Panel Granger Causality Between Financial Development and Economic Growth

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This paper uses panel Granger causality estimations with the approaches developed by Nair-Reichert and Weinhold (2001), and Bangake and Eggoh (2011) to analyse the causality relations between all the nine IMF financial development indices, and the real GDP growth considering a sample of 46 countries spread by all continents over the interval 1990-2017. The results revealed the dynamic character of these causality relations. Overall, no significant differences were found when comparing the results obtained for the financial institutions indices with those regarding the financial markets indices. The results confirm the existence of bidirectional causality, although not with the same statistical robustness for all the IMF indices addressing relevant aspects of financial development: access, depth, and efficiency of the financial institutions and markets.

Keywords: panel Granger causality, financial development, IMF financial development indices, financial institutions and markets, economic growth

INTRODUCTION

Over decades, and particularly since the 1990s, the link between the quality of the financial systems and economic growth has been studied and analysed with different methods and empirical tests, but it remains a controversial issue, still deserving further investigation.

A relevant strand of literature used panel data and provided several robust findings demonstrating the relevant contribution of different measures of financial development to economic growth. Several of these empirical studies included as output variables different financial variables and ratios such as total lending, private credit, liquid liabilities, bank loans to the private sector, or stock market capitalization, which were considered representative of the performance of the financial systems and institutions (see for example, Khan and Senhadji, 2000; Wachtel, 2001; and Sahay et al, 2015, for relevant discussion of the appropriate measures of financial sector development and the importance of the chosen econometric models and estimation techniques).

Other studies supported the reverse view, saying that economic growth had a positive effect on financial development (namely, Kar et al., 2011; Song et al., 2021), and many others analyzed the direction of the causality relation between financial development and economic growth providing evidence to support the existence of one direction or bi-direction causality (among others, Levine et al., 2000; Calderón and Liu, 2003; Hassan et al., 2011; Pradhan et al., 2018).

This paper contributes to the literature by estimating panel Granger causality regressions with the approaches developed by Nair-Reichert and Weinhold (2001), Bangake and Eggoh (2011) to analyze the causality relations between all the nine IMF financial development indices and the real GDP growth considering a sample of 46 countries spread by all continents over the interval 1990-2017.

Overall, the results demonstrate the existence of bidirectional causality, although not with the same statistical robustness for all the nine IMF financial development indices. They also confirm the need to use multiple indicators to measure the different aspects of the development of financial markets and institutions. Moreover, no significant differences were found when comparing the results obtained for the financial institutions indices with those regarding the financial markets indices.

This paper is organized as follows: Section 2 provides a brief literature review; Section 3 describes the methodological aspects; Section 4 presents the used data and the results obtained; Section 5 concludes.

BRIEF LITERATURE REVIEW

A large strand of literature is analyzing the relevance of the financial sector's performance to economic growth, particularly after the publication of the renowned King and Levine papers (1993a, 1993b). Many of these studies empirically analysed the financial system's contribution to economic growth with time series, cross-country regressions, and panel estimations, considering different proxies for financial development, and most of them concluded that well-functioning banking institutions and financial markets contributed to economic growth.

King and Levine (1993a) present cross-country evidence that financial development could promote economic growth using data on 80 countries over the period 1960-1989 and considering different measures of financial development, namely liquid liabilities over GDP, bank credit divided by the sum of bank and central bank credit, credit issued to nonfinancial private firms divided by total credit, credit issued to nonfinancial private firms divided by GDP. This empirical analysis was reviewed and extended in King and Levine (1993b) together with the analysis of the theoretical linkages between financial development and growth, corroborating that financial systems and institutions were important for productivity growth and economic development.

Rousseau and Wachtel (1998) used data from five countries (USA, UK, Canada, Sweden, and Norway) for 1871-1929. They concluded that there was a one-way causality between financial development and output. The financial development was measured by the ratio of financial institutions' assets to output and the ratio of the sum of financial institution assets, corporate stocks, and corporate bonds to total financial assets. Levine and Zervos (1998) considered data from 49 countries for the time interval 1976–1990, concluding that stock market liquidity and banking development positively predicted growth, capital accumulation, and productivity improvements when included in regression estimations.

Demirguç-Kunt and Levine (1999), using data from 150 countries spanning the 1990s, also concluded that wealthy countries had more developed financial systems, and analysed this development in terms of the size and efficiency of the financial sector, measured by the assets, liabilities, overhead costs, and interest rate margins.

Greenwood et al. (2010, 2013) also empirically analyzed the effects of financial development on economic growth, using a state cost verification model, and concluding that as financial sector efficiency rose, financial resources got redirected from the less productive firms to their more productive peers.

Other authors analyzed how financial systems differed worldwide, comparing those that were mostly bank-based with those that were primarily market-based. Levine (1997) discussed many of these studies, providing a cross-country examination of which view of financial structure was more consistent with the data. The main conclusions indicated that although financial development was robustly linked with economic growth, there was no robust support for either the bank-based or the market-based view.

Different conclusions were obtained by Gaytan and Rancière (2004), pointing out that, on the one hand, credit to the private sector and bank deposits contributed negatively to growth but, on the other hand, stock market size, liquidity, and investment contributed positively to economic development. The same kind of conclusions were obtained by Ayadi et al. (2015) using a sample of northern and southern Mediterranean countries for the 1985–2009 period: these authors confirmed that there were deficiencies in bank credit allocation in the considered countries as credit to the private sector and bank deposits were negatively associated with economic growth; however, on the stock market side, their results indicated that stock market size and liquidity did contribute to growth. Also, Cournède and Denk (2015), focusing on advanced countries, more precisely on OECD countries and G20 countries between 1970 and 2011, found that intermediated credit had a negative link with GDP growth and that stock market size had a positive one.

Simultaneously, another strand of the literature analyzed the potential causality relations between financial development and economic growth, considering that not only financial development could promote economic growth but also that increased growth could contribute to financial development.

Demetriades and Hussein (1996) analyzed some empirical works addressing the issue of causality between financial development and economic growth, and using time series techniques, they conducted causality tests between financial development (measured by the ratio bank deposit liabilities to GDP and the ratio of bank claims on the private sector to GDP) and real GDP using data from 16 not highly developed countries. Their results provided little support to the view that finance was a leading sector in the process of economic development, but they found considerable evidence of bi-directionality and some relevant evidence of reverse causation, meaning that it was finance that followed economic growth.

Berthelemy and Varoudakis (1996) discussed a theoretical endogenous growth model. They tested it with data from 95 countries, demonstrating that causality between financial development and growth ran in both ways, since growth in the real sector caused the financial market to expand, thereby increasing banking competition and efficiency. In return, the development of the banking sector raised the net yield on savings and enhanced capital accumulation and growth. The same kind of conclusions were obtained by Luintel and Khan (1999), who tested the long-run relationship between financial development (measured by the ratio of a bank's total deposit liabilities to one period lagged nominal GDP) and economic growth, using a sample of 10 countries and a data set that had an average period of 38 years. They found bi-directional causality between financial development and economic growth.

Levine et al. (2000) constructed a new dataset and, using different measures of financial intermediation, applied traditional cross-section, instrumental-variable procedures as well as dynamic panel techniques, considering a panel dataset of 74 countries, where the data were averaged over each of the seven 5-year intervals composing the period 1960-1995 and concluding that the development of financial intermediaries exerted an important causal impact on growth.

Calderón and Liu (2003) studied the causality between financial development and growth employing pooled data from 109 developing and industrial countries from 1960 to 1994 and found that financial development generally leaded to economic growth, as well as that the Granger causality from financial development to economic growth and the Granger causality from economic growth to financial development coexisted.

Bangake and Eggoh (2011) used panel methods on a data set of 71 developed and developing countries from 1960–2004 to assess the causal relationship between financial development and economic growth, confirming the existence of bidirectional causality between finance and growth. In addition, they concluded that while in low-and middle-income countries, there was no supportive evidence of short-run causality between financial development and economic growth, in high-income countries, economic growth significantly affected financial development.

Hassan et al. (2011) also empirically analyzed how financial development linked to economic growth by applying Granger causality tests for a sample period between 1980 and 2007 to different groups of countries: low- and middle-income countries in different geographic regions and two groups of high-income countries (OECD and non-OECD countries). They found a causal relationship between financial development and economic growth in developing countries. However, the short-term multivariate analysis provided mixed results: a two-way Granger causality between finance and growth for most of the considered regions and a one-way Granger causality from growth to finance for the two poorest regions. The same kind of conclusions were obtained by Kahouli (2017), testing the Granger causality between economic growth, energy consumption, and financial development in six South Mediterranean countries over the 1995–2015 period, and presenting mixed results for individual countries, as the causal relationships diverged essentially in intensity, and the rates of adjustment varied from country to country.

Pradhan et al. (2018) used panel cointegration and causality tests to analyze the interactions between innovation, financial development, and economic growth in 49 European countries between 1961 and 2014. They found many results, demonstrating the existence of unidirectional or bidirectional causal links between the variables in several cases. For example, they found evidence of unidirectional causality from financial development to per capita economic growth, particularly when banking sector development was linked to innovation and per capita economic growth. They also found evidence of bidirectional causality between financial development and economic growth, particularly when both stock market development and overall financial development were considered jointly with innovation and economic growth.

Yang (2019) tested the impact of financial systems on economic growth in cross-sectional and time series frameworks considering three groups of economies: trapped middle-income economies, graduated middle-income economies, and high-income economies from 1970 to 2016. The main conclusions confirmed that financial development contributed significantly to economic growth and the existence of Granger causality between equity market development and economic growth for all three groups of economies, although some stronger and some weaker. Moreover, there was a reverse causality between economic growth and equity market development in high-income economies, which was not detected in the other economies.

METHODOLOGY

The paper considers the traditional Granger causality test (Granger, 1969) and the approaches developed by Nair-Reichert and Weinhold (2001), and Bangake and Eggoh (2011) to analyze the existence of causality relationships among variables in panels.

According to the Granger causality concept, correlation does not imply causality since the cause cannot come after its effect. More precisely, a variable, x, is said to Granger cause another variable y, if the current value of this variable y (y_t) significantly depends on the past values of the variable x, that is, x_{t-1}, x_{t-2}, … (but not on its current value, x_t).

The starting point of the methodology is then the estimation of a general linear panel Granger causality model with two equations:

$$y_{i,t} = \alpha_1 + \sum_{k=1}^{K} \gamma_{1,i,k} y_{i,t-k} + \sum_{k=1}^{K} \beta_{1,i,k} x_{i,t-k} + \varepsilon_{1,i,t} \tag{1}$$

$$x_{i,t} = \alpha_2 + \sum_{k=1}^{K} \gamma_{2,i,k} x_{i,t-k} + \sum_{k=1}^{K} \beta_{2,i,k} y_{i,t-k} + \varepsilon_{2,i,t} \tag{2}$$

where $i = 1,...,N$ are the cross units; $t = 1,...,T$ are the periods; $\alpha_{1,2}$ are the intercepts; $k = 1,...K$ are the considered lags; $\varepsilon_{1,2}$ are the error terms (including not only the disturbance terms, but also the individual cross-unit specific effects).

The test of Granger noncausality considers the null hypothesis H_0: $\beta_i = 0$, $\forall i = 1,...,N$.

If H_0 is rejected, it is possible to conclude that causality exists. More precisely, the strength of the Granger causality relations in each estimated equation can be evaluated using Wald tests for each of the β_i that are obtained for the considered time lags (t-1, t-2,…). If the Wald test indicates that H_0 is rejected, causality from x to y (or from y to x) exists.

DATA AND EMPIRICAL RESULTS

Data

The paper considers the interval 1990-2017. It includes annual data for 46 countries covering all continents: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Ireland, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

All the data used in the estimations were sourced from the IMF databases. Economic growth is measured by the natural logarithm of the real Gross Domestic Product. Financial development is represented by the nine IMF financial development indices that measure the depth, access, and efficiency of the financial markets and institutions, as presented in Annex I and very well explained in Sahay et al. (2015) and in Svirydzenka (2016).

Before proceeding with the causality estimations, the stationarity of the considered series is analyzed, using two of the most recommended panel unit roots tests: the Levin-Lin-Chu tests (Levin et al, 2002), and Fisher-type (ADF) test (Choi, 2001; Maddala and Wu, 1999). The results obtained are reported in Annex II and reveal that some of the variables are not stationary in their levels, but all of them are stationary in their first differences.

Further, the cointegration between each of the nine IMF financial development indices and the natural logarithm of the real GDP is analyzed with the application of the Westerlund (2007) panel cointegration test, which is very flexible and works well in heterogeneous and/or relatively small panels, allowing for dependence both between and within the cross-panel units. The results obtained for the four Westerlund test statistics are presented in Annex III and provide clear support to accept the existence of cointegration between the real GDP growth and all the nine IMF financial development indices.

Results Obtained With the Panel Granger Causality Estimations

Following the methodology presented in the previous section, the panel causality estimations analyze the causality from financial development to economic growth (represented by Equation 1) and the causality from economic growth to financial development (Equation 2).

Both equations are first estimated with panel fixed effect estimations, which may not be fully appropriate since fixed-effects models cannot deal with endogenous regressors, and endogeneity may be an important concern in the context of the considered model. To deal with this eventual limitation, both equations are also estimated with GMM (Generalized Method of Moments) dynamic one-step and two-step estimations, following Arellano and Bond (1991) and Blundell and Bond (1998) as GMM estimations can not only address the endogeneity problems (although only for weak endogeneity and not for full endogeneity, as explained in Bond, 2002) but also reduce the potential bias of the estimated coefficients.

The use of annual data does not recommend the consideration of many lags (k) in the estimations, therefore, only two models were estimated: Model 1 considering only one lag (k=1) and Model 2 including two lags (k=2).

The results of the panel Granger causality estimations are presented in Annex IV and are statistically validated overall. The R-squared of the fixed effects estimations is acceptable for panel estimations; in almost all situations, the Arellano and Bond (1991) tests reject the null hypothesis of no autocorrelation of the first order and do not reject the hypothesis of no autocorrelation of the second order; moreover, with few exceptions, the Sargan and Hansen statistics, as well as the Wald-test results, validate the instruments.

Table 1 summarises the causality results obtained with fixed effects, GMM one-step GMM, and two-step estimations, providing evidence that in almost all situations, the Wald test results validate the instruments of both models, and very particularly in the GMM estimations.

Overall, the results obtained with Model 1 are corroborated by the results corresponding to the first lag of Model 2 (although not always by the results corresponding to the second lag) and they allow the following conclusions regarding the causality relations between the real GDP growth and the nine IMF financial development indices:

1) There is clear evidence that, with few exceptions, the IMF financial development indices Granger cause real GDP growth, (with the main exception of the results regarding the Financial Institutions Access Index).
2) The results regarding the causality from real GDP growth to financial development indices are not statistically as strong nor unanimous. Nevertheless, there is still robust evidence that the real GDP growth Granger causes the Financial Institutions Access Index, the Financial Markets Efficiency Index, and to some extent, also the Financial Institutions Efficiency Index, and the Financial Institutions Index.

TABLE 1
SUMMARY OF THE PANEL GRANGER CAUSALITY ESTIMATIONS

Causality: Financial Development → GDP							Causality: GDP → Financial Development						
Expl. Variable	**Model 1**			**Model 2**			**Expl. Variable**	**Model 1**			**Model 2**		
	FE	GMM1	GMM2	FE	GMM1	GMM2		FE	GMM1	GMM2	FE	GMM1	GMM2
Financial Development Index t-1	-	+ ***	+ ***	+	+ ***	+ ***	**GDP t-1**	+ ***	-	- **			
Financial Development Index t-2							**GDP t-2**				+ ***	+	- ***
WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.910	0.000	0.000	0.009 0.000 0.000	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.003	0.676	0.050	0.056 0.002 0.000	0.805 0.544 0.82	0.275 0.020 0.055
Financial Institutions Access Index t-1	-	- **	- ***	-		-	**GDP t-1**	+ ***	+ ***	+ ***	+ ***		
Financial Institutions Access Index t-2					-	- ***	**GDP t-2**					+	+ ***
WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.443	0.023	0.000	0.221 0.464 0.313	0.984 0.654 0.313	0.998 0.012 0.313	WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.000	0.000	0.000	0.000 0.000 0.000	0.136 0.276 0.189	0.000 0.000 0.000

Financial Institutions Depth Index t-1	-	+ ***	+ ***		+ ***	+ ***	**GDP t-1**	**-**	**- *****	**- *****			
Financial Institutions Depth Index t-2				- ***			**GDP t-2**				**+ *****	**+ *****	**+ *****
WALD TEST p-values ($\beta_{t-1}=0$) ($\beta_{t-2}=0$) ($\beta_{t-1}=b_{t-2}=0$)	0.202	0.000	0.000	0.002 0.000 0.000	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values ($\beta_{t-1}=0$) ($\beta_{t-2}=0$) ($\beta_{t-1}=b_{t-2}=0$)	0.469	0.012	0.000	0.016 0.000 0.000	0.000 0.000 0.000	0.000 0.000 0.000

Financial Institutions Efficiency Index t-1	+ ***	+ ***	+ ***	+ ***	+ ***	+ ***	**GDP t-1**	**+**	**+**	**+ ***	**+ ****	**+**	**+ *****
Financial Institutions Efficiency Index t-2							**GDP t-2**						
WALD TEST p-values ($\beta_{t-1}=0$) ($\beta_{t-2}=0$) ($\beta_{t-1}=b_{t-2}=0$)	0.000	0.000	0.000	0.001 0.198 0.001	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values ($\beta_{t-1}=0$) ($\beta_{t-2}=0$) ($\beta_{t-1}=b_{t-2}=0$)	0.209	0.790	0.093	0.034 0.630 0.099	0.113 0.111 0.140	0.000 0.000 0.000

Financial Institutions Index t-1	+	+ ***	+ ***		+ ***	+ ***	**GDP t-1**	**+ *** **	**+**	**+ ****		**+**	**+ *** **
Financial Institutions Index t-2				- **			**GDP t-2**				**+ *** **		
WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.474	0.009	0.000	0.070 0.028 0.090	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.009	0.863	0.015	0.069 0.000 0.000	0.483 0.170 0.214	0.000 0.000 0.000

Financial Markets Access Index t-1	+	+ ***	+ ***	+ ***	+ ***	+ ***	**GDP t-1**	**+ ****	**-**	**- *** **	**+ ***	**+**	**- *** **
Financial Markets Access Index t-2							**GDP t-2**						
WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.227	0.000	0.000	0.000 0.000 0.000	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.024	0.330	0.000	0.065 0.319 0.032	0.458 0.909 0.755	0.000 0.362 0.000

Financial Markets Depth Index t-1	+	+ ***	+ ***		+ ***	+ ***	**GDP t-1**	-	- ***	- ***		- ***	- ***
Financial Markets Depth Index t-2				- ***			**GDP t-2**				+ ***		
WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.503	0.000	0.000	0.000 0.000 0.000	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.951	0.000	0.000	0.106 0.000 0.000	0.000 0.029 0.000	0.000 0.000 0.000

Financial Markets Efficiency Index t-1	- **	- ***	- ***	- ***			**GDP t-1**	+ **	+ *	+ ***	+ **	+ *	+ ***
Financial Markets Efficiency Index t-2					+ ***	+ ***	**GDP t-2**						
WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.027	0.303	0.000	0.002 0.155 0.005	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values (β_{t-1}=0) (β_{t-2}=0) (β_{t-1}=b_{t-2}=0)	0.054	0.066	0.000	0.038 0.835 0.093	0.023 0.279 0.069	0.000 0.000 0.000

Financial Markets Index t-1	-	+ ***	+ ***	+ **	+ ***	+ ***	**GDP t-1**	+ **	- ***	- ***	+	-	- ***
Financial Markets Index t-2							**GDP t-2**						
WALD TEST p-values ($\beta_{t-1}=0$) ($\beta_{t-2}=0$) ($\beta_{t-1}=b_{t-2}=0$)	0.550	0.303	0.000	0.015 0.000 0.005	0.000 0.000 0.000	0.000 0.000 0.000	WALD TEST p-values ($\beta_{t-1}=0$) ($\beta_{t-2}=0$) ($\beta_{t-1}=b_{t-2}=0$)	0.046	0.529	0.000	0.153 0.219 0.054	0.524 0.889 0.815	0.000 0.168 0.000

***significant at 1% level; ** significant at 5% level; * significant at 10% level. In Model 2, there is indication of the results obtained for lag 2 only when they clearly dominate the results obtained for lag 1.

Source: Author’s calculations presented in Annex IV.

CONCLUDING REMARKS

This paper contributes to the literature using the traditional Granger causality tests, following the approaches developed by Nair-Reichert and Weinhold (2001), and Bangake and Eggoh (2011to analyse the causality relations between all the nine IMF financial development indices and the real GDP growth, considering a panel of 46 countries covering all continents over the interval 1990-2017.

The results obtained point to the existence of bi-directional causality, although not statistically with the same robustness for all the nine indices, confirming the potential existence of mixed results that were already found, for example, in Kar et al (2011), Kahouli (2017), and Pradhan et al. (2018). Nevertheless, the results of this paper allow the following conclusions:

- In almost all situations, the Wald test obtained with the traditional panel Granger causality tests reveal the adequacy of the considered instruments and the presence of causality relations. Moreover, the results are more robust when using GMM estimations confirming the dynamic character of the tested causality relations, considering the capacity of this kind of estimation to reduce the potential bias of the estimated coefficients and well addressing the eventual endogeneity problems.
- With few exceptions, the results obtained with GMM estimations confirm the causality running from the IMF financial development indices to GDP growth and, although not with the same statistical robustness, also running from GDP growth to the financial development indices.

Overall, the results obtained in this paper confirm the relevance of the relationships between financial development and economic growth, supporting the statements of Svirydzenka (2016) in regard to the need to use multiple indicators to measure the different aspects of development, namely considering the access, depth, and efficiency of the financial markets and institutions. Also, the results obtained support the main results of Levine (1997) but are not fully in line with the conclusions of some more recent works, such as Gaytan and Rancière (2004), Ayadi et al. (2013), and Cournède and Denk (2015), as this paper does not reveal the existence of significant differences between the results obtained for the financial institutions indices versus the results regarding the financial markets indices.

Further research is still needed in this field due to the complex and dynamic causality relations between the different aspects of financial development and economic growth, considering the diversity of the financial systems across countries and their different levels of development.

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APPENDIX 1: CONSTRUCTION OF THE FINANCIAL DEVELOPMENT INDEX

	FINANCIAL INSTITUTIONS	**FINANCIAL MARKETS**
DEPTH	1. Private-sector credit (% of GDP) 2. Pension fund assets (% of GDP) 3. Mutual fund assets (% of GDP) 4. Insurance premiums, life and non-life (% of GDP)	1. Stock market capitalization to GDP 2. Stocks traded to GDP 3. International debt securities government (% of GDP) 4. Total debt securities of nonfinancial corporations (% of GDP) 5. Total debt securities of financial corporation of GDP)
ACCESS	1. Branches (commercial banks) per 100,000 adults 2. ATMs per 100,000 adults	1. Percent of market capitalization outside of top 10 largest companies 2. Total number of issuers of debt (domestic and external, nonfinancial corporations, and financial corporations)
EFFICIENCY	1. Net interest margin 2. Lending-deposits spread 3. Non-interest income to total income 4. Overhead costs to total assets 5. Return on assets 6. Return on equity	1. Stock market turnover ratio (stocks traded/ capitalization)

Source: Sahay, R., Cihak, M., N'Diaye, P., Barajas, A., Bi, R., Ayala, D., Gao, Y., Kyobe, A., Nguyen, L., Saborowski, C., Svirydzenka, K. and Yousefi, S.R. (2015) Rethinking Financial Deepening: Stability and Growth in Emerging Markets, IMF Staff Discussion Note, SDN/15/08, pp. 34.

APPENDIX 2: RESULTS OBTAINED WITH PANEL UNIT ROOT TESTS (p-VALUES)

	Financial Development Index	Financial Institutions Access Index	Financial Institutions Depth Index	Financial Institutions Efficiency Index	Financial Institutions Index	Markets Access Index	Financial Markets Depth Index	Financial Markets Efficiency Index	Financial Markets Index	Ln GDP
Levin Li Levels Differences	0.0000 0.0000	0.5006 0.0000	0.0039 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0. 9543 0.0000
Fisher (P statistic) Levels Differences	0.0000 0.0000	0.0000 0.0000	0.0001 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0488 0.0000	0.0000 0.0000	0.0000 0.0000	1.0000 0.0000

Source: Author's calculations using STATA statistical software. Data were sourced from the IMF databases.

APPENDIX 3: RESULTS OBTAINED WITH WESTERLUND PANEL COINTEGRATION TESTS: COEFFICIENTS OF THE COINTEGRATION BETWEEN THE NATURAL LOGARITHM OF THE REAL GDP AND THE NINE IMF FINANCIAL DEVELOPMENT INDICES

	Financial Development Index	Financial Institutions Access Index	Financial Institutions Depth Index	Financial Institutions Efficiency Index	Financial Institutions Index	Markets Access Index	Financial Markets Depth Index	Financial Markets Efficiency Index	Financial Markets Index
Gt	-3.003***	-2.670 ***	-2.182 ***	-3.844***	-3.370***	-2.788***	-2.346***	-3.453***	-2.573***
Ga	-12.184***	-9.263***	-7.457	-14.491***	-14.056	-10.031***	-9.261***	-13.130***	-9.492***
Pt	-23.113***	-25.319***	-19.708***	-27.592***	-32.789***	-15.597***	-12.016**	-19.934***	-16.166***
Pa	-12.670***	-11.995***	-9.434***	-16.703***	-19.627***	-7.928***	-6.765***	-10.660***	-5.256***

***significant at 1% level; ** significant at 5% level; * significant at 10% level.
Source: Author's calculations using STATA statistical software. Data were sourced from the IMF databases.

APPENDIX 4: RESULTS OBTAINED WITH PANEL GRANGER CAUSALITY ESTIMATIONS

Financial Development Index → GDP

	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.00352	0.000	.00341	0.000	.00544	0.000	.00495	0.000	.00547	0.000	.00501	0.000
GDP_{t-2}			-.00057	0.100			-.0027	0.000			-.00276	0.000
Financial Development Index $_{t-1}$	-.00148	0.910	.06226	0.009	.08941	0.000	.52975	0.000	.08944	0.000	.52429	0.000
Financial Development Index $_{t-2}$			-.08967	0.000			-.4767	0.000			-.47265	0.000
R-squared	0.1568		0.1417									
AB AR(1) z p- value					-10.78 0.000		-9.43 0.000		-3.79 0.000		-3.88 0.000	
AB AR(2) z p- value					-0.91 0.365		0.93 0.354		-0.45 0.649		0.66 0.509	
Sargan test chi2 Prob > chi2					582.08 0.000		404.10 0.000		582.08 0.000		404.10 0.000	
Hansen test chi2 Prob > chi2									45.52 0.615		43.69 0.527	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.01 0.9097		6.82 0.0091		18.97 0.0000		44.43 0.0000		1783.87 0.0000		1262.80 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			15.10 0.0001				32.52 0.0000				1013.21 0.0000	
WALD TEST ($\beta_{t-1}=\beta_{t-2}$=0) chi2 Prob > chi2			8.02 0.0003				49.66 0.0000				1263.19 0.0000	
No.observatio	1242		1196		1242		1196		1242		1196	

GDP → Financial Development Index

	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Development Index $_{t-1}$	.7948	0.000	.8441	0.000	1.024	0.000	1.080	0.577	1.022	0.000	1.085	0.000
Financial Development Index $_{t-2}$			-.0350	0.170			-.049	0.577			-.056	0.000
GDP_{t-1}	.0011	0.003	.0007	0.056	-.0003	0.676	-.0002	0.805	-.0003	0.050	-.0001	0.275
GDP_{t-2}			.0012	0.002			.0005	0.543			-.0004	0.000
R-squared	0.9576		0.9649									
AB AR(1) z p- value					-11.21 0.000		-5.67 0.000		-5.48 0.000		-5.57 0.000	
AB AR(2) z p- value					-2.12 0.034		-1.23 0.219		-2.46 0.014		-1.61 0.108	
Sargan test chi2 Prob > chi2					42.71 0.007		102.46 0.000		42.71 0.007		102.46 0.000	
Hansen test chi2 Prob > chi2									45.03 0.635		44.99 0.472	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	8.88 0.0029		3.65 0.0562		0.18 0.6757		0.06 0.8048		3.85 0.0497		1.19 0.2752	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			9.23 0.0024				0.37 0.5435				5.43 0.0198	
WALD TEST ($\beta_{t-1}=\beta_{t-2}$=0) chi2 Prob > chi2			10.31 0.0000				0.37 0.8294				5.79 0.0553	
No.observatio	1242		1196		1242		1196		1242		1196	

	Financial Development Index → GDP											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.003511	0.000	.003576	0.000	.00545	0.000	.005982	0.000	.00544	0.000	.005982	0.000
GDP_{t-2}			-.00057	0.102			-.00275	0.000			-.00274	0.000
Financial Institutions Access $_{t-1}$	-.00702	0.443	-.02892	0.221	-.0431	0.023	-.00197	0.984	-.0429	0.000	-.00004	0.998
Financial Institutions Access $_{t-2}$			.016851	0.464			-.04377	0.654			-.04692	0.012
R-squared	0.1697		0.1660									
AB AR(1) z p- value					-11.19 0.000		-10.54 0.000		-3.84 0.000		-3.88 0.000	
AB AR(2) z p- value					-0.71 .478		2.30 0.021		-0.36 0.717		1.42 0.155	
Sargan test chi2 Prob > chi2					601.91 0.000		524.36 0.000		601.91 0.000		524.36 0.000	
Hansen testchi2 Prob > chi2									45.70 0.608		45.80 0.439	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.59 0.4425		1.50 0.2214		5.18 0.0228		0.00	0.98	2193.81 0.0000		0.00 0.9980	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			0.54 0.4644				0.20 0.6544				6.37 0.0116	
WALD TEST ($\beta_{t-1}=\beta_{t-2}$=0)chi2 Prob > chi2			1.16 0.3126				5.35 0.0689				245.37 0.0000	
No.observati	1242		1196		1242		1196		1242		1196	

	GDP → Financial Development Index											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Institutions Access $_{t-1}$	.8890	0.000	.99558	0.000	.9470	0.000	1.320	0.000	.9502	0.000	1.321	0.000
Financial Institutions Access $_{t-2}$			-.0531	0.018			-.365	0.000			-.369	0.000
GDP_{t-1}	.0022	0.000	.00150	0.000	.0020	0.002	.0011	0.135	.0019	0.000	.001	0.000
GDP_{t-2}			.00185	0.000			.0008	0.276			.0009	0.000
R-squared	0.9752		0.9853									
AB AR(1) z p- value					-9.41 0.000		-6.48 0.000		-4.01 0.000		-4.78 0.000	
AB AR(2) z p- value					0.45 0.651		1.30 0.192		0.57 0.565		1.76 0.078	
Sargan test chi2 Prob > chi2					92.14 0.000		51.94 0.222		92.14 0.000		51.94 0.222	
Hansen test chi2 Prob > chi2									43.76 0.685		44.16 0.508	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	32.28 0.0000		19.35 0.0000		9.20	0.0	2.23 0.1355		467.25 0.0000		150.66 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			29.49 0.0000				1.19 0.2763				27.12 0.0000	
WALD TEST ($\beta_{t-1}=\beta_{t-2}$=0) chi2 Prob > chi2			39.30 0.0000				4.26 0.1188				185.89 0.0000	
No.observati	1242		1196		1242		1196		1242		1196	

Financial Development Index → GDP												
	Fixed effects				GMM one-step system				GMM two-step system			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.00350	0.000	.003602	0.000	.005836	0.000	.005951	0.000	.00583	0.000	.005984	0.000
GDP_{t-2}			-.00066	0.054			-.00233	0.009			-.00225	0.000
Financial Institutions Depth $_{t-1}$	-.0182	0.202	.084193	0.002	.070036	0.000	1.03179	0.000	.06938	0.000	1.03008	0.000
Financial Institutions Depth $_{t-2}$			-.13194	0.000			-.96992	0.000			-.97956	0.000
R-squared	0.1469		0.1011									
AB AR(1) z p- value					-11.47 0.000		-8.64 0.000		-3.81 0.000		-3.88 0.000	
AB AR(2) z p- value					-0.53 0.597		1.25 0.210		-0.26 0.792		0.97 0.330	
Sargan test chi2 Prob > chi2					567.90 0.000		235.68 0.000		567.90 0.000		235.68 0.000	
Hansen test chi2 Prob > chi2									45.17 0.629		40.55 0.661	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	1.63 0.2019		10.07 0.0015		23.67 0.0000		79.02 0.0000		378.65 0.0000		954.38 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			25.72 0.0000				70.85 0.0000				860.59 0.0000	
WALD TEST ($\beta_{t-1}=\beta_{t-2}$=0) chi2 Prob > chi2			14.63 0.0000				83.47 0.0000				1003.02 0.0000	
No.observati	1242		1196		1242		1196		1242		1196	

GDP → Financial Development Index												
	Fixed effects				GMM one-step system				GMM two-step system			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Institutions Depth $_{t-1}$	.8237	0.000	.91638	0.000	.9854	0.000	.7887	0.000	.9892	0.000	.7967	0.000
Financial Institutions Depth $_{t-2}$			-.0866	0.001			.2031	0.008			.1924	0.000
GDP_{t-1}	-.0002	0.469	-.0008	0.016	-.0016	0.012	-.0020	0.000	-.0015	0.000	-.0019	0.000
GDP_{t-2}			.00161	0.000			.0024	0.000			.0023	0.000
R-squared	0.9824		0.9854									
AB AR(1) z p- value					-12.25 0.000		-3.92 0.000		-4.82 0.000		-5.48 0.000	
AB AR(2) z p- value					-2.77 0.006		-3.04 0.002		-2.26 0.024		-3.11 0.002	
Sargan test chi2 Prob > chi2					110.94 0.000		129.19 0.000		110.94 0.000		129.19 0.000	
Hansen test chi2 Prob > chi2									44.97 0.637		42.63 0.573	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.52 0.4694		5.83 0.0160		6.25 0.0124		12.56 0.0004		123.75 0.0000		141.73 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			22.36 0.0000				16.44 0.0001				261.85 0.0000	
WALD TEST ($\beta_{t-1}=\beta_{t-2}$=0) chi2 Prob > chi2			11.36 0.0000				22.66 0.0000				272.54 0.0000	
No.observati	1242		1196		1242		1196		1242		1196	

inancial Development Index → GDP												
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.00344	0.000	.003489	0.000	.00526	0.000	.005381	0.000	.00523	0.000	.005522	0.000
GDP_{t-2}			-.0006	0.049			-.0030	0.000			-.0031	0.000
Financial Institution Efficiency	.03348	0.000	.04868	0.001	.1316	0.000	.39793	0.000	.1311	0.000	.41574	0.000
Financial Institution Efficiency			-.0172	0.198			-.2503	0.000			-.2682	0.000
R-squared	0.1433		0.1292									
AB AR(1) z p- value					-10.65 0.000		-8.64 0.000		-3.77 0.000		-4.13 0.000	
AB AR(2) z p- value					-1.22 0.221		1.58 0.113		-0.64 0.525		1.10 0.271	
Sargan test chi2 Prob > chi					568.92 0.000		345.17 0.000		568.92 0.000		345.17 0.000	
Hansen test chi2 Prob > chi									45.40 0.620		40.37 0.668	
WALD TEST (β_{t-1}=0) chi2 Prob > chi	14.17 0.0002		10.82 0.0010		22.44 0.0000		35.94 0.0000		926.19 .0000		1487.44 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi			1.66 0.1977				15.80 0.0001				514.19 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi			6.83 0.0011				40.57 0.0000				1495.14 0.0000	
No.observat	1242		1196		1242		1196		1242		1196	

GDP → Financial Development Index												
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Institutions $Efficiency_{t-1}$	.6748	0.000	.5919	0.000	.7312	0.000	.5845	0.000	.7350	0.000	.5693	0.000
Financial Institution Efficiency			.1332	0.000			.2290	0.011			.2394	0.000
GDP_{t-1}	.0008	0.209	.0013	0.034	.0003	0.790	.0018	0.113	.0002	0.093	.0017	0.000
GDP_{t-2}			-.000	0.630			-.001	0.111			-.001	0.000
R-squared	0.8097		0.8418									
AB AR(1) z p- value					-9.64 0.000		-4.60 0.000		-4.59 0.000		-4.28 0.000	
AB AR(2) z p- value					1.22 0.223		-0.80 0.426		0.94 0.349		-1.66 0.096	
Sargan test chi2 Prob > chi					79.57 0.004		66.65 0.020		79.57 0.004		66.65 0.020	
Hansen test chi2 Prob > chi									43.79 0.684		39.01 0.723	
WALD TEST (β_{t-1}=0) chi2 Prob > chi	1.58 0.2087		4.49 0.0342		0.07 0.7902		2.51 0.1129		2.82 0.0928		62.31 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi			0.23 0.6301				2.55 0.1106				32.35 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi			2.32 0.0987				3.93 0.1402				64.87 0.0000	
No.observat	1242		1196		1242		1196		1242		1196	

	Financial Development Index → GDP											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.00351	0.000	.003510	0.000	.00560	0.000	.00486	0.000	.00556	0.000	.004775	0.000
GDP_{t-2}			-.00065	0.063			-.0033	0.000			-.00322	0.000
Financial Institutions $Index_{t-1}$	.009266	0.474	.04687	0.070	.05182	0.009	.86470	0.000	.05148	0.000	.862063	0.000
Financial Institutions $Index_{t-2}$			-.0522	0.028			-.8025	0.000			-.79645	0.000
R-squared	0.1398		0.1495									
AB AR(1) z p- value					-11.23 0.000		-8.31 0.000		-3.81 0.000		-4.00 0.000	
AB AR(2) z p- value					-0.71 0.477		2.06 0.040		-0.36 0.716		1.74 0.082	
Sargan test chi2 Prob > chi2					590.55 0.000		290.00 0.000		590.55 0.000		290.00 0.000	
Hansen test chi2 Prob > chi2									45.61 0.612		43.09 0.553	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.51 0.4742		3.29 0.0698		6.84 0.0089		43.08 0.0000		311.17 0.0000		478.17 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			4.84 0.0279				39.27 0.0000				501.95 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			2.42 0.0892				43.79 0.0000				503.02 0.0000	
No.observation	1242		1196		1242		1196		1242		1196	

	GDP → Financial Development Index											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Institutions $Index_{t-1}$	.7680	0.000	.8028	0.000	.9429	0.000	.8805	0.000	.9451	0.000	.8788	0.000
Financial Institutions $Index_{t-2}$			.0423	0.042			.0711	0.389			.073 0	0.000
GDP_{t-1}	.0009	0.009	.0006	0.069	.0001	0.863	.0004	0.483	.0001	0.015	.0004	0.000
GDP_{t-2}			.0014	0.000			.0008	0.170			.0007	0.000
R-squared	0.9621		0.9785									
AB AR(1) z p- value					-10.26 0.000		-5.35 0.000		-5.03 0.000		-4.88 0.000	
AB AR(2) z p- value					0.00 0.998		-0.03 0.977		0.00 0.998		-0.06 0.951	
Sargan test chi2 Prob > chi2					77.94 0.005		84.48 0.000		77.94 0.005		84.48 0.000	
Hansen test chi2 Prob > chi2									43.48 0.696		42.95 0.559	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	6.79 0.0093		3.31 0.0693		0.03	0.863	0.49 0.4828		5.97 0.0145		28.39 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			20.79 0.0000				1.89 0.1697				94.16 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			18.12 0.0000				3.09 0.2136				132.74 0.0000	
No.observation	1242		1196		1242		1196		1242		1196	

	Financial Development Index → GDP											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.003495	0.000	.003551	0.000	.00504	0.000	.005699	0.000	.00508	0.000	.00567	0.000
GDP_{t-2}			-.00068	0.049			-.00312	0.000			-.00318	0.000
Financial Markets $Access_{t-1}$	.009979	0.227	.04818	0.001	.10278	0.000	.276343	0.000	.10196	0.000	.273923	0.000
Financial Markets $Access_{t-2}$			-.04826	0.001			-.18899	0.001			-.18609	0.000
R-squared	0.1434		0.1475									
AB AR(1) z p- value					-10.48 0.000		-10.06 0.000		-3.79 0.000		-4.20 0.000	
AB AR(2) z p- value					-1.04 0.299		1.99 0.046		-0.52 0.602		1.30 0.195	
Sargan test chi2 Prob > chi2					583.55 0.000		412.13 0.000		583.55 0.000		412.13 0.000	
Hansen test chi2 Prob > chi2									44.96 0.638		45.08 0.469	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	1.46 0.2266		11.44 0.0007		39.15 0.0000		26.85 0.0000		1601.02 0.0000		301.97 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			11.97 0.0006				10.98 0.0009				111.14 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			6.52 0.0015				45.43 0.0000				1146.93 0.0000	
No.observatio	1242		1196		1242		1196		1242		1196	

	GDP → Financial Development Index											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Markets $Access_{t-1}$	.7815	0.000	.6662	0.000	.9836	0.000	.7755	0.000	.9822	0.000	.7833	0.000
Financial Markets $Access_{t-2}$			.1231	0.000			.2358	0.030			.2236	0.000
GDP_{t-1}	.0015	0.024	.0013	0.065	-.0014	0.330	.0002	0.458	-.0015	0.000	-.0011	0.000
GDP_{t-2}			.0007	0.319			-.0018	0.909			.0002	0.362
R-squared	0.9407		0.9432									
AB AR(1) z p- value					-13.90 0.000		-4.17 0.000		-4.35 0.000		-4.18 0.000	
AB AR(2) z p- value					-0.46 0.647		-1.86 0.063		-0.44 0.657		-2.71 0.007	
Sargan test chi2 Prob > chi2					69.55 0.028		71.32 0.007		69.55 0.028		71.32 0.007	
Hansen test chi2 Prob > chi2									44.92 0.639		44.40 0.497	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	5.09 0.0242		3.40 0.0653		0.95 0.3296		0.55 0.4581		13.95 0.0002		13.33 0.0003	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			1.00 0.3185				0.01 0.9088				0.83 0.3623	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			3.46 0.0317				0.56 0.7554				16.29 0.0003	
No.observatio	1242		1196		1242		1196		1242		1196	

	Financial Development Index → GDP											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.003493	0.000	.003459	0.000	.00525	0.000	.005236	0.000	.00526	0.000	.005273	0.000
GDP_{t-2}			-.00042	0.204			-.00121	0.095			-.00126	0.000
Financial Markets $Depth_{t-1}$	.005015	0.503	.133828	0.000	.09835	0.000	.397305	0.000	.09810	0.000	.392225	0.000
Financial Markets $Depth_{t-2}$			-.14970	0.000			-.37410	0.000			-.37006	0.000
R-squared	0.1512		0.2037									
AB AR(1) z p- value					-10.45 0.000		-9.71 0.000		-3.71 0.000		-4.25 0.000	
AB AR(2) z p- value					-0.90 0.369		0.10 0.923		-0.45 0.655		0.11 0.914	
Sargan test chi2 Prob > chi2					578.64 0.000		343.10 0.000		578.64 0.000		343.10 0.000	
Hansen test chi2 Prob > chi2									45.86 0.601		44.85 0.478	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.45 0.5034		85.16 0.0000		51.07 0.0000		152.49 0.0000		882.28 0.0000		2093.97 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			108.69 0.0000				112.36 0.0000				1479.64 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			54.47 0.0000				152.87 0.0000				2149.65 0.0000	
No.observatio	1242		1196		1242		1196		1242		1196	

	GDP → Financial Development Index											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Markets $Depth_{t-1}$	.8562	0.000	.8359	0.000	.9902	0.000	.8690	0.000	.9928	0.000	.8734	0.000
Financial Markets $Depth_{t-2}$			.0034	0.907			.1546	0.015			.1551	0.000
GDP_{t-1}	-.00004	0.951	-.001	0.106	-.0045	0.000	-.0052	0.000	-.0045	0.000	-.0052	0.000
GDP_{t-2}			.0024	0.000			.0029	0.029			.0029	0.000
R-squared	0.9561		0.9552									
AB AR(1) z p- value					-15.28 0.000		-6.17 0.000		-5.01 0.000		-4.91 0.000	
AB AR(2) z p- value					-1.69 0.092		-1.97 0.049		-1.96 0.050		-2.65 0.008	
Sargan test chi2 Prob > chi2					273.01 0.000		278.50 0.000		273.01 0.000		278.50 0.000	
Hansen test chi2 Prob > chi2									45.60 0.612		45.13 0.467	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.00 0.9512		2.61 0.1064		13.01 0.0003		16.83 0.0000		2373.86 0.0000		701.77 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			13.19 0.0003				4.77 0.0289				63.30 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			6.62 0.0014				17.76 0.0001				818.82 0.0000	
No.observatio	1242		1196		1242		1196		1242		1196	

	Financial Development Index → GDP											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.003536	0.000	.003622	0.000	.00554	0.000	.00719	0.000	.00552	0.000	.007202	0.000
GDP_{t-2}			-.00058	0.093			-.00289	0.000			-.00291	0.000
Financial Markets $Efficiency_{t-1}$	-.00916	0.027	-.01885	0.002	-.0136	0.000	-.10759	0.000	-.0138	0.000	-.10798	0.000
Financial Markets $Efficiency_{t-2}$			.008651	0.155			.123455	0.000			.125110	0.000
R-squared	0.1392		0.1281									
AB AR(1) z p- value					-11.00 0.000		-9.39 0.000		-3.84 0.000		-4.07 0.000	
AB AR(2) z p- value					-0.61 0.542		2.36 0.018		-0.31 0.753		1.62 0.106	
Sargan test chi2 Prob > chi2					605.41 0.000		380.21 0.000		605.41 0.000		380.21 0.000	
Hansen test chi2 Prob > chi2									45.75 0.606		45.15 0.466	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	4.89 0.0272		9.25 0.0024		1.06 0.3030		15.89 0.0001		120.92 0.0000		746.91 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			2.02 0.1554				22.73 0.0000				1306.65 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			5.28 0.0052				22.83 0.0000				1321.62 0.0000	
No.observation	1242		1196		1242		1196		1242		1196	

	GDP → Financial Development Index											
	Fixed effects				**GMM one-step system**				**GMM two-step system**			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Markets $Efficiency_{t-1}$	.7127	0.000	.7272	0.000	.7734	0.000	.7783	0.000	.7806	0.000	.8136	0.000
Financial Markets $Efficiency_{t-2}$			-.019	0.483			.0402	0.686			.0043	0.906
GDP_{t-1}	.0029	0.054	.0033	0.038	.0052	0.066	.0070	0.023	.0051	0.000	.0064	0.000
GDP_{t-2}			-.0003	0.835			-.0033	0.279			-.0032	0.000
R-squared	0.8053		0.8158									
AB AR(1) z p- value					-9.53 0.000		-4.35 0.000		-4.65 0.000		-4.46 0.000	
AB AR(2) z p- value					-2.03 0.043		-1.37 0.169		-1.76 0.079		-1.46 0.144	
Sargan test chi2 Prob > chi2					110.99 0.000		87.95 0.000		110.99 0.000		87.95 0.000	
Hansen test chi2 Prob > chi2									44.49 0.656		43.85 0.521	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	3.72 0.0539		4.32 0.0380		3.38	0.066	5.15 0.0232		106.69 0.0000		75.36 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			0.04 0.8349				1.17 0.2789				96.14 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			2.38 0.0926				5.34 0.0693				172.68 0.0000	
No.observation	1242		1196		1242		1196		1242		1196	

Financial Development Index → GDP												
	Fixed effects				GMM one-step system				GMM two-step system			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
GDP_{t-1}	.00353	0.000	.00344	0.000	.00522	0.000	.005418	0.000	.00523	0.000	.005393	0.000
GDP_{t-2}			-.00055	0.112			-.00272	0.000			-.00276	0.000
Financial Markets Index $_{t-1}$	-.0047	0.550	.0364	0.015	.08483	0.000	.246719	0.000	.0837	0.000	.248915	0.000
Financial Markets Index $_{t-2}$			-.0535	0.000			-.17787	0.000			-.18134	0.000
R-squared	0.1548		0.1371									
AB AR(1) z p- value					-10.54 0.000		-9.88 0.000		-3.76 0.000		-3.86 0.000	
AB AR(2) z p- value					-1.10 0.270		1.26 0.207		-0.55 0.580		0.80 0.423	
Sargan test chi2 Prob > chi2					580.91 0.000		454.31 0.000		580.91 0.000		454.31 0.000	
Hansen test chi2 Prob > chi2									45.62 0.611		44.55 0.491	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	0.36 0.5503		5.89 0.0154		24.19 0.0000		28.17 0.0000		639.03 0.0000		869.39 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			13.05 0.0003				13.26 0.0003				334.95 0.0000	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			7.19 0.0008				37.03 0.0000				1589.56 0.0000	
No.observatior	1242		1196		1242		1196		1242		1196	

GDP → Financial Development Index												
	Fixed effects				GMM one-step system				GMM two-step system			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Financial Markets Index $_{t-1}$	.8331	0.000	.8756	0.000	1.011	0.000	1.136	0.000	1.009	0.000	1.137	0.000
Financial Markets Index $_{t-2}$			-.0614	0.027			-.1362	0.147			-.1457	0.000
GDP_{t-1}	.0012	0.046	.0009	0.153	-.0008	0.000	-.0009	0.524	-.0008	0.000	-.0008	0.000
GDP_{t-2}			.0008	0.219			.0002	0.889			.0004	0.168
R-squared	0.9324		0.9352									
AB AR(1) z p- value					-11.84 0.000		-5.71 0.000		-5.20 0.000		-5.03 0.000	
AB AR(2) z p- value					-3.16 0.002		-1.10 0.269		-3.17 0.002		-1.66 0.097	
Sargan test chi2 Prob > chi2					144.89 0.000		109.20 0.000		144.89 0.000		109.20 0.000	
Hansen test chi2 Prob > chi2									45.68 0.608		43.82 0.522	
WALD TEST (β_{t-1}=0) chi2 Prob > chi2	3.99 0.0461		2.05 0.1527		0.40 0.5292		0.41 0.5242		22.25 0.0000		32.62 0.0000	
WALD TEST (β_{t-2}=0) chi2 Prob > chi2			1.51 0.2189				0.02 0.8885				1.90 0.1678	
WALD TEST (β_{t-1}=β_{t-2}=0) chi2 Prob > chi2			2.93 0.0538				0.41 0.8150				32.62 0.0000	
No.observatior	1242		1196		1242		1196		1242		1196	

Source: Author's calculations using STATA statistical software. Data were sourced from the IMF databases.