Trade openness, financial depth and economic development: Causality evidence from Asia-Pacific countries

Thai-Ha Le*

Department of Economics, Finance and Marketing

Centre of Commerce and Management, RMIT University, Vietnam

702 Nguyen Van Linh Blvd., District 7, HCMC, Vietnam

Email: ha.lethai@rmit.edu.vn; Telephone: +84-983502188

* Corresponding author.

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ABSTRACT

This study investigates the causality patterns between financial deepening, trade openness and economic development for 14 countries in Asia and the Pacific. The Gregory Hansen cointegration tests which account for one endogenous structural break and Toda-Yamamoto non-Granger causality tests are used to add to the existing empirical evidence. In general, the evidence indicates (1) a strong link between financial depth and economic development, (2) a somewhat weaker linkage between financial depth and trade openness and (3) a sceptical linkage between trade openness and economic development, for most of the sample.

Key words: financial depth, economic development, trade openness, Toda-Yamamoto non Granger causality test, Gregory Hansen cointegration test, Asia and the Pacific.

JEL: N2, O1, O43.

1. INTRODUCTION

The last decades have witnessed development strategies adopted by many economies that prioritize the modernization of their financial systems. The countries of Asia and the Pacific (henceforth AP) are not exceptional cases. The current remarkable growth in the AP financial markets, particularly with the recent developments in credit markets, is certain to continue. Efforts to develop financial markets are theoretically needed to foster critical economic activities such as the capital allocation process, monetary policy implementation and government borrowing. The current global economic situation further underscores the compelling rationale for the development of sound and integrated financial markets in the region. However, the effectiveness of such policies requires a causal relationship between financial and real sectors.

Even though the relationships between trade, financial depth and economic development have been extensively explored in literature, the majority of the studies have used a bi-variate framework to examine the causal relationship between trade and economic development and between financial and economic development (e.g., Shahbaz, 2012; Calderon and Lin, 2003). However, it has been clear that the results obtained by conducting bi-variate causality test might be invalid due to the omission of an important variable which affect both the variables included in the causality model. As such, the introduction of a third variable in the causality framework may not only alter the direction of causality but also the magnitude of the estimates (Loizides and Vamvoukas, 2005).

Further, several studies have employed methods for cross-sectional data analysis with a hope that the causalities between the variables of interest could be generalized (e.g., Yanikkaya, 2003; Harrison, 1996). Yet, the problem of using a cross-sectional method is that by grouping countries at different stages of trade openness, financial and economic development, the method could not take into account the country-specific effects of trade openness and financial depth on economic development and vice versa. Particularly, it fails to explicitly address the potential biases arising from the existence of cross-country heterogeneity, which may lead to inconsistent and misleading estimates (Ghirmay, 2004; Casselli et al., 1996). To avoid this backdrop, this study attempts to investigate the causalities among trade openness, financial depth and economic development in a number of AP economies using a tri-variate framework.

This research assesses whether financial depth has led to economic development in a sample of AP countries as these markets are expected to play a further critical role in the world capital markets for investment and risk management. The study investigates whether a policy focus on financial sector development is appropriate for fostering development. Thus causality between finance and economic development is tested, capturing indirect linkages also by scrutinizing the relationship between financial depth and trade openness. This study contributes to the existing literature by (1) using advanced econometric methods that are less prone to the misspecifications that occur when testing for cointegration and causality, (2) employing a composite finance indicator in order to proxy financial development in a broad sense, and (3) taking into account the linkages between financial depth and trade openness that allow for further impacts on economic development.

The balance of this paper is structured as follows. Section 2 reviews the related academic literature. Section 3 describes the data, variables and the testing framework. Section 4 presents and discusses the empirical results. Section 5 concludes with a summary.

2. BACKGROUND AND OVERVIEW

(a) Literature review

(i) Trade openness and economic development

Conventional trade theory proposes that international trade is associated with a reallocation of resources within the national borders determined by exogenous differences across countries. This reallocation of resources generates efficiency gains that lead to an increase in the level of aggregate national income. Krugman (1979, 1980) claims two other sources of gain from international trade. First, there could be more varieties of products available for consumption. Second, the increased competition lowers the market power of firms and hence the equilibrium prices. The lower prices raise real purchasing powers, which is another source of gain for consumers. Further, the increased size of the market allows firms to realize economies of scale. Even though the size and distribution of the welfare gains from trade may be disputed, there is strong consensus of a positive relationship between international trade and aggregate national income.

The same degree of consensus, however, does not appear to hold for the growth effects of international trade. New growth theories do not predict that trade will unambiguously raise economic growth. It is argued that increased competition could discourage innovation by lowering expected profits (Schumpeter, 1934; 1942). Many empirical analyses estimate positive growth effects of trade openness, but the size of these effects is often rather small. However, it is argued that intervention in trade could raise long-run growth if protection encourages investment in research-intensive sectors for countries with an international advantage in these kinds of goods. Some empirical evidence suggests that trade openness may indeed positively affect economic performance (e.g., Edwards, 1998; Harrison, 1996). Since the theoretical literature shows a mixed answer, empirical work is needed to help resolve the debate.

(ii) Financial depth and economic development

Financial markets, at a very broad level, are the venues where borrowers and lenders interact, and capital is raised for real investment and then gets reallocated among investors. Liquid and deep financial markets sway economic development. Financial development contributes to increased mobilisation of savings as well as a reduction in information asymmetries, which leads to better allocation of resources. Further, developing liquid financial markets is essential for governments and central banks for the conduct of their fiscal and monetary policy implementation. At a micro level, financial development involves improved monitoring of managers and a higher level of corporate control which facilitates risk reduction (King and Levine, 1993). A number of theoretical models have been proposed to analyse the linkage between financial depth and economic growth (e.g., Levine, 2005).

The debate regarding the direction of causality between financial development and economic growth has been ongoing since the 19th century. The first view argues that financial development leads to economic growth due to its influence through the accumulative and the allocative channel. The accumulative channel emphasizes the finance-induced effects of physical and human capital accumulation on economic growth (e.g., Pagano, 1993). Meanwhile, the allocative channel focuses on the finance-induced gains in resource allocation efficiency which translates into augmented growth (e.g., King and Levine, 1993). The second view maintains that economic growth drives the development of the financial sector. For instance, in an expanding economy, the private sector may demand new financial instruments

and a better access to external finance. As such, the finance activities simply amplify instep with general economic development (e.g., Robinson, 1952). The third view contends that finance and growth may be mutually dependent. The real sector may provide the financial system with the funds necessary to enable financial deepening, eventually allowing for a capitalization on financial economies of scale which in turn facilitates economic development (e.g., Berthelemy and Varoudakis, 1996). Finally, the fourth view follows more sceptical views that finance and growth may also evolve independently of each other, so no causality (or insignificant causation) exists between them (Chandavarkar, 1992).

The majority of empirical studies on the relationship between finance and growth are cross-sectional studies based on cross-sectional regressions. They documented a positive connection between financial development and economic activity (e.g., King and Levin, 1993; La Porta et al, 2002). None of these cross-country studies, however, gave a satisfactory answer to the causality question between financial depth and economic growth. Compared with cross-country studies, in studies of individual countries, researchers can design specific measures of financial development according to the particular characteristics of the country. These studies can also avoid dealing with country-specific factors in regression analysis.

(iii) Financial depth and trade openness

It is shown that the countries with a relatively well-developed financial sector have a comparative advantage in industries and sectors that rely on external finance (Kletzer and Bardhan, 1987). Extending this argument and allowing both sectors to use external finance, one being more credit intensive due to increasing returns to scale, the level of financial development is found to have an effect on the structure of the trade balance (Beck, 2002). On the one hand, reforming the financial sector might have implications for the trade balance if the level of financial development is a determinant of countries' comparative advantage. On the other hand, the effect of trade reforms on the level and structure of the trade balance might depend on the level of financial development. More recently, in building a model with two sectors, one of which is financially extensive, Do and Levchenko (2004) find that openness to trade will affect demand for external finance, and thus financial depth, in the trading countries. In particular, their model predicts that in wealthy countries, trade should be related with faster financial development. On the contrary, in poor countries, more trade

should slow financial development, because these countries import financially intensive goods rather than develop their own financial system.

(iv) Financial depth-trade openness links and economic development

Multi-causal linkages among trade openness, economic development and financial deepening emerge from the evidence that not only financial development favourably impacts but the extent of financial activity itself depends positively on growth (e.g., Bencivenga and Smith, 1998). This is because the cost of financial services carries a fix component that falls with the volume of financial transactions. As such, financial markets will develop only when a threshold level of income is attained. But, if financial outcomes are endogenous to economic development, the question of interest would be how greater trade integration affects the state of financial development itself.

Gries et al. (2009) contends that linkages between financial depth and trade openness could allow for more complex paths to economic development. In particular, if increasing trade openness contributes to a higher level of financial development, this may promote economic growth where financial depth is found to enhance growth via the allocative and accumulative channels. But if financial deepening induces trade openness, it may subsequently foster economic development where openness to trade is found to be a growth factor.

Blackburn and Hung (1998) employs the well-known endogenous growth model of Romer (1990) to explore the multi-causal relationships among trade openness, economic growth and financial development. In the model, economic growth is driven by horizontal innovation in intermediate goods, which are encouraged by expanding the markets for new goods, e.g., through trade liberalisation. This implies that more firms would enter the research sector and seek for external financing of risky and independent research projects. This helps financial intermediaries to better diversify their portfolios and decreases their default probability. As a result, the agency cost related to the need for depositors to monitor the intermediary portfolio is reduced. The reduction in the agency cost of financial intermediation leads to higher economic growth. This is because firms in the research sector start operating at positive profits and this encourages new firms to enter the market. The rate at which new process are invented is thus increased. This is an indirect financial market's gain from trade. Specifically, trade liberalisation can accelerate innovations and the development of financial markets

through scale effects. Hence, there theoretically exists a complementary relationship between trade and financial development.

(b) Economic development in Asia and the Pacific

Over the last 20 years, the AP region has continued to keep high economic growth rates exceeding those in other regions. Having accounted for more than half of global economic growth, the region has consequently come to be known as the growth centre of the global economy. Furthermore, the scale is expanding. The overall Asia-Pacific economy is growing faster than any other regional economy. It is anticipated to be larger than that of Western Europe and be equal to that of the Americas (North and South) by 2025. However, the countries (and territories) of the region are at various levels of economic growth. While Australia, Japan, Republic of Korea, New Zealand, and Singapore are regarded as highly industrialized countries, Bangladesh, Cambodia, China, India, Pakistan, and Vietnam are categorized as low-income countries. Indonesia and Philippine could be regarded as middle income countries, and Thailand and Malaysia be as high income countries.[1]

The economic potential of this region implies opportunities for robust financial systems to develop in the region. However, the linkage between the development of the financial markets and their role in economic development needed to be carefully considered. For instance, it might need to evaluate how big a financial system should be to remain anchored in real economic activity. Further, it is important to see if financial systems are being built to serve economies, or economies are being made subservient to the needs of financial system. The ambiguity of the empirical literature, based on the above discussion, provides an additional motivation for this study.

3. DATA AND METHODOLOGY

(a) Variables and data

Annual time-series observations are used as they are sufficient to ensure the quality of the analysis, as argued by Hakkio and Rush (1991). The choice of the countries to be included in the sample of this study is due to the availability of comprehensive data set. As for economic

[1] Please refer to Chapter 1-1, 'A Long-term Perspective on Environment and Development in the Asia-Pacific Region', available at: http://www.env.go.jp/en/earth/ecoasia/workshop/bluebook/chapter1-1.html

development, the logarithm of real GDP per capita (log-level data) is used and labelled as OUTPUT. For trade openness, the logarithm of the sum of exports plus imports to real GDP (log-level data) is used and labelled as OPENNESS because this measure is a simple and common indicator of trade openness as suggested by Harrison (1996). The data are taken from International Financial Statistics (IFS). As to financial development, there is a large literature discussing its possible measures. In the related literature, several proxies for financial depth have been suggested, for instance, money aggregates such as M2 to GDP (e.g., Odhiambo, 2008) but there has been no consensus on the superiority of any indicator. For measuring overall financial development, the most popular measure is the ratio of liquid liabilities to GDP (LLGDP). Based on the liquid liabilities of the financial system, this measure has been used in King and Levine (1993). This measure, however, can be too high in countries with undeveloped financial markets. Other standard measures are the ratio to GDP of credit issued to the private sector by banks and other financial intermediaries (PCRDBOFGDP) and the ratio of the commercial bank assets to the sum of commercial bank assets and central bank assets (DBACBA).

This study follows a recent method by Ang and McKibbin (2007) to construct a composite indicator of financial deepening which is as broad as possible. Specifically the finance proxies including LLGDP, PCRDBOFGDP and DBACBA are used to construct this index labelled DEPTH via a principal component analysis. Since most financial systems in Asia are bank-based, the financial indicators that are primarily associated with bank development are used. Data for the individual finance indicators is taken from the updated and expanded version of Financial Development and Structure Database (FDSD). The principal component analysis reduces data sets to lower dimensions while retaining as much information of the original sets as possible. In this case, the finance indicators are transformed into natural logarithms and only the first unrotated principal component is extracted as DEPTH.

(b) Methodology

This study uses unit root and cointegration tests to identify the stationary properties and possible cointegration relationships of the investigated time series. Specifically, the unit root test by Phillips and Perron (1988), the PP test, is employed to check whether the considered time series is stationary, that is, I(0), or first difference stationary, that is, I(1). The PP test is used as it is particularly powerful when low frequency data are used (Choi and Chung, 1995).

Different methodological alternatives have been proposed in econometric literature to empirically analyse cointegrating relationships between time-series variables (e.g., Engle and Granger, 1987; Johansen, 1988; Johansen and Juselius, 1990). The cointegration frameworks in these studies, however, have limitations when dealing with data as major economic events may affect the data generating process. The presence of structural breaks in turn leads to inefficient estimation and lower testing power (Gregory et al., 1996). The sensitivity of the outcome of the tests to structural breaks has been documented in several studies (e.g., Lau and Baharumshah, 2003). This study thus employed the Gregory and Hansen (GH hereafter) (1996) tests for cointegration to analyse the long-run relationships and dynamics interactions between time-series variables. The advantage of this test is the ability to account for the possible presence of an endogenous structural break.

Following GH test, the TY methodology is employed to conduct causality test. Even though the most common way to test for causal relationships between two variables is the Granger (1969)'s causality test, it has probable shortcomings of specification bias and spurious regression (Gujarati, 1995). The TY procedure improves the power of the Granger-causality test. The procedure is a methodology of statistical inference, which makes parameter estimation valid even when the VAR system is not co-integrated. This technique is applicable irrespective of the integration and cointegration properties of the system, and fitting a standard VAR in the levels of the variables rather than first differences like the case with the Granger causality test. Thereby, the risks associated with possibly wrongly identifying the orders of integration of the series, or the presence of cointegration are minimized and so is the distortion of the tests' sizes as a result of pre-testing (Mavrotas and Kelly, 2001). The method involves using a Modified Wald statistic for testing the significance of the parameters of a VAR(p) model where p is the optimal lag length in the system. The estimation of a VAR($p+d_{max}$) guarantees the asymptotic χ^2 distribution of the Wald statistic, where d_{max} is the maximum order of integration in the model. In this study, the lag lengths in the causal models were selected based on the SC and the VAR was made sure to be well-specified by, for instance, ensuring that there is no serial correlation in the residuals. If need be, the lag length was increased until any autocorrelation issues are resolved. Needless to say, the system must satisfy the stability conditions and the common assumptions to yield valid inferences. The null of 'no Granger causality' is rejected if the test statistic is statistically significant. That is, a rejection supports the presence of Granger causality.

4. EMPIRICAL RESULTS AND DISCUSSION

First, the principal component analysis is performed. Table 1 gives an overview of the results of the principal component analysis and a descriptive overview of the investigated countries. The index DEPTH used in this study is usually the only component to show fitting characteristics. In all the cases, this index exhibits at least 60% of the initial variance of the considered series and an eigenvalue that is significantly larger than one. Thus, the first principal component captures adequately the three components of the DEPTH index.

[Please insert Table 1 here]

Next, this study uses the Phillips and Perron (PP)'s (1988) unit root test to check whether the considered time series is I(0), that is, stationary, or I(1), that is, first difference-stationary. The PP test is used as it is particularly powerful when the low frequency data are used (Choi and Chung, 1995). As reported in Table 2, in almost all cases the PP test fails to reject the null hypothesis of the existence of a unit root for the data at log level. Meanwhile, in all but two cases the null hypothesis is rejected strongly when the first difference is taken. The examined time series are thus I(1) at log level and I(0) at first log difference.

[Please insert Table 2 here]

Next, this study tests for cointegration in trivariate VAR models using log-level data, following Gregory-Hansen (1996). Table 3a, 3b and 3c report the cointegration results for trivariate VAR models using all three statistics: ADF*, Z_{α}^{*} and Z_{t}^{*}, with DEPTH, OUTPUT and OPENNESS as the dependent variables in cointegrating equations, respectively. For Korea, the results indicate two cointegrating relations between the series at 10% significance level. For Japan, Nepal, China and Israel, the common suggestion is at most one cointegration relationship at 10% significance level. When a cointegrating relationship is present, financial depth, economic development and trade openness share a common trend and long-run equilibrium as suggested theoretically. As to other countries in the sample of this study, however, there is not enough evidence to conclude on the existence of cointegration between the three series.

[Please insert Table 3a, b, c here]

The unit root test results indicate that the maximum order of integration among the variables of interest is 1. Based on this, this study performs Toda-Yamamoto test in the next stage. In

order to obviate the possibility of spurious causality, TY causality analyses are run in trivariate models. That is, causality between two series is test, conditional upon the presence of a third one. The abovementioned theories of possible interactions between financial depth, economic development and trade openness provides the ground for such specifications.

(a) Financial deepening – economic development causality

The theory suggests that financial depth may be either a critical factor or a negligible one for economic development. The former supports for the supply-leading or bidirectional causality hypothesis while the latter supports for demand-following or insignificant financial depth-economic development causation. Table 4a presents the results of the interaction between DEPTH and OUTPUT, conditional on OPENNESS. The results generally show no sign of autocorrelation or multicollinearity and are statistically significant and stable, in particular with respect to the lag orders chosen in accordance with the causality testing procedure.

The analysis reveals relatively strong causal linkages between financial depth and economic development for the investigated countries. Particularly, the evidence of finance-led economic development is found in the cases of Malaysia and New Zealand. For China, Indonesia and Japan, the findings suggest a feedback relationship between financial deepening and economic development, that is, bidirectional finance-growth causality. For Australia, Nepal and Philippines, the results support the demand-following hypothesis, so financial depth is caused by economic development. With respect to the other countries in the sample, the analysis does not show any significant causal linkages between financial depth and economic development.

[Please insert Table 4a here]

Based on the findings, it can be concluded that there are indeed interactions between financial depth and economic development in Asia and Pacific countries, as theories on the finance-growth nexus imply. The results fit in reasonably well, thanks to generally continuous improvements in financial depth and related institutions in AP countries.

Even for the poorest economy in the region like Nepal, over the past 20 years the country's financial sector has become deeper and the number and type of financial intermediaries have grown rapidly. The Nepalese financial system witnessed a large jump in terms of number of

financial institutions after financial liberalization that started in the mid of the 1980s. This has translated into an increasing trend of financial development in this country. His Majesty's Government (HMG) of Nepal has recently implemented further financial reforms, improved public expenditure management, strengthened anticorruption institutions, and improved financial sector regulatory framework. Financial sector reform has been undertaken to improve the performance of loss making public financial institutions. Other major recent initiatives include (a) governance reform program, (b) decentralization and transfer of local level activities in basic education, basic health, agriculture extension, drinking water, and rural infrastructure to local bodies and the community level management committees (c) strengthening of monitoring and evaluation system and establishment of poverty monitoring mechanism and (d) privatisation of public enterprises.[2] Recent reforms have made the Nepalese banking sector more stable. Still, access to financial services remains limited for many people in Nepal and thus HMG needs measures to strengthen further its reform process.

Overall, it appears reasonable to find that for the considered Asia-Pacific countries, financial sectors interact with real sectors quite significantly. The findings suggest that a policy focus on deepening financial sector to stimulate economic development seems to be justified.

(b) Financial deepening – trade openness causality

Theoretical considerations suggest that finance may unilaterally lead openness or that openness may induce financial development. A nexus between finance and openness may additionally allow for bidirectional causality. More sceptical views, however, may suggest no evidence of significant causality between finance and openness. Table 4b shows the results for causal inferences of DEPTH and OPENNESS, controlling for OUTPUT. The results again show no sign of autocorrelation or multicollinearity and appear to be stable, particularly with respect to the chosen lag orders.

The findings appear to confirm the existence of a nexus between financial depth and trade openness. Nevertheless, this study is unable to identify a predominant causation pattern for many investigated countries. Specifically, the evidence of the hypothesis that financial depth Granger causes trade openness is found for India and Malaysia. Meanwhile, the findings

[2] Refer to the progress report on Nepal available at: http://www.un.org/special-rep/ohrlls/ldc/MTR/Nepal.pdf for further details.

suggest that trade openness has unilaterally influenced financial depth in the cases of China, Indonesia, Japan, Korea, Nepal, New Zealand and Philippines. For the rest of the countries included in the sample, the results do not indicate any stable long-run causality. This finding may not be surprising. A possible explanation for the lack of causal linkage between trade and financial depth (defined as formal finance) could be that, especially for low-income countries, informal finance could be important for trade (see Roy et al., 2014).

[Please insert Table 4c here]

The findings thus offer support for theoretical and empirical considerations on financial deepening – trade openness linkages. Policies that aim at enhancing a country's financial depth are thus likely to significantly shape trade structures as a by-product. Along the line of this argument, policies that are targeted at increasing the levels of openness can be expected to have substantial finance-promoting effects.

However, the effect of financial deepening – trade openness linkages on general economic development in the investigated AP countries appears to be rather marginal. On the one hand, the influence of trade openness on financial depth has not translated into economic development, as shown by the previous results. Only in the cases of China, Indonesia, Japan and New Zealand does it seem that trade openness has interacted with financial depth, which in turn has contributed to economic development. In other words, there is rather limited evidence of an indirect effect of trade openness on economic development via the channel of financial development.

On the other hand, neither does this study find strong evidence of the hypothesis that finance-induced advances in trade openness have translated into enhanced economic performance. This is apparent from the causality analysis results of OUTPUT and OPENNESS, conditional on DEPTH, which is presented in Table 4c. Here in most cases either trade openness Granger-causes economic development or both series share a feedback relationship. When combining the findings from Table 4b and 4c, the results indicate that in all cases, no indirect effect of financial deepening on economic development through the channel of trade openness can be demonstrated.

[Please insert Table 4b here]

(c) Robustness

This study relies on a composite indicator of financial depth. While the use of this index yields some advantages as discussed, it may also have disadvantages. Such shortcomings may, for example, be associated with a limited interpretability of the index. As such, this study once again performs the empirical analysis using liquid liabilities to GDP (LLGDP) as the indicator of financial depth. This measure is a more traditional finance indicator and has been employed by a number of studies in literature (e.g. King and Levin, 1993). Using LLGDP instead of DEPTH should help to assess the validity of the previous empirical findings. The same econometric procedure as introduced is followed. In general, the robustness findings confirm the previous results. Unit root and cointegration tests show almost identical patterns when using LLGDP instead of DEPTH. Causal linkages between the variables in the sample are also qualitatively the same.

(d) Discussion and Policy implications

The findings indicate (1) a relatively strong linkage between financial depth and economic development, (2) a significant but somewhat weaker linkage between financial depth and trade openness and (3) a sceptical linkage between trade openness and economic development, for most of the sample.

The findings support the empirical studies that find strong linkages between financial depth and economic development (e.g., King and Levin, 1993; Robinson, 1952; Berthelemy and Varoudakis, 1996). Still, other studies do not find significant links (e.g., Chandavarkar, 1992). It might be concluded that the different findings of studies on financial deepening-economic growth causality are attributable to different country samples rather than differences in methodology. This is because the robustness check indicates that the findings in this study are not random, so different methodologies are less likely to account for varying results than different country samples. Generally, the findings of this study support the view that ‘one size does not fit all’ when analysing financial deepening-economic development interactions (Rioja and Valev, 2004). That is, the actual effect of financial depth on economic development (and vice versa) seems to depend on the level of financial development. When the level of financial development is low, the effect of finance on economic development is uncertain (Rioja and Valev, 2004).

The analysis of this study suggests that (4) only few of the selected AP countries in the sample have actually benefited directly or indirectly from financial development. Meanwhile, (5) the direct and indirect effect of trade openness on economic development is somewhat more pronounced. As a consequence, development strategies that unilaterally focus either financial or trade sector development do not appear to be feasible for the countries in the sample. Though the findings suggest that finance and finance-related policies have not mattered significantly in the past, they do not imply that finance is irrelevant to development in the future. This is because evidence from other parts of the world does reveal that financial deepening promotes economic development. One possible explanation for the lack of causal linkage between financial depth (defined as formal finance) and real sectors in this case could be that, especially for the low-income countries, informal finance plays an important role. Much like trade, financial development (or the state of the financial sector in a country) is outcomes, in large parts, of policies such as financial reforms. In other words, obstacles to economic development such as poor institutions or political instability are also obstacles to the development of financial markets. As such, economic policies that aim at removing growth obstacles may also be helpful in promoting financial development, thereby helping to overcome financial system deficiencies and benefiting finance-growth dynamics. Possible promising development strategies are greater political and macroeconomic stability or improved institutional quality, all of which could in turn positively impact financial development (e.g., Montiel, 2003; Demetriades and Law, 2006). Hence, a general approach taking into account fundamental determinants of development seems to be more appropriate for the sample of AP countries in this study. At the same time, these countries could gain more from trade by implementing such policies.

5. CONCLUDING REMARKS

This study draws on conflicting considerations about the relationships between financial deepening, economic development and trade openness by testing for causality for 14 AP countries. Particularly, this study conducts a principal component analysis to obtain a broad indicator of financial depth. The research employs unit root and cointegration tests to analyse the properties of the investigated time series and to identify possible long-run relationships between them. Toda-Yamamoto non-Granger causality test within unrestricted VAR frameworks is then used due to its methodological advantages over standard causality tests.

The principal findings of the study are: (1) Financial depth, trade openness and economic development do not share significant long-run relationships for the majority of the sample (except for Korea, Japan, Nepal, China and Israel). (2) The results reveal a strong linkage between financial depth and economic development. Yet, there is only some support for the hypothesis of finance-led development. For most countries it is detected only a demand-following or an insignificant relationship between financial depth and economic development. (3) The connection between financial depth and trade openness is significant but somewhat weaker. This study is unable to find enough evidence to suggest that either financial deepening has promoted economic development indirectly via influencing trade openness or that trade openness has contributed to economic development as a by-product of its impact on financial development. (4) Finally, this study finds that there is a sceptical linkage between trade openness and economic development, for most of the countries.

As a result, this research does not advocate development strategies that prioritize unilaterally either financial or trade sector development. Instead, it supports a more balanced policy approach that takes into account other fundamental development factors, for example political or macroeconomic stability, or institutional quality. A general approach toward strengthening of these factors may also help to reduce deficiencies in financial systems, so countries in Asia and the Pacific may benefit from financial deepening in the future. Such an approach should also help countries to gain more from trade openness.

Word Count: 5,616 words.

Table 1: Summary statistics and results of principal component analysis

Income category	Country (data availability)	DEPTH (principal component), %	Component matrix		
			DBMA	LL	PC
East Asia and Pacific (Lower-middle-income economies)	Indonesia (1981-2011)	65.63	0.507	0.500	0.701
South Asia (Lower-middle-income economies)	India (1961-2011)	96.09	0.571	0.580	0.581
High-income OECD members	Japan (1961-2011)	60.28	-0.164	0.726	0.668
High-income OECD members	Korea (1971-2011)	89.75	0.571	0.585	0.576
East Asia and Pacific (Upper-middle-income economies)	Malaysia (1961-2011)	71.10	0.349	0.667	0.658
East Asia and Pacific (Lower-middle-income economies)	Philippines (1961-2011)	69.58	0.516	0.584	0.626
East Asia and Pacific (Upper-middle-income economies)	Thailand (1966-2011)	91.51	0.561	0.585	0.586
East Asia and Pacific (Upper-middle-income economies)	China (1987-2011)	92.36	0.559	0.587	0.586
High-income OECD members	New Zealand (1961-2010)	86.42	0.570	0.585	0.576
High-income OECD members	Australia (1961-2011)	81.37	0.524	0.587	0.617
South Asia (Lower-middle-income economies)	Pakistan (1961-2011)	76.62	0.524	0.596	0.609
High-income OECD	Israel (1961-	89.11	0.540	0.588	0.602

members	2009)				
South Asia (Lower-income economies)	Nepal (1964-2011)	67.98	0.207	0.690	0.694
South Asia (Lower-middle-income economies)	Sri Lanka (1961-2011)	82.20	0.565	0.573	0.593

Note: Data for the individual finance indicators is taken from the updated and expanded version of Financial Development and Structure Database (FDSD). The column DEPTH contains the value of the initial eigenvalues as a percentage of the total variance the first principal component contains (percentage of variance criterion) that represents the composite indicator of financial depth. Following the standard income measurement of the World Bank as taken from Beck et al. (2001), Indonesia, India, Philippines, Pakistan and Sri Lanka can be classified as Lower Middle Income countries; Thailand, Malaysia and China can be classified as Upper Middle Income countries; Japan, Korea, New Zealand, Australia and Israel can be classified as High Income countries; Nepal is classified as Lower Income country.

Table 2: Phillips-Perron unit root test statistics

Country		Log level		First log difference	
		INT	INT& TREND	INT	INT& TREND
Australia	OUTPUT	-0.861	-2.139	-6.004***	-6.022***
	OPENNESS	-0.201	-1.988	-5.954***	-5.885***
	DEPTH	-0.272	-1.619	-5.575***	-5.516***
China	OUTPUT	1.031	-1.748	-2.567	-2.736
	OPENNESS	0.064	-1.728	-4.673***	-4.596***
	DEPTH	-1.133	-1.319	-3.335**	-3.378*
India	OUTPUT	9.462	2.090	-5.834***	-8.231***
	OPENNESS	0.462	-2.142	-6.065***	-6.151***
	DEPTH	-0.425	-1.781	-5.177***	-5.126***
Indonesia	OUTPUT	-0.710	-1.738	-4.051***	-3.968**
	OPENNESS	-0.235	-1.890	-4.988***	-4.988***
	DEPTH	-2.594	-2.211	-2.967**	-3.024
Israel	OUTPUT	-2.675	-2.512	-5.207***	-5.349***
	OPENNESS	-1.043	-1.612	-7.268***	-7.294***
	DEPTH	-2.041	-3.242*	-6.248***	-6.214***
Japan	OUTPUT	-6.449	-2.223	-3.910***	-5.344***
	OPENNESS	-1.414	-1.219	-6.547***	-6.655***
	DEPTH	-3.440**	-2.227	-4.357***	-4.243***
Korea	OUTPUT	-1.694	-0.603	-5.320***	-5.563***
	OPENNESS	-3.620***	-3.537**	-4.751***	-5.148***
	DEPTH	-0.344	-3.099	-5.005***	-4.859***
Malaysia	OUTPUT	-0.943	-1.931	-6.161***	-6.162***

	OPENNESS	-0.269	-2.339	-5.645***	-5.578***
	DEPTH	-0.973	-2.036	-7.147***	-7.656***
Nepal	OUTPUT	2.181	-1.300	-8.756***	-10.318***
	OPENNESS	0.449	-2.772	-7.386***	-7.476***
	DEPTH	-1.017	-2.981	-6.346***	-6.306***
New Zealand	OUTPUT	-1.257	-2.970	-5.198***	-5.090***
	OPENNESS	-1.401	-1.324	-7.010***	-7.437***
	DEPTH	-1.127	-2.324	-6.112***	-6.135***
Philippines	OUTPUT	-0.742	-1.648	-3.826***	-3.778**
	OPENNESS	-0.632	-2.246	-6.263***	-6.182***
	DEPTH	-1.871	-2.472	-4.612***	-4.548***
Pakistan	OUTPUT	-0.742	-1.648	-3.826***	-3.778***
	OPENNESS	-0.705	-2.418	-5.534***	-5.496***
	DEPTH	-3.544**	-2.952	-3.906***	-4.166***
Sri Lanka	OUTPUT	3.500**	-1.070	-4.945***	-6.131***
	OPENNESS	-0.322	-2.965	-6.451***	-6.411***
	DEPTH	-1.385	-2.492	-4.669***	-4.643***
Thailand	OUTPUT	-0.931	-1.562	-4.389***	-4.422***
	OPENNESS	-0.154	-2.533	-5.513***	-5.460***
	DEPTH	-1.054	-1.218	-3.966***	-3.853**

Note: ***, ** and * denote significance at 1%, 5% and 10% levels, respectively. The critical values are taken from MacKinnon (1996).

Table 3a: Gregory-Hansen cointegration test: Dependent variable DEPTH

		Level shift C	Level shift with trend C/T	Regime shift C/S
Australia	ADF*	-3.599 (2)	-3.941 (2)	-5.256 (3)*
		[1971]	[1972]	[1985]
	Z_α^*	-17.497	-26.137	-28.131
		[1973]	[1976]	[1984]
	Z_t^*	-3.216	-4.065	-4.191
		[1973]	[1976]	[1985]
China	ADF*	-4.347 (0)	-4.620 (0)	-5.794 (3)**
		[2005]	[2005]	[2000]
	Z_α^*	-25.229	-26.483	-26.000
		[2006]	[2006]	[2005]
	Z_t^*	-4.893**	-5.342**	-5.097
		[2006]	[2006]	[2005]
India	ADF*	-3.685 (2)	-3.906 (2)	-3.605 (1)
		[1972]	[1984]	[1973]
	Z_α^*	-19.974	-19.138	-19.810
		[1968]	[1986]	[1973]
	Z_t^*	-3.363	-3.345	-3.328
		[1968]	[1986]	[1982]
Indonesia	ADF*	-4.101 (0)	-6.039 (1)***	-4.099 (0)
		[1999]	[1993]	[1997]
	Z_α^*	-20.826	-21.689	-21.705
		[1999]	[1993]	[1997]
	Z_t^*	-4.176	-4.468	-4.174
		[1999]	[1993]	[1997]
Israel	ADF*	-4.996 (6)**	-5.001 (2)	-5.224 (6)
		[1999]	[1998]	[1999]
	Z_α^*	-27.472	-26.895	-27.619

		[1998]	[1998]	[1998]
	Z_t^*	-4.370	-4.422	-4.431
		[1998]	[1981]	[1981]
Japan	ADF*	-5.389 (1)**	-5.662 (1)**	-5.373 (1)*
		[2002]	[2002]	[2002]
	Z_α^*	-31.996	-34.695	-31.974
		[2002]	[2002]	[2002]
	Z_t^*	-4.632	-5.034*	-4.629
		[2002]	[2002]	[2002]
Korea	ADF*	-5.641 (3)***	-6.015 (0)***	-5.610 (0)**
		[1983]	[1978]	[1979]
	Z_α^*	-34.835	-39.408	-37.406
		[1979]	[1979]	[1979]
	Z_t^*	-5.545***	-6.233***	-5.716**
		[1979]	[1979]	[1979]
Malaysia	ADF*	-4.747 (1)*	-4.832 (1)	-4.994 (1)
		[1992]	[1969]	[1992]
	Z_α^*	-26.545	-30.979	-27.965
		[1993]	[1968]	[1986]
	Z_t^*	-4.133	-4.529	-4.320
		[1994]	[1968]	[1986]
Nepal	ADF*	-5.996 (4)***	-4.729 (4)	-5.572 (1)**
		[1971]	[1982]	[1969]
	Z_α^*	-34.875	-24.547	-35.281
		[1967]	[1984]	[1969]
	Z_t^*	-5.161**	-4.097	-5.482*
		[1967]	[1982]	[1974]
New Zealand	ADF*	-4.538 (3)	-5.063 (3)*	-4.246 (3)
		[1988]	[1988]	[1992]
	Z_α^*	-17.670	-29.481	-23.926
		[1975]	[1999]	[1975]

	Z_t^*	-3.253	-4.411	-3.995
		[1975]	[1999]	[1972]
Pakistan	ADF*	-5.412 (1)***	-5.835 (1)***	-4.547 (1)
		[1982]	[1967]	[1987]
	Z_α^*	-22.867	-20.992	-23.135
		[1983]	[1979]	[1973]
	Z_t^*	-3.665	-3.553	-3.664
		[1983]	[1968]	[1973]
Philippines	ADF*	-4.973 (1)**	-5.415 (1)**	-4.902 (1)
		[1983]	[1993]	[1985]
	Z_α^*	-23.928	-26.350	-30.562
		[1984]	[1984]	[1984]
	Z_t^*	-4.171	-4.707	-4.674
		[1984]	[1994]	[1984]
Sri Lanka	ADF*	-4.375 (1)	-5.238 (1)*	-5.377 (1)*
		[1968]	[1997]	[1997]
	Z_α^*	-18.155	-25.903	-27.126
		[1967]	[1995]	[1995]
	Z_t^*	-3.125	-3.932	-4.138
		[1995]	[1995]	[1995]
Thailand	ADF*	-5.261 (1)**	-5.218 (1)*	-6.080 (1)***
		[2002]	[2002]	[2002]
	Z_α^*	-17.758	-19.988	-24.722
		[2003]	[1984]	[1986]
	Z_t^*	-3.224	-3.393	-4.005
		[2003]	[1984]	[1986]

Table 3b: Gregory-Hansen cointegration test: Dependent variable OUTPUT

		Level shift C	Level shift with trend C/T	Regime shift C/S
Australia	ADF*	-3.742 (2)	-3.860 (2)	-4.052 (2)
		[1984]	[1986]	[1984]
	Z_α^*	-12.133	-18.926	-17.370
		[1970]	[1968]	[1986]
	Z_t^*	-2.567	-3.378	-3.178
		[1996]	[1968]	[1986]
China	ADF*	-3.832 (2)	-4.654 (2)	-4.793 (0)
		[2006]	[2006]	[2006]
	Z_α^*	-26.603	-14.670	-26.471
		[2006]	[2006]	[2003]
	Z_t^*	-5.247**	-3.023	-5.225
		[2006]	[2006]	[2003]
India	ADF*	-3.134 (0)	-4.301 (0)	-3.985 (0)
		[1975]	[1975]	[1986]
	Z_α^*	-16.498	-28.628	-26.377
		[1975]	[1975]	[1986]
	Z_t^*	-3.105	-4.345	-4.052
		[1975]	[1975]	[1986]
Indonesia	ADF*	-4.816 (3)*	-5.519 (1)**	-5.480 (3)*
		[1998]	[1994]	[1992]
	Z_α^*	-22.803	-22.858	-24.974
		[1985]	[1993]	[1992]
	Z_t^*	-4.169	-4.426	-4.560
		[1985]	[1993]	[1992]
Israel	ADF*	-4.522 (4)	-4.886 (0)	-5.531 (0)**
		[1978]	[1969]	[1974]
	Z_α^*	-22.498	-30.918	-38.189
		[1976]	[1969]	[1974]

	Z_t^*	-4.004	-4.947	-5.584**
		[1976]	[1969]	[1974]
Japan	ADF*	-4.607 (4)	-4.503 (4)	-5.376 (4)*
		[2001]	[2001]	[1990]
	Z_α^*	-19.602	-21.123	-28.637
		[2002]	[1967]	[1972]
	Z_t^*	-3.315	-3.458	-4.288
		[1975]	[1967]	[1972]
Korea	ADF*	-5.125 (0)**	-3.626 (1)	-5.303 (1)*
		[1979]	[1988]	[1984]
	Z_α^*	-33.637	-20.344	-33.064
		[1979]	[1988]	[1984]
	Z_t^*	-5.239**	-3.392	-5.020
		[1979]	[1988]	[1984]
Malaysia	ADF*	-4.578 (0)	-3.850 (0)	-4.956 (1)
		[1996]	[1967]	[1995]
	Z_α^*	-22.946	-25.658	-24.397
		[1995]	[1967]	[1980]
	Z_t^*	-4.625	-4.041	-4.800
		[1996]	[1967]	[1995]
Nepal	ADF*	-4.640 (1)	-4.503 (0)	-7.164 (0)***
		[1968]	[1969]	[1985]
	Z_α^*	-27.437	-29.480	-49.709
		[1968]	[1968]	[1985]
	Z_t^*	-4.364	-4.552	-7.241***
		[1969]	[1969]	[1985]
New Zealand	ADF*	-5.215 (3)**	-5.388 (3)**	-5.390 (3)*
		[2001]	[1996]	[1998]
	Z_α^*	-21.308	-28.871	-24.154
		[2002]	[1999]	[2000]
	Z_t^*	-3.455	-4.402	-3.809

		[2002]	[1999]	[2000]
Pakistan	ADF*	-3.343 (1)	-4.222 (1)	-3.159 (1)
		[1982]	[1987]	[1987]
	Z_α^*	-16.853	-23.122	-17.674
		[1983]	[1986]	[1983]
	Z_t^*	-2.751	-3.771	-3.198
		[1983]	[1986]	[1983]
Philippines	ADF*	-3.019 (6)	-3.682 (3)	-2.563 (6)
		[1980]	[1989]	[1968]
	Z_α^*	-8.454	-17.941	-8.348
		[1987]	[1985]	[1991]
	Z_t^*	-1.902	-3.265	-1.705
		[1985]	[1985]	[2002]
Sri Lanka	ADF*	-4.169 (6)	-3.519 (3)	-3.536 (2)
		[1998]	[1999]	[1995]
	Z_α^*	-14.299	-16.488	-18.649
		[2002]	[2002]	[1991]
	Z_t^*	-2.759	-2.705	-3.217
		[2002]	[2002]	[1994]
Thailand	ADF*	-5.163 (1)**	-4.719 (3)	-5.673 (3)**
		[1974]	[1989]	[1989]
	Z_α^*	-22.677	-20.641	-26.723
		[1975]	[1990]	[1979]
	Z_t^*	-3.888	-3.590	-4.696
		[1975]	[1990]	[1979]

Table 3c: Gregory-Hansen cointegration test: Dependent variable OPENNESS

		Level shift C	Level shift with trend C/T	Regime shift C/S
Australia	ADF*	-4.372 (5)	-4.619 (3)	-4.054 (3)
		[1980]	[1995]	[1983]
	Z_α^*	-20.756	-24.987	-18.459
		[1975]	[1995]	[1975]
	Z_t^*	-3.359	-3.901	-3.079
		[1975]	[1994]	[1974]
China	ADF*	-4.608 (0)	-5.732 (0)**	-5.786 (0)**
		[2006]	[2003]	[2004]
	Z_α^*	-24.101	-29.403	-32.611
		[2006]	[2003]	[2003]
	Z_t^*	-4.712	-5.856***	-6.702***
		[2006]	[2003]	[2003]
India	ADF*	-4.265 (6)	-4.692 (3)	-4.150 (3)
		[1973]	[1979]	[1974]
	Z_α^*	-20.448	-24.784	-20.519
		[1976]	[1976]	[1976]
	Z_t^*	-3.448	-3.962	-3.503
		[1975]	[1975]	[1975]
Indonesia	ADF*	-4.890 (3)*	-7.617 (3)***	-5.391 (3)*
		[1998]	[2004]	[1996]
	Z_α^*	-23.123	-23.096	-20.891
		[1985]	[1985]	[1987]
	Z_t^*	-4.117	-4.113	-3.827
		[1985]	[1985]	[1987]
Israel	ADF*	-5.176 (0)**	-5.598 (0)**	-5.787 (0)**
		[1976]	[1974]	[1974]
	Z_α^*	-34.351	-39.376	-41.338
		[1975]	[1974]	[1974]

	Z_t^*	-5.484***	-5.734**	-5.939**
		[1975]	[1974]	[1974]
Japan	ADF*	-4.016 (6)	-4.774 (0)	-4.382 (0)
		[1968]	[1973]	[1973]
	Z_α^*	-21.564	-31.798	-29.326
		[1975]	[1973]	[1973]
	Z_t^*	-3.566	-4.802	-4.382
		[1975]	[1973]	[1973]
Korea	ADF*	-4.774 (0)*	-5.973 (1)***	-5.387 (1)*
		[1978]	[1978]	[1984]
	Z_α^*	-31.528	-39.230	-32.274
		[1978]	[1978]	[1984]
	Z_t^*	-4.858*	-6.061***	-4.825
		[1978]	[1978]	[1984]
Malaysia	ADF*	-5.024 (6)**	-4.787 (1)	-5.111 (6)
		[1980]	[1967]	[1980]
	Z_α^*	-22.198	-31.466	-28.662
		[1967]	[1967]	[1975]
	Z_t^*	-4.164	-4.759	-4.308
		[1975]	[1967]	[1975]
Nepal	ADF*	-4.348 (2)	-4.171 (0)	-4.329 (2)
		[1978]	[1967]	[1978]
	Z_α^*	-25.120	-28.062	-27.839
		[1976]	[1967]	[1976]
	Z_t^*	-3.992	-4.191	-4.253
		[1976]	[1967]	[1973]
New Zealand	ADF*	-4.400 (3)	-4.637 (1)	-4.314 (1)
		[1975]	[1976]	[1977]
	Z_α^*	-24.744	-32.420	-27.796
		[1976]	[1999]	[1977]
	Z_t^*	-3.913	-4.821	-4.192

		[1976]	[1999]	[1977]
Pakistan	ADF*	-4.047 (1)	-5.274 (5)*	-4.697 (0)
		[1982]	[1978]	[1973]
	Z_α^*	-21.582	-21.478	-30.615
		[1982]	[1977]	[1973]
	Z_t^*	-3.443	-3.465	-4.688
		[1982]	[1977]	[1973]
Philippines	ADF*	-5.579 (1)***	-6.439 (1)***	-5.279 (1)*
		[1983]	[1976]	[1983]
	Z_α^*	-27.139	-28.881	-32.936
		[1983]	[1975]	[1989]
	Z_t^*	-4.376	-4.829	-4.590
		[1984]	[1975]	[1990]
Sri Lanka	ADF*	-3.826 (5)	-4.019 (5)	-4.447 (1)
		[1980]	[1980]	[1976]
	Z_α^*	-17.516	-19.993	-28.747
		[1976]	[1967]	[1976]
	Z_t^*	-3.520	-3.580	-4.252
		[1976]	[1967]	[1976]
Thailand	ADF*	-4.188 (1)	-4.387 (1)	-5.367 (0)*
		[1976]	[1976]	[1973]
	Z_α^*	-23.227	-24.206	-37.111
		[1975]	[1975]	[1973]
	Z_t^*	-3.817	-3.942	-5.428*
		[1975]	[1975]	[1973]

Note: VAR consists of DEPTH, OPENNESS and OUTPUT (m=2).*, ** and *** denote significance, i.e. rejection of the null hypothesis of no cointegration at 10%, 5% and 1% levels, respectively. Numbers in (.) are lag orders to include in equations. Lag lengths are determined automatically based on AIC (max=6). Time breaks are in [.]

Note: Approximate asymptotic critical values for C, C/T and C/S respectively: m=2: -5.44, -5.80, -5.97 for ADF* and Z_t^* and -57.01, -64.77, -68.21 for Z_α^* (at 1% level); -4.92, -5.29, -5.50 for ADF* and Z_t^* and -46.98, -53.92, -58.33 for Z_α^* (at 5% level); -4.69, -5.03, -5.23 for ADF* and Z_t^* and -42.49, -48.94, -52.85 for Z_α^* (at 10% level). Critical values are taken from Table 1, page 109, Gregory and Hansen, 1996, Residual-based tests for cointegration in models with regime shifts, Journal of Econometrics, 70, p. 99-126.

Table 4a: Toda-Yamamoto non-Granger causality test: DEPTH AND OUTPUT

	Null hypothesis	Lag	Wald statistic	p-value
Australia	DEPTH → OUTPUT	2	1.249	0.536
	OUTPUT → DEPTH	2	5.125*	0.077
China	DEPTH → OUTPUT	2	8.047**	0.018
	OUTPUT → DEPTH	2	5.154*	0.076
India	DEPTH → OUTPUT	4	1.828	0.767
	OUTPUT → DEPTH	4	5.329	0.255
Indonesia	DEPTH → OUTPUT	5	9.498*	0.091
	OUTPUT → DEPTH	5	11.638**	0.040
Israel	DEPTH → OUTPUT	3	3.314	0.346
	OUTPUT → DEPTH	3	5.451	0.142
Japan	DEPTH → OUTPUT	2	9.072**	0.011
	OUTPUT → DEPTH	2	6.999**	0.030
Korea	DEPTH → OUTPUT	1	0.158	0.691
	OUTPUT → DEPTH	1	0.581	0.446
Malaysia	DEPTH → OUTPUT	3	8.787**	0.032
	OUTPUT → DEPTH	3	0.880	0.830
Nepal	DEPTH → OUTPUT	2	1.736	0.420
	OUTPUT → DEPTH	2	4.638*	0.098
New Zealand	DEPTH → OUTPUT	2	5.651*	0.059
	OUTPUT → DEPTH	2	1.532	0.465
Philippines	DEPTH → OUTPUT	2	0.378	0.828
	OUTPUT → DEPTH	2	8.646**	0.013
Pakistan	DEPTH → OUTPUT	2	2.591	0.274
	OUTPUT → DEPTH	2	0.821	0.663
Sri Lanka	DEPTH → OUTPUT	2	1.096	0.578
	OUTPUT → DEPTH	2	2.569	0.277
Thailand	DEPTH → OUTPUT	2	0.350	0.839
	OUTPUT → DEPTH	2	0.110	0.946

Note: VAR consists of DEPTH, OUTPUT and OPENNESS (satisfy stability condition). The maximum order of integration among the variables of interest is 1.Lag lengths are determined based on Schwarz Information Criterion (SIC). *, ** and *** denote significance, i.e. rejection of the null hypothesis of no causality at 10%, 5% and 1% levels, respectively.

Table 4b: Toda-Yamamoto non-Granger causality test: DEPTH AND OPENNESS

	Null hypothesis	Lag	Wald statistic	p-value
Australia	DEPTH → OPENNESS	2	2.585	0.275
	OPENNESS → DEPTH	2	1.020	0.600
China	DEPTH → OPENNESS	2	0.935	0.627
	OPENNESS → DEPTH	2	7.497**	0.024
India	DEPTH → OPENNESS	4	13.788***	0.008
	OPENNESS → DEPTH	4	2.304	0.680
Indonesia	DEPTH → OPENNESS	5	4.057	0.541
	OPENNESS → DEPTH	5	12.549**	0.028
Israel	DEPTH → OPENNESS	3	1.761	0.623
	OPENNESS → DEPTH	3	1.047	0.790
Japan	DEPTH → OPENNESS	2	0.609	0.737
	OPENNESS → DEPTH	2	5.038*	0.080
Korea	DEPTH → OPENNESS	1	0.403	0.526
	OPENNESS → DEPTH	1	4.205**	0.040
Malaysia	DEPTH → OPENNESS	3	10.120**	0.018
	OPENNESS → DEPTH	3	0.280	0.960
Nepal	DEPTH → OPENNESS	2	2.957	0.228
	OPENNESS → DEPTH	2	5.249*	0.073
New Zealand	DEPTH → OPENNESS	2	0.933	0.627
	OPENNESS → DEPTH	2	4.842*	0.089
Philippines	DEPTH → OPENNESS	2	0.213	0.899
	OPENNESS → DEPTH	2	5.011*	0.082
Pakistan	DEPTH → OPENNESS	2	0.679	0.712
	OPENNESS → DEPTH	2	0.743	0.690
Sri Lanka	DEPTH → OPENNESS	2	1.898	0.387
	OPENNESS → DEPTH	2	1.617	0.445
Thailand	DEPTH → OPENNESS	2	1.164	0.559
	OPENNESS → DEPTH	2	0.226	0.893

Note: VAR consists of DEPTH, OUTPUT and OPENNESS (satisfy stability condition). The maximum order of integration among the variables of interest is 1.Lag lengths are determined based on Schwarz Information Criterion (SIC). *, ** and *** denote significance, i.e. rejection of the null hypothesis of no causality at 10%, 5% and 1% levels, respectively.

Table 4c: Toda-Yamamoto non-Granger causality test: OPENNESS AND OUTPUT

	Null hypothesis	Lag	Wald statistic	p-value
Australia	OPENNESS → OUTPUT	2	3.778	0.151
	OUTPUT → OPENNESS	2	2.415	0.299
China	OPENNESS → OUTPUT	2	5.335*	0.069
	OUTPUT → OPENNESS	2	1.237	0.539
India	OPENNESS → OUTPUT	4	1.498	0.827
	OUTPUT → OPENNESS	4	2.310	0.679
Indonesia	OPENNESS → OUTPUT	5	9.315*	0.097
	OUTPUT → OPENNESS	5	13.077**	0.023
Israel	OPENNESS → OUTPUT	3	7.755*	0.051
	OUTPUT → OPENNESS	3	2.721	0.437
Japan	OPENNESS → OUTPUT	2	1.835	0.400
	OUTPUT → OPENNESS	2	0.779	0.677
Korea	OPENNESS → OUTPUT	1	2.846	0.092
	OUTPUT → OPENNESS	1	0.035	0.853
Malaysia	OPENNESS → OUTPUT	3	0.305	0.959
	OUTPUT → OPENNESS	3	5.928	0.115
Nepal	OPENNESS → OUTPUT	2	10.567***	0.005
	OUTPUT → OPENNESS	2	1.451	0.484
New Zealand	OPENNESS → OUTPUT	2	1.450	0.484
	OUTPUT → OPENNESS	2	3.804	0.149
Philippines	OPENNESS → OUTPUT	2	4.667*	0.097
	OUTPUT → OPENNESS	2	3.371	0.185
Pakistan	OPENNESS → OUTPUT	2	3.165	0.205
	OUTPUT → OPENNESS	2	1.561	0.458
Sri Lanka	OPENNESS → OUTPUT	2	0.447	0.800
	OUTPUT → OPENNESS	2	1.266	0.531
Thailand	OPENNESS → OUTPUT	2	0.649	0.723
	OUTPUT → OPENNESS	2	2.161	0.339

Note: VAR consists of DEPTH, OUTPUT and OPENNESS (satisfy stability condition). The maximum order of integration among the variables of interest is 1.Lag lengths are determined based on Schwarz Information Criterion (SIC). *, ** and *** denote significance, i.e. rejection of the null hypothesis of no causality at 10%, 5% and 1% levels, respectively.

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