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Does Financial or Trade Integration Cause Instability? Evidence from Emerging and ASEAN Economies

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Abstract: *This study empirically examines the nexus amongst financial integration, trade integration, and instability in various emerging and Association of Southeast Asian Nations (ASEAN) economies. Using newly constructed financial integration indices and the Toda-Yamamoto causality test, it is found that (i) tremendous changes occurred in the levels of financial and trade integration in these economies during the COVID-19 pandemic; (ii) in most cases, financial integration caused exchange rate volatility, inflation volatility, and interest rate volatility, while trade integration caused credit volatility, exchange rate volatility, and growth volatility; and (iii) not all types of integration caused instability, and portfolio integration caused exchange rate instability in most cases.*

Keywords: Financial Integration; Trade Integration; Instability; Toda-Yamamoto Causality Test

JEL Classification: F20, F21, F41, F65

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1. Introduction

Over the past 3 decades, the world has observed an unprecedented rise in the speed and degree of financial integration (FI)[1] and trade integration (TI) (Lane and Milesi-Ferretti, 2007). Many emerging economies have lifted the restrictions on capital and current account transactions, resulting in several benefits like higher economic growth, lower inflation, and international risk-sharing. Concomitant to the increased integration, a higher level of market integration can lower the cost of capital and increase risk-sharing and welfare benefits (Bekaert, Harvey, Lundblad, 2005; Suzuki, 2014; Donadelli and Gufler, 2021). However, increased integration can also result in vulnerability to external shocks and reduce the diversification of portfolios (Fratzscher, 2012; Donadelli and Paradiso, 2014). For instance, this phenomenon was observed during the 2008–2009 global financial crisis,[2] when countries with strong economic fundamentals were adversely affected due to their higher linkages with global markets.

During the COVID-19 pandemic, most countries' economic growth collapsed due to the lack of global finance and unavailability of imported inputs (Padhan and Prabheesh, 2021). The economic instability of emerging market and Association of Southeast Asian Nations (ASEAN) economies increased, indicating a positive link between the integration process and economic instability (Mühleisen, Gudmundsson, and Poirson Ward, 2020).

In emerging market and ASEAN economies, FI and TI play crucial roles in the reduction of costs of capital and in generating welfare benefits. Economic instability is a key component of an integrated economy since integration directly or indirectly affects the level of economic well-being. If an economy is strongly integrated, its stability depends on external factors. Hence, the dynamics between integration[3] and (in)stability are worth exploring.

[1] The Reserve Bank of India (2007) defined FI as 'a process of unifying the financial markets in [a] proper way that risk-adjusted returns on financial instruments of different countries should be equal when returns are expressed in single currency'. The International Monetary Fund stated that FI is the process by which two or more countries' or regions' financial markets become more interconnected (IMF, 2016). In this paper, de facto-based FI is considered, which is the outcome/results of the de jure policy of an economy. Here, FI means a country's integration with the world.

[2] The terms 'instability' and 'volatility' are simultaneously used in this paper.

[3] Here, two forms of globalisation are considered, i.e. finance and trade. The link between finance and trade are complementary and are explained by the familiarity effect, default risk, and information symmetry (Padhan and Prabheesh, 2019; 2023). Here, the objective is to explore whether FI or TI causes instability – rather than the relationship between FI and TI.

1.1. Motivation of the Study

Until the global financial crisis, there was a consensus that FI always brings benefits through efficient capital allocation and higher investment. However, during the crisis – wherein financial contagion caused instability across economies – the benefits of FI were questioned. Similarly, regarding TI, due to the United States–China trade war, competitive devaluation, and exposure to terms of trade shocks, the benefits from TI were also re-examined. Policymakers began to rethink the premise that FI and TI cause instability and how they perform in the presence of each other.

The dynamics amongst FI, TI, and instability are highly complex in the literature. As per the theoretical literature, FI produces both benefits and costs. For instance, it boosts financial and economic stability through increased allocation efficiency, international risk sharing, and intertemporal consumption smoothing (Fischer, 1998; Summers, 2000; Obstfeld; 1994). FI provides access to the global capital market, which enhances investment, diversification of portfolios, and consumption smoothing, which subsequently helps reduce financial instability through more efficient capital allocation and promotion of international risk sharing (Kose et al., 2006). Conversely, Bhagwati (1998), Rodrik (1998), and Stiglitz (2002) emphasised the risks associated with FI, such as macroeconomic volatility and financial contagion, which may overcome these benefits. Babecký, Komárek, and Komárková (2012) posited that FI leads to the transmission of shocks, which creates financial instability. Further, a financial crisis is easily transmitted due to financial contagion, which leads to financial instability (Imbs, 2010).

However, in the empirical literature, findings are more mixed; there is no uniformity in the dynamics between FI and instability. For instance, Agénor (2003) argued that higher FI leads to financial stability and efficiency. In contrast, Yu, Fung, and Tam (2010) argued that FI may increase financial instability due to exposure to external shocks. Yet De Nicolò and Juvenal (2014) did not find any evidence of a trade-off between FI and macroeconomic stability, while Asamoah, Adjasi, and Alhassan (2016) affirmed that macroeconomic instability negatively affects FI.

For TI and instability, there is a lack of uniformity in the literature regarding their dynamics. Krugman (1993) argued that output is volatile in an increased trade environment with interindustry specialisation. Further, such environments are exposed to industry-specific shocks, which affect their business cycles and consumption. As per the empirical literature, however, TI promotes stability by generating economic growth and lowering inflation (Wynne and Kersting, 2007). Kose et al. (2006) posited that enhanced trade promotes lower inflation by increasing the share of imports on domestic demand and alters the impact of the real exchange rate on economic growth, thus promoting macroeconomic stability; further, open economies are more capable of tolerating volatility. Conversely, Easterly, Islam, and Stiglitz (2001) wrote that the exposure to trade shocks and adverse current account balances can lead to macroeconomic instability for an economy, and higher TI generates output volatility.

This study is motivated by concerns about the COVID-19 pandemic, which has severely affected global trade and resulted in unprecedented damage in the form of unemployment, output loss, and financial instability (Narayan, 2021; Padhan and Prabheesh, 2021; Vidya and Prabheesh, 2020). Further, it has caused uneasy financial conditions and vulnerabilities, higher inflation, and monetary tightening across economies. It is also evident that the health crisis stopped the economic circle throughout the world and forced economies to spend considerable budgets to mitigate the consequences, which has resulted in higher economic instability.

Moreover, the pandemic has resulted in higher global financial risks, which adversely affects the global financial market, while higher uncertainty and lower stock returns adversely affect capital flows. Due to higher uncertainty and reduction in capital flows, the FI of economies has been affected (Goodell, 2020; Padhan and Prabheesh, 2021). It has also resulted in overly stretched asset valuations, tighter financial conditions, and trade reduction; hence, the pace and degree of FI and TI have changed across economies. In this context, it is imperative to examine the degrees of FI and TI and their links to instability to safeguard economies from vulnerability and to promote stability in the post-pandemic period.

Indeed, the existing literature demonstrates several research gaps. First, none have examined the dynamics amongst FI, TI, and instability during the pandemic. Second, no special emphasis has been placed on the type of FI measures to be employed when examining dynamics. Third, existing studies have no insights into the type of FI that leads to instability. This study thus seeks to answer the following questions: (i) Has the COVID-19 pandemic changed the paces and degrees of FI and TI? (ii) Does FI or TI lead to instability? and (iii) Do all types of FI similarly cause instability?

1.2. Research Approach and Framework

It is hypothesised that emerging and ASEAN economies have witnessed a considerable change in the paces and degrees of FI and TI. FI and TI are theorised to have reduced instability due to international risk sharing and consumption smoothing. Further, the presence of bi-directional dynamics is thought to occur amongst FI, TI, and instability.

First, the dynamics amongst FI, TI, and instability are looked at as a related phenomenon rather than an independent one. Second, seven emerging and ASEAN economies are examined to capture variation in the samples, and the causality direction is analysed, resulting in four classifications of economies.[4] Third, stock-based FI indices are constructed on a quarterly basis to measure the paces and degrees of FI and TI for a comparative analysis before and during the pandemic. Fourth, the economies with high and low FI as well as high and low TI are identified; snapshots of their FI and TI levels and exposure to COVID-19 are provided. Finally, quarterly data are used to perform an econometric analysis to study these dynamics.

1.3. Contribution of the Study

This is the first study to examine the types of FI resulting in instability, and its use of stock-based quarterly FI indices makes it unique. As the study period includes the COVID-19 pandemic – which caused a worse form of uncertainty – it sets a benchmark for emerging and ASEAN economies in understanding these dynamics. This study will also help policymakers when deciding on whether to restrict or to increase FI due to prevailing instability and determine further openness. It is not advisable to make decisions on financial/capital controls after liberalisation except for controlling the fragile components of FI to make an integration process effective.

1.4. Structure of the Paper

Section 2 provides a snapshot of the economies and a comparative analysis of FI, TI, and exposure to COVID-19. Section 3 reports the empirical model, data, and empirical

[4] Seven emerging and ASEAN economies were chosen for the case study because (i) these economies joined the waves of FI in the 1980s and 1990s and have yet to enjoy the benefits (Lane and Milesi-Ferretti, 2017); (ii) increasing the weight of these economies with a lower level of FI comparative to advanced economies paves the way for a policy decision on whether further integration or promotion of stability needs to be emphasised; (iii) most emerging and ASEAN economies were severely hit by the pandemic and experienced more economic impacts than from the global financial crisis (Muhleisen, Gudmundsson, Poirson Ward, 2020); and (iv) these economies witnessed severe uncertainty, which may have caused changes in the degree of integration, and need to be given standing.

methodology. Section 4 presents the empirical findings. Finally, Section 5 concludes and reveals policy implications.

2. Snapshot of the Emerging and ASEAN Economies

Table 1 shows the levels of FI and TI of the selected economies and their exposure to COVID-19. Seven economies are selected: Malaysia, Thailand, Chile, Saudi Arabia, Ukraine, India, and Indonesia. They provide four classifications: (i) high FI and high TI economies (i.e. Malaysia and Thailand), (ii) high FI and low TI economies (i.e. Chile and Saudi Arabia), (iii) low FI and high TI economies (i.e. Ukraine), and (iv) low FI and low TI economies (i.e. India and Indonesia). Although all were affected by the COVID-19 pandemic, India, Indonesia, and Ukraine were the mostly severely affected.

Table 1: Selected Emerging and ASEAN Economies in This Study

Country	Level of Financial Integration	Level of Trade Integration	Combination	Confirmed COVID-19 Cases per 100,000	Fatalities from COVID-19
Malaysia	199%	173%	High/High	15,584.19	36,996
Thailand	143%	119%	High/High	6,773.90	33,918
Chile	190%	63%	High/Low	27,109.78	64,247
Saudi Arabia	196%	73%	High/Low	2,383.77	9,617
Ukraine	131%	97%	Low/High	12, 345.68	111,308
India	57%	38%	Low/Low	3,238.20	530,775
Indonesia	92%	54%	Low/Low	2,463.26	160,934

Notes:
1. This table reports the level of financial integration (using the TOTAL Index from Lane and Milesi-Ferretti, 2007) and trade integration (using export and import of goods and services to gross domestic product) during 1995–2015 and 1995–2019, respectively.
2. The combination of high and low is calculated on the basis of the mean value of 34 economies (i.e. 29 emerging and 10 ASEAN economies, i.e. less 5 common countries).
3. It reports the exposure to COVID-19 in terms of confirmed cases per 100,000 population and number of fatalities to 7 March 2023.

Source: Authors' calculations and WHO, WHO Coronavirus (COVID-19) Dashboard, https://covid19.who.int/ (accessed 7 March 2023).

3. Empirical Model, Data and Construction of Variables, and Empirical Methodology

3.1. Empirical Model

The following system equations are estimated to analyse the dynamics between FI and instability:

$$INS_t = \propto_1 + \sum_{i=1}^{m+d_{max}} \beta_{1i} INS_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{1i} FI_{t-i} + \varepsilon_{1i} \quad (1)$$

$$FI_t = \mu_2 + \sum_{i=1}^{m+d_{max}} \beta_{2i} FI_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{2i} INS_{t-i} + \varepsilon_{2i} \quad (2)$$

$$INS_t = \propto_1 + \sum_{i=1}^{m+d_{max}} \beta_{1i} INS_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{1i} FI_{t-i} + \theta_1 TI_t + \varepsilon_{1i} \quad (3)$$

$$FI_t = \mu_2 + \sum_{i=1}^{m+d_{max}} \beta_{2i} FI_{t-i} + \sum_{i=1}^{m+d_{max}} \gamma_{2i} INS_{t-i} + \theta_2 TI_t + \varepsilon_{2i} \quad (4)$$

where INS_t includes volatility of credit, exchange rate, interest rate, gross domestic product (GDP) growth, and inflation. FI_t and TI_t stand for financial integration and trade integration, respectively. ε is the serially uncorrelated random error term, m is the optimal lag length, and d_{max} is the maximum order of integration of the vector autoregression (VAR) model.

In equations (1) and (2), the statistical significance of γ_{1i} indicates that causality runs from FI to instability, whereas the statistical significance of γ_{2i} denotes causality running from instability to FI. In equations (3) and (4), whether the presence of TI affects the direction of causality between FI and instability is examined. A similar system of equations is utilised to analyse the dynamics with TI in the presence of FI. Further, equations (1) and (2) are re-examined with foreign direct investment (FDI), portfolio, and debt FI to explore the types of integration that cause instability.

3.2. Data and Construction of Variables

Quarterly data[5] are used for studying these dynamics. Credit, exchange rate,[6] interest rate, GDP growth, and inflation data are collected, and volatility is measured using the 5-quarter rolling standard deviation method.[7] Data are collected from the Bank for International Settlements, International Financial Statistics, Balance of Payments and International Investment Positions, and CEIC Database. Next, the ratio of exports and imports to GDP is considered a proxy for TI.[8] Following Lane and Milesi-Ferretti's TOTAL index, FI indices are constructed.

Lane and Milesi-Ferretti (2007) and Padhan and Prabheesh (2023) are followed to construct a quarterly TOTAL index for the selected economies:

$$\mathbf{TOTAL_{it}} = \frac{\boldsymbol{FDIA_{it} + PEQA_{it} + PDQA_{it} + FDIL_{it} + PEQL_{it} + PDQL_{it} + (RESERVES - GOLD)_{it}}}{\boldsymbol{GDP_{it}}} \quad (5)$$

where $FDIA_{it}$, $PDQA_{it}$, and $PDQA_{it}$ are the stock of FDI assets, portfolio equity assets, and portfolio debt assets of country i abroad in time t, respectively. $FDIL_{it}$, $PEQL_{it}$, and $PDQL_{it}$ are the stock of FDI liabilities, portfolio equity liabilities, and portfolio debt liabilities of the rest of the world in period t.

The quarterly TOTAL index is constructed using Balance of Payments and International Investment Position Statistics published by International Monetary Fund. The advantage of stock data over flow data is that the former is capable of representing the integration of economies globally; moreover, they are less volatile, free from fluctuations, and less prone to measurement errors (Padhan and Prabheesh, 2022).

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5 The data periods for Malaysia, Thailand, Chile, Saudi Arabia, Ukraine, India, and Indonesia are 2015Q1–2022Q2, 2012Q1–2022Q3, 2007Q4–2022Q2, 2012Q1–2022Q3, 2001Q3–2021Q4, 1996Q4–2022Q1, and 2014Q1–2022Q3, respectively.

6 As Saudi Arabia is pegged to the US dollar, its national currency (riyal) is used with Euro exchange rate.

7 As the generalised autoregressive conditional heteroskedasticity (GARCH) approach to measure volatility is inappropriate due to the low frequency of data, the rolling standard deviation is used to measure instability.

8 As a country's exports and imports of goods and services show its trade linkages with the world, its ratio to GDP is used as a proxy for TI. In the literature, this proxy is also used as trade openness and indicates a country's integration in the form of trade. While sectoral trade openness fails to provide the complete picture, export- and import-based proxies are limited in their use due to their one-sided coverage.

3.3. Empirical Methodology

3.3.1. Graphical Analysis

Before empirical analysis, indicators of FI and TI are plotted to verify whether the COVID-19 pandemic changed their paces and degrees.

3.3.2. Unit Root Test

To test the unit root properties of the variables, a standard unit root test is used. The augmented Dickey-Fuller (ADF) and Philip-Perron (PP) tests are applied with the null hypothesis that the series is not stationary. The ADF test is conducted by including the lagged value of the independent variable:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad (6)$$

where ε_t is a white noise error term, and the null hypothesis is that variables have a unit root. The regression coefficient Δy_{t-1} is the subject of the test.

The hypothesis of containing a unit root is rejected if the coefficient is significantly different from zero. $H_o,\ \delta = 0$, and $H_1: \delta < 0$ is the null and alternative hypothesis for the unit root test in Y_t. The presence of stationarity in the series is indicated by rejecting the null hypothesis. The null hypothesis cannot be rejected if the ADF test statistic is smaller than the Mackinnon critical tau values, and the conclusion is reached that the series is non-stationary at their level.

Unit root testing can be done in two ways: with only the intercept or with both the intercept and trend together. Next, the PP unit root test explores the stationary properties of variables. The ADF test overcomes the problem of serial correlation by adding the lagged difference term of the regressand, whereas to resolve the problem of serial correlation without introducing lagged difference values, Philips and Perron employed a non-parametric statistical technique. It is modified here so that serial correlation has no impact on the asymptotic distribution. It indicates that all variables of order 1 are integrated with and without linear trends and with and without an intercept term. This is based on the Dickey-Fuller test of the null hypothesis that equals $\delta = 0$ in the equation:

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad (7)$$

where Δ is the first difference operator. The PP unit root test addresses the possibility that the data-generation process for Y_t has a greater order of autocorrelation than that indicated in the test equation, rendering Y_{t-1} endogenous and invalidating the Dickey-Fuller test. The ADF test solves the problem by using ΔY_t lags, but the PP test uses a non-parametric adjustment.

3.3.3. Toda-Yamamoto Causality Test

A widely known approach to examine the direction of the nexus between two variables is the Granger causality test (Granger, 1969). However, it has several limitations in practical applications. First, without considering the effect of other variables, a two-variable Granger causality test is subject to possible specification bias. Gujarati (1995) also explained that a causality test is sensitive to model specification and choice of lags and can yield different results if relevant variables are not included in the model. Second, if the variables are cointegrated, the use of F-statistics for Granger causality testing may be invalid, as these do not fit into the standard distribution (Gujarati, 2006). Further, time-series data are usually non-stationary in nature, which increases the probability of spurious regressions in the model.

Thus, a Granger causality test based on Toda and Yamamoto (1995) is used to examine the direction of the nexus between variables. This is advantageous over the traditional Granger causality test in that it is applicable even if the variables are integrated in arbitrary order or cointegrated in arbitrary order (Toda and Yamamoto, 1995). This causality test is applied on the level of VAR and minimises the risk of wrongly identifying the order of integration of the variables. It involves the estimation of an augmented VAR ($k + d$max) model, where k is the optimal lag length and $d$max is the maximum order of integration of variables in the system. The test applies modified Wald (MWALD) test statistics – an asymptotic (Chi-square) distribution with k degrees of freedom – to test zero restrictions on the parameters of the original VAR (k). As the traditional Granger causality test may be invalid due to the absence of a standard distribution in the presence of integrated or cointegrated time series, Toda and Yamamoto (1995) proposed the MWALD test for testing the null hypothesis for causality.

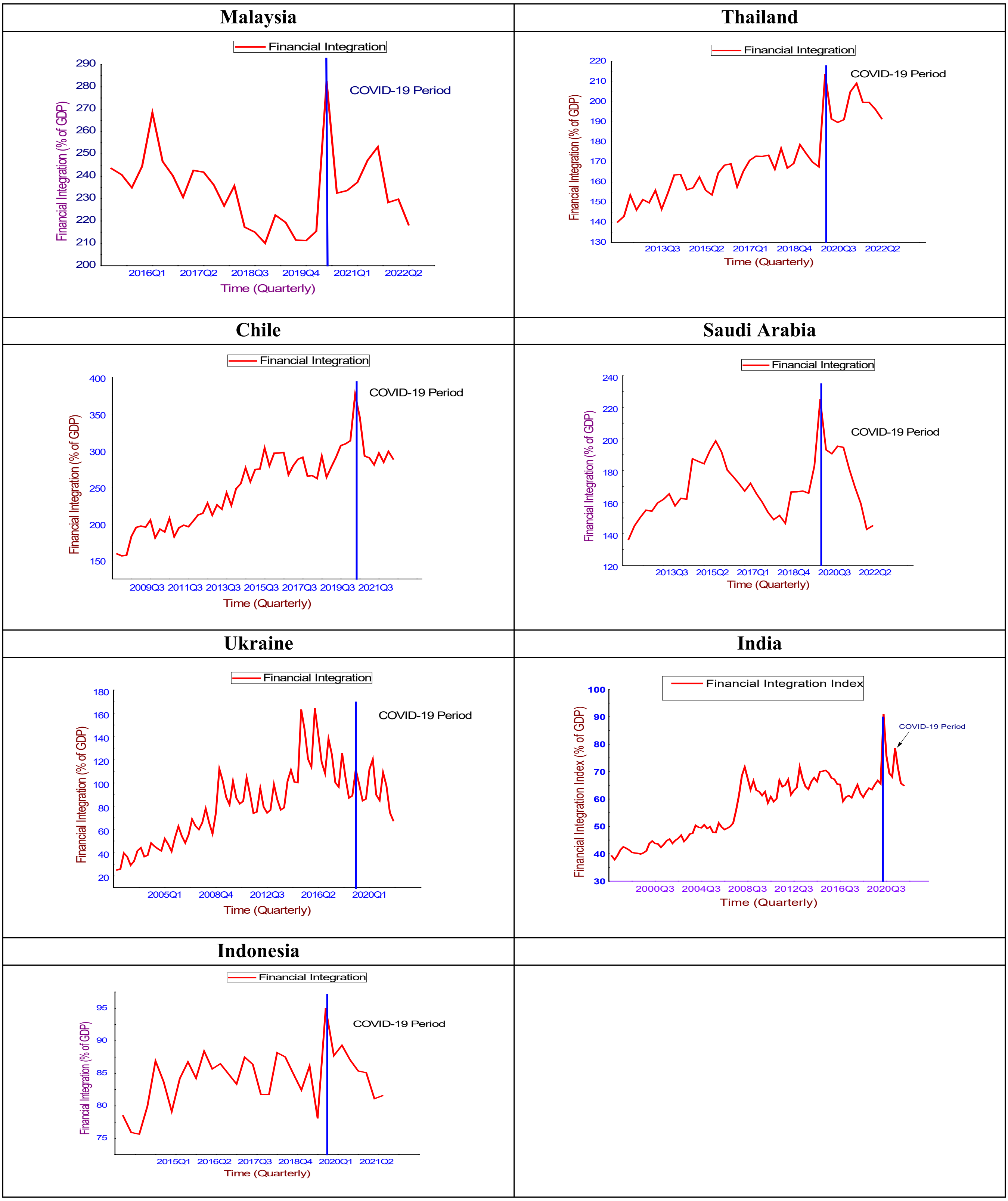
4. Empirical Findings and Result Discussions

4.1. Graphical Analysis

Figures 1 and 2 exhibit the levels of FI and TI for the seven economies. Both FI and TI in these economies have witnessed tremendous changes due to the COVID-19 pandemic. Both forms of globalisation have seen higher volatility during the pandemic period. Levels of FI for all economies fell, which can be attributed to COVID-19 and capital outflow. Yet the levels of TI were highly volatile during the pandemic period, possibly due to trade restrictions and precautions adopted.

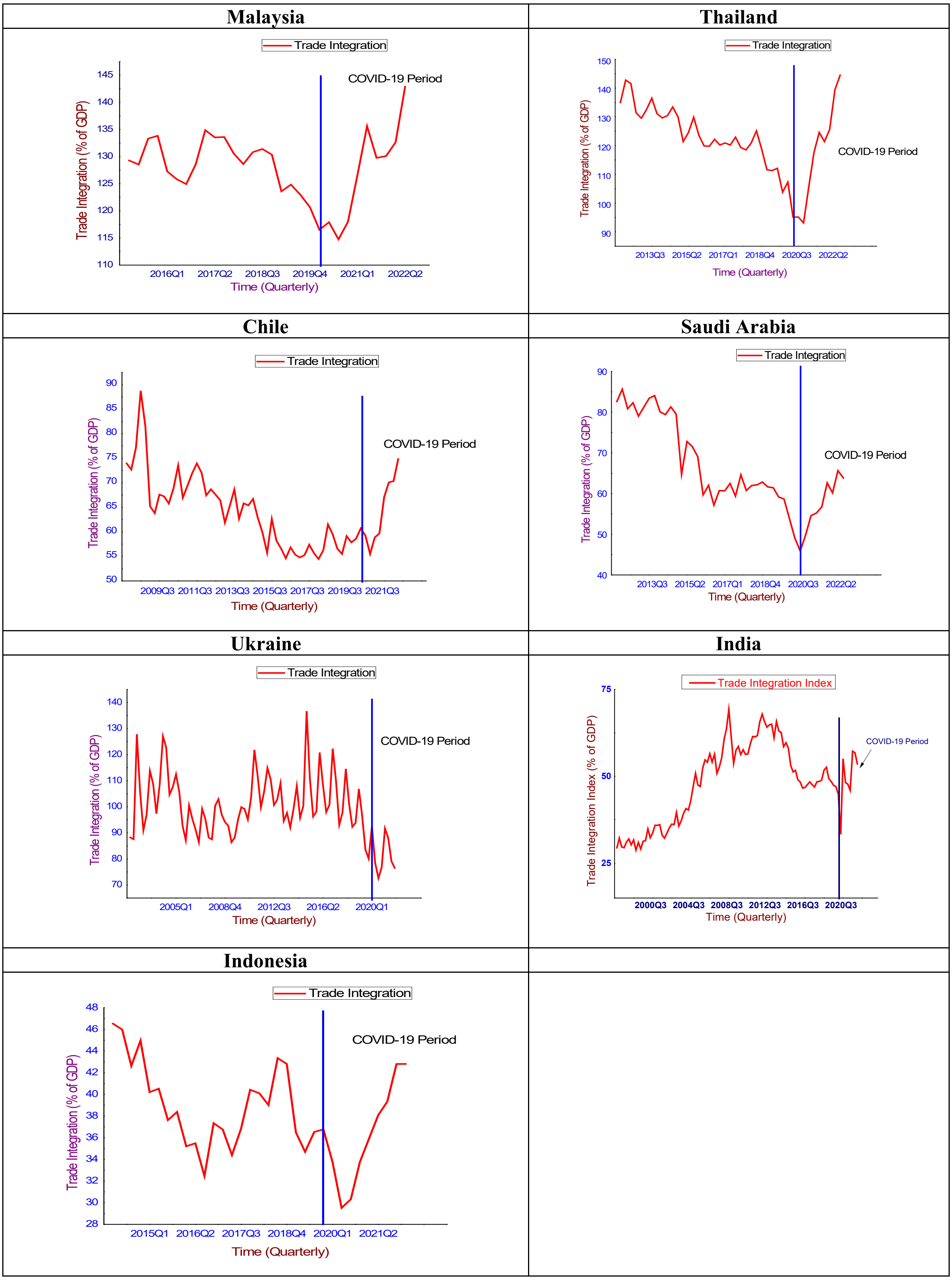
All of the economies were on an increasing trend after the pandemic, except for Ukraine due to the Russian invasion. Further, an opposite trend can be observed between FI and TI during the COVID-19 period in most cases, implying that financial market integration was impacted by the pandemic and has yet to recover to pre-COVID-19 levels.

Figure 1: Financial Integration Index



GDP = gross domestic product, Q = quarterly.
Note: The blue line indicates the pre-COVID and COVID-19 periods.
Source: Author.

Figure 2: Trade Integration Indices



GDP = gross domestic product, Q = quarterly.
Note: The blue line indicates the pre-COVID and COVID-19 periods.
Source: Author.

4.2. Unit Root Test

Before estimating the models, the unit root properties of the variables are tested, and results are in Table 2. The null and alternative hypotheses are non-stationary series (i.e. contains the unit root) and stationary series (i.e. no-unit root), respectively. The statistics of the ADF and PP tests are compared with critical values tabulated by MacKinnon (1994) and MacKinnon (1996), respectively.

The conventional unit root tests – the ADF and PP – show that FI and TI are stationary at the first difference for all of the economies. Variable credit volatility is stationary at the level for Malaysia, Thailand, and India, whereas it is stationary at the first difference for Chile and Indonesia. Exchange rate volatility is stationary at the level for Thailand, Ukraine, India, and Indonesia, while it is stationary at the first difference for Malaysia and Chile. For Saudi Arabia, it remains inconclusive. Interest rate volatility is stationary at the level for India and Indonesia, and stationary at the first difference for Malaysia and Chile. It remains inconclusive for Thailand, Saudi Arabia, and Ukraine. Variable growth volatility is stationary at the level for Ukraine, while it is stationary at the first difference for Malaysia, Thailand, Chile, and Indonesia. For Saudi Arabia and India, it remains inconclusive. Finally, inflation volatility is stationary at the level for Ukraine, while it is stationary at the first difference for Thailand, Chile, Saudi Arabia, and Indonesia. It remains inconclusive for Malaysia and India.

Table 2: Conventional Unit Root Test Results

Variables	Augmented Dickey-Fuller		Philip-Perron		Results
	Level	1st Difference	Level	1st Difference	
Malaysia					
FI	–0.420	–7.323*	–0.771	–14.613*	I(1)
TI	–0.525	–3.787	–0.502	–3.508*	I(1)
Credit V	–3.637*	–5.148*	–3.659**	–7.327*	I(0)
EXV	–2.704	–5.192*	–2.855	–4.959*	I(1)
IRV	–2.728	–3.685**	–2.506	–3.578***	I(1)
EGV	–2.436	–5.742*	–2.242	–5.806*	I(1)
INFV	–4.783*	–4.381*	–2.127	–2.290**	I(0)/I(1)
Thailand					
FI	–0.565	–6.985*	–1.906	–17.769*	I(1)
TI	–1.192	–5.261*	–1.282	–5.307*	I(1)

Variables	Augmented Dickey-Fuller		Philip-Perron		Results
	Level	1st Difference	Level	1st Difference	
Credit V	–28.129*	–45.707*	–16.721*	–47.903*	I(0)
EXV	–4.123*	–5.770*	–2.564***	–4.392*	I(0)
IRV	–3.888*	–4.670*	–2.216	–5.116*	I(0)/I(1)
EGV	–1.899	–6.630*	–1.899	–6.664*	I(1)
INFV	–0.326	–5.695*	–0.024	–5.638*	I(1)
Chile					
FI	–1.950	–10.131*	–1.790	–11.720*	I(1)
TI	–2.197	–7.237*	–2.026	–7.547*	I(1)
Credit V	–2.359	–7.639*	–2.536	–7.649*	I(1)
EXV	–1.950	–10.131*	–1.790	–11.720*	I(1)
IRV	–1.859	–5.322*	–1.801	–2.953**	I(1)
EGV	–1.616	–6.143*	–1.722	–6.136*	I(1)
INFV	–1.543	–4.235*	–1.792	–3.419*	I(1)
Saudi Arabia					
FI	–2.334	–6.401*	–2.407	–6.402*	I(1)
TI	–1.710	–8.272*	–1.654	–8.272*	I(1)
Credit V					
EXV	–3.563**	–4.233*	–2.502	–3.762*	I(0)/I(1)
IRV	–4.340*	–5.160*	–1.522	–4.463*	I(0)/I(1)
EGV	–4.112**	–4.676*	–2.338	–7.411*	I(0)/I(1)
INFV	–2.938	–4.893*	–2.171	–3.844**	I(1)
Ukraine					
FI	–2.236	–3.140*	–0.344	–12.272*	I(1)
TI	–0.694	–4.718*	–0.436	–14.682*	I(1)
Credit V					
EXV	–2.414**	–5.436*	–1.967**	–5.436*	I(0)
IRV	–2.012**	–4.874*	–1.607	–4.495*	I(0)/I(1)
EGV	–2.414**	–5.436*	–1.967**	–5.437*	I(0)
INFV	–1.744***	–6.955*	–2.031**	–5.802*	I(0)
India					
FI	–2.218	–12.325*	–1.845	–12.325*	I(1)
TI	–0.033	–6.397*	–0.931	–17.167*	I(1)
Credit V	–2.928**	–8.921*	–3.225**	–11.241*	I(0)
EXV	–3.424**	–5.890*	–2.610***	–8.843*	I(0)
IRV	–5.597*	–7.506*	–3.359**	–7.068*	I(0)
EGV	–3.864*	–4.079*	–2.240	–10.661*	I(0)/I(1)

Variables	Augmented Dickey-Fuller		Philip-Perron		Results
	Level	1st Difference	Level	1st Difference	
INFV	–3.873**	–8.230*	–2.899	–6.665*	I(0)/I(1)
Indonesia					
FI	–1.171	–9.908*	–0.269	–11.813*	I(1)
TI	–0.475	–5.584	–0.480	–5.587*	I(1)
Credit V	–1.431	–6.122*	–1.438	–6.115*	I(1)
EXV	–2.490**	–3.917*	–2.465**	–3.804*	I(0)
IRV	–1.886***	–4.145*	–1.777***	–3.255*	I(0)
EGV	–0.176	–9.944*	–0.409	–5.196*	I(1)
INFV	–1.687	–4.492*	–1.780	–7.083*	I(1)

Credit V = credit volatility, EGV = GDP growth volatility, EXV = exchange rate volatility, FI = financial integration, GDP = gross domestic product, INF V = inflation volatility, IRV = interest rate volatility, TI = trade integration.

Notes:

1. Lags are selected automatically using the Schwarz information criterion.
2. *, **, and *** denote rejection of the unit root at 1%, 5%, and 10% levels, respectively.
3. The sample period for Malaysia, Thailand, Chile, Saudi Arabia, Ukraine, India, and Indonesia are 2015Q1–2022Q2, 2012Q1–2022Q3, 2007Q4–2022Q2, 2012Q1–2022Q3, 2001Q3–2021Q4, 1996Q4–2022Q1, and 2014Q1–2022Q3, respectively. These data periods include the COVID-19 pandemic.

Source: Authors' calculations.

4.3. Toda-Yamamoto Causality Test

The causality results are reported in Table 3. Parts A and B report the Granger causality of FI and TI on instability, Part C reports the causality between FI and instability with the presence of TI, and Part D reports the causality between TI and instability in the presence of FI.

Table 3: Granger Causality Test Results

Causality Pattern	Lag	T-Statistics	Probability
Malaysia			
Part A: FI with Instability			
FI to Credit V	1	0.249	0.617
Credit V to FI	1	0.031	0.860
FI to EXV	1	0.111	0.738
EXV to FI	1	1.772	0.181
FI to IRV	1	0.613	0.433
IRV to FI	1	1.325	0.249
FI to EGV	1	0.002	0.957
EGV to FI	1	0.052	0.819
FI to INFV	1	0.025	0.874

Causality Pattern	Lag	T-Statistics	Probability
INFV to FI	1	0.020	0.8861
Part B: TI with Instability			
TI to Credit V	3	7.432	0.059***
Credit V to TI	3	3.009	0.390
TI to EXV	1	0.029	0.864
EXV to TI	1	0.359	0.549
TI to IRV	1	2.223	0.135
IRV to TI	1	0.083	0.772
TI to EGV	2	7.641	0.021**
EGV to TI	2	8.906	0.011**
TI to INFV	2	1.546	0.461
INFV to TI	2	7.793	0.020**
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	1	0.249	0.617
Credit V to FI	1	0.031	0.860
FI to EXV	1	0.063	0.801
EXV to FI	1	3.143	0.076***
FI to IRV	1	0.445	0.504
IRV to FI	1	1.305	0.253
FI to EGV	1	0.038	0.844
EGV to FI	1	0.072	0.787
FI to INFV	1	0.003	0.951
INFV to FI	1	0.025	0.872
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	3	8.701	0.033**
Credit V to TI	3	2.919	0.404
TI to EXV	1	0.006	0.936
EXV to TI	1	0.706	0.400
TI to IRV	1	2.360	0.124
IRV to TI	1	0.125	0.722
TI to EGV	2	9.934	0.007*
EGV to TI	2	8.282	0.015**
TI to INFV	2	1.138	0.556
INFV to TI	2	7.389	0.024**
Thailand			
Part A: FI with Instability			
FI to Credit V	3	2.378	0.497
Credit V to FI	3	2.428	0.488
FI to EXV	3	2.326	0.507
EXV to FI	3	3.017	0.389
FI to IRV	2	3.549	0.169

Causality Pattern	Lag	T-Statistics	Probability
IRV to FI	2	0.141	0.931
FI to EGV	2	0.162	0.686
EGV to FI	2	0.262	0.608
FI to INFV	2	5.247	0.072***
INFV to FI	2	3.092	0.213
Part B: TI with Instability			
TI to Credit V	1	0.960	0.327
Credit V to TI	1	1.786	0.181
TI to EXV	2	2.704	0.258
EXV to TI	2	0.644	0.724
TI to IRV	2	2.280	0.246
IRV to TI	2	1.455	0.482
TI to EGV	3	10.714	0.013**
EGV to TI	2	3.986	0.269
TI to INFV	3	5.260	0.153
INFV to TI	3	2.012	0.569
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	3	2.637	0.451
Credit V to FI	3	3.874	0.275
FI to EXV	3	1.475	0.687
EXV to FI	3	3.657	0.300
FI to IRV	2	3.012	0.221
IRV to FI	2	0.226	0.892
FI to EGV	2	1.043	0.307
EGV to FI	2	0.306	0.579
FI to INFV	2	7.601	0.022**
INFV to FI	2	4.281	0.117
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	1	0.706	0.400
Credit V to TI	1	1.281	0.257
TI to EXV	2	3.160	0.205
EXV to TI	2	1.460	0.481
TI to IRV	2	2.333	0.311
IRV to TI	2	1.472	0.478
TI to EGV	3	5.715	0.126
EGV to TI	3	5.749	0.133
TI to INFV	3	2.752	0.431
INFV to TI	3	3.401	0.333
Chile			
Part A: FI with Instability			
FI to Credit V	2	2.033	0.361

Causality Pattern	Lag	T-Statistics	Probability
Credit V to FI	2	0.392	0.821
FI to EXV	3	0.895	0.112
EXV to FI	3	13.112	0.022**
FI to IRV	2	0.356	0.836
IRV to FI	2	2.297	0.317
FI to EGV	1	2.850	0.091***
EGV to FI	1	0.328	0.566
FI to INFV	3	1.050	0.789
INFV to FI	3	1.279	0.734
Part B: TI with Instability			
TI to Credit V	1	1.006	0.315
Credit V to TI	1	0.111	0.738
TI to EXV	2	9.156	0.010*
EXV to TI	2	8.456	0.014*
TI to IRV	2	0.430	0.806
IRV to TI	2	1.512	0.469
TI to EGV	1	3.237	0.072***
EGV to TI	1	0.224	0.621
TI to INFV	3	5.051	0.168
INFV to TI	3	1.704	0.635
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	2	2.337	0.310
Credit V to FI	2	0.963	0.617
FI to EXV	3	10.828	0.054***
EXV to FI	3	17.000	0.004*
FI to IRV	2	0.140	0.932
IRV to FI	2	1.440	0.486
FI to EGV	3	3.370	0.337
EGV to FI	3	2.545	0.467
FI to INFV	3	3.570	0.311
INFV to FI	3	0.954	0.812
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	1	4.643	0.031**
Credit V to TI	1	0.641	0.423
TI to EXV	2	15.676	0.000*
EXV to TI	2	6.497	0.038**
TI to IRV	2	0.156	0.924
IRV to TI	2	1.802	0.406
TI to EGV	1	1.343	0.246
EGV to TI	1	0.532	0.465
TI to INFV	3	4.970	0.174

Causality Pattern	Lag	T-Statistics	Probability
INFV to TI	3	1.468	0.689
Saudi Arabia			
Part A: FI with Instability			
FI to Credit V			
Credit V to FI			
FI to EXV	2	0.159	0.923
EXV to FI	2	0.467	0.791
FI to IRV	2	3.329	0.189
IRV to FI	2	2.273	0.320
FI to EGV	1	1.137	0.286
EGV to FI	1	4.995	0.025**
FI to INFV	2	5.625	0.060***
INFV to FI	2	1.228	0.541
Part B: TI with Instability			
TI to Credit V			
Credit V to TI			
TI to EXV	2	0.135	0.934
EXV to TI	2	0.609	0.737
TI to IRV	2	0.254	0.880
IRV to TI	2	3.115	0.210
TI to EGV	2	0.284	0.867
EGV to TI	2	5.150	0.076***
TI to INFV	1	0.641	0.423
INFV to TI	1	1.784	0.181
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V			
Credit V to FI			
FI to EXV	2	0.247	0.883
EXV to FI	2	0.575	0.749
FI to IRV	2	4.435	0.108
IRV to FI	2	3.173	0.204
FI to EGV	1	0.402	0.522
EGV to FI	1	5.113	0.023**
FI to INFV	2	2.803	0.246
INFV to FI	2	0.796	0.671
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V			
Credit V to TI			
TI to EXV	2	0.123	0.940
EXV to TI	2	1.543	0.462
TI to IRV	2	0.359	0.835

Causality Pattern	Lag	T-Statistics	Probability
IRV to TI	2	2.961	0.227
TI to EGV	2	0.851	0.653
EGV to TI	2	4.632	0.098***
TI to INFV	1	0.697	0.443
INFV to TI	1	0.587	0.403
Ukraine			
Part A: FI with Instability			
FI to Credit V			
Credit V to FI			
FI to EXV	3	7.101	0.213
EXV to FI	3	7.276	0.200
FI to IRV	3	9.918	0.077***
IRV to FI	3	6.826	0.233
FI to EGV	3	5.031	0.412
EGV to FI	3	6.868	0.230
FI to INFV	3	32.860	0.000*
INFV to FI	3	1.027	0.960
Part B: TI with Instability			
TI to Credit V			
Credit V to TI			
TI to EXV	3	5.221	0.389
EXV to TI	3	7.531	0.184
TI to IRV	3	6.015	0.304
IRV to TI	3	3.128	0.680
TI to EGV	3	5.141	0.398
EGV to TI	3	7.445	0.189
TI to INFV	3	9.571	0.088***
INFV to TI	3	3.346	0.646
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V			
Credit V to FI			
FI to EXV	3	8.297	0.140
EXV to FI	3	6.062	0.300
FI to IRV	3	9.762	0.082***
IRV to FI	3	7.534	0.183
FI to EGV	3	5.703	0.336
EGV to FI	3	6.755	0.239
FI to INFV	3	30.588	0.000*
INFV to FI	3	0.505	0.991
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V			

Causality Pattern	Lag	T-Statistics	Probability
Credit V to TI			
TI to EXV	3	9.794	0.081***
EXV to TI	3	9.081	0.105
TI to IRV	3	4.816	0.438
IRV to TI	3	3.338	0.647
TI to EGV	3	5.024	0.412
EGV to TI	3	8.242	0.143
TI to INFV	3	9.806	0.080***
INFV to TI	3	3.243	0.662
India			
Part A: FI with Instability			
FI to Credit V	3	11.242	0.010**
Credit V to FI	3	1.118	0.772
FI to EXV	2	7.824	0.020**
EXV to FI	2	2.090	0.351
FI to IRV	2	2.550	0.279
IRV to FI	2	2.784	0.248
FI to EGV	1	0.367	0.554
EGV to FI	1	4.289	0.038**
FI to INFV	3	2.961	0.397
INFV to FI	3	0.036	0.998
Part B: TI with Instability			
TI to Credit V	2	13.149	0.004*
Credit V to TI	2	3.323	0.344
TI to EXV	2	1.751	0.416
EXV to TI	2	1.191	0.551
TI to IRV	2	2.876	0.237
IRV to TI	2	1.458	0.482
TI to EGV	2	7.433	0.190
EGV to TI	2	32.131	0.000*
TI to INFV	2	0.487	0.783
INFV to TI	2	2.050	0.358
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	3	10.689	0.013**
Credit V to FI	3	2.500	0.475
FI to EXV	2	4.785	0.091***
EXV to FI	2	2.981	0.225
FI to IRV	2	2.561	0.227
IRV to FI	2	2.088	0.351
FI to EGV	1	0.137	0.710
EGV to FI	1	3.466	0.062***

Causality Pattern	Lag	T-Statistics	Probability
FI to INFV	3	2.599	0.457
INFV to FI	3	0.189	0.979
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	2	10.473	0.005*
Credit V to TI	2	2.884	0.236
TI to EXV	2	1.730	0.421
EXV to TI	2	1.207	0.546
TI to IRV	2	2.747	0.253
IRV to TI	2	1.443	0.485
TI to EGV	2	8.895	0.063***
EGV to TI	2	28.715	0.000*
TI to INFV	2	0.392	0.821
INFV to TI	2	2.039	0.360
Indonesia			
Part A: FI with Instability			
FI to Credit V	1	0.079	0.777
Credit V to FI	1	0.609	0.435
FI to EXV	2	6.896	0.031**
EXV to FI	2	0.353	0.837
FI to IRV	2	0.853	0.652
IRV to FI	2	3.836	0.146
FI to EGV	1	0.405	0.524
EGV to FI	1	0.080	0.776
FI to INFV	1	0.145	0.703
INFV to FI	1	0.249	0.617
Part B: TI with Instability			
TI to Credit V	1	0.072	0.787
Credit V to TI	1	0.160	0.688
TI to EXV	2	0.108	0.947
EXV to TI	2	0.673	0.713
TI to IRV	2	3.377	0.184
IRV to TI	2	1.017	0.601
TI to EGV	1	3.145	0.076***
EGV to TI	1	0.044	0.832
TI to INFV	1	0.020	0.886
INFV to TI	1	0.453	0.500
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	1	0.922	0.336
Credit V to FI	1	0.348	0.554
FI to EXV	2	8.080	0.017**
EXV to FI	2	0.139	0.932

Causality Pattern	Lag	T-Statistics	Probability
FI to IRV	2	0.993	0.608
IRV to FI	2	2.753	0.252
FI to EGV	1	2.044	0.152
EGV to FI	1	0.015	0.910
FI to INFV	1	1.822	0.177
INFV to FI	1	0.003	0.950
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	1	1.795	0.180
Credit V to TI	1	0.001	0.997
TI to EXV	2	0.231	0.890
EXV to TI	2	0.653	0.721
TI to IRV	2	2.835	0.242
IRV to TI	2	0.574	0.750
TI to EGV	1	3.149	0.076***
EGV to TI	1	0.055	0.813
TI to INFV	1	0.021	0.884
INFV to TI	1	0.808	0.364

Credit V = credit volatility, EGV = GDP growth volatility, EXV = exchange rate volatility, FI = financial integration, GDP = gross domestic product, INF V = inflation volatility, IRV = interest rate volatility, TI = trade integration.

Notes:

1. The table shows the Granger causality test results obtained from the modified Wald (MWALD) test proposed by Toda and Yamamoto (1995).
2. The null hypothesis is that there is no causal relationship, and the alternative hypothesis is that there is a causal relationship.
3. *, **, and *** denote rejection of the null hypothesis at 1%, 5%, and 10% significance levels, respectively.
4. The sample periods for Malaysia, Thailand, Chile, Saudi Arabia, Ukraine, India, and Indonesia are 2015Q1–2022Q2, 2012Q1–2022Q3, 2007Q4–2022Q2, 2012Q1–2022Q3, 2001Q3–2021Q4, 1996Q4–2022Q1, and 2014Q1–2022Q3, respectively. These data periods include the COVID-19 pandemic.

Source: Authors' calculations.

For Malaysia, Part A reveals that the null hypothesis – that FI does not cause instability – can be rejected for all variables. From Part B, there is uni-directional causality from TI to credit volatility, implying that TI improves the predictability of credit volatility for the Malaysian economy. Bi-directional causality is established between TI and growth volatility. Further,

uni-directional causality runs from inflation volatility to TI, indicating the need for inflation stability policies for achieving higher TI. From Part C, uni-directional causality runs from exchange rate volatility to FI in the presence of TI. This finding is consistent with the notion that a volatile exchange rate creates segmentation between financial markets and acts as a barrier to higher FI. Finally, from Part D, the results are consistent with the results of Part B – the presence of FI.

For Thailand, parts A and B show that there is uni-directional causality that runs from FI to inflation volatility and TI to growth volatility, respectively. From Part C, uni-directional causality runs from TI to inflation volatility in the presence of FI, indicating the importance of inflation stability for an open economy.

For Chile, uni-directional causality is established from exchange rate volatility to FI and FI to growth volatility. Part B confirms bi-directional causality between TI and exchange rate volatility and uni-directional causality from TI to growth volatility. These results indicate that increases in both FI and TI cause growth volatility, while the exchange rate improves the predictability of TI. Part C confirms bi-directional causality between FI and exchange rate volatility in the presence of TI. Bi-directional causality between TI and exchange rate volatility is consistent with Part B in the presence of FI in Part D. Further, uni-directional causality from TI to credit volatility remains the same in the presence of FI.

For Saudi Arabia, Part A confirms uni-directional causality from growth volatility to FI and FI to inflation volatility. From Part B, uni-directional causality is seen from growth volatility to TI. While Part C shows uni-directional causality from growth volatility to FI in the presence of TI, Part D shows a similar causality to TI in the presence of FI. This implies the need for growth stabilisation policies in Saudi Arabia.

For Ukraine, Part A confirms uni-directional causality from FI to interest rate volatility and inflation volatility. Uni-directional causality is established from TI to inflation volatility as shown in Part B. Part C shows uni-directional causality from FI to interest rate volatility in the presence of TI. From Part D, uni-directional causality runs from TI to exchange rate volatility and inflation volatility in the presence of FI, implying the importance of interest rate and inflation stabilisation policies for Ukraine.

For India, the null hypothesis that FI does not cause credit volatility cannot be rejected. This implies that FI improves the predictability of credit instability; a rise in FI leads to credit instability in the Indian economy. Further, the null hypothesis that FI does not cause exchange rate volatility and economic growth cannot be rejected, indicating that FI improves the predictability of exchange rate volatility and growth volatility. There is bi-directional causality between FI and growth volatility, implying the need for policies to promote exchange rate stability and growth stability in the Indian economy to retrieve the benefits of FI and to achieve a higher level of FI.

From Part B, uni-directional causality is established from TI to credit instability and from economic growth instability to TI; thus, TI may improve the predictability of credit instability, while growth instability improves the predictability of TI. This further indicates the need for credit and growth stabilisation policies for the Indian economy. Part C rejects the null hypothesis that FI causes credit instability in the presence of TI. This implies that FI in the presence of TI does not cause credit instability, perhaps due to the shock-absorbing ability of trade openness. The causal direction of FI to exchange rate instability remains the same – even if in the presence of TI – and bi-directional causality is established between FI and growth volatility. Part D establishes uni-directional causality from TI to credit instability in the presence of FI. This suggests that TI improves the predictability of credit instability even in the presence of FI as well as the need for credit stabilisation policies for the Indian economy. Surprisingly, in the presence of FI, a bi-directional causal relationship is established between TI and growth instability, denoting that in the presence of FI, TI causes growth instability.

For Indonesia, from Part A, uni-directional causality runs from FI to exchange rate volatility, indicating that an increase in FI improves the predictability of exchange rate instability. This result is consistent even in the presence of TI, as shown in Part C, demonstrating that FI causes exchange rate instability in the presence of TI. From Part B, uni-directional causality runs from TI to growth volatility, and the result remains the same in the presence of FI, as shown in Part D. This result indicates the need for exchange rate and growth stabilisation policies for Indonesia.

Thus, in high FI and TI countries, FI causes inflation volatility, while TI causes credit, growth, and inflation volatility. For high FI and low TI countries, FI causes growth volatility, exchange rate volatility, and inflation volatility, while TI causes growth and credit volatility. For low FI and high TI countries, FI causes interest rate and inflation volatility, while TI causes exchange rate and inflation volatility. Finally, for low FI and low TI countries, FI and TI both cause credit, exchange rate, and growth volatility. Conclusively, with different levels of FI and TI, they cause different kinds of instability.

After establishing the causal relationship between FI and instability, whether all types of FI have a similar impact on instability is tested. Using three different FI indices – FDI, portfolio, and debt – the relationship between each type of FI and instability is examined. The results are reported in Table 4.

Table 4: Granger Causality Test Results with Different Financial Inclusion Indices

Causality Pattern	Lag	T-Statistics	Probability
Thailand			
FDIFI to INFV	2	2.085	0.352
FPIFI to INFV	2	4.931	0.084***
DEBTFI to INFV	2	8.132	0.017**
Chile			
FDIFI to EGV	2	2.510	0.285
FPIFI to EGV	2	2.425	0.297
DEBTFI to EGV	2	3.026	0.220
Saudi Arabia			
FDIFI to INFV	2	5.141	0.076***
FPIFI to INFV	2	14.514	0.000*
DEBTFI to INFV	2	15.415	0.000*
Ukraine			
FDIFI to IRV	3	11.358	0.044**
FPIFI to IRV	3	11.994	0.051***
DEBTFI to IRV	3	10.197	0.069***
FDIFI to INFV	3	28.589	0.000*
FPIFI to INFV	3	42.860	0.000*
DEBTFI to INFV	3	36.482	0.000*
India			
FDIFI to Credit V	2	0.518	0.771
FPIFI to Credit V	2	0.093	0.954
DEBTFI to Credit V	2	0.416	0.811
FDIFI to EXV	2	5.206	0.074***
FPIFI to EXV	2	9.626	0.008*
DEBTFI to EXV	2	0.345	0.841
Indonesia			
FDIFI to EXV	2	2.890	0.235
FPIFI to EXV	2	7.034	0.029**
DEBTFI to EXV	2	2.043	0.360

Credit V = credit volatility, DEBTFI = debt financial integration, EGV = GDP growth volatility, EXV = exchange rate volatility, FDI = foreign direct investment, FDIFI = FDI financial integration, FPIFI portfolio financial integration. GDP = gross domestic product, INF V = inflation volatility, IRV = interest rate volatility.

Notes:

1. The table shows Granger causality test results obtained from the modified Wald (MWALD) test proposed by Toda and Yamamoto (1995).
2. The null hypothesis is that there is no causal relationship, and the alternative hypothesis is that there is a causal relationship.
3. *, **, and *** denote rejection of the null hypothesis at 1%, 5%, and 10% significance levels, respectively.

Source: Authors' calculations.

For Thailand, portfolio and debt FI cause inflation instability, whereas FDI integration is insignificant. Surprisingly, for Chile, disaggregated FI types do not significantly cause growth instability. For Ukraine, disaggregated FI types cause interest rate instability and inflation instability. For India, no disaggregated FI types significantly cause credit instability, whereas both FDI and portfolio FI cause exchange rate volatility. Finally, for Indonesia, portfolio FI causes exchange rate volatility, whereas FDI and debt FI are insignificant. Overall, these findings indicate that not all types of FI cause instability, and portfolio integration causes exchange rate stability in most cases.

The empirical analysis is also performed with and without the COVID-19 trend dummy (see Appendix for a pre-pandemic table). Although in some cases, results show few differences.

5. Conclusion and Policy Implications

There has been a drastic change in the levels of FI and TI due to the COVID-19 pandemic in the seven economies studied. In most cases, FI caused exchange rate volatility, inflation volatility, and interest rate volatility, while TI caused credit volatility, exchange rate volatility, and growth volatility. The findings indicate that not all types of integration caused instability, however, but portfolio integration caused exchange rate instability in most cases.

The findings suggest the need for exchange rate, inflation, and growth stabilisation policies for emerging and ASEAN economies. From a policy perspective, financially integrated economies need to promote credit, exchange rate, and growth stabilisation policies to retrieve the benefits of FI as well as to achieve a higher level of FI. Further, these economies should regulate short-term integration and portfolio investments before moving towards full capital account convertibility, while trade-integrated economies should concentrate on credit, exchange, and growth stabilisation policies. Irrespective of FI or TI, an exchange rate stabilisation policy is imperative for any economy.

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Appendix

Table A-1: Granger Causality Test Results (Pre-COVID-19 Period)

Causality Pattern	Lag	T-Statistics	Probability
Malaysia			
Part A: FI with Instability			
FI to Credit V	1	0.709	0.701
Credit V to FI	1	0.498	0.779
FI to EXV	2	0.747	0.668
EXV to FI	2	5.063	0.079***
FI to IRV	1	0.002	0.961
IRV to FI	1	0.220	0.639
FI to EGV	1	0.217	0.640
EGV to FI	1	0.282	0.595
FI to INFV	1	0.001	0.996
INFV to FI	1	0.011	0.916
Part B: TI with Instability			
TI to Credit V	1	0.785	0.675
Credit V to TI	1	0.673	0.713
TI to EXV	1	0.713	0.398
EXV to TI	1	0.009	0.921
TI to IRV	1	4.499	0.033**
IRV to TI	1	0.083	0.772
TI to EGV	1	0.027	0.868
EGV to TI	1	5.974	0.014**
TI to INFV	1	3.515	0.318
INFV to TI	1	1.320	0.724
Part C: FI with Instability (with the presence of TI)			
FI to Credit V	2	0.724	0.696
Credit V to FI	2	0.420	0.810
FI to EXV	1	0.042	0.978
EXV to FI	1	4.337	0.114
FI to IRV	1	0.002	0.959
IRV to FI	1	0.992	0.319
FI to EGV	1	2.554	0.109

Causality Pattern	Lag	T-Statistics	Probability
EGV to FI	1	5.215	0.022**
FI to INFV	1	2.889	0.089***
INFV to FI	1	0.608	0.435
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	3	0.414	0.519
Credit V to TI	3	0.041	0.838
TI to EXV	1	0.007	0.930
EXV to TI	1	0.502	0.478
TI to IRV	2	6.297	0.042**
IRV to TI	2	0.027	0.986
TI to EGV	2	0.654	0.721
EGV to TI	2	10.719	0.004*
TI to INFV	2	4.245	0.119
INFV to TI	2	0.830	0.660
Thailand			
Part A: FI with Instability			
FI to Credit V	1	3.100	0.078***
Credit V to FI	1	0.150	0.698
FI to EXV	2	1.432	0.488
EXV to FI	2	1.515	0.468
FI to IRV	2	0.087	0.957
IRV to FI	2	0.883	0.642
FI to EGV	1	2.470	0.116
EGV to FI	1	1.804	0.179
FI to INFV	2	3.604	0.061***
INFV to FI	2	0.409	0.213
Part B: TI with Instability			
TI to Credit V	2	0.204	0.902
Credit V to TI	2	0.835	0.658
TI to EXV	2	0.407	0.815
EXV to TI	2	3.923	0.140
TI to IRV	2	0.946	0.623
IRV to TI	2	4.271	0.118
TI to EGV	2	2.921	0.087***

Causality Pattern	Lag	T-Statistics	Probability
EGV to TI	2	0.101	0.750
TI to INFV	2	0.204	0.902
INFV to TI	2	0.835	0.658
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	1	1.793	0.180
Credit V to FI	1	0.003	0.985
FI to EXV	2	0.894	0.639
EXV to FI	2	1.346	0.509
FI to IRV	2	0.670	0.715
IRV to FI	2	1.577	0.454
FI to EGV	1	2.068	0.150
EGV to FI	1	1.941	0.163
FI to INFV	2	3.415	0.018**
INFV to FI	2	0.153	0.925
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	2	0.425	0.808
Credit V to TI	2	2.505	0.285
TI to EXV	2	2.422	0.297
EXV to TI	2	2.265	0.332
TI to IRV	2	0.801	0.670
IRV to TI	2	4.429	0.109
TI to EGV	2	0.836	0.360
EGV to TI	2	0.002	0.988
TI to INFV	2	0.425	0.808
INFV to TI	2	2.505	0.285
Chile			
Part A: FI with Instability			
FI to Credit V	2	1.192	0.551
Credit V to FI	2	3.591	0.166
FI to EXV	2	6.119	0.046**
EXV to FI	2	3.229	0.018**
FI to IRV	2	0.058	0.971
IRV to FI	2	4.152	0.125

Causality Pattern	Lag	T-Statistics	Probability
FI to EGV	2	0.354	0.837
EGV to FI	2	3.243	0.197
FI to INFV	2	1.032	0.598
INFV to FI	2	4.760	0.092***
Part B: TI with Instability			
TI to Credit V	1	1.424	0.232
Credit V to TI	1	0.225	0.635
TI to EXV	3	15.546	0.001*
EXV to TI	3	15.767	0.001*
TI to IRV	3	5.349	0.147
IRV to TI	3	3.291	0.348
TI to EGV	2	8.429	0.014**
EGV to TI	2	0.461	0.793
TI to INFV	3	6.133	0.105
INFV to TI	3	3.161	0.367
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	2	1.754	0.415
Credit V to FI	2	7.475	0.023**
FI to EXV	2	7.503	0.023**
EXV to FI	2	4.329	0.011**
FI to IRV	2	0.022	0.988
IRV to FI	2	2.166	0.338
FI to EGV	2	0.280	0.869
EGV to FI	2	4.123	0.127
FI to INFV	2	2.697	0.259
INFV to FI	2	3.097	0.212
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	1	4.530	0.033**
Credit V to TI	1	1.398	0.236
TI to EXV	3	19.491	0.000*
EXV to TI	3	11.637	0.008*
TI to IRV	3	5.199	0.157
IRV to TI	3	3.354	0.340

Causality Pattern	Lag	T-Statistics	Probability
TI to EGV	2	3.131	0.208
EGV to TI	2	0.847	0.654
TI to INFV	3	5.589	0.133
INFV to TI	3	3.688	0.297
Saudi Arabia			
Part A: FI with Instability			
FI to Credit V			
Credit V to FI			
FI to EXV	2	3.481	0.175
EXV to FI	2	0.889	0.641
FI to IRV	1	2.925	0.087***
IRV to FI	1	0.069	0.792
FI to EGV	2	0.423	0.809
EGV to FI	2	0.064	0.968
FI to INFV	1	0.205	0.650
INFV to FI	1	0.395	0.529
Part B: TI with Instability			
TI to Credit V			
Credit V to TI			
TI to EXV	2	0.565	0.753
EXV to TI	2	0.999	0.606
TI to IRV	2	0.893	0.639
IRV to TI	2	0.137	0.933
TI to EGV	2	1.440	0.486
EGV to TI	2	0.743	0.689
TI to INFV	1	0.083	0.773
INFV to TI	1	0.142	0.705
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V			
Credit V to FI			
FI to EXV	2	3.370	0.185
EXV to FI	2	0.805	0.665
FI to IRV	1	2.928	0.087***
IRV to FI	1	1.536	0.215

Causality Pattern	Lag	T-Statistics	Probability
FI to EGV	2	0.329	0.847
EGV to FI	2	0.614	0.735
FI to INFV	1	1.098	0.294
INFV to FI	1	0.008	0.925
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V			
Credit V to TI			
TI to EXV	2	0.715	0.699
EXV to TI	2	1.026	0.598
TI to IRV	2	0.547	0.760
IRV to TI	2	0.225	0.893
TI to EGV	2	1.399	0.496
EGV to TI	2	0.790	0.673
TI to INFV	1	0.019	0.889
INFV to TI	1	0.003	0.954
Ukraine			
Part A: FI with Instability			
FI to Credit V			
Credit V to FI			
FI to EXV	3	3.498	0.320
EXV to FI	3	44.066	0.000*
FI to IRV	3	6.848	0.076***
IRV to FI	3	3.712	0.294
FI to EGV	3	2.039	0.564
EGV to FI	3	5.835	0.119
FI to INFV	3	30.490	0.000*
INFV to FI	3	11.893	0.007*
Part B: TI with Instability			
TI to Credit V			
Credit V to TI			
TI to EXV	3	1.409	0.703
EXV to TI	3	3.105	0.375

Causality Pattern	Lag	T-Statistics	Probability
TI to IRV	3	4.519	0.210
IRV to TI	3	1.614	0.656
TI to EGV	3	1.300	0.728
EGV to TI	3	4.077	0.253
TI to INFV	3	9.531	0.023**
INFV to TI	3	3.048	0.384
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V			
Credit V to FI			
FI to EXV	3	4.655	0.198
EXV to FI	3	33.673	0.000*
FI to IRV	3	6.644	0.081***
IRV to FI	3	3.004	0.390
FI to EGV	3	2.761	0.492
EGV to FI	3	7.811	0.048**
FI to INFV	3	30.323	0.000*
INFV to FI	3	8.478	0.037**
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V			
Credit V to TI			
TI to EXV	3	1.789	0.617
EXV to TI	3	4.843	0.183
TI to IRV	3	2.784	0.426
IRV to TI	3	1.277	0.734
TI to EGV	3	0.762	0.858
EGV to TI	3	4.611	0.202
TI to INFV	3	7.176	0.066***
INFV to TI	3	1.046	0.790
India			
Part A: FI with Instability			
FI to Credit V	4	7.800	0.099***
Credit V to FI	4	3.846	0.427
FI to EXV	2	5.362	0.068***

Causality Pattern	Lag	T-Statistics	Probability
EXV to FI	2	1.275	0.528
FI to IRV	2	2.102	0.349
IRV to FI	2	2.745	0.253
FI to EGV	1	2.287	0.130
EGV to FI	1	8.419	0.003*
FI to INFV	3	1.233	0.744
INFV to FI	3	0.167	0.982
Part B: TI with Instability			
TI to Credit V	2	8.343	0.015**
Credit V to TI	2	0.204	0.902
TI to EXV	2	1.675	0.195
EXV to TI	2	0.039	0.842
TI to IRV	2	0.005	0.943
IRV to TI	2	0.009	0.923
TI to EGV	2	0.144	0.735
EGV to TI	2	5.567	0.013**
TI to INFV	2	1.242	0.264
INFV to TI	2	0.002	0.958
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	4	2.877	0.237
Credit V to FI	4	0.436	0.804
FI to EXV	2	4.844	0.088***
EXV to FI	2	2.241	0.326
FI to IRV	2	5.940	0.051***
IRV to FI	2	1.619	0.445
FI to EGV	1	2.224	0.135
EGV to FI	1	6.589	0.010**
FI to INFV	3	0.616	0.892
INFV to FI	3	0.306	0.958
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	2	8.473	0.003*
Credit V to TI	2	2.783	0.329
TI to EXV	2	0.097	0.754

Causality Pattern	Lag	T-Statistics	Probability
EXV to TI	2	0.159	0.689
TI to IRV	2	1.082	0.298
IRV to TI	2	0.065	0.789
TI to EGV	2	1.735	0.187
EGV to TI	2	4.640	0.023*
TI to INFV	2	0.220	0.638
INFV to TI	2	0.003	0.956
Indonesia			
Part A: FI with Instability			
FI to Credit V	1	0.405	0.524
Credit V to FI	1	0.342	0.558
FI to EXV	2	10.434	0.015**
EXV to FI	2	0.131	0.987
FI to IRV	2	0.875	0.645
IRV to FI	2	1.533	0.464
FI to EGV	1	0.034	0.852
EGV to FI	1	0.197	0.656
FI to INFV	1	0.288	0.591
INFV to FI	1	0.008	0.927
Part B: TI with Instability			
TI to Credit V	1	3.464	0.062***
Credit V to TI	1	1.235	0.266
TI to EXV	2	1.131	0.344
EXV to TI	2	2.167	0.338
TI to IRV	2	2.256	0.323
IRV to TI	2	0.718	0.698
TI to EGV	1	3.380	0.066***
EGV to TI	1	0.181	0.670
TI to INFV	1	0.817	0.336
INFV to TI	1	0.246	0.619
Part C: FI with Instability (with the Presence of TI)			
FI to Credit V	1	0.282	0.594
Credit V to FI	1	0.349	0.554
FI to EXV	2	2.663	0.446

Causality Pattern	Lag	T-Statistics	Probability
EXV to FI	2	0.841	0.839
FI to IRV	2	0.873	0.646
IRV to FI	2	1.821	0.402
FI to EGV	1	0.111	0.738
EGV to FI	1	0.016	0.897
FI to INFV	1	2.563	0.109
INFV to FI	1	0.034	0.853
Part D: TI with Instability (with the Presence of FI)			
TI to Credit V	1	2.728	0.098***
Credit V to TI	1	0.397	0.528
TI to EXV	2	3.804	0.149
EXV to TI	2	2.371	0.305
TI to IRV	2	1.557	0.459
IRV to TI	2	0.727	0.659
TI to EGV	1	2.917	0.087***
EGV to TI	1	0.203	0.651
TI to INFV	1	1.318	0.250
INFV to TI	1	0.708	0.339

Credit V = credit volatility, EGV = GDP growth volatility, EXV = exchange rate volatility, FI = financial integration, GDP = gross domestic product, INF V = inflation volatility, IRV = interest rate volatility, TI = trade integration.

Notes:

1. The table shows the Granger causality test results obtained from the modified Wald (MWALD) test proposed by Toda and Yamamoto (1995).
2. The null hypothesis is that there is no causal relationship, and the alternative hypothesis is that there is a causal relationship.
3. *, **, and *** denote rejection of the null hypothesis at 1%, 5%, and 10% significance levels, respectively.

Source: Authors' calculations.

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