Fintech in Europe: Do Banking Measures Matter?

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Abstract

The aim of this study is to analyze the relationship between specific banking variables and the degree of adoption of Fintech in European countries. Exploiting banking ecosystem variables, obtained from the International Monetary Fund database, and two different indeces of Fintech we have run a multiple regression in order to test the relationship. The originality of this work depends on several factors, as the specificity of the explaining variables and the geographical area analyzed. Results show that some banking variables have a good explanatory ability of Fintech adoption by countries, but these finding are referable only to Global Fintech Index. Our work contributes to existing literature offering a different approach to the topic. Moreover, findings represent a useful tool for decision makers, who can manage variables that affect the degree of adoption of Fintech.

1. Introduction

Although the numerous definitions of Fintech, the IMF/World Bank's Bali Fintech Agenda defines it as technological advances with the potential to transform the delivery of financial services by stimulating new business models, applications, processes, and products. Fintech covers a wide range of activities, including new areas such as cryptocurrencies and the use of artificial intelligence (AI) for fraud detection, as well as innovation in more traditional financial services (Vrontis et al., 2020; Hornuf et al., 2020; Saxunova et al., 2021; Chueca Vergara & Ferruz Agudo, 2021; Hodula, 2022; Feyen et al., 2021). In Europe, Fintech was initially spurred by the 2008 global financial crisis, which exposed the inefficiencies of traditional financial systems and created a need for more innovative and accessible solutions. Through the years the sector has seen an exponential growth, powered by technological advancement, increasing Internet and smartphone penetration, and by a shift in consumer expectations, more oriented toward digital and personalized financial services. Fintech, that is a young phenomenon (Di Nallo et al., 2023), has introduced a wide range of new products and services, ranging from digital payments and mobile banking to peer-to-peer lending platforms and blockchain and cryptocurrency-based solutions. These innovations have made financial services more accessible, convenient, and personalized, benefiting both individual consumers and small and medium-sized businesses.

The European Union has played a key role in fostering the development of Fintech by creating a favorable regulatory environment for innovation while maintaining high standards of security and consumer protection. On the basis of the proposal of the European Parliament and the Council of the European Union, and following a public consultation, the Commission outlined the "Financial Technologies Action Plan: for a more competitive and innovative European financial sector" aimed at developing a more forward-looking and inclusive regulatory framework for the digital phenomenon, in order to create an ecosystem in which financial technologies can develop and spread, benefiting the economies of scale of the single market, while not compromising financial stability or consumer and investor protection.

The Action Plan consists of a number of initiatives, primarily designed to: enable innovative business models to expand EU-wide through the identification of clear and consistent authorization requirements; increase competition and cooperation among market participants through common standards and interoperable solutions; assess the adequacy of EU rules and provide safeguards for new technologies in the financial sector; promote the diffusion of technological innovation; and strengthen the security and resilience of the financial sector.

Fintech adoption across European countries is influenced by several variables, including factors related to the banking ecosystem. The analysis of these variables allows to provide a clear picture of how various factors can influence the degree of adoption of financial technologies. The maturity of the banking sector, for example, is a significant variable: countries with a well-developed and mature banking sector may be slower to adopt innovative Fintech solutions due to the existence of established banking infrastructure and resistance to change (Gholami et al, 2023; Wonglimpiyarat et al, 2017; Carbo-Valverde et al, 2021). Access to advanced technologies and a robust infrastructure are also relevant. Countries with high Internet penetration and high smartphone adoption tend to have a higher degree of Fintech adoption (Solarz et al, 2021). Financial culture and consumer appetite for change can influence Fintech adoption (Singh et al, 2020): countries with a younger, more technologically inclined population are more open to adopting new financial solutions (Solarz et al, 2021).

Fintech adoption in Europe varies widely among countries, influenced by a combination of factors related to the banking ecosystem, regulation, technology, culture, and economic support. Understanding these variables helps to predict Fintech adoption patterns and identify opportunities and challenges for the future of the industry in different European contexts (Kowalewski et al, 2023).

Therefore, the aim of this study is to provide an analysis about the specific banking variables and their effect on the degree of adoption of Fintech. The originality of this work depends on several factors. First of all, at present and according to our knowledge, there are no works that focus on the specific analysis of the individual variables deriving from the banking ecosystem and their impact on the degree of Fintech adoption at a country level. The literature focuses on topics relating to consumer analysis (Mahmud et al., 2022a; Huong et al., 2021) and/or on different geographical areas respect to Europe, such as developing countries (Mahmud et al., 2022b).

This work is divided as follows. After the introduction, in Section 2 we focus on the literature review. Section 3 describes the data, variables and methodology used. Section 4 is about results. Section 5 provides conclusions, implications and future research agenda.

2. Literature review

Factors influencing the adoption of Fintech have been studied in a growing literature (Mahmud et al., 2022a), considering its central role in ensuring access to finance and in generating an ecosystem with a greater economic growth and poverty reduction (Agarwal et al., 2022). The existing literature highlights macro-level, micro-level and user-specific factors that contribute to the adoption of Fintech.

A first attempt (Mahmud et al., 2022b) to examine the topic of factors influencing Fintech at a cross-country level makes a comparison between nations of emerging countries based on variables taken from the literature: population, median age, gross national income per capita, literacy rate, mobile phone connections, number of internet users, unbanked population, investment in fintech, number of fintech companies, and regulation. So, the theme of indeces is strictly relavant. One of the important Fintech indices (Feng et al., 2019) refers solely to China: an index is developed for the different Chinese geographical areas. In the analysis a series of variables are considered, including measures on credit and digitalisation. Another country index (Hieminga et al., 2016) contains three different levels (demand, supply, and risk) and thirteen factors, including indicators of the urgency of financial technology, financial technology infrastructure, financial technology ecosystem, and political and regulatory environment. An evolution of this index, with a focus in Europe, is proposed by Boitan & Barbu (2021).

Pauliukevičienė & Stankevičienė (2021) link the Fintech sector to the external context defining 4 external environments area and a total of 32 indicators. The most important environments areas are: technological environment (30.1%), political environment (24.5%), economic environment (21.5%) and social environment (21.5%). Focusing on the indicators, openness to businesses and the regulatory context are the most significant indicators of the political environment; the country's attractiveness and competitiveness as a FinTech nation and the leading city as a FinTech hub are the main drivers of the economic environment; the availability of talent and intellectual capital are influencing variables about the social environment; digitalisation and telecommunication infrastructure are the main drivers for the technological environment. The theme of the importance of the environment is also relevant in order to define the opportunity space for Fintech in countries (Agarwal et al., 2022). Some scholars (Mahmud et al., 2022a) focus on adoption of Fintech by users. Using multivariable logistic regression on a sample of 1,282 people in Bangladesh, the authors highlight that customers are less likely to adopt Fintech services if they have higher levels of concern about security, secrecy of information, limited control by the government and high levels of barriers to the intuitiveness of the service.

The findings suggest that these factors of concern are the main driver behind Fintech adoption, more important than demographic, technological and economic variables, including banking-related variables. Huong et al. (2021) analyze the level of Fintech adoption by consumers through the construction of a Fintech index for ASEAN countries. In constructing their index, the scholars identify eight dimensions, represented by 24 indicators. The variables used are related to the characteristics of fintech companies, such as the amount of crowdfunding campaign, asset under management of Roboadvisors and so on.

Another line of research analyzes the determinants of the creation and activity of fintech companies (Kowalewski & Pisany, 2023): demographic factors play an important role while the quality and severity of regulation are considered as an obstacle. In this work, also the relationship between the banking sector and fintech companies emerges, in a mix of cooperation and competition: in developed economies there is greater collaboration, while in emerging countries competition is more widespread. Banks in developed markets often look to Fintech companies as sources of innovation, supporting the formation of Fintech startups. In order to consider the bank industry measure like number of bank branches and amount of the loans are used.

The aim of the Lavrinenko et al. (2023) is to determine the impact of Fintech on financial development in EU countries. The work focuses on the European geographical area and considers banking development variables such as the number of ATMs and bank branches. The results show how FinTech has a significant impact on financial development, especially in financial markets.

Instead, about the effect of Fintech on overall financial sytem, literature focus on how fintech can affect financial inclusion (Odei-Appiah et al., 2022; Yang & Zhang, 2022; Chueca Vergara & Ferruz Agudo, 2021; Tao et al., 2022), bank stability (Daud et al., 2022) and bank specific issues (Wang et al., 2021; Kou et al., 2021; Guo & Zhang, 2023; Sheng, 2021; Li et al., 2022). Moreover, also pandemic period seems to influence the evolution of Fintech adoption (Fu & Mishra, 2020).

Therefore, considering the emerging literature on Fintech adoption factors, the relationship between Fintech and banking industry and the impact of Fintech on financial system our research question is:
RQ: Do the banking variables affect the Fintech grade in European countries?

3. Sample and methodology

The structuring of the sample starts from the nations belonging to the European Union. The final sample is represented by 27 countries and the year of analysis is 2021. Some countries are excluded due to the absence of fundamental variables for the analysis (specifically the independent variables, relating to the banking ecosystem). Therefore, the sample considers the following nations: Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Switzerland.
Main information about the variables used are provided in the following table:

	Source	**Acronymous**
Independent variables		
Number of ATMs per 100,000 adults	International Monetary Fund - Macroeconomic and Financial Data	ATMs
Number of commercial bank branches per 100,000 adults	International Monetary Fund - Macroeconomic and Financial Data	BankBranches
Outstanding deposits with commercial banks (% of GDP)	International Monetary Fund - Macroeconomic and Financial Data	DEP
Outstanding loans from commercial banks (% of GDP)	International Monetary Fund - Macroeconomic and Financial Data	LOANS
Dependent variables		
Global Fintech Index	Findexable	GFI
Fintech Index developed by McKinsey	McKinsey	MKIndex

Table 1: variables used (our elaboration)

The first four variables, representative of specific country factors of banking ecosystem, are used in literature (Lavrinenko et al., 2023; Kowalewski & Pisany, 2023). GFI is a real time ranking and index of fintech companies and ecosystems. It is widely used as measure of Fintech (Lavrinenko et al., 2023; Mahmud et al., 2022b; Albarrak & Alokley, 2021). An higher index corresponds to a higher level of Fintech. In order to consider also other measure of Fintech index we introduce another variable: MKIndex (McKinsey, 2022). This specific measure for European countries is developed starting from five key performance indicators: Fintechs founded; Fintech funding; number of Fintech deals; Unicorns; Workforce.

Differently from GFI, a lower value of this index represents a greater degree of Fintech adoption in the country. The inclusion of this additional dependent variable is useful in order to check the results and their consistency.

About the methodology the multiple regression analysis is used to test the relationship between independent variables and the dependent variables in the two configurations (GFI, MKIndex). We specified the following regression models separately for different questions (all variables are as defined in Table 1).

$$GFI = \alpha + \beta_1 ATMs + \beta_2 BankBranches + \beta_3 DEP + \beta_4 LOANS + \varepsilon$$

$$MKIndex = \alpha + \beta_1 ATMs + \beta_2 BankBranches + \beta_3 DEP + \beta_4 LOANS + \varepsilon$$

4. Results

In this first part of the section, we use the descriptive statistics to describe the variables used in the analysis. Therefore, we have developed and reported the mean, median, maximum, minimum and standard deviation of selected variables (Table 2).

	Mean	Median	Min	Max	St. Dev.
ATMs	72,31	63,049	26,882	168,56	36,7076
BankBranches	23,317	22,442	5,4472	61,181	13,5323
DEP	95,723	70,723	31,128	583,68	102,079
LOANS	72,572	53,125	25,814	385,4	69,3918
GFI	5,713	4,4107	1,2353	14,951	3,63361
MKIndex	15,981	15,8	4,2	29	7,74501

Table 2: descriptive statistics (our elaboration)

BankBranches has close value of mean and median. In general the variability appears to be more limited for ATMs, BankBranches, GFI e MKIndex. About this last variable is useful to highlight that it comes from a composed ranking of five key performance indicators, with a range value of 1-30. It is also useful to remember that lower value (rank) represent a higher adoption of Fintech.

Therefore, we have conducted the analysis with the application of multiple linear regression (Tables 3 and 4).

Model 1	*Coef.*	*Std. Err.*	*t*	*p-value*	
Const	8,18932	1,37003	5,977	<0,0001	***
ATMs	−0,0309018	0,0178847	−1,728	0,0980	*
BankBranches	−0,0796535	0,0468640	−1,700	0,1033	
DEP	−0,106283	0,0267861	−3,968	0,0007	***
LOANS	0,162448	0,0402274	4,038	0,0005	***
R-squared	0,473932		Adjusted R-squared	0,378284	
F	4,954929		P-value(F)	0,005306	
*sign. at 0,1 *** sign. at 0,001					

Table 3: GFI as dependent variable (our elaboration)

Model 2	*Coef.*	*Std. Err.*	*t*	*p-value*	
Const	11,1268	3,62745	3,067	0,0056	***
ATMs	0,0654179	0,0473535	1,381	0,1810	
BankBranches	0,0911507	0,124083	0,7346	0,4703	
DEP	0,116877	0,0709221	1,648	0,1136	
LOANS	−0,181734	0,106511	−1,706	0,1020	
R-squared	0,188258		Adjusted R-squared	0,040669	
F	1,275552		P-value(F)	0,309639	
*** sign. at 0,001					

Table 4: MK Index as dependent variable (our elaboration)

The first insight about the analysis, answering in part to RQ, is that the explanotory power of the first model (GFI as dependent variable) is higher than the second model: the R-squared is 47% showing a good ability to explain the phenomenon, while in the second approach (MKindex) we have a value of 19%.

Another issue is about the significance of explanative variables: in the first model DEP, LOANS and costant result significant at 0,001, ATMs at 0,1, while variable BankBranches, despite a p-value very close to 0,1 is not significant. Instead in the second model we find significance only in constant. DEP and LOANS show p-values close to 0,1 but they are not significant.

So, focusing on model 1, the negative coefficient of ATMs, BankBranches and DEP indicates that an increase of this value has negative consequences on Fintech Index. These results are in line with expectations: a greater density of banks and ATMs, which are variables that can represent non-digitalisation, leads to a lower overall degree of Fintech adoption. Considering that in model 2 the coefficients of the variables must be considered differently (if MKIndex increases the degree of Fintech decreases), despite some significance problems, the results show consistency with the results of model 1.

About to the significance of the models, the QQ plots highlight the best performances of model 1 (Figures 1 and 2).
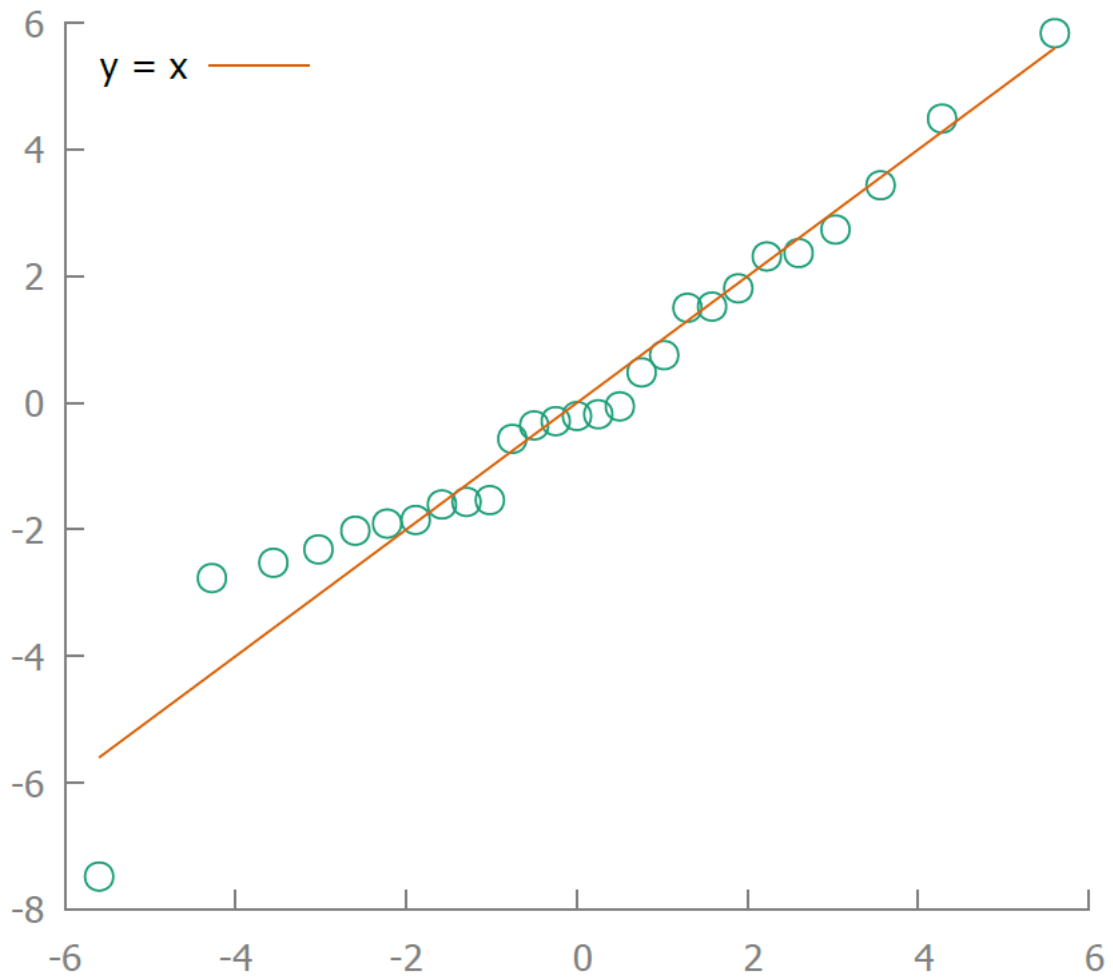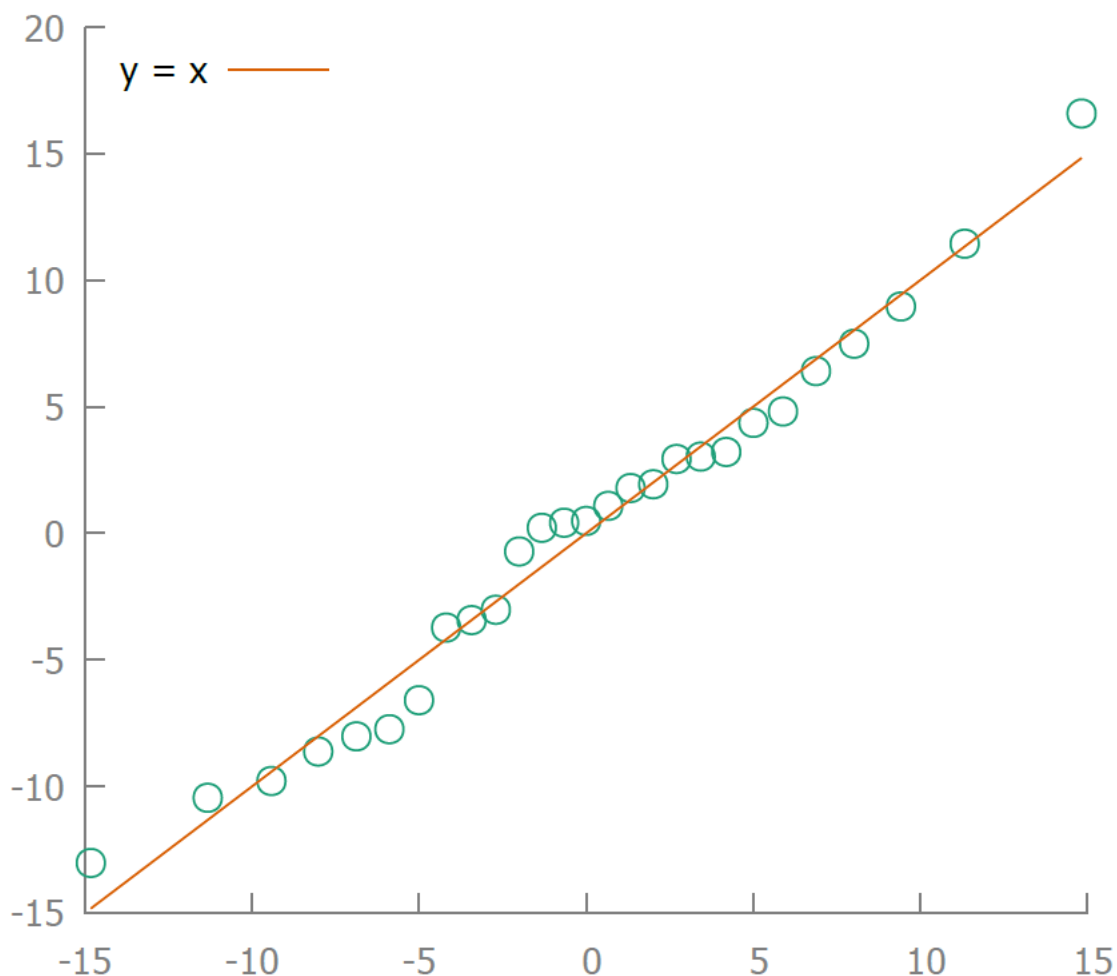
Figure 1: QQ Plot Model 1

Figure 2: QQ Plot Model 2 (our elaboration)

5.   Conclusions, Implications and Future Research Agenda

The increasing attention to Fintech in the organisations and especially in perspective of country index is confirmed by our results and statistics contributing to existing literature. While the existing literature has steadily grown in breadth and depth on Fintech adoption drivers, the cross-country perspective is still to improve (Mahmud et al. 2022b). Relating to the geographical area of analysis (i.e. Europe), the increasing interest is confirmed also by regulatory activities. In 2018, the European Commission identified an action plan on FinTech. It consists of 19 phases with the aim of developing a more competitive and innovative financial industry. On the side of the banking authorities, the European Banking Association has published several works with fosus on the impact of FinTech on banks' business models and the risks and opportunities arising from the integration of FinTech into normal banking activity.

Thus, our work contributes to existing literature offering different approaches to the topic. First of all, the geographical aspect: many of the works present in the literature focus on emerging countries and/or nations where the conditions are different (Mahmud et al., 2022b; Feng et al., 2019) especially in relation to the banking environment. Then the topic of the subjects analysed. Some research calculate the index starting from the analysis of the users (Mahmud et al., 2022a; Huong et al., 2021) or the characteristics of the Fintech companies: in our paper we change perspective, focusing on the variables of the system banking of each individual country. Therefore, in order to answer to our research question, we use Fintech explanatory variables used in the literature (Lavrinenko et al., 2023; Kowalewski & Pisany, 2023) changing the analysis perspective. Furthermore, compared to the prevailing literature on indices capable of representing the Fintech phenomenon at a country level, we have expanded the analysis to other types of indicators.

This paper has several theoretical and practical implications. A first practical implication is closely linked to the results: the banking measures used have effects on the degree of fintech adoption in countries. This insight assume relevance, especially considering the number of ATMs and bank branches: a negative relationship emerges. This information represents a useful tool for decision makers, who can manage these variables. Another implication is about a potential indirect impact on performance of financial system.

In fact, according to the literature, the Fintech has an impact on financial inclusion (Odei-Appiah et al., 2022; Yang & Zhang, 2022; Chueca Vergara & Ferruz Agudo, 2021; Tao et al., 2022), bank stability (Daud et al., 2022) and bank specific issues (Wang et al., 2021; Kou et al., 2021; Guo & Zhang, 2023; Sheng, 2021; Li et al., 2022). Thus, the identification of variables capable of influencing the degree of Fintech adoption is useful for policymakers in order to have a positive impact on the various themes highlighted. An academic implication starts from the assumption that the research encounters limits due to the scarcity of data on Fintech (Lavrinenko et al., 2023): advances on the determinants of Fintech can represent a starting point for other related research. Finally, on Fintech measures: the use of an index other than the GFI does not seem to provide statistically valid data.

Like other scientific works, this paper faces several limitations, among which the time horizon assumed in the analysis (2021) and the investigation of a single geographical area. Referring to the single year of analysis, it's important to highlight that Covid is changing the context (Fu & Mishra, 2020), so future research could consider an extended time horizon.

Concerning the geographical area, the results cannot be extended to nations with different characteristics.
Another limit is about the explanatory variables: we consider only variable that represent the banking ecosystem. An interesting extension of the research could consider other cathegory of variables, like gross domestic product. Even with regards to the banking system variables, the use of more complete databases could allow to not exclude any country from the analysis. Finally, on the geographical aspect: in the analysis of the Euro zone, future research could use more homogeneous sub-samples in order to test the results.

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