)	0.0240 (2.05)
Denmark	1.26 (1.06, 1.59)	9.808 (244.25)	0.0278 (2.00)
Estonia	1.25 (0.93, 1.87)	9.341 (217.06)	0.0307 (1.80)
Finland	1.29 (1.06, 1.71)	9.741 (228.53)	0.0321 (1.92)
France	1.24 (1.07, 1.51)	10.518 (269.96)	0.0281 (2.30)
Germany	1.25 (1.05, 1.56)	11.034 (261.86)	0.0290 (2.02)
Greece	1.48 (1.28, 1.80)	9.428 (277.79)	---
Hungary	1.25 (0.90, 1.79)	10.263 (252.60)	---
Iceland	1.16 (0.94, 1.56)	8.448 (140.31)	0.0347 (2.33)
Ireland	1.25 (1.03, 1.62)	9.442 (228.12)	0.0338 (2.40)
Italy	1.19 (1.02, 1.48)	10.789 (243.14)	0.0264 (2.16)
Latvia	1.35 (0.95, 2.07)	9.564 (206.85)	---
Lithuania	1.17 (0.92, 1.66)	9.664 (212.54)	0.0346 (2.40)
Luxembourg	1.29 (1.05, 1.68)	8.790 (216.45)	0.0359 (2.26)
Malta	1.11 (0.93, 1.39)	8.266 (232.15)	0.0310 (4.23)
Netherlands	1.26 (1.07, 1.58)	10.219 (242.53)	0.0306 (2.07)
Norway	1.25 (1.07, 1.57)	9.779 (257.77)	0.0323 (2.50)
Poland	0.96 (0.74, 1.30)	10.902 (259.79)	0.0252 (3.50)
Portugal	1.31 (1.09, 1.67)	9.676 (224.52)	0.0354 (1.96)
Romania	1.20 (0.84, 1.78)	10.432 (158.23)	---
Russia	1.21 (0.98, 1.58)	11.500 (137.23)	---
Serbia	0.60 (0.29, 1.04)	10.073 (96.89)	0.0203 (2.58)
Slovakia	1.31 (1.06, 1.77)	9.814 (269.92)	0.0325 (1.93)
Slovenia	0.93 (0.61, 1.53)	9.952 (186.04)	0.0173 (2.25)
Spain	1.37 (1.14, 1.75)	10.366 (226.64)	0.0394 (1.69)
Sweden	1.23 (1.02, 1.61)	9.917 (249.17)	0.0256 (2.11)
Switzerland	1.21 (1.03, 1.58)	10.085 (217.85)	0.0323 (2.58)
UK	1.25 (1.04, 1.66)	10.709 (283.34)	0.0247 (2.01)
EU	1.26 (1.05, 1.58)	11.569 (281.43)	0.0304 (2.10)

Notes: The values in parenthesis in column 2 are the 95% confidence bands for d; those in columns 3 and 4 are the t-values of the estimated coefficients.

Source: Authors' elaboration.

gary (1.25), Estonia (1.25), Croatia (1.30) and Latvia (1.35). In the rest of the cases, d is significatively higher than 1, and the highest values of d correspond to Portugal (1.31), Belgium (1.32), and particularly, Spain (1.37) and Greece (1.48).

Conclusions and policy recommendations

This paper examines the degree of persistence in consumption expenditure in 33 European countries using fractional integration methods. The results indicate very

high levels of persistence with no evidence of mean reversion in any single case since the series are all I(1) or I(d), with d > 1. Consequently, the general conclusion is that there is no mean reversion in the series of consumption and shocks are expected to be permanent. In the event of a negative shock such as an abrupt reduction in consumption, strong measures must be adopted by the authorities to recover the original trends. Moreover, special attention should be paid to some southern European countries such as Greece, Portugal and Spain, which present some of the highest degrees of integration. This suggests that shocks or changes in the consumption levels in these economies, whether positive or negative, tend to have a more enduring and long-lasting impact compared to other parts of Europe. The higher persistence in southern European consumption patterns stems from various factors that set them apart from other countries, including: political processes (Gough, 1996); socio-demographic characteristics, dominant values about private life and the way in which laws are produced (Martin, 1996); the vulnerable position of young people in the labour market (Madsen et al., 2013); the widening North-South gap within Europe, stemming from the euro area crisis, which began in 2010 (Matthijs, 2014); the underdevelopment of child and family policy (Jurado-Guerrero & Naldini, 2018); and even vulnerabilities in water security and the corresponding strong impact on strategic parts of these Mediterranean economies (Ludwig et al., 2011).

In the case of an adverse shock that leads to a sudden decrease in consumption, authorities should implement robust measures to restore the initial patterns or trends (Maćkowiak, 2006). The reasons for a decrease in consumption can be very diverse. We propose consideration of the following general suggestions and policy implications to improve consumption.

Revision of tax for essential products

This can involve reducing or eliminating VAT on essential goods and services, such as food (water, rice, milk, meat and vegetables), health (medicines and cleaning products), clothes (basic ones according to the climate), dwelling (electricity, water and gas), education, communication and transport. By lowering the tax burden on these essential items, households can have increased purchasing power and affordability, which would stimulate consumption (Dallongeville et al., 2011; Lyssiotou & Savva, 2021).

Also, implementing expansionary fiscal policies, such as tax rebates and lowering direct taxes can boost disposable income and encourage consumer spending (Kaplan & Violante, 2014; Stoilova & Todorov, 2021).

Several authors have analysed the opposite effect – how an increase in taxes leads to a decrease in consumption (Alm & El-Ganainy, 2013; Buettner & Madzharova, 2021; Colchero et al., 2017). Undoubtedly, taxes have an impact on the final consumer price, which in turn affects household spending and, consequently, corporate profits.

On the other hand, meeting the basic needs of the first two levels (out of five) of Maslow's hierarchy of needs: basic and safety needs is crucial. In European countries with a certain level of development, this should not pose a significant challenge. Thus, it becomes possible to foster consumerism that extends to fulfilling the higher levels of the pyramid (Ganassali & Matysiewicz, 2021; Wikansari et al., 2023).

Employment measures to increase hiring

The previous subsection is directly related to this one, since taxes should be in line with the purchasing power of the population, which is closely linked to their salary and savings capacity. Employment measures are an effective policy approach to boost consumption and stimulate economic growth. To enhance disposable income, policies that focus on improving wages, reducing unemployment rates and promoting job creation can increase household income, leading to higher consumption levels (Banker et al., 2013; Yasar, 2017). Also, it is beneficial for companies to foster a favourable business environment. Policies that support entrepreneurship, innovation and a favourable business environment can lead to economic growth, job creation and increased consumer spending (Wüstenhagen et al., 2008). Another way to improve income is facilitating access to credit for households that can stimulate consumption by enabling them to make larger purchases and investments (Kus, 2013).

A reference point is the national minimum wage. According to the 2024 data (Expansión, 2025), the following groups are found:[1]

Less than 1,000€: Russia (€194), Bulgaria (€477), Serbia (€544), Hungary (€686), Latvia (€700), Romania (€743), Slovakia (€750), Czechia (€765), Estonia (€820), Croatia (€840), Lithuania (€924), Malta (€925), Portugal (€957) and Greece (€968).

Between €1,000 and €2,000: Cyprus (€1,000), Poland (€1,008), Slovenia (€1,254), Spain (€1,323) and France (€1,767).

1 Austria, Denmark, Finland, Italy, Norway and Sweden have no data.

More than €2,000: Germany (€2,054), Belgium (€2,070), the Netherlands (€2,134), Ireland (€2,146), the UK (€2,231), Luxembourg (€2,571), Iceland (€2.830) and Switzerland (€4,549).

Not all countries have the same situation and need the same policies. It can be observed that Group A consists mainly of Eastern European countries (except for Portugal), Group B includes a diverse set of countries (predominantly from Western Europe), and Group C comprises Central European countries that include the original founding members of the European Union. Within the policy of improving purchasing power through employment, countries in Group A should take into account the aspects that influence the calculation of the minimum interprofessional wage, such as the consumer price index, average national productivity achieved, an increase in the share of labour in national income and the general economic situation.

Infrastructure investment

Investing in infrastructure projects can have a positive impact on consumption by creating jobs, improving transportation networks and enhancing overall economic activity (Ramey, 2020; Yan et al., 2024). Infrastructure support is not only a fundamental component of a country's development but also an integral part of the consumption chain, as it facilitates the distribution of goods (Skender et al., 2019).

Considering that the European Union and the Schengen Area constitute a free movement zone for goods and people, infrastructure development among countries fosters overall economic growth (Butkus et al., 2023), which in turn impacts consumption. Collaborative efforts are essential for the development and improvement of all nations.

All the above suggestions are simply recommendations in the event of an exogenous shock based on the high degree of persistence shown in the series across all countries, especially Greece, Portugal and Spain. To our knowledge, there is no other analysis of our topic using this specific methodology. This makes our study on the persistence of consumption behaviour in Europe, using fractional integration techniques, a potentially valuable contribution to this field.

For future analysis, various topics can be proposed. For example, various events have impacted the European economy, with some, particularly in southern European countries, having a deeper and more negative effect. Further research and analysis are needed to understand the underlying causes and mechanisms behind the observed persistence and its association with southern European countries.

From a methodological viewpoint, the analysis can be extended to a longer time series, which will reduce the width of the intervals, producing therefore more precise estimates of the order of integration of the series of interest. In addition, there are several issues that may deserve further attention, including, for instance, the presence of non-linearities/breaks or even outliers in the data that may have biased the results reported in this paper. Work in this direction is now in progress.

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