Received: 20 January 2021 | Revised: 1 November 2022 | Accepted: 28 January 2023

DOI: 10.1002/ijfe.2793

RESEARCH ARTICLE

WILEY

Financial development, economic growth and the role of fiscal policy during normal and stress times: Evidence for 26 EU countries

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Abstract

This article empirically explores the finance-growth relationship and the performance of the financial system measured by financial depth, accessibility, and efficiency of both financial sectors, that is, institutions and stock markets. It also examines the role of fiscal policy in conjunction with the performance of financial development during both normal and stress times. The data consists of a panel of 26 European Union countries over the period 1990–2020. The results show that during normal times, the finance-led growth relationship and the stock market are greatly important, while during stress times the relationship becomes insignificant. Interestingly, financial institutions are found to be more effective at promoting growth and there is clear evidence that a potentially dynamic positive effect of institutions to growth is absorbed by macroeconomic shocks. In addition, there is evidence for a threshold at a lower level compared to those previously identified in the literature. This latter finding can be attributed to different measures of financial institutions used and the impact of macroeconomic shocks. The inability of both financial sectors to enhance economic activity seems to exhibit persistence from the occurrence of the global financial crisis until the onset of the recent Covid-19 pandemic.

KEYWORDS

economic growth, financial development, fiscal policy, panel data

1 | INTRODUCTION

A large amount of the literature has examined the finance-growth nexus and most of the evidence suggests the existence of a positive relationship. In the aftermath of the global financial crisis of 2008–2009 (henceforth, GFC), the impact of the financial sector on growth has been decreased, while the crisis transformed into a debt crisis and the subsequent austerity measures undertaken amplified further the fiscal impact on the crisis (Lane, 2012). In addition, the recent Covid-19 pandemic has negatively affected economies worldwide and governments committed to protect their economies by purchasing sovereign debt, among other measures. These two crises have different roots but have had severe detrimental effects on economies.

Although research about the finance-growth relationship for EU economies has grown rapidly, empirical evidence about the relationship comparing normal times, stress times including the GFC, and the recent pandemic, has been rather scarce. In addition, the effectiveness of fiscal policy during the above crises has important implications for EU countries, substantiating the argument of high financial integration and the complexity of the financial system (Ramey, 2019). The existing evidence demonstrates that the finance-growth relationship depends on the particular variables used as proxies for financial development (e.g., see Alexiou et al., 2018 and Asteriou & Spanos, 2019), while the multidimensional nature of finance is not widely considered (Purewal & Haini, 2022) leading to inconclusive findings. The question that emerges regards the nature of the relationship between financial development and economic growth, in both the short- and the long-run horizon, within and outside the two recent global crises, with a special interest for the effectiveness of fiscal policy. Furthermore, there is a need to re-evaluate the relationship using a superior measure of financial development, thus capturing more effectively the performance of the overall financial system.

In this article we explore the finance-growth relationship with a special focus on the role of fiscal policy using data for 26 European Union countries over the period 1990–2020. We contribute to the existing literature in four aspects. First, we use the new financial indices proposed by Svirydzenka (2016) which consider the multidimensional nature and complexity of the financial system and measure the financial depth, accessibility, and efficiency for both major financial sectors, institutions and stock markets. Second, we adopt a dynamic panel model to capture the performance of the two financial sectors across several sub-periods: normal times, GFC, and the start of the Covid-19 pandemic. Third, we estimate the impact on economic growth that arises from the response of financial development when fiscal policy shocks are employed as additional variables, thus capturing more effectively the sovereign debt crisis and the quality of fiscal policy. Finally, we use the new financial indicators to investigate threshold effects for both financial sectors on economic growth.

Our results shed light on the performance of the finance-growth relationship in relation to the quality of fiscal policy at normal times and periods of stress. Our findings indicate that stock markets contributed positively to economic growth at normal times but had adverse effects at times of stress also depending on the magnitude of fiscal shocks. We additionally find that financial institutions are more effective at promoting economic growth and provide evidence that a potentially dynamic positive effect from institutions to growth is absorbed by macroeconomic shocks from government expenditures and taxes. Nevertheless, the overall estimated results, indicate that after more than a decade from the GFC, both financial sectors show high persistence in favour of an insignificant effect on economic growth, and this insignificant effect may potentially exist for a long time until the return to levels observed before the crisis. Our article also provides new evidence regarding the existence of threshold effects of financial institutions and stock markets on economic growth. In particular, we find a lower level of threshold point compared to those in the literature, possibly due to the use of different measures of financial institutions and high levels of debt. Irrespective of the group of countries examined and the degree of financial integration, our results indicate that fiscal shocks from sovereign debt and the size of the government play a critical role in the performance of the financial system both at normal times and at severe times of stress.

The rest of the article is organized as follows: Section 2 reviews the literature, Section 3 describes the data and the methodology, Section 4 contains the empirical results and discussion, and Section 5 concludes.

2 | LITERATURE REVIEW

After the GFC many central banks and other financial institutions raised the holdings of their governments' debts in order to enhance their credibility and avoid a default, thus following to some degree the practice of the financial repression. Studies have illustrated that the repression policy has been most successful in liquidating debts (Reinhart & Rogoff, 2011).

From a theoretical perspective, the research on the role of financial development in economic growth can be traced back to Bagehot (1873) who argued that well-organised capital markets in England enhanced resource allocation towards more productive investments. During the 1960s, studies emphasised the critical role of the banking system for economic growth in mobilising savings and encouraging investments (Goldsmith, 1969; Hicks, 1969). McKinnon (1973) produced a theoretical framework focusing on the liberalisation of the interest rate which leads to increases in savings thus spurring investments and eventually driving economic growth. He argued that the outcome of repression would be low savings, high consumption, low investments, thus preventing the bank sector of an economy to function at its full capability and lead to depressed economic growth. Generally, the literature suggests that financial liberalisation is a strong prerequisite to promote economic growth while one of the most critical factors that provided an impetus for moving to financial liberalisation was the pressure from globalisation.

Following financial liberalisation most cross-sectional studies used measures of financial development such as liquid liabilities to GDP, credit to private sector to GDP, and stock market capitalisation to GDP, and confirmed the existence of a positive finance-growth relationship, finding in line with King and Levine (1993) and Levine and Zervos (1998). These studies recognised that economic growth without a well-developed financial sector would be detrimental to the long-run sector prospects in developing countries and that suitable reform programs can lead to higher financial development which in turn can contribute to higher economic growth (Shleifer & Vishny, 1997). Another strand of the literature provided substantial evidence that the primary channel through which financial development is positively related to economic growth is the efficiency of investments (Rajan & Zingales, 1998). However, there is also cross-country evidence suggesting negligible or weak negative association in the finance-growth relationship (Bumann et al., 2013). Furthermore, significant discrepancies are found because of the heterogeneities of developed and developing countries and structural or institutional issues (Ahmed, 1998).

In studies employing time-series data, the finance-growth relationship has not reached a consensus with regards to the direction of causality. Studies that investigated individual countries concluded in favour of unidirectional causality (Asteriou & Price, 2000; Yang & Yi, 2008), while others that used more than one country found bi-directional causality (Demetriades and Hussein, 1996). When VAR, VECM or ARDL models were employed, the conclusions were in favour of a positive effect of financial development on growth (Ang & McKibbin, 2007; Arestis et al., 2001), while considering the period of the GFC findings indicated that financial development enhanced and impaired economic performance, in the period before and after the crisis, respectively (Akan et al., 2021). In a recent study, Barradas (2020) examined the relative importance of banks and stock markets in contributing to economic growth and found that stock markets are more powerful in promoting growth than money markets.

Significant contributions to knowledge were made by studies that employed panel data which considered the dynamic properties of country heterogeneity effects and longer time-periods. In particular, Hassan et al. (2011) and Anwar and Cooray (2012) found a significant impact on economic development over the periods 1980–2007 and 1970–2009 while the interaction of the quality of governance proxied by government expenditures was found to be significantly positive as well.

In general, the literature indicates absence of consensus concerning the extent to which financial development plays an important role on economic growth. It seems that it is not only the performance of economies during the GFC that has shed doubt on the finance-growth nexus relationship but there are other fundamental issues that need to be addressed. Ayadi et al. (2015) argued that the finance-growth relationship is negative for the bank sector and confirmed deficiencies in credit allocation in different regions and pointed towards the weaknesses of financial regulations, supervision and quality of institutions. Samargandi et al. (2015) revisited the relationship between financial development and economic growth using data for 52 countries and found evidence in favour of an insignificant impact of financial development on economic growth in the short-run and an inverted U-shaped relationship in the long-run. Further, the impact varies across countries due to the heterogeneous nature of economic structures, institutional quality and financial markets. In this direction, Arcand et al. (2015) showed that the relationship turns negative at very high levels of financial development while Cecchetti and Kharroubi (2012) examined effects at both country and industry level and concluded that the level of financial development is a good predictor for growth but only up to a point. These results in favour of an inverse U-shaped financial development effect are consistent with the diminishing effects reported by Rousseau and Wachtel (2011).

Using data from the Groningen Growth and Development Centre database for 41 economies Aizenman et al. (2015) examined the interaction between quality and quantity of finance and output growth for ten sectors. They reported a negative impact of financial depth on growth in several sectors and provided results which point towards a nonlinear impact of financial development on growth. Alexiou et al. (2018) found that over the period 1998–2014, increased credit flows negatively affected 34 European and Commonwealth of Independent States economies while the significant positive effect of money supply on growth before the GFC is not confirmed for advanced economies in contrast to developing countries. Makrychoriti et al. (2022) used a sample of EU countries over the period 2002–2020 and suggested that trust can influence the behaviour of economic agents and improve access to financing for both households and corporations. Therefore, trust could mitigate the negative impact of financial stress on economic growth. Purewal and Haini (2022) found that financial markets and institutions promote growth, with institutions dominating with regards to this positive effect, while they also confirmed the existence of an inverse U-shaped finance-growth relationship.

Another strand of the literature provided evidence that fiscal reaction functions changed after the outbreak of the GFC. The ease with which countries could roll over debt and finance new debt increased risk and also the lack of liquidity in government debt markets are likely among the factors which have enhanced fiscal prudence across

Europe (Lane, 2012; Shambaugh et al., 2012). In addition, following the GFC several EU governments experienced serious fiscal problems with some estimations revealing a divergent fiscal performance in the countries before and after the crisis (Baldi & Staehr, 2016).

In conclusion, there is not an agreement about the finance-growth relationship behaviour which can be attributed to different characteristics of countries, periods examined, and types of data. Making use of advancements in econometric methodologies and particularly in panel data, the focus of research has shifted to the determinants or sources of financial development and the ingredients of growth rather than the finance-growth link itself (Law & Singh, 2014).

3 | DATA AND METHODOLOGY

This study employs annual data for a panel of 26 EU countries over the period 1990–2020 with a total of 806 observations. The sample countries are Austria, Belgium, Bulgaria, Croatia, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

Equation (1) below presents our baseline panel model:

$$ggdp_{it} = a + \beta' FD_{it} + \gamma' X_{it} + u_{it}. \quad (1)$$

The dependent variable is economic growth expressed as the annual percentage rate of GDP (*ggdp*) at constant 2010 US dollars. **FD** is a matrix of financial development variables which includes three financial development indices from the IMF Financial Development Index database proposed by Svirydzenka (2016) that consider the depth, access, and efficiency of the respective financial sector: financial institutions (*fininst*) which includes banks, insurance companies, mutual and pension funds; financial markets (*finmar*) which includes stock and bond markets; and a financial development index (*findev*) which measures the broadly multi-dimensional financial system and is a combination of both *fininst* and *finmar*. Matrix **X** includes control macroeconomic variables that are considered significant for economic growth, namely inflation (*inf*), foreign direct investment (*fdi*) and trade openness (*open*). Inflation is a measure of the degree of uncertainty and is expected to negatively affect the economy (Alexiou et al., 2018; Barro, 2003), while foreign direct investment is expected to be positively associated with economic growth because of the endogenous relationship between them (Li & Liu, 2005). Trade openness is the sum of exports and imports to GDP and constitutes an index for the degree of international trade. Openness is expected to contribute to economic growth through competition and technological progress (Hye & Lau, 2015).

TABLE 1 List of variables

Variables	Description	Source
ggdp	Growth rate of GDP (%)	World Bank
findev	Financial development index	International Monetary Fund
fininst	Financial institutions index	International Monetary Fund
finmar	Financial markets index	International Monetary Fund
inf	Inflation rate (%)	World Bank
fdi	Foreign direct investment (% of GDP)	World Bank
open	Trade openness (exports + imports, % of GDP)	European Data Warehouse
debt	Government debt (% of GDP)	International Monetary Fund, Global Debt Database
tax	Tax revenue (% of GDP)	European Data Warehouse
exp	Government expenses (% of GDP)	European Data Warehouse
bd	Budget deficit (% of GDP)	European Data Warehouse

We additionally attempt to examine the response of financial development measures to the quality of fiscal policy which plays an essential role in the current and future directions in economic growth. In this direction, we attempted to identify unexpected fiscal policy changes in government debt (*debt*) and government size proxied by tax revenues (*tax*) and public spending (*exp*), as well as budget deficits (*bd*). To isolate these unexpected changes we fit AR (1) models[1] that employ as independent variable observations from previous time steps in order to predict the value at the next time step. The AR (1) equations for each country are estimated in first differences to guarantee stationarity and are given below.

$$\Delta debt_t = \widehat{\beta}_1 \Delta debt_{t-1} + e_{debt}, \quad (2)$$

$$\Delta tax_t = \widehat{\beta}_2 \Delta tax_{t-1} + e_{tax}, \quad (3)$$

$$\Delta exp_t = \widehat{\beta}_3 \Delta exp_{t-1} + e_{exp}, \quad (4)$$

$$\Delta bd_t = \widehat{\beta}_4 \Delta bd_{t-1} + e_{bd}, \quad (5)$$

where *debt*, *tax*, *exp* and *bd*, stand for the predicted values for time t from its own previous value in time $t-1$. The obtained residuals e_{debt}, e_{tax}, e_{exp} and e_{bd} are the unexpected changes in fiscal policy and indicators of the quality of fiscal policy which are used as additional explanatory variables in our regressions.

For comparison purposes, besides the full sample period (1990–2020), we estimate our models for various sub-periods, namely the pre-GFC period (1990–2007), the GFC period (2008–2009), the post-GFC period (2008–2020), and the Covid-19 pandemic period (2019–2020). All the data for the macroeconomic variables are obtained from the World Bank, the International Monetary Fund and the European Data Warehouse. Table 1 presents the description and source of the variables. Summary statistics and the correlation matrix are provided in the Appendix (Tables A1 and A2) along with panel unit root tests to establish the order of integration of the variables (Table A3).

Panel methodologies such as OLS and fixed effects estimators are consistent when N is large but also T is large (Baltagi et al., 2016). However, the existence of bi-directional causality between variables, omitted variable bias, time invariant country characteristics (fixed effects) which may be correlated with the explanatory variables that can lead to endogeneity, as well as the presence of autocorrelation, are well known shortcomings of traditional panel methods (Alexiou et al., 2018; Bond, 2002; Caselli et al., 1996).

The generalised method of moments (GMM) estimator was developed to overcome the above shortcomings as it controls for possible specification bias (Blundell & Bond, 1998) and it is well suited for datasets with small T and larger N. Following Holtz-Eakin et al. (1988), Arellano and Bond (1991) developed a GMM estimator that instruments the differenced variables with all their available lags in levels. A problem with this estimator is that lagged levels are poor instruments for first differences if the variables are close to a random walk. System GMM is an augmented version developed by Blundell and Bond (1998) that overcomes this issue by employing both levels and differences as instruments while the assumption is that these differences are uncorrelated with the country-specific effects. Difference and System GMM are applied in one and two step variants. The two-step variants use a weighting matrix that makes two-step GMM asymptotically efficient. In this article we employ the system GMM estimator proposed by Roodman (2009) using a two-step approach and obtain robust standard errors with Windmeijer's (2005) finite sample correction. We provide results for the robustness and sensitivity of the instruments and coefficients and report Hansen's test of instrument validity and overidentifying restrictions, as well as the Arellano and Bond test of serial correlation.

Finally, we additionally attempt to examine the existence of nonlinearity in the finance-growth relationship and apply the fixed-effect panel threshold model proposed by Hansen (1999). The empirical model is provided below:

$$ggdp_{it} = \mu_i + \beta_1' FD_{it}(I)(q_{it} \le \gamma) + \beta_2' FD_{it}(I)(q_{it} > \gamma) + \beta_3' \Phi_{it} + u_{it}, \tag{6}$$

where μ_i is the vector of the country-specific fixed effect, **FD** is the vector of the regime-dependent variable of institutions or stock market sectors (*fininst* or *finmar*), $\mathbf{\Phi}$ is a matrix that includes the financial development index which is the not regime-dependent variable as well as the control variables (inflation, foreign direct investment and trade openness), the variable q includes the threshold variables *fininst* or *finmar* used to split the sample into regimes, γ is the unknown threshold parameter, and (I) is the indication function which takes the value 1 if the argument in parenthesis is valid, and 0 otherwise. The model examines a single-threshold and divides the equation into two regimes with coefficients $\boldsymbol{\beta}_1'$ and $\boldsymbol{\beta}_2'$.

4 | EMPIRICAL RESULTS

4.1 | System GMM panel estimation results

Table 2 presents the results for the finance-growth relationship during different sub-periods. The results for the full sample time period (Models I and II, 1990–2020) suggest that the positive impact of financial development (*findev*) on economic growth can be attributed to the significant positive effect of the stock market (*finmar*). Interestingly, the findings show that during the full sample period financial institutions (*fininst*) have not enhanced economic activity. These results are in line with the findings of studies who suggested that financial development promotes economic growth (Beck & Levine, 2004; Demirgüç-Kunt & Maksimovic, 1998; King & Levine, 1993; Levine et al., 2000; Levine & Zervos, 1998; Rajan & Zingales, 1998). In the pre-GFC period (Models III and IV, 1990–2007) the results are similar to those in the full sample period, while in the GFC period (Models V and VI, 2008–2009) stock markets exhibit a statistically significant negative effect. In the post-GFC period (Models VII and VII, 2008–2020) and the recent Covid-19 pandemic period (Models IX and VIII, 2019–2020) both sectors do not appear to have an significant effect. Our results confirm to some degree previous findings in favour of an

TABLE 2 Panel estimation results

	Full (1990–2020)		Pre-GFC (1990–2007)		GFC (2008–2009)		Post-GFC (2008–2020)		Covid-19 pandemic (2019–2020)	
Period	**Model I**	**Model II**	**Model III**	**Model IV**	**Model V**	**Model VI**	**Model VII**	**Model VIII**	**Model IX**	**Model X**
$ggdp_{t-1}$	0.597***	0.584***	0.426***	0.410***	0.043	0.214	0.450***	0.445***	−0.718	−0.753
	(10.46)	(10.34)	(6.40)	(6.01)	(0.11)	(0.66)	(4.29)	(4.22)	(−1.62)	(−1.38)
Δ*findev*	0.088**		0.134*		−0.130**		0.029		−0.506	
	(2.01)		(1.79)		(−2.09)		(0.42)		(−1.34)	
Δ*fininst*		0.025		0.068		0.223		0.099		−0.453
		(0.33)		(0.64)		(1.36)		(1.09)		(−0.91)
Δ*finmar*		0.052***		0.084***		−0.148***		−0.002		−0.209
		(3.10)		(3.15)		(−3.46)		(−0.06)		(−0.93)
inf	−0.011**	−0.011**	−0.013***	−0.013***	0.493	0.190	0.347***	0.325**	1.497***	1.595***
	(−2.36)	(−2.13)	(−3.23)	(−2.61)	(1.58)	(0.52)	(2.61)	(2.02)	(4.95)	(3.44)
fdi	−0.0007	−0.001	−0.040	−0.048	0.009	0.008	−0.0008	−0.001	0.036	0.040
	(−0.10)	(−0.27)	(−1.10)	(−1.27)	(1.44)	(1.35)	(−0.16)	(−0.21)	(1.24)	(1.05)
Δ*open*	0.057	0.054	−0.037	−0.041	0.270***	0.345***	0.261***	0.266***	0.265**	0.248**
	(1.53)	(1.39)	(−0.91)	(−0.95)	(5.16)	(5.52)	(5.81)	(5.71)	(2.45)	(2.50)
Constant	0.691***	0.722***	1.210***	1.211***	−0.768**	−0.387	−0.599***	−0.527**	−0.873	−1.028
	(2.97)	(3.12)	(5.05)	(4.43)	(−2.54)	(−0.91)	(−3.06)	(−2.33)	(−0.62)	(−0.79)
Observations	779	779	442	442	52	52	337	337	51	51
AR (1) *p*-value	0.008	0.009	0.001	0.002	0.180	0.502	0.112	0.144	0.076	0.093
AR (2) *p*-value	0.859	0.825	0.329	0.316	0.355	0.615	0.290	0.325	0.253	0.266
Hansen *p*-value	0.182	0.270	0.125	0.184	0.361	0.657	0.122	0.212	0.143	0.249
Number of instruments	22	26	23	20	17	20	22	26	17	20

Note: The dependent variable is *ggdp*. Δ denotes the first difference operator used for the variables that were transformed to become stationary. Models (I) includes the financial development index and control variables; Model (II) includes both financial development indices (financial institutions and stock markets). Models (III)–(X) are defined similarly to models (I)–(II) but with different sample periods examined. All estimations are based on a two-step estimation procedure and Windmeijer's corrected standard error. Robust z-statistics are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

TABLE 3 Panel estimation results, full sample period (1990–2020)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
$ggdp_{t-1}$	0.457***	0.552***	0.570***	0.589***	0.421***	0.533***	0.569***	0.580***
	(7.48)	(13.30)	(14.19)	(12.35)	(9.30)	(13.14)	(14.63)	(12.52)
Δ*findev*	0.105**	0.113***	0.100***	0.098***				
	(2.36)	(2.74)	(3.17)	(2.70)				
Δ*fininst*					0.053	0.127*	0.104**	0.084
					(1.03)	(1.84)	(2.00)	(1.45)
Δ*finmar*					0.019	0.031**	0.028**	0.037***
					(0.98)	(2.17)	(2.13)	(2.86)
inf	−0.014	−0.012**	−0.010***	−0.008*	−0.011*	−0.012**	−0.010***	−0.009*
	(−1.48)	(−2.56)	(−3.37)	(−1.69)	(−1.85)	(−2.49)	(−3.10)	(−1.83)
fdi	0.0004	0.001	−0.005	−0.005	0.005	−0.002	−0.006	−0.007
	(0.04)	(0.11)	(−0.70)	(−0.71)	(0.68)	(−0.26)	(−1.10)	(−1.32)
Δ*open*	0.062	0.054	0.037	0.058	0.037	0.040	0.039	0.050
	(1.04)	(1.12)	(0.78)	(1.06)	(0.86)	(0.89)	(0.89)	(1.06)
edebt	−0.289***				−0.344***			
	(−5.03)				(−6.88)			
etax		−0.340***				−0.329***		
		(−2.93)				(−2.62)		
eexp			−0.397***				−0.405***	
			(−3.20)				(−3.41)	
ebd				−0.269**				0.281**
				(−2.11)				(−2.40)
Constant	0.968***	0.806***	0.814***	0.716***	1.137***	0.912***	0.831***	0.765***
	(3.34)	(3.63)	(3.44)	(2.91)	(4.37)	(4.00)	(3.60)	(3.18)
Observations	750	753	753	753	750	753	753	753
AR (1) *p*-value	0.001	0.001	0.001	0.001	0.001	0.004	0.001	0.001
AR (2) *p*-value	0.904	0.501	0.549	0.495	0.734	0.488	0.544	0.480
Hansen *p*-value	0.121	0.713	0.519	0.529	0.681	0.628	0.606	0.657
Number of instruments	14	14	14	14	16	16	15	16

Note: The dependent variable is *ggdp*. Δ denotes the first difference operator used for the variables that were transformed to become stationary. Models (I)–(IV) include the financial development index, control variables, public debt (*edebt*), tax revenues (*etax*), government expenditures (*eexp*) and the budget deficit (*ebd*) as proxies for fiscal policy. Models (V)–(VIII) are similar to models (I)–(IV) but with both financial institutions and stock markets instead of the financial development index. All estimations are based on a two-step estimation procedure and Windmeijer's corrected standard error. Robust z-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

insignificant relationship at higher levels of financial development (Aghion et al., 2005; Alexiou et al., 2018; Allen et al., 2012; Arcand et al., 2015; Cecchetti & Kharroubi, 2012). The results for the control variables show a statistically significant negative effect of inflation on economic growth in the full sample and pre-GFC periods which is nonsignificant during the GFC and then turns to positive in the post-GFC period and the pandemic. Trade openness has been a positive driving force for economic growth during and after the GFC, while foreign direct investment is statistically insignificant across all examined periods.

The findings suggest that the financial development indicators exhibit quite different behaviour in crisis periods compared to normal periods. There is strong evidence to suggest that stock markets positively affected the economy in the pre-GFC period while both financial sectors have not contributed to economic growth across all the periods after the GFC. A possible reason for the detected insignificant effects of financial institutions might be the type of credit available to the private sector. In particular, household credit and enterprise credit have a much different impact on economic growth, where the

TABLE 4 Panel estimation results, pre-GFC (1990–2007)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
$ggdp_{t-1}$	0.433***	0.467***	0.459***	0.465***	0.465***	0.380***	0.683***	0.618***
	(8.22)	(9.14)	(9.19)	(10.35)	(7.39)	(5.22)	(12.49)	(10.19)
Δ*findev*	0.109**	0.121**	0.099**	0.100**				
	(2.00)	(1.99)	(1.97)	(1.97)				
Δ*fininst*					0.066	0.079	0.002	0.007
					(0.66)	(0.76)	(0.03)	(0.09)
Δ*finmar*					0.039**	0.071***	0.033***	0.034**
					(1.97)	(3.03)	(2.86)	(2.34)
inf	−0.013***	−0.013***	−0.013***	−0.012***	−0.013**	−0.014**	−0.009**	−0.009**
	(−2.81)	(−2.94)	(−3.31)	(−2.89)	(−2.15)	(−2.54)	(−2.48)	(−2.53)
fdi	−0.019	−0.018	−0.019	−0.022	−0.017	−0.070	−0.012	−0.003
	(−0.83)	(−0.97)	(−1.15)	(−1.26)	(−0.69)	(−1.26)	(−0.87)	(−0.21)
Δ*open*	−0.024	−0.044	−0.046	−0.046	−0.015	−0.039	−0.031	−0.041
	(−0.50)	(−0.92)	(−1.00)	(−0.99)	(−0.27)	(−0.76)	(−0.81)	(−0.95)
edebt	−0.252***				−0.240***			
	(−4.61)				(−3.56)			
etax		−0.166				−0.151		
		(−1.55)				(−1.16)		
eexp			−0.288***				−0.189	
			(−2.93)				(−1.55)	
ebd				−0.191*				−0.178
				(−1.66)				(−1.56)
Constant	1.534***	1.590***	1.621***	1.605***	1.435***	1.703***	1.434***	1.538***
	(5.88)	(7.00)	(7.21)	(6.92)	(4.53)	(4.44)	(4.81)	(5.47)
Observations	413	416	416	416	413	416	416	416
AR (1) *p*-value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
AR (2) *p*-value	0.789	0.243	0.287	0.251	0.800	0.170	0.586	0.479
Hansen *p*-value	0.199	0.160	0.189	0.195	0.165	0.126	0.362	0.448
Number of instruments	26	26	26	26	23	23	23	23

Note: See Table 3.

former has no effect or even reduces economic growth (Beck et al., 2009; Jappelli & Pagano, 1994) while the later enhances economic activity (Levine, 2005). In addition, over-lending to households created a credit boom that led to banking crises, which in turn reduced economic growth (Demirguc & Detragiache, 1998; Kaminsky & Schmukler, 2002).

Regarding the insignificant effect of financial stock markets on economic growth more than a decade after the GFC, this might be related to the liquidity trap (Krugman, 1988) with investors preferring to keep their assets in the form of cash or savings. This explanation is also consistent with the arguments provided by Asteriou and Spanos (2021) who show that savings are responsible for the insignificant impact of financial stock markets on economic growth. However, after the GFC many EU countries experienced high sovereign debts exerting upward pressure on interest rates and expecting higher taxes in the future which in turn led stock prices to fall (Wisniewski & Jackson, 2021). In addition, strong linkages and stock market co-movements due to the integration of the EU countries' financial markets might be a possible explanation for the weakness of stock markets to promote economic growth after the crisis.

At the next step, we estimate our baseline model this time adding the indicators of the quality of fiscal policy. Table 3 presents the results for the full sample period (1990–2020) and the findings in Models I to IV verify the

TABLE 5 Panel estimation results, GFC (2008–2009)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
$ggdp_{t-1}$	−0.019	−0.137	0.322	0.026	0.088	0.013	0.300	0.359
	(−0.06)	(−0.34)	(0.75)	(0.08)	(0.21)	(0.04)	(1.40)	(0.97)
Δ*findev*	−0.057	−0.085	−0.040	−0.096*				
	(−0.52)	(−0.97)	(−0.62)	(−1.66)				
Δ*fininst*					0.148	0.165	0.180	0.230
					(0.83)	(0.94)	(1.56)	(1.53)
Δ*finmar*					−0.101**	−0.102*	−0.112*	−0.139***
					(−1.99)	(−1.78)	(−1.75)	(−2.58)
inf	0.416	0.625*	0.204	0.525*	0.241	0.427	0.140	0.182
	(1.57)	(1.84)	(0.50)	(1.81)	(0.71)	(1.33)	(0.61)	(0.58)
fdi	0.019*	0.008	0.005	0.016***	0.017	0.005	0.007**	0.014**
	(1.74)	(0.63)	(0.85)	(2.68)	(1.26)	(0.69)	(1.96)	(2.31)
Δ*open*	0.218***	0.294***	0.114**	0.154***	0.235***	0.329***	0.131***	0.185***
	(3.93)	(3.20)	(2.07)	(4.19)	(3.57)	(3.93)	(5.72)	(4.02)
edebt	−0.405***				−0.385***			
	(−7.41)				(−3.71)			
etax		−0.202				−0.157		
		(−0.25)				(−0.28)		
eexp			−0.945***				−0.954***	
			(−4.57)				(−4.47)	
ebd				−0.546***				−0.647***
				(−4.38)				(−4.02)
Constant	0.391	−0.709	0.101	−0.488*	0.439	−0.531	0.189	−0.274
	(1.21)	(−0.90)	(0.33)	(−1.67)	(0.92)	(−0.72)	(0.67)	(−0.74)
Observations	52	52	52	52	52	52	52	52
AR (1) *p*-value	0.313	0.313	0.559	0.323	0.485	0.345	0.426	0.475
AR (2) *p*-value	0.629	0.653	0.379	0.610	0.575	0.627	0.420	0.566
Hansen *p*-value	0.403	0.195	0.630	0.593	0.392	0.328	0.342	0.607
Number of instruments	19	19	19	19	22	22	22	22

Note: See Table 3.

significant and consistent effect of financial development (*findev*) in line with the results in Table 2, Model I. In Models V to VIII, we notice an insignificant effect of financial institutions (*fininst*) that becomes significant after adding taxes and government expenditures, an indication of the importance of fiscal policy shocks relative to the government size. The results also show a possible trade-off between financial institutions and the proxies for government size with the negative effects of fiscal shocks relevant to higher expenditures through taxes being absorbed by financial institutions. Therefore, the negative effects of government spending and taxes may hinder financial efficiency and accessibility to promote economic growth. Also, increasing government spending can lead to a more inefficient allocation of resources since governments tend to be less effective in spending money, while higher public spending can crowd-down domestic credit. Our results are in line with Purewal and Haini (2022) and Haini and Loon (2021), who argued that financial development is a positive contributor to growth while government spending has a negative impact. The estimated coefficients for the stock market index (*finmar*) are significant and positive with the exception of the model with government debt (Model V). Finally, across all models we notice that the macroeconomic factors for the quality of fiscal policy have not enhanced economic activity, thus indicating that changes of fiscal policy may not always live up to expectations for more economic growth.

TABLE 6 Panel estimation results, post-GFC (2008–2020)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
$ggdp_{t-1}$	0.280**	0.386***	0.426***	0.445***	0.254	0.424***	0.431***	0.433***
	(2.49)	(3.62)	(3.20)	(3.38)	(1.59)	(3.40)	(3.04)	(2.69)
Δ*findev*	0.021	0.028	0.021	0.029				
	(0.24)	(0.44)	(0.31)	(0.47)				
Δ*fininst*					0.016	0.097	0.094	0.089
					(0.14)	(1.16)	(1.13)	(0.92)
Δ*finmar*					0.002	−0.015	−0.01	0.001
					(0.05)	(−0.40)	(−0.27)	(0.04)
inf	0.256***	0.335***	0.295***	0.329***	0.266***	0.266*	0.272*	0.319**
	(3.76)	(3.10)	(2.59)	(2.85)	(2.59)	(1.81)	(1.94)	(2.04)
fdi	0.001	−0.003	−0.002	−0.001	0.002	−0.004	−0.003	−0.002
	(0.32)	(−0.81)	(−0.54)	(−0.22)	(0.31)	(−0.81)	(−0.54)	(−0.34)
Δ*open*	0.177***	0.259***	0.233***	0.242***	0.167***	0.273***	0.239***	0.249***
	(4.50)	(6.20)	(5.45)	(5.16)	(2.95)	(5.33)	(4.73)	(4.23)
edebt	−0.310***				−0.322***			
	(−4.29)				(−4.44)			
etax		−0.573**				−0.577**		
		(−2.52)				(−2.32)		
eexp			−0.345***				−0.346***	
			(−3.38)				(−3.27)	
ebd				−0.232**				−0.241**
				(−2.57)				(−2.48)
Constant	0.317	−0.455**	−0.363	−0.473**	0.338	−0.356	−0.348	−0.469*
	(0.86)	(−2.02)	(−1.42)	(−2.08)	(0.90)	(−1.60)	(−1.33)	(−1.89)
Observations	337	337	337	337	337	337	337	337
AR (1) *p*-value	0.238	0.250	0.268	0.265	0.271	0.284	0.286	0.297
AR (2) *p*-value	0.503	0.418	0.447	0.481	0.505	0.401	0.451	0.493
Hansen *p*-value	0.186	0.184	0.133	0.129	0.126	0.142	0.178	0.120
Number of instruments	20	20	20	20	23	23	23	23

Note: See Table 3.

Table 4 presents the results for the pre-GFC period (1990–2007). The findings suggest that the signs and statistical significance for all the financial development indices do not change after adding the fiscal policy variables, thus confirming the robustness of the results in Table 2, Models III–IV. In addition, there is substantial evidence that public debt is one of the most detrimental factors that adversely affected the economy during this period. The insignificant effect of financial institutions to promote growth in the pre-GFC period might be an indication of the financial system fragility and the lack of supervision. Loans not being properly supervised led to non-performance loans which in turn harmed real economic activity and exposed financial institutions to extreme leverage and risk. This explanation is in line with the findings of Singh (1997), Duffie (2019) and Wu et al. (2010), who found that improving risk diversification and information services of commercial banks results in more stable economic development and a reasonably supervised financial system can be more resilient to severe shocks.

Table 5 presents the results for the GFC period (2008–2009). The financial development index is not statistically significant at any reasonable level while the stock market exhibits a negative effect thus confirming the robustness of the main results in Table 2, Models V–VI. Focusing on the fiscal policy variables, we note that taxes are insignificant, while all other macroeconomic factors for the quality of fiscal policy have negatively affected economic activity.

TABLE 7 Panel estimation results, Covid-19 pandemic (2019–2020)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
$ggdp_{t-1}$	0.004	−1.754***	−1.785***	−2.466***	0.459	−1.820***	−2.110***	−2.624***
	(0.01)	(−3.16)	(−2.96)	(−3.30)	(1.27)	(−3.58)	(−3.20)	(−3.89)
Δ*findev*	−0.155	−0.483	−0.391	−0.346				
	(−1.38)	(−1.59)	(−1.07)	(−0.84)				
Δ*fininst*					−0.050	−0.641	−0.910	−0.834
					(−0.38)	(−1.00)	(−1.31)	(−1.41)
Δ*finmar*					−0.067	−0.031	−0.064	−0.068
					(−0.90)	(−0.20)	(−0.30)	(−0.30)
inf	0.580***	1.924***	1.917***	2.148***	0.439**	2.071***	2.116***	2.316***
	(2.73)	(6.30)	(6.15)	(4.72)	(2.11)	(4.80)	(5.48)	(4.86)
fdi	0.010	0.069*	0.077***	0.0823***	−0.001	0.081**	0.087***	0.089***
	(1.40)	(1.79)	(3.06)	(6.75)	(−0.15)	(2.45)	(4.13)	(6.38)
Δ*open*	0.021	0.345***	0.291***	0.327***	0.015	0.305***	0.291***	0.318***
	(0.39)	(3.39)	(3.52)	(4.36)	(0.35)	(3.02)	(3.42)	(4.50)
edebt	−0.414***				−0.417***			
	(−7.60)				(−9.15)			
etax		−0.084				−0.061		
		(−0.14)				(−0.10)		
eexp			−0.074				−0.033	
			(−0.68)				(−0.26)	
ebd				−0.040				−0.050
				(−0.30)				(−0.39)
Constant	−0.047	1.654	1.708	3.179	−1.054	1.355	1.820	2.846
	(−0.07)	(0.90)	(0.83)	(1.32)	(−1.30)	(0.93)	(1.08)	(1.60)
Observations	51	51	51	51	51	51	51	51
AR (1) *p*-value	0.285	0.249	0.258	0.257	0.299	0.254	0.253	0.245
AR (2) *p*-value	0.593	0.858	0.855	0.906	0.502	0.850	0.863	0.899
Hansen *p*-value	0.433	0.195	0.190	0.521	0.410	0.194	0.224	0.584
Number of instruments	14	13	14	14	16	16	16	16

Note: See Table 3.

Table 6 presents the results for the post-GFC period (2008–2020) which confirm the existence of an adverse effect of fiscal policy on growth. Financial institutions have mostly failed to promote growth in the years after the crisis and this might be due to the ineffectiveness of unconventional monetary policy implemented by the European Central Bank through quantitative easing which aimed to help the Eurozone countries to refinance their sovereign debts. Also, the inability of stock markets to contribute to economic activity might be an indication that EU stock markets are subject to significant effects indirectly through the transmission of fiscal shocks. In this context, Hanousek et al. (2009) argued that EU stocks markets are significantly affected by macroeconomic announcements.

Finally, Table 7 presents the results for the onset of the Covid-19 pandemic (2019–2020) which show that the estimated parameters of the financial development indices are statistically insignificant, a finding in line with Table 2, Models IX–X. Interestingly, from the group of the fiscal policy variables only public debt presents a significantly negative effect.

The overall results are consistent with the initial findings in Table 2. There is substantial evidence that the different performance of the financial system during normal versus stress times can be partly attributed to the quality of fiscal policy. Focusing on financial institutions, the results indicate that during the full sample period they respond to government size and are positive, implying

TABLE 8 Panel threshold estimation results for financial institutions

	Model I	Model II	Model III	Model IV	Model V
Δ*fininst*	0.062***	0.047***	0.061***	0.055***	0.058***
	(2.85)	(2.81)	(2.88)	(2.70)	(2.75)
inf	−0.017***	−0.024***	−0.023***	−0.017***	−0.015***
	(−4.94)	(−8.95)	(−6.52)	(−5.21)	(−4.35)
fdi	−0.012*	−0.009*	−0.014**	−0.015**	−0.013**
	(−1.81)	(−1.95)	(−2.31)	(−2.42)	(−2.09)
Δ*open*	0.164***	0.103***	0.165***	0.126***	0.137***
	(8.81)	(7.06)	(9.16)	(7.36)	(7.79)
edebt		−0.376***			
		(−20.72)			
etax			−0.586***		
			(−5.75)		
eexp				−0.347***	
				(−7.52)	
ebd					−0.206***
					(−4.39)
Constant	2.032***	2.172***	2.083***	2.193***	2.167***
	(14.31)	(19.80)	(15.09)	(16.58)	(15.95)
Threshold estimates, financial institutions index *fininst*					
$\widehat{\gamma}$	68.93	62.17	68.93	64.80	64.80
F-statistic	14.41***	40.40***	14.87***	12.06***	10.36**
Bootstrap *p*-value	0.006	0.000	0.010	0.010	0.016
95% confidence interval	62.9–68.9	61.04–62.59	62.9–68.9	59.4–65.02	59.05–65.02
Regime variable, financial institutions index Δ*fininst*					
$\widehat{\beta}_1$	0.369***	0.340***	0.385***	0.403***	0.379***
	(6.49)	(7.96)	(6.97)	(3.14)	(2.87)
$\widehat{\beta}_2$	−0.007	−0.011	−0.044	−0.025	−0.057
	(−0.10)	(−0.10)	(−0.53)	(−0.23)	(−0.49)
Observations	650	650	650	676	676

Note: See Table 3.

that apart from unproductive loans and lack of supervision financing government expenditures might be an additional reason for the difficulty of financial institutions to promote growth. However, the findings during the sub-periods (pre-GFC, GFC, post-GFC, pandemic) suggest that financial institutions are insignificant and failed to promote growth. Focusing on the stock market, the initial positive effect on growth at normal times reversed during the GFC. The failure of the stock market to enhance economic activity, taking also in mind the role of fiscal policy, indicates that deviations from expectations play an important role in this effect. The findings show that stock market performance is sensitive to fiscal shocks and reflect the higher degree of financial spillover effects of fiscal shock at times of economic recessions.

A general conclusion is that fiscal policy has negatively affected economic growth in EU economies and this can be mostly attributed to government debt, public expenditures, and budget deficits, with the estimated coefficients having much larger magnitudes after the GFC. The significant and negative effect of debt on economic growth at normal times might indicate the lack of incentives for some Eurozone countries to control and reduce public debt thus making them less able to service their liabilities hence leading to higher interest rates and a fall in stock market prices. This explanation is in line

TABLE 9 Panel threshold estimation results for financial stock markets

	Model I	Model II	Model III	Model IV	Model V
Δ*finmar*	0.253***	0.216***	0.270***	0.240***	0.238***
	(5.37)	(5.83)	(5.88)	(5.33)	(5.13)
inf	−0.017***	−0.024***	−0.023***	−0.018***	−0.015***
	(−4.86)	(−8.65)	(−6.31)	(−5.29)	(−4.37)
fdi	−0.011*	−0.008*	−0.013**	−0.013**	−0.011*
	(−1.69)	(−1.67)	(−2.12)	(−2.14)	(−1.78)
Δ*open*	0.174***	0.113***	0.175***	0.143***	0.154***
	(9.26)	(7.51)	(9.59)	(7.76)	(8.13)
edebt		−0.364***			
		(−19.46)			
etax			−0.539***		
			(−5.21)		
eexp				−0.377***	
				(−7.70)	
ebd					−0.247***
					(−4.94)
Constant	2.080***	2.232***	2.144***	2.114***	2.082***
	(14.62)	(19.92)	(15.43)	(15.54)	(14.91)
Threshold estimates, financial markets index *finmar*					
$\widehat{\gamma}$	33.18	33.18	28.42	33.18	33.18
F-statistic	1.30	0.96	0.89	0.75	1.13
Bootstrap *p*-value	0.670	0.700	0.840	0.870	0.690
95% confidence interval	33–33.20	33–33.18	28.16–28.52	33–33.21	33–33.19
Threshold estimates, financial markets index *finmar*					
$\widehat{\gamma}$	33.18	33.18	28.42	33.18	33.18
F-statistic	1.30	0.96	0.89	0.75	1.13
Bootstrap *p*-value	0.670	0.700	0.840	0.870	0.690
95% confidence interval	33–33.20	33–33.18	28.16–28.52	33–33.21	33–33.19

Note: See Table 3.

with the findings of Conway and Orr (2000) and Ardagna et al. (2007), who argued that accumulation of higher public debt and spending leads to higher inflationary pressures and as a consequence higher short- and long-term interest rates. However, the findings that government expenditures negatively affected the economy is in contrast to previous results by Alexiou et al. (2018) who suggested that this effect is positive.

The significant negative effects of debts and budget deficits continued for many years after the GFC indicating that the financial crisis was converted to a debt crisis (Reinhart & Rogoff, 2011; Romer, 2012). A possible explanation is that the sharp recession in 2008 and the sudden fall in output, increased the debt-to-GDP ratio and the active spending policies or austerity measures undertaken to reduce it led to an even deeper recession. Moreover, governments were under pressure to offer a sovereign risk premium for their debt to be sold and when this happens the cost of debt rises even further, making default more likely. Thus, in order to avoid default it is necessary for governments to impose fiscal limits, namely, limits to tax revenues and to public spending. Nevertheless, after the GFC our results imply that the effectiveness of the undertaken austerity measures by policymakers did not have the expected outcomes. The results are consistent with existing findings which argue that surprising changes may not constitute good policy (Candelon & Lieb, 2013; Mountford & Uhlig, 2009).

4.2 | Fixed effects panel threshold results

Table 8 reports the results of estimating Equation (6) using financial institutions as threshold as well as

regime-dependent variable. Model I does not include the fiscal policy variables and the estimated threshold value ($\hat{\gamma}$) is around 68% to GDP, Model II includes the debt variable and produces a threshold value of 62%, Model III involves taxes and results in a threshold value of 68%, while Models IV and V with spending and the budget deficit produce a threshold value of 64%. Regarding the estimated coefficients β_1 and β_2, below the threshold there is evidence that economic growth is endorsed while above it the effect becomes negative and insignificant. The empirical findings suggest a nonlinear relationship between finance and growth and are to some degree in line with other studies that found finance contributing to economic growth up to a certain point after which it turns negative (Arcand et al., 2015; Cecchetti & Kharroubi, 2012; Samargandi et al., 2015; Shen & Lee, 2006). However, the thresholds are around 62% to 68% and are remarkably lower than those reported in the literature (80%–100%).[2] This last finding might be due to the different financial indicators we employ since we use a new index that includes indicators of financial depth, access and efficiency, while the main variables used in the literature are indicators of financial depth, namely liquid liabilities and credit to private sector.

Table 9 reports the results of estimating Equation (6) using financial stock market as threshold and regime-dependent variable. Interestingly, across all models, we find high F-statistic *p*-values thus we do not reject the null hypothesis of a linearity. With the exception of Model II, the results for the coefficients β_1 and β_2 show that below the thresholds the effect on economic growth is insignificant but turns to significant and positive after the threshold values (around 33%).

To sum up, we find a non-linear effect of financial institutions on growth, while for stock markets the evidence indicates linearity. Financial institutions significantly affect the economy up to a certain point with the positive effect below the threshold reflecting their efficiency in providing funds to the private sector. The effect deteriorates above the threshold implying that financial institutions possibly channel credit to unproductive investment projects. This explanation is in line with Huang and Lin (2009) who argue that financial development facilitates investment loans that tend to promote growth, while consumption loans which are not productive tend to impede growth. Turning to the stock market, the results reveal that the direction of the effect on growth does not change before and after the threshold while the effect is stronger above a value of around 33%. Based on our results and the findings in the available literature, it is suggested that the prevalence of excess bank credit can dampen economic growth (Arcand et al., 2015; Rousseau & Wachtel, 2011) while stock markets can have a comparative advantage over banks and other institutions in raising funds for innovative and high-tech investments.

5 | CONCLUSIONS

Following the GFC many studies re-examined the relationship between finance and economic growth. Contrary to earlier studies which supported the finance-led-growth hypothesis, more recent studies argued that the finance-growth relationship is nonlinear. Although the literature has highlighted the adverse effects of a financial turmoil, the transformation of the GFC into a debt crisis in EU countries and the role of fiscal shocks in the finance-growth nexus presented risks for the achievement of long-term sustainable growth.

This study used data on 26 EU countries over the period 1990–2020 to examine the finance-growth relationship in conjunction with the role of fiscal policy. We adopt a dynamic estimation model and consider the performance of financial systems measured by financial depth, accessibility, and efficiency of both financial sectors, institutions and stock markets, across different sub-periods of normal and stress times. We provide new evidence regarding the impact on economic growth that arises from the behaviour of financial development when fiscal policy shocks are used as additional variables thus understanding better the sovereign debt crisis in some EU countries in the aftermath of the GFC.

The results indicate a different performance of the financial system and its interaction with the quality of fiscal policy at normal versus stress times. When the full time period is examined, the results provide support that financial development promotes economic growth and both sectors contribute to this positive effect. In contrast, when the sample period is divided to the pre-GFC, the GFC, the post-GFC, and the pandemic periods, the results reveal a much different behaviour of the financial system. The significant and positive effect of the stock market at normal times becomes insignificant or changes to negative, while on the other hand financial institutions are insignificant in the sub-periods examined. Furthermore, during the recent pandemic the effect of both sectors is statistically insignificant. Overall, our findings show that more than a decade since the GFC both sectors exhibit insignificant effects on economic growth.

We additionally provide evidence in favour of a nonlinear relationship between financial development and economic growth where after a threshold point more finance from financial institutions has a negative effect on economic growth. It should be noted that our findings

suggest the existence of a threshold at lower level compared to those previously identified in the literature possibly due to the different financial indicators we employ which regard financial depth, access and efficiency. On the other hand, our results show that the effect of the stock market on economic growth is linear.

The results of the current study can have important implications for the financial sector and its sensitivity to fiscal policy shocks. It is clear that financial development somewhat failed to play a safeguarding role for economic growth in a mostly homogeneous group of countries such that of the EU. Regulators should formulate policies to improve prudential regulations and supervisory framework to advance the financial system, allowing institutions to have sufficient capital and adequate risk controls in place. Also, further revisions to the regulatory treatment of government bonds should be advanced, since sovereign exposures that are relatively high before a stress event could drive the bank-sovereign nexus to aggravate a crisis. By achieving the proper balance between prudential risk and government bond holdings, financial institutions can be more effective in promoting growth, while macroprudential policy can mitigate the risk of stock markets which in turn can play a significant role for the overall economy. Further research is needed to find the best strategy for refinancing public debt and finding the optimal threshold for the debt-growth relationship. Finally, policymakers can strengthen the macroeconomic environment by encouraging savings and discouraging speculation, thus preventing underinvestments and misallocation of resources in periods of stress events.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[1] The assumption behind an AR (1) model is that the behaviour of a time series is largely determined by its own value in the preceding period. So, what will happen in time t is largely dependent on what happened in t-1. Alternatively, what will happen in $t + 1$ will be determined by the behaviour of the series in the current time t.

[2] For example, see some interesting findings from the literature in the Appendix, Table A4.

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How to cite this article: Asteriou, D., Spanos, K., & Trachanas, E. (2023). Financial development, economic growth and the role of fiscal policy during normal and stress times: Evidence for 26 EU countries. *International Journal of Finance & Economics*, 1–20. https://doi.org/10.1002/ijfe.2793

APPENDIX A

TABLE A1 Summary statistics

Variables	*N*	Mean	*SD*	Min	Max
ggdp	805	1.79	4.47	−34.90	25.18
findev	795	51.20	21.01	0.82	94.71
fininst	793	61.09	18.79	10.35	96.93
finmar	795	39.63	25.84	1.618	94.94
fdi	806	6.580	20.80	−40.08	280.1
inf	806	17.02	93.82	−9.66	1500
open	806	94.46	39.45	17.49	252.3
tax	806	42.09	7.18	23.43	61.35
exp	806	44.58	7.62	23.70	67.75
debt	803	58.56	34.98	0.300	211.2
bd	806	2.49	3.81	−13.98	32.02

TABLE A2 Correlation matrix

Variables	*Findev*	*Fininst*	*Finmar*	*Inf*	*Fdi*	*Open*	*Debt*	*Tax*	*Exp*
findev	1.000								
fininst	0.878	1.000							
finmar	0.942	0.666	1.000						
inf	−0.174	−0.201	−0.131	1.000					
fdi	0.063	0.056	0.058	−0.035	1.000				
open	−0.145	−0.036	−0.201	−0.050	0.209	1.000			
debt	0.427	0.382	0.397	−0.075	0.059	−0.139	1.000		
tax	0.343	0.255	0.355	−0.107	−0.096	−0.182	0.303	1.000	
exp	0.322	0.246	0.330	−0.154	−0.103	−0.270	0.402	0.882	1.000

TABLE A3 Panel unit root tests

Variables	Specification	LLC	Breitung	IPS	ADF	PP	I (·)	I (·)
ggdp	Intercept	−2.78***		−8.30***	165.16***	163.17***	I (0)	
ggdp	Intercept and trend	−4.88***	4.56	−6.59***	135.08***	110.44***	I (0)	I (0)
ggdp	None	−12.35***			225***	233***	I (0)	
findev	Intercept	−3.66***		−2.99***	65.72	108.04***	I (0)	
findev	Intercept and trend	4.68	−0.34	3.427	16.8	104.95***	I (1)	I (1)
findev	None	2.32			16.1	10.35	I (1)	
Δ*findev*	Intercept	18.01		−3.39***	72.81**	475***	I (0)	
Δ*findev*	Intercept and trend	29.92	−4.25***	−4.94***	99.90***	760***	I (0)	I (0)
Δ*findev*	None	−9.60***			157.4***	867***	I (0)	
fininst	Intercept	−1.69**		−0.529	50.5	85.98	I (1)	
fininst	Intercept and trend	3.844	4.7	3.245	28.74	106.5***	I (1)	I (1)
fininst	None	1.162			24.55	23.41	I (1)	
Δ*fininst*	Intercept	6.871		−4.172***	98.1***	498***	I (0)	
Δ*fininst*	Intercept and trend	10.51***	−2.88***	−4.31***	100.3***	1129***	I (0)	I (0)
Δ*fininst*	None	−9.57***			177.88***	847***	I (0)	
finmar	Intercept	−4.36***		−3.77***	81.63***	92.03***	I (0)	
finmar	Intercept and trend	2.364	−0.591	0.47	33.53	62.25	I (1)	I (1)
finmar	None	0.575			23.01	23.37	I (1)	
Δ*finmar*	Intercept	13.70***		−5.149***	103.93***	552.01***	I (0)	
Δ*finmar*	Intercept and trend	23.73	−3.628***	−4.418***	91.11***	552.52***	I (0)	I (0)
Δ*finmar*	None	−10.54***			195.93***	745.81***	I (0)	
inf	Intercept	−21.47***		−22.10***	238.49***	273.5***	I (0)	
inf	Intercept and trend	−40.57***	−4.20**	−26.79***	609***	861.1***	I (0)	I (0)
inf	None	−158***			940.8***	703.9***	I (0)	
fdi	Intercept	−8.73***		−9.40***	190.43***	192.07***	I (0)	
fdi	Intercept and trend	−7.71***	−5.39***	−7.00***	140.7***	136.2***	I (0)	I (0)
fdi	None	−6.76***			120.99***	161.64***	I (0)	
open	Intercept	4.6		−0.78	51.08	23.27	I (1)	
open	Intercept and trend	−6.28***	−0.09	−4.69***	115.15***	88.24***	I (0)	I (1)
open	None	4.19			9.85	2.73	I (1)	
Δ*open*	Intercept	−16.50***		−21.73***	457***	475***	I (0)	
Δ*open*	Intercept and trend	−10.57***	−5.40***	−18.64***	364***	409***	I (0)	I (0)
Δ*open*	None	−25.94***			635***	645***	I (0)	

Note: Δ denotes the first difference operator. ***, ** and * indicate rejection of the null hypothesis at the 1%, 5% and 10% levels, respectively.

TABLE A4 Summary of studies who investigated the nonlinear properties and threshold effects in the relationship between finance and growth

Authors	Sample size	Data	Method	Threshold and findings
Cecchetti and Kharroubi (2012)	50	Panel data, 1980–2009	Pooled OLS	$\widehat{\gamma} = 90\%$ (PRIVY)
Arcand et al. (2015)	>100	Cross-sectional and panel data, 1960–2010	Semi-parametric GMM	$\widehat{\gamma} = 100\%$ (PRIVY)
Law and Singh (2014)	87	Panel data, 1980–2010	Kremer (2013) GMM	$\widehat{\gamma} = 80\%$ (PRIVY) $\widehat{\gamma} = 91\%$ (LLY) $\widehat{\gamma} = 99\%$ (PRIVY)
Samargandi et al. (2015)	52	Panel data, 1980–2008	Caner and Hansen (2004)	FD index Bank sector index $\widehat{\gamma} = 91.5\%$ (FD) $\widehat{\gamma} = 91.8\%$ (FD) $\widehat{\gamma} = 43.3\%$ (FD)

Note: PRIVY stands for credit to private sector, and LLY stands for liquid liabilities.