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Finance-Growth Nexus and Globalization in Brazil, India, Philippines, Thailand, and Turkey: Evidence from VECM Cointegration Analysis

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Abstract

We investigate the causal relationship between financial development and economic growth—the finance-growth nexus—in Brazil, India, Philippines, Thailand, and Turkey by controlling for the globalization indicators of trade openness, foreign direct investment (FDI), and portfolio investment, together with the structural break dummy. Our sample countries of different regions have various experiences of developing and liberalizing their financial systems and external sectors as well as financial crises. Time series data span over the period 1974-2017, and two financial indicators of size and efficiency are used in estimation. Implementing the cointegration and Granger causality tests in the framework of the vector error correction model (VECM), we find that: 1) financial size and economic growth are in a positive, bilateral relationship in all the sample countries, although that of Turkey is more inclining toward economic growth causing financial size; 2) when financial development is proxied by financial efficiency, the results are different among the five countries; and 3) although theoretically expected to be contributive, the globalization indicators of trade openness, FDI, and portfolio investment exhibit either a positive or negative impact on financial development and economic growth. Based on empirical findings, we argue that policy-makers should design and develop financial sector polices and growth strategies fully considering the nature of their countries' own institutional and structural characteristics.

Keywords: *Economic Growth; Financial Development; Globalization; VECM; Cointegration; Granger Causality.*

JEL Classification: *E44, F43, F62, O53, O54.*

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1. Introduction

The relationship between financial development and economic growth —the finance-growth nexus— has been long discussed in the literature. This argument was started by the work of Schumpeter (1911) who highlighted the important functioning of a financial system to attain higher economic growth through technological innovations. Theoretically, it is considered that financial development helps to identify better investment opportunities, reduces productive cost, mobilizes savings, boosts technological innovation and enhances the risk taking capacity of investors (Levine, 1997). As the growth effect of financial development has been recognized, it is required to empirically confirm the issue of the finance-growth nexus, that is, whether/how financial development significantly influences economic growth, specifically in developing countries.

Furthermore, as globalization goes on rapidly, how trade openness, FDI, and portfolio investment impact on the level of economic growth has been highlighted in the literature. While the growth effect of trade (export + import) has been traditionally recognized since David Ricardo put forward the classical theory of comparative advantage in 1817, those of FDI and portfolio investment are differently discussed (e.g. De Vita & Kyaw, 2009; Durham, 2004; Nunnenkamp & Spatz, 2004). However, the conformity of financial development and globalization leading to higher growth has been increasingly questioned as several financial crisis episodes have been witnessed in emerging economies (Minsky, 1984; Tobin, 1984). As evidence of an increasing extent of financial deepening and globalization, many developing countries have implemented policy changes of financial liberalization and market deregulation—following the structural adjustment programs prescribed by the IMF and the World Bank—since the early 1980s. We observe that such efforts were not fully beneficial but rather typically caused financial crisis and market failure, bringing severe damage not only on a single country but also worldwide.

For examining the finance-growth nexus, it is also important to address the issue of measuring financial development. Most empirical studies have used the size-based financial indicators as it is simply assumed that more credit and funding are relevant to more efficient allocation. But it can be questioned whether those size-based indexes, which are generally measured by the ratio of total domestic credit or various monetary aggregates to nominal GDP, are appropriate to measure the effect of financial development (Wachtel, 2011).As financial development is a multidimensional concept, there are several channels through which it can influence economic growth (Patra & Dastidar, 2018).

Therefore, we suggest the two indicators of financial size and efficiency to examine the finance-growth nexus.

The objective of the present paper is to investigate the relationship between financial development and economic growth in Brazil, India, Philippines, Thailand, and Turkey in the context of on-going globalization consisting of trade openness, foreign direct investment (henceforth FDI), and portfolio investment, together with a structural break[1]. While these countries of different regions possess various experiences of developing and liberalizing their financial systems and external sectors as well as financial crises, so far there are no studies which highlighted the heterogeneity in their finance-growth nexus. We attempt to fill this vacant area by conducting a country specific in-depth analysis with the vector error correction model (VECM) approach.

The rest of the paper is organized as follows. The related literature is reviewed in Section 2. The basic models and data are given in Section 3, and methodology is elucidated in Section 4. Empirical findings are presented and discussed in Section 5, and Section 6 concludes.

2. Literature Review

2.1. Finance-growth nexus debate

The topic of the finance-growth nexus has been long debated, yet with little agreement. Considering whether/how financial development and economic growth influence each other, Patrick (1966) assumes different directions, i.e. either "supply-leading" (finance→growth) or "demand-following" (growth→finance) or "bilateral" (finance↔growth) throughout the development process. The supply-leading hypothesis virtually coincides with theoretical achievements of such economists as McKinnon (1973) and Shaw (1973), that is, financial institutions utilize productive resources to facilitate capital formation and thus play a crucial role in mobilizing savings and in allocating thus collected resources efficiently to productive sectors. Over the 1950s and 1960s, conventional policy advice was that governments in developing countries actively promote development by intervening in financial markets. By the early 1970s, the so-called financial repression was suggested by McKinnon (1973) and Shaw (1973) who were in favour of liberalizing the financial system while criticizing such

[1] The present paper is an extended version of Fukuda (2019) which focuses on investigating Mexico's finance-growth nexus.

repression policies as ceilings on interest rates, high reserve requirements and administrative credit allocation.

In contrast, according to the demand-following hypothesis, since financial depth can be enhanced by output growth, financial development is just a phenomenon in response to the increasing demand for new financial instruments and service; as an economy grows, such a demand will spontaneously rise and result in the evolution of an economy's financial system. Robinson (1952) mentions that 'where enterprise leads finance follows'. Since the increasing demand for financial services is brought by economic growth, it is economic growth that is the chief driving force behind financial deepening and the growth effect of finance is overstressed (Lucas, 1988). The other view is that finance and growth may be interdependent, i.e. the bilateral relationship where financial development and economic growth have an impact on each other (finance↔growth) (e.g. Demetriades & Hussein, 1996). While a well-developed system is essential for output growth, the latter is also necessary for the former as financial markets effectively respond to the demand for certain financial instruments and services which are created by economic expansion.

To reconcile the theoretical debate of the finance-growth nexus, several empirical studies have been conducted, but there are some issues. First, while the leading evidence of financial development positively impacting economic growth is presented by cross-country studies (e.g. King & Levine, 1993; Levine & Zervos, 1998), several economists contend that those studies are implicitly based on the assumption of homogeneity in different countries' growth patterns, thus ignoring country-specific factors in estimation (e.g. Demetriades & Hussein, 1996; Luintel & Khan, 1999). It is a simple question that although different countries have pursued different strategies and policies of economic development, why do they share the same result for the finance-growth nexus?

Second, as far as time series studies assessing this topic are concerned, since the use of a bivariate causality analysis was very common, previous "finance and output only" studies were likely to suffer from the omission-of-variable bias. It is pointed out that a country's finance-growth linkage is more complicated highly depending on other variables than finance and output because a growth-enhancing financial system requires a far-reaching spectrum of structural reforms and policy measures (Cevik & Rahmati, 2018), otherwise the omission of such variables could lead to misspecification (Luintel & Khan, 1999). As a result, an increasing number of empirical studies have introduced various third and more variables to the estimation of the finance–growth causality.

2.2. Globalization

As globalization rapidly extends, how trade openness, FDI, and portfolio investment impact on economic growth is widely discussed and investigated in the literature. The view that trade (export + import) enhances economic growth and welfare has a long history, considering that outward-oriented economies consistently have higher growth rates than inward-oriented countries[2].On the other hand, those of FDI and portfolio investment are differently discussed. The removal of barriers to capital flows in the developing world has encouraged the regional outward and inward investments, which surely influence economic development in developing countries.FDI produces (favorable) externalities through the diffusion of new technology and of business know-how, contributing relatively more to economic growth than domestic investment. Thus, FDI is expected to exert considerable spillover effects to enhance the productivity of an economy in the long run. Meanwhile, portfolio investment can promote economic growth by increasing the liquidity of financial markets. As domestic markets become more liquid, deeper and broader, a wider range of projects can be financed more efficiently in the short run (De Vita & Kyaw, 2009).

While these two types of investment become available for developing countries, international agencies have advised developing countries to rely mainly on FDI (Nunnenkamp& Spatz, 2004). One reason is the frequency of “financial crisis” and “boom-and-bust” cycles (Durham, 2004) observed in several emerging economies. Rapid financial deepening typically leads to growth volatility, financial instability and financial crisis. Indeed, there are several crisis episodes in the developing world, such as India in 1991, Asian countries in 1997–1998, Latin America in 1999-2002, and Turkey in 2001 (Ari & Cergibozan, 2016).More liquid financial markets due to the increasing volume of portfolio investment-associated with speculation activities-significantly cause higher vulnerability to international shocks, resulting in a financial crisis that brought a severe negative impact on an economy. In this regard, FDI, which offers not only capital but also access to modern technology and know-how, is less volatile than portfolio investment.

[2] Indeed, the growth effect of trade is a key subject of debate in research and policy discourses, differently discussed in terms of either trade volume or trade restrictions (Yanikkaya, 2003).

3. Empirical Strategy and Data

To explain the empirical strategy for investigating the finance-growth nexus in the five countries, we present the following five-variable equations:

$$EG_t = f_1(FS_t, TOP_t, FDI_t, PFI_t) \quad (1)$$

$$FS_t = f_2(EG_t, TOP_t, FDI_t, PFI_t) \quad (2)$$

$$EG_t = f_3(FE_t, TOP, FDI_t, PFI_t) \quad (3)$$

$$FE_t = f_4(EG_t, TOP_t, FDI_t, PFI_t) \quad (4)$$

Equations 1, 2, 3, and 4 imply that the Granger causality tests are conducted to give interference to the causal linkage between the economic growth indicator (real per capita GDP, EG) and each of the financial development indicators (FS and FE). Trade openness (TOP), FDI (FDI), and portfolio investment (PFI) are the "globalization" indicators that are incorporated to address the omission-of-variable bias in estimation; it is rational as the sample countries have been exposed to an increasing extent of globalization, accepting a large volume of international trade (exports + imports), FDI, and portfolio investment[3]. Estimating equations 1 and 2, we confirm whether/how economic growth and financial size are related to each other, that is, the causality is either FS→EG or EG→FS or FS↔EG. In the same way, the causality of either FE→EG or EG→FE or FE↔EG—whether/how economic growth and financial efficiency Granger-cause each other—is also assessed by equations 3 and 4.

Financial size (FS) is a quantitative indicator that is measured by the GDP ratio of domestic credit to the private sector provided by commercial banks. Financial efficiency (FE) is a qualitative indicator that is proxied by the ratio of domestic credit to the private sector provided by banks to the private sector to the gross domestic savings; formally, Beck et al. (2009) propose the ratio of private credit to total deposit (demand + time deposits), but since continuous series of the five countries' total deposit are unavailable, those of gross domestic savings are employed instead[4]. Trade openness (TOP) is represented by the GDP

[3] Instead of FDI and portfolio investment, there are such composite measures of financial openness as Lane and Milesi-Ferretti (2007) and Chinn and Ito (2008). However, those measures do not provide long-enough data series to conduct a time-series estimation, and we have an intension to separately highlight the impacts of FDI and portfolio investment on the finance-growth nexus in our sample countries.

[4] Like most developing countries, it is assumed that bank credit—not stock market transactions—is dominant in our sample countries. Also, as compared with stock market indexes, banking ones are more available over a longer time period.

ratio of the sum of exports and imports of goods and services. “FDI” is the GDP ratio of the net flows of FDI. Portfolio investment (PFI) is the GDP ratio of net flows through cross-border public and publicly guaranteed and private nonguaranteed bond issues.

All the underlying variables are converted into logarithm. We employ annual data series mainly from the World Bank’s World Development Indicators (WDI) and from the IMF’s International Financial Statistics (IFS). The sample period covers 1979 to 2017 for Brazil, 1982 to 2017 for India, 1977 to 2017 for Philippines, 1975 to 2017 for Thailand, and 1974 to 2017 for Turkey, respectively.

4. Methodology

4.1. VECM Specification

The formal specification of the vector error correction model (VECM) with weakly exogenous variables is expressed as follows:

$$\mathrm{X}_t = \Pi Y_{t-p} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta \mathrm{Y}_{t-2} + \cdots + \Gamma_{p-1} \Delta Y_{t-p+1} + u_t \tag{5}$$

In equation 5, X_t = [EG, FS/FE] is a 2 × 1 vector of the endogenous/dependent variables; Y_t = [EG, FS/FE, TOP, FDI, PFI] is the cointegrating vector of the endogenous and weakly exogenous variables; p is the lag order included in the system; Γ_i refers to short-run coefficient matrices; and u_t is a vector of error terms. The cointegrating relationship between the endogenous/dependent variables is given by the rank of Π matrix (r) in which $0 < r < 2$. The two matrices α and β with dimension ($2 \times r$) are such that $\alpha\beta` = \Pi$. The matrix $\beta$ contains the $r$ cointegrating vectors, having the property that $\beta`Y_t$ is stationary. α is the matrix of the error correction presentation that shows the speed of adjustment from a short-run disequilibrium to a long-run steady state equilibrium. Assuming a single cointegrating vector (r = 1) in estimation, we form the following system equations:

$$\begin{bmatrix}\Delta EG_t \\ \Delta FS_t\end{bmatrix} = \begin{bmatrix}\alpha_{1j} \\ \alpha_{2j}\end{bmatrix} [\beta_{i1}\ \beta_{i2}\ \beta_{i3}\beta_{i4}\beta_{i5}] \begin{bmatrix}EG_{t-1} \\ FS_{t-1} \\ TOP_{t-1} \\ FDI_{t-1} \\ PFI_{t-1}\end{bmatrix} + \Gamma_{ij} \begin{bmatrix}\Delta EG_{t-p} \\ \Delta FS_{t-p} \\ \Delta TOP_{t-p} \\ \Delta FDI_{t-p} \\ \Delta PFI_{t-1}\end{bmatrix} + \begin{bmatrix}\hat{u}_{1t} \\ \hat{u}_{2t}\end{bmatrix} \tag{6}$$

$$\begin{bmatrix}\Delta EG_t \\ \Delta FE_t\end{bmatrix} = \begin{bmatrix}\alpha_{3j} \\ \alpha_{4j}\end{bmatrix} [\beta_{i6}\ \beta_{i7}\ \beta_{i8}\beta_{i9}\beta_{i10}] \begin{bmatrix}EG_{t-1} \\ FE_{t-1} \\ TOP_{t-1} \\ FDI_{t-1} \\ PFI_{t-1}\end{bmatrix} + \Gamma_{ij} \begin{bmatrix}\Delta EG_{t-p} \\ \Delta FE_{t-p} \\ \Delta TOP_{t-p} \\ \Delta FDI_{t-p} \\ \Delta PFI_{t-1}\end{bmatrix} + \begin{bmatrix}\hat{u}_{3t} \\ \hat{u}_{4t}\end{bmatrix} \tag{7}$$

Equation 6 is “Model I” whose financial development indicator is the financial size (FS), whereas equation 7 is “Model II” whose financial development indicator is the financial efficiency (FE). In the two equations, EG and FS/FE are the endogenous/dependent variables, and TOP, FDI, and PFI are treated as the weakly exogenous variables in the cointegrating vector.

By normalizing each of EG and FS/FE to one, we implement two types of the Granger causality test. The first test is the weak exogeneity test that imposes zero restrictions on α, i.e. H_0: $\alpha_{ij} = 0$; the rejection of the null hypothesis indicates that there is a long-run causality formed by all the underlying variables in the system (Johansen & Juselius, 1992). The second test is the strong exogeneity test that is relevant to an overall causality by imposing a restriction on both α and either of β, i.e. H_0: $\alpha_{ij}\ \beta_{ij} = 0$ (Toda & Phillips, 1993). Based on the significant statistics of the two tests, we give interference to the finance-growth nexus in the five countries.

4.2. Structural Break Dummy

Following the argument of Johansen et al. (2000), we take the element of structural break into the VECM analysis. We consider that with the inclusion of structural break, all the underlying variables can collectively and properly explain variations in the finance-growth nexus. To this end, break dates in the five countries’ EG (real per capita GDP) series are specified by conducting the Lee and Strazicich (2003; 2004) test (hereafter the LS test). Four models of the LS test are estimated. Referring to break dates given by Models A and AA which provide a change in level but no change in the trend rate, we make level shift dummies (LSD). Trend break dummies (TBD) are also produced with break dates pinpointed by Models C and CC which provide a change both in level and in the trend rate. Those LSDs and TBDs reported in the third and sixth columns of Table 1 are such dummy variables that give a single cointegration ($r = 1$) and no autocorrelation in estimation.

5. Empirical Results

5.1. Initial Procedures

We begin the VECM cointegration estimation of the finance-growth nexus by first conducting two unit root tests of the GLS augmented Dickey–Fuller (ADF-GLS) test (Elliott et al., 1996) and the Phillips and Perron (PP) test (Phillips & Perron

1988). The ADF-GLS test is an amended version of the Dickey–Fuller test as the former is based on a modified statistics of the latter with generalized least squares (GLS). The other is the PP test whose residual variance is robust to autocorrelation. In order to save the space, we do not present unit root statistics though, EG, FS, FE, TOP, FDI, and PFI are estimated as non-stationary in their levels but are stationary after taking their first-differences at the 1% level (the results are available on request). Thus, all the underlying variables are confirmed as adequate for the analysis.

Next we implement the Johansen (1988) cointegration test whose lag order is set at either two or three or four for each country. While TOP, FDI, and PFI are taken as the weakly exogenous variables, different combinations of deterministic components—intercept, trend, level shift dummy (LSD), and trend break dummy (TBD)—are also included in estimation. The results in Table 1 indicate that there is a single cointegration relationship (r = 1) at the 1% significance level in all the models except for Philippines' model I which is significant the 5% level[5]. Before further discussing empirical results, we need to check the diagnostic test statistics of autocorrelation, non-normality and heteroscedasticity in Table 2 and judge all ten models of the VECM analysis adequate for considering the finance-growth nexus.

Table 1. Cointegration Test Results

	Model I			**Model II**		
	Null	***p-value***	***Det. Component***	***Null***	***p-value***	***Det. Component***
BRAZIL	$r = 0$	0.000***	Trend	$r = 0$	0.001***	Intercept
	$r <= 1$	0.071	TBD(2000)	$r <= 1$	0.077	LSD(2007)
INDIA	$r = 0$	0.008***	Trend	$r = 0$	0.001***	Intercept
	$r <= 1$	0.517	TBD(2002)	$r <= 1$	0.077	LSD(1996)
PHILIPPINES	$r = 0$	0.032**	Trend	$r = 0$	0.006***	Trend
	$r <= 1$	0.481	TBD(1999)	$r <= 1$	0.245	LSD(1999)
THAILAND	$r = 0$	0.000***	Intercept LSD(1998)	$r = 0$	0.000***	Intercept
	$r <= 1$	0.135	LSD(2010)	$r <= 1$	0.130	LSD(1987)
TURKEY	$r = 0$	0.000***	Trend	$r = 0$	0.000***	Trend
	$r <= 1$	0.171	TBD(2002)	$r <= 1$	0.143	TBD(2002)

[5] Although both trace and eigen value statistics are available for the Johansen (1988) test, we provide the former only, highlighting more robust estimates (Cheng and Lai, 1993).

Table 2. Diagnostic Test Results

Test	Brazil		India		Philippines		Thailand		Turkey	
	Model I	***Model II***	***Model I***	***Model II***	***Model I***	***Model II***	***Model I***	***Model II***	***Model I***	***Model II***
Autocorrelation	1.402 [0.844]	3.675 [0.452]	6.719 [0.152]	4.180 [0.382]	6.169 [0.187]	4.139 [0.387]	1.337 [0.855]	6.058 [0.195]	5.778 [0.216]	4.061 [0.398]
Normality	1.375 [0.848]	0.848 [0.932]	3.911 [0.418]	3.518 [0.475]	5.587 [0.232]	8.679 [0.070]	7.098 [0.131]	3.668 [0.453]	2.370 [0.668]	1.874 [0.759]
ARCH	13.761 [0.745]	22.204 [0.223]	6.418 [0.994]	24.591 [0.137]	10.649 [0.909]	6.004 [0.996]	7.776 [0.982]	21.208 [0.269]	7.896 [0.980]	12.442 [0.824]

5.2. Identified Cointegrating Vectors

Identified cointegrating vectors for economic growth and financial size/financial efficiency together with α and weak exogeneity test statistics are provided in Table 3. "α" is the error correction term (ECT) coefficient that shows the speed of adjustment back to the long-run equilibrium whenever there is a deviation from a steady state in the system. In this regards, the ECT coefficient is expected to be statistically significant with a negative sign. We normalize the coefficient of EG/FS/FE is normalized to one in the cointegrating to confirm the direction of each underlying variable with respect to the three dependent variables, i.e. whether one variable is either positive or negative to economic growth/financial size/financial efficiency by looking at each variable's sign in the cointegrating vector.

Table 3. Cointegrating Vectors

	MODEL I	**MODEL II**
Brazil	$EG = 0.236FS - 0.092TOP + 0.102FDI + 0.117PFI + 0.003TBD(2000) + 0.003Trend$ α = -0.607***	$EG = 0.350FE - 0.054TOP + 0.111FDI + 0.209PFI + 0.009(2007LSD) + 5.422$ α = -0.314***
	$FS = 4.243\ EG + 0.389TOP - 0.434FDI - 0.495PFI - 0.013TBD(2000) - 0.014Trend$ α = -1.513***	$FE = 2.857EG + 0.153TOP - 0.317FDI - 0.598PFI - 0.025(2007LSD) - 15.491$ α = -1.503***
India	$EG = 0.037FS - 0.109TOP + 0.013FDI + 0.00008PFI + 0.021TBD(2002) + 0.038Trend$ α = -0.524***	$EG = 0.373FE + 0.809TOP - 0.055FDI + 0.016PFI + 0.724(1996LSD) + 3.071$ α = -0.060***
	$FS = 26.953EG + 2.928TOP - 0.357FDI + 0.002PFI - 0.554TBD(2002) - 1.013Trend$ α = -0.059***	$FE = 2.684EG - 2.172TOP + 0.148FDI - 0.042PFI - 1.945(1996LSD) - 8.242$ α = 0.048
Philippines	$EG = 0.075FS + 0.263TOP + 0.053FDI - 0.101PFI + 0.069TBD(1999) - 0.027Trend$ α = -0.319**	$EG = 0.066FE + 0.321TOP + 0.074FDI - 0.133PFI + 0.077TBD(1999) - 0.036Trend$ α = -0.198
	$FS = 13.370EG - 3.552TOP - 0.706FDI + 1.347PFI - 0.919TBD(1999) + 0.357Trend$ α = -0.112**	$FE = 15.049EG - 4.833TOP - 1.108FDI + 2.000PFI - 1.155TBD(1999) + 0.541Trend$ α = -0.192***
Thailan	$EG = 1.981FS - 4.382TOP + 0.382FDI + 0.226PFI + 2.450(1998LSD) - 0.379LSD(2010LSD) + 16.647$ α = -0.031	$EG = -0.149FE + 0.062TOP - 0.073FDI - 0.033PFI + 0.275(1987LSD) + 6.422$ α = -0.556***
	$FS = 0.505EG + 2.212TOP - 0.193FDI - 0.114PFI - 1.237(1998LSD) + 0.191(2010LSD) - 8.402$ α = -0.173	$FE = -6.715EG + 0.415TOP - 0.487FDI - 0.219PFI + 1.844(1987LSD) + 43.127$ α = -0.063
Turkey	$EG = 0.016FS + 0.310TOP - 0.153FDI - 0.595\ PFI + 0.037TBD(2002) + 0.002Trend$ α = -0.187**	$EG = 0.669FE + 0.416TOP - 0.289FDI - 0.053PFI + 0.003TBD(2002) - 0.000Trend$ α = -0.041
	$FS = 8.606EG - 2.666TOP + 1.320FDI + 2.757PFI - 0.322TBD(2002) - 0.018Trend$ α = -0.125***	$FE = 1.494EG - 0.621TOP + 0.432FDI + 0.079PFI - 0.004TBD(2002) - 0.000Trend$ α = -0.730***

Notes: (***) 1% level, (**) 5% of significance. The significance of α (ETC coefficient) is given by the weakly exogeneity test.

5.3. Granger Causality Test Results

The results of the weak and strong exogeneity tests of Brazil, India, Philippines, Thailand, and Turkey are reported in Tables 4, 5, 6, 7, and 8, respectively, whose third columns report the direction of impact confirmed with each underlying variable's sign in the cointegrating vector (see Table 3). Based on

the significant results, we determine the causal direction of each underlying variable.

5.3.1. Brazil's Results

The Brazilian causality test results are presented in Table 4. We first need to check each model's ECT coefficient which is statistically significant at the 1% level—given by the weakly exogenous test—together with a negative sign and an acceptable size.

The strong exogeneity statistics of Model I show that financial size is positive for economic growth, and economic growth is positive for financial size, so that we find a positive bilateral relationship between financial size and economic growth at the 1% significance level. From the Model II results, the same relationship is detected, that is, a positive two-way linkage between financial efficiency and economic growth.

We also look at the causality test results of the globalization indicators (trade openness, FDI, and portfolio investment) either on economic growth or on financial size or on financial efficiency. Not following a standard expectation, Brazil's trade openness exhibits a negative impact on economic growth in both Models I and II; it is positive for financial size in Model I; and no meaningful estimate is found for financial efficiency in Model II. According to the FDI statistics, FDI promotes economic growth in both Models I and II, but is negative for financial size in Model I and financial efficiency in Model II. Likewise, Brazil's portfolio investment is positive for economic growth in both Models I and II, but it is negative for financial size and financial efficiency in Models I and II, respectively.

5.3.2. India's Results

We repot India's causality test results in Table 5. The two ECT coefficients of India's Model I have a negative sign positioning an acceptable range at the 1% significance level. The Model II results show that the ECT coefficient has a negative sign within an acceptable size at the 1% significance level when economic growth is the dependent variable, but it exhibits a positive sign when financial efficiency is taken as the dependent variable. Therefore, we do not provide the statistics of financial efficiency being the dependent variable, as a long-run equilibrium relationship is not established in this case.

According to the strong exogeneity statistics of Model I, financial size is positive for economic growth, and economic growth is positive for financial size. We thus detect a positive bilateral relationship at the 1% significance level. The

Model II results indicate a one-way relationship of financial efficiency causing economic growth at the 1% significance level.

On the other hand, the statistics of the globalization indicators show that while FDI and portfolio investment are positive for economic growth, trade openness is negative for economic growth at the 1% significance level in Model I. However, according to the Model II statistics, it is different as trade openness and portfolio investment are positive for economic growth; FDI is negative for economic growth at the 1% significance level. And as far as the impact on financial size is concerned, trade openness is positive; FDI is negative; and no meaningful estimate is detected from portfolio investment in Model II.

5.3.3. Philippines' Results

Philippines' causality test results are reported in Table 6. We first see Model I's two ECT coefficients which possess a negative sign and an acceptable size at the 5% significance level. The Model II ECT coefficient of economic growth being the dependent variable has a negative sign, but is statistically insignificant; whereas that of financial efficiency being the dependent variable has a negative sign within an acceptable size at the 1% significance level, so that the causality test results of the former case are not provided.

Looking at the Model I statistics, we confirm that financial size is positive for economic growth, and economic growth is positive for financial size. Thus, a positive bilateral relationship is detected at the 1% significance level. The Model II statistics indicate a one-way relationship of economic growth causing financial efficiency at the 1% significance level.

According to the results of the globalization indicators, while trade openness and FDI promote economic growth, portfolio investment discourages economic growth at the 1% significance level in Model I. On the other hand, both Models I and II results indicate that trade openness and FDI are negative, but portfolio investment is positive for the two indicators of financial development at the 5% significance level or more.

5.3.4. Thailand's Results

In Table 7, the Thai causality test statistics show that the two ECT coefficients of Model I have a negative sign and an acceptable size at the 1% significance level. In contrast, those of Model II are different: the ECT coefficient has a negative sign and an acceptable size at the 1% significance level when financial size is the dependent variable, but it is statistically insignificant—although having a negative sign and an acceptable sign—when financial efficiency is the dependent variable.

So we do not present the Model II results of financial efficiency being the dependent variable.

The Model I results show that financial size is positive for economic growth, and economic growth is positive for financial size. We thus find a positive bilateral relationship at the 1% significance level. The Model II results are judged as a one-way relationship of financial efficiency causing economic growth at the 1% significance level because, as mentioned above, the ECT coefficient of financial efficiency being the dependent variable is statistically insignificant.

The statistics of the globalization indicators show that while FDI and portfolio investment are positive for economic growth at the 5% significance level or better, trade openness is negative for economic growth at the 1% significance level in Model I; TOP is positive for financial size, whereas FDI and portfolio investment are negative for financial size at the 1% significance level in Model I. According to the Model II statistics, all the globalization indicators are positive for economic growth at the 1% significance level.

5.3.5. Turkey's Results

In Table 8, the Turkish results report that the two ECT coefficients of Model I have a negative sign and an acceptable size; that of economic growth being the dependent variable is significant at the 5% level, whereas that of financial size being the dependent variable is significant at the 1% level. In case of Model II, while the ECT coefficient of economic growth being the dependent variable is insignificant although possessing a negative sign and an acceptable size, that of financial efficiency being the dependent variable is significant at the 1% significance level. Hence, the Model II results of the former is not reported as a long-run equilibrium relationship is not established in that case.

The Model I statistics show that financial size is positive for economic growth, and economic growth is also positive for financial size. Thus, a positive bilateral relationship is detected, but the direction of financial size causing economic growth is marginally significant at the 10% level (that of economic growth causing financial size is significant at the 1% level). From the Model II results we draw a one-way relationship of economic growth causing financial efficiency at the 1% significance level because, as mentioned above, the ECT coefficient of economic growth being the dependent variable is statistically insignificant.

According to the results of the globalization indicators, while trade openness is positive for economic growth at the 5% significance level, FDI and portfolio investment are negative for economic growth at the 1% significance level in

Model I; trade openness is negative for financial size, whereas FDI and portfolio investment are positive for financial size at the 1% significance level in Model I; trade openness is negative for financial efficiency, whereas FDI and portfolio investment are positive for financial efficiency at the 1% significance level In Model II.

Table 4. Brazil's Causality Test Results

(a) Model I (Financial development index: FS)

W. E. Test (Dependent Variable: EG)

α = -0.607***

S.E. Test (H_0: FS/TOP/FDI/PFI does not cause EG)

Regressors	***Result***	***Causal Direction***
FS & ECT(-1)	52.663***	Positive
TOP & ECT(-1)	11.755***	Negative
FDI & ECT(-1)	49.200***	Positive
PFI & ECT(-1)	29.353***	Positive

W. E. Test (Dependent Variable: FS)

α = -1.513***

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FS)

Regressors	***Result***	***Causal Direction***
EG & ECT(-1)	55.531***	Positive
TOP & ECT(-1)	40.509***	Positive
FDI & ECT(-1)	40.646***	Negative
PFI & ECT(-1)	32.826***	Negative

(b) Model II (Financial development index: FE)

W. E. Test (Dependent Variable: EG)

α = -0.314***

S.E. Test (H_0: FE/TOP/FDI/PFI does not cause EG)

Regressors	***Result***	***Causal Direction***
FE & ECT(-1)	52.937***	Positive
TOP & ECT(-1)	11.562***	Negative
FDI & ECT(-1)	43.935***	Positive
PFI & ECT(-1)	30.286***	Positive

W. E. Test (Dependent Variable: FE)

α = -1.503***

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FE)

Regressors	***Result***	***Causal Direction***
EG & ECT(-1)	46.065***	Positive
TOP & ECT(-1)[§]	—	—
FDI & ECT(-1)	44.579***	Negative
PFI & ECT(-1)	45.005***	Negative

Notes: (***) 1% level of significance. (§) Since the chosen normalization invalidates calculation of the "standard error" for beta, the result is not provided.

Table 5. India's Causality Test Results

(a) Model I (Financial development index: FS)

W. E. Test (Dependent Variable: EG)			W. E. Test (Dependent Variable: FS)		
α = -0.524***			α = -0.059***		
S.E. Test (H_0: FS/TOP/FDI/PFI does not cause EG)			S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FS)		
Regressors	***Result***	***Causal Direction***	***Regressors***	***Result***	***Causal Direction***
FS & ECT(-1)	10.568***	Positive	EG & ECT(-1)	29.957***	Positive
TOP & ECT(-1)	17.331***	Negative	TOP & ECT(-1)	22.929***	Positive
FDI & ECT(-1)	11.891***	Positive	FDI & ECT(-1)	22.929***	Negative
PFI & ECT(-1)	9.790***	Positive	PFI & ECT(-1) [§]	—	—

(b) Model II (Financial development index: FE)

W. E. Test (Dependent Variable: EG)			W. E. Test (Dependent Variable: FE)		
α = -0.060***			α = 0.048		
S.E. Test (H_0: FE/TOP/FDI/PFI does not cause EG)			S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FE)		
Regressors	***Result***	***Causal Direction***	***Regressors***	***Result***	***Causal Direction***
FE & ECT(-1)	11.079***	Positive	EG & ECT(-1)	—	—
TOP & ECT(-1)	16.829***	Positive	TOP & ECT(-1)	—	—
FDI & ECT(-1)	10.394***	Negative	FDI & ECT(-1)	—	—
PFI & ECT(-1)	9.307***	Positive	PFI & ECT(-1)	—	—

Notes: (***) 1% level of significance. (§) Since the chosen normalization invalidates calculation of the "standard error" for beta, the result is not provided. The Model II results whose dependent variable is FE are not provided as the sign of its ECT coefficient is positive.

Table 6. Philippines' Causality Test Results

(a) Model I (Financial development index: FS)

W. E. Test (Dependent Variable: EG)

α = -0.319**

S.E. Test (H_0: FS/TOP/FDI/PFI does not cause EG)

Regressors	***Result***	***Causal Direction***
FS & ECT(-1)	9.062**	Positive
TOP & ECT(-1)	11.595***	Positive
FDI & ECT(-1)	9.601***	Positive
PFI & ECT(-1)	9.808***	Negative

W. E. Test (Dependent Variable: FS)

α = -0.112**

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FS)

Regressors	***Result***	***Causal Direction***
EG & ECT(-1)	15.782***	Positive
TOP & ECT(-1)	11.676***	Negative
FDI & ECT(-1)	6.698**	Negative
PFI & ECT(-1)	12.025***	Positive

(b) Model II (Financial development index: FE)

W. E. Test (Dependent Variable: EG)

α = -0.198

S.E. Test (H_0: FE/TOP/FDI/PFI does not cause EG)

Regressors	***Result***	***Causal Direction***
FE & ECT(-1)	—	—
TOP & ECT(-1)	—	—
FDI & ECT(-1)	—	—
PFI & ECT(-1)	—	—

W. E. Test (Dependent Variable: FE)

α = -0.192***

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FE)

Regressors	***Result***	***Causal Direction***
EG & ECT(-1)	28.290***	Positive
TOP & ECT(-1)	15.143***	Negative
FDI & ECT(-1)	15.502***	Negative
PFI & ECT(-1)	17.765***	Positive

Notes: (***) 1% level and (**) 5% level of significance. The Model II results whose dependent variable is EGare not provided as the ECT coefficient is statistically insignificant.

Table 7. Thailand's Causality Test Results

(a) Model I (Financial development index: FS)

W. E. Test (Dependent Variable: EG)

α = -0.031***

S.E. Test (H_0: FS/TOP/FDI/PFI does not cause EG)

Regressors	***Result***	***Causal Direction***
FS & ECT(-1)	31.940***	Positive
TOP & ECT(-1)	21.050***	Negative
FDI & ECT(-1)	7.745**	Positive
PFI & ECT(-1)	9.235***	Positive

W. E. Test (Dependent Variable: FS)

α = -0.173***

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FS)

Regressors	***Result***	***Causal Direction***
EG & ECT(-1)	17.042***	Positive
TOP & ECT(-1)	27.625***	Positive
FDI & ECT(-1)	25.321***	Negative
PFI & ECT(-1)	15.774***	Negative

(b) Model II (Financial development index: FE)

W. E. Test (Dependent Variable: EG)

α = -0.556***

S.E. Test (H_0: FE/TOP/FDI/PFI does not cause EG)

Regressors	***Result***	***Causal Direction***
FE & ECT(-1)	35.287***	Negative
TOP & ECT(-1)	24.491***	Positive
FDI & ECT(-1)	27.889***	Positive
PFI & ECT(-1)	25.809***	Positive

W. E. Test (Dependent Variable: FE)

α = -0.063

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FE)

Regressors	***Result***	***Causal Direction***
EG & ECT(-1)	—	—
TOP & ECT(-1)	—	—
FDI & ECT(-1)	—	—
PFI & ECT(-1)	—	—

Notes: (***) 1% level and (**) 5% level of significance. The Model II results whose dependent variable is FE are not provided as the ECT coefficient is statistically insignificant

Table 8. Turkey's Causality Test Results

(a) Model I (Financial development index: FS)

W. E. Test (Dependent Variable: EG)

α = -0.187**

S.E. Test (H_0: FS/TOP/FDI/PFI does not cause EG)

Regressors	*Result*	*Causal Direction*
FS & ECT(-1)	5.796*	Positive
TOP & ECT(-1)	7.986**	Positive
FDI & ECT(-1)	10.987***	Negative
PFI & ECT(-1)	28.025***	Negative

W. E. Test (Dependent Variable: FS)

α = -0.125***

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FS)

Regressors	*Result*	*Causal Direction*
EG & ECT(-1)	24.967***	Positive
TOP & ECT(-1)	24.034***	Negative
FDI & ECT(-1)	23.603***	Positive
PFI & ECT(-1)	39.690***	Positive

(b) Model II (Financial development index: FE)

W. E. Test (Dependent Variable: EG)

α = -0.041

S.E. Test (H_0: FE/TOP/FDI/PFI does not cause EG)

Regressors	*Result*	*Causal Direction*
FE & ECT(-1)	—	—
TOP & ECT(-1)	—	—
FDI & ECT(-1)	—	—
PFI & ECT(-1)	—	—

W. E. Test (Dependent Variable: FE)

α = -0.730***

S.E. Test (H_0: EG/TOP/FDI/PFI does not cause FE)

Regressors	*Result*	*Causal Direction*
EG & ECT(-1)	34.552***	Positive
TOP & ECT(-1)	26.462***	Negative
FDI & ECT(-1)	26.332***	Positive
PFI & ECT(-1)	28.132***	Positive

Notes: (***) 1% level, (**) 5% level, and (*) 10% level of significance. The Model II results whose dependent variable is EG are not provided as the sign of its ECT coefficient is statistically insignificant.

5.4. Finance-Growth Causal Direction

In Table 9, we summarize the finance-growth causal directions of the five countries. It is noted that since financial size/financial efficiency and economic growth are positively related in all the models, non-linearity is not a serious issue in the present study[6]. We detect that financial size and economic growth are jointly endogenous in all the sample countries, although that of Turkey is more inclining toward economic growth causing financial size because the causality statistic of financial size causing economic growth is marginally significant at the

[6] The Mexican results of Fukuda (2019) are: 1) financial size is negative for economic growth with no feedback; and 2) financial efficiency and economic growth are in a negative bilateral relationship.

10% level (see Table 8).These findings of a bilateral causality coincide with those of Demetriades and Hussein (1996) and Luintel and Khan (1999). On the other hand, when financial development is measured by financial efficiency, the results are different among the five countries. While financial efficiency—the ratio of private credit to total deposit (demand + time deposits)—represents one important aspect of financial depth, it may be highly affected by each country's policy and institutional factors. According to our empirical results, a more efficient finance contributes to higher economic growth in India and Thailand, a growing economy enhances the efficiency of the financial system in Philippines and Turkey, and finance and economic growth make each other more efficient in Brazil.

Table 9. Summary of the Finance-Growth Nexus Results

Country	Result
Brazil	Financial Size ↔ Economic Growth (+) Financial Efficiency ↔ Economic Growth (+)
India	Financial Size ↔ Economic Growth (+) Financial Efficiency → Economic Growth (+)
Philippines	Financial Size ↔ Economic Growth (+) Economic Growth → Financial Efficiency (+)
Thailand	Financial Size ↔ Economic Growth (+) Financial Efficiency → Economic Growth (+)
Turkey	Financial Size ↔ Economic Growth (+) more inclining toward Economic Growth →Financial Size (+) Economic Growth → Financial Efficiency (+)

6. Conclusion

We investigate the causal linkage between financial development and economic growth in Brazil, India, Philippines, Thailand, and Turkey by using the VECM technique. In estimation, each of financial size and financial efficiency is taken as the dependent variable, and the globalization variables of trade openness, FDI and portfolio investment together with a structural break are also incorporated. The main findings are: 1) a bilateral relationship between financial size and economic growth; 2) different results for the relationship between financial efficiency and economic growth; and 3) various impacts of the globalization indicators on financial size/financial efficiency and economic growth in the five countries.

Emphasizing the importance of conducting a country-specific analysis to empirically address the issue of the finance-growth nexus, we present the following policy implication. While the positive relationship between financial size/financial efficiency and economic growth is detected in this study, it should be evaluated considering the impact of on-going globalization. Although theoretically expected to be contributive, the three globalization indicators of trade openness, FDI and portfolio investment are confirmed as either positive or negative for financial development and economic growth in the five countries. It simply indicates that while globalization is progressing rapidly, the situation surrounding the finance-growth nexus is becoming more complicated. As a core of policy recommendations from the IMF and the World Bank, the promotion of globalization has been undoubtedly accepted as "always good" to attain higher economic growth and so to enhance national welfare. However, such a way of simple thinking seems to be very dangerous. Based on empirical findings of this study, we argue that policymakers should design and develop financial sector polices and growth strategies fully considering the nature of their countries' own institutional and structural characteristics.

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