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**A Firm-level Analysis of the Impact of the
Coronavirus Outbreak in ASEAN**

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Abstract: *This study examines the impact of the coronavirus pandemic on economic integration in the ASEAN-6 region. The study finds that the pandemic's impact can be easily traced using stringency, bilateral exports, and tourist arrivals, indicating significant implications for the economic integration process. The firm-level analysis suggests that although the coronavirus outbreak's uniformly impacted firms, the extent of the effect varies across ASEAN-6 nations. Large firms are strongly impacted by the pandemic. Overall, the findings of this study are relevant for policymakers and academia.*

Keywords: Firm-level data; Coronavirus Pandemic; Market integration; Networks

JEL Classification: F15; F23; D85

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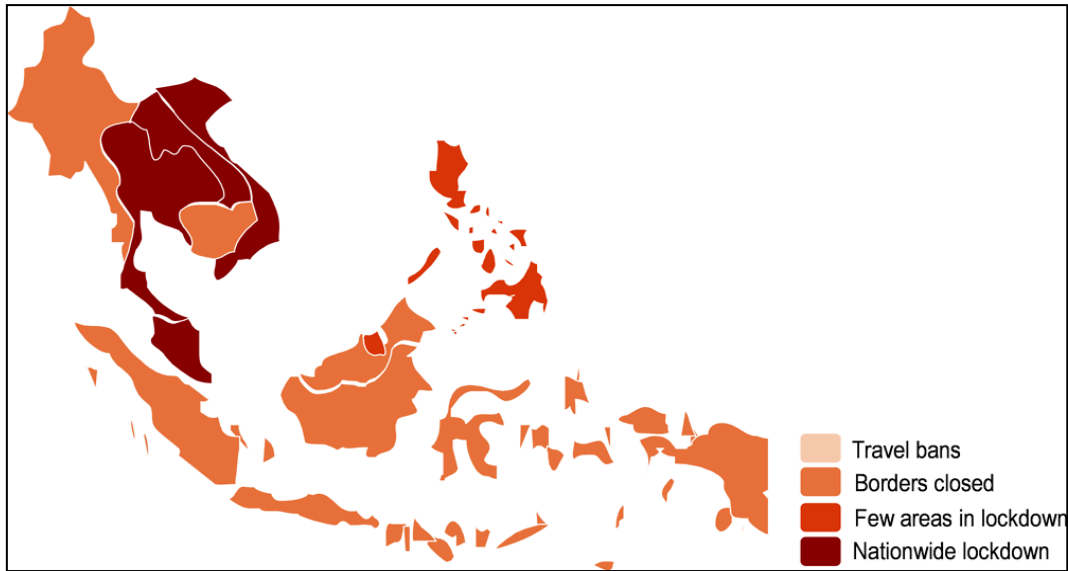
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1. Introduction

The Association of Southeast Asian Nations (ASEAN) comprises 10 nations, including Thailand, Indonesia, Malaysia, Viet Nam, Singapore, and the Philippines. ASEAN is home to 647 million (2018) people with an economy worth US\$9.34 trillion (2019), making it the fifth-largest economy in the world. The ASEAN nations offer socio-economic complementarities and have the motto to make the region ‘*One Vision, One Identity, One Community.*’ The region offers enormous scope for regional and economic cooperation. According to the ASEAN Integration Report (ASEAN, 2019), intra-ASEAN trade has the largest share in trade and foreign direct investment of 23% and 15.9%, respectively. The tourism sector is another major contributor to regional economic integration and contributed more than 12% to output in 2018. Several key measures have helped the Southeast Asia region to prosper over the years, and the prospects also look promising.

In this light, the main aim of this study is to draw the new contours of regional economic integration in the Southeast Asian region in light of the coronavirus pandemic, which has reversed the cycles of growth and prosperity across globe. As of 16 December 2020, amongst ASEAN nations, Indonesia and the Philippines had the highest number of coronavirus cases, followed by Malaysia and Singapore. Viet Nam and Thailand had low rates of infection. Comparative analysis suggests that most countries in the ASEAN-6 group imposed travel restrictions, lockdowns, and social distancing measures in March 2020 and took measures to gradually open up their economies. ASEAN-6 nations also announced a special stimulus package to thwart the persistence of economic vulnerabilities. Figure 1 shows ASEAN’s response to the coronavirus outbreak.

Figure 1: ASEAN's Response to the Coronavirus Outbreak



Source: OECD. *COVID-19 Crisis Response in ASEAN Member States*.
<http://www.oecd.org/coronavirus/policy-responses/covid-19-crisis-response-in-asean-member-states-02f828a2/> (accessed 23 October 2020).

One of the main features of this study is that it attempts to provide an in-depth analysis of major ASEAN nations' economic integration at the aggregate and disaggregate levels. The aggregate analysis helps understand the impact of stringency measures at the economy level, and the disaggregate analysis involves firm-level measures. Specifically, the study examines how the stringency measures affected these economies' macro indicators, including trade and tourism, in the first step. In the second step, the study identifies significant events through search procedures and statistical analysis and confirms these events' impact using event study methodology (ESM) at the firm level.

The analysis of these two dimensions may provide necessary policy support for experts. The study analyses ASEAN-6 countries: Thailand, Indonesia, Malaysia, Viet Nam, Singapore, and the Philippines. As a comparative analysis, the study also includes the Republic of Korea (henceforth, Korea), Japan, and China for some dimensions.

1.2. Objectives of the research

The objectives of the research are the following.

- To examine the spillover effects of stringency measures on major ASEAN nations' bilateral trade and tourism.
- To develop the causal network between the coronavirus outbreak and the measures of economic integration.
- To confirm whether the impacts of the coronavirus outbreak events are symmetric across firms.
- To determine whether firms' networks based on their directional connectedness help identify the significant lead and lagged sectors and firms.

In the literature on the coronavirus outbreak, studies have so far analysed the impact of the outbreak at the aggregate (macroeconomic) level. There is a shortage of literature in general at the micro (firm) level and on Southeast Asia, in particular. Davis, Hansen, and Seminario-Amez (2020) showed the differences in United States (US)-incorporated firms stock returns depending upon their different risk exposure categories like financial regulations and exports to China, etc. Another study on US-incorporated firms by Rameli and Wagner (2020) indicated the severe effect of disrupted exports on trade-driven firms and stresses the role of upstream supply shocks on their financial performance. Al-Awadhi et al. (2020) found a considerable impact of coronavirus cases and deaths on Chinese firms' stock returns. Zhang, Hu, and Ji (2020) examined the pandemic's significant influence on 10 major economies, including the US, China, and Italy. Using detrended moving cross-correlation analysis and detrended cross-correlation analysis, they find a significant impact of COVID-19 on the stock market. Akhtaruzzaman, Boubaker, and Sensoy (2020) found a contagion effect between China and the G7 during the COVID-19 outbreak and report the evidence of financial contagion and increased hedge ratios. Shehzad, Xiaoxing, and Kazouz (2020) found an impact of COVID-19 on the US and Japan market returns. Le, Meenagh, and Minford (2020) provided evidence of how one can reduce the impacts of news shocks on macroeconomic variables using the rational expectations framework. Harjoto, Rossi, and Paglia (2020) reported that the US government's stimulus package amid the coronavirus

outbreak has benefited large firms more than small ones. Salisu and Vo (2020) examined the COVID-19 pandemic by analysing health news and reporting that health news searches outperform the conventional benchmark model and predict stock market returns.

At the sectoral level, Haroon and Rizvi (2020) analysed the effects of the coronavirus outbreak at the sectoral level for the world and the US and report that pandemic-related news indeed increased the volatility of these indices. Goodell and Huynh (2020) analysed the effects of COVID-19 on 23 US sectors using an event study approach by considering US legislators' trading patterns. They identify positive (negative) abnormal returns for medical (restaurants) and pharmaceuticals (hotels and motels). Ahmad et al. (2021) and Ahmad, Kutan, and Gupta (2021) also found the significant impact of the coronavirus outbreak on the US, UK, and European sectors and identify the most and least impacted sectors. The present study is a unique contribution and may fill the research gap even for ASEAN. The micro (firm) level analysis may also help in undertaking the right measures to revive the sectoral output. Currently, policy experts have the huge challenge of providing concrete evidence for how recovery plans have to be designed to address large and small firms. Employment generation seems to be a major challenge, as smaller firms have disappeared due to unbearable losses and bad loans. The analysis of firms at the large- and small-scale levels may further provide a vital direction for undertaking some measures.

For ASEAN nations, Kimura et al. (2020) provided an overview of the coronavirus shock to trade and global value chains and discuss the need for regional cooperation in combating the pandemic and maintaining stability in trade relations. In light of the above studies and in contrast to their findings, this study aims to answer the following research questions: *First*, how have the stringency measures impacted the process of economic integration amongst ASEAN-6 nations? In other words, to what extent have the measures undertaken to curb the spread of the virus had an impact on trade integration and tourist flows? *Second*, what is the extent of the spillovers of the pandemic-related stringency measures? *Third* and last, is it possible to examine the coronavirus outbreak events across firms and sectors? In other words, from a regional integration perspective, is it possible to identify the

firms that have either been badly impacted or benefited during the pandemic? To our knowledge, these questions are still unanswered in the context of ASEAN-6 nations. They may provide immense support to the policy experts in formulating a recovery plan in the ASEAN group. This study is a maiden attempt.

2. Economic Implications of the Coronavirus in the ASEAN Region

The coronavirus outbreak started in January 2020 in Wuhan, China, and has since caused enormous losses of lives and livelihoods. The lockdown and travel restrictions had an unprecedented impact on the well-being of citizens and the economy. According to IMF-WEO (2020), the ASEAN-5 may have -3.4% growth in 2020, although its current account balance is expected to remain positive in 2020 and 2021. According to the World Bank (2020), the growth of 10 nations of East Asia and Southeast Asia is estimated to be around 1% in 2020, the lowest since 1967.

According to the World Bank (2020), the coronavirus pandemic in East Asia and the Pacific has triggered shocks in three possible ways. *First*, the pandemic itself. *Second*, the pandemic's impact on individual economies due to the lockdown and travel restriction measures has impacted economic integration. *Third*, the effect of the global recession on trade and tourism. ASEAN nations have taken several steps to tackle the coronavirus outbreak, yet the impact of these measures is still unknown, and the present study may have immense value. According to the OECD (2020), the coronavirus pandemic has adversely impacted the region's robust trade and tourism industries. The heavily skewed economic integration towards China has resulted in a significant fall in inflows of travel, trade, and bilateral investment. There is also widespread fear for livelihoods as unemployment is expected to soar, and firms may lay off employees across sectors. Economic integration may be better understood by analysing the extent of interdependence during the coronavirus outbreak's peak periods, and this can be done by considering bilateral exports and tourists' arrivals in these economies. To measure the impact of lockdowns and social distancing norms, some researchers have developed relevant indicators which are useful for in-depth analysis.

3. Data and Empirical Framework

3.1. Data

For the aggregate-level analysis, this study uses the Stringency Index data for ASEAN-6 and China, Japan, and Korea. The COVID-19 Government Response Stringency Index (Stringency Index) is developed by Oxford University. Bilateral exports and bilateral arrivals of tourists are considered variables of economic integration. The study also considers China, Japan, and Korea because of the heavy economic dependence of ASEAN countries. The sample period of the study is 2 May 2019–31 October 2020. For the firm-level analysis, the study takes the stock market perspective and analyses the broad indices' stocks. To do this, the study downloads the daily stock price data of the constituents of representative stock market indices. Table 1 shows the constituents in each sample's stock market index. For the firm classifications, the study uses total assets to indicate size, as well as the number of employees. All the sample data are retrieved from the Thomson Reuters DataStream. Lastly, the coronavirus cases and death data are obtained from the John Hopkins Coronavirus Resource Center.¹

Table 1. List of Stock Market Indices

Country	Stock Market Index	Number of Firms
Thailand	Bangkok SET	614
Malaysia	FTSE Bursa Malaysia KLCI	30
Indonesia	Index Composite	708
Philippines	Philippines Stock Exchange I (Psei)	30
Singapore	Straits Times Index	30
Viet Nam	Ho Chi Minh Stock Exchange Viet Nam Index	399

Source: Compiled by authors.

¹ <https://github.com/CSSEGISandData/COVID-19> (accessed on 23 October 2020).

3.2. Empirical framework

The study examines the impact of the coronavirus outbreak at the aggregate and disaggregate levels. For the aggregate level analysis, the study adopts the following empirical procedure. First, in order to understand the extent of economic integration during the pandemic period, the study develops networks based on the magnitude of directional connectedness during the pandemic period represented by the Stringency Index. Second, to measure the extent of the economic implications of the pandemic on bilateral exports and tourist arrivals, the study also constructs networks using the estimates of Granger causality (Granger, 1969). For the directional spillover, the study explores the Diebold and Yilmaz (2012) connectedness approach. In the first step, the sample variables are introduced as a reduced-form model in the spillover method developed by Diebold and Yilmaz (2012, hereafter DY). In the next step, the residuals are extracted to generate the forecast error variance decompositions. Suppose we have n -variate process

$z_t = (z_{t,1}, \dots, z_{t,n})$ described by the structural VAR(p) at $t = 1, \dots, T$ as:

$$\Phi(L)z_t = u_t \quad (1)$$

where $\Phi(L) = \sum_h^H \Phi_h L^h$ is the $(n \times np)$ -th order lag-polynomial, and u_t is a residual term with a white-noise property and has a non-diagonal covariance matrix Σ . The VAR process can be represented as the following moving average

$MA(\infty)$ representation if the roots of $|\Phi(z)|$ lie outside the unit circle:

$$z_t = \Psi(L)u_t,$$

where, $\Psi(L)$ is an $(n \times n)$ infinite lag polynomial matrix of coefficients. In the

DY method, the generalised forecast error variance decompositions are:

$$(\Theta_H)_{j,k} = \frac{\sigma_{kk}^{-1} \sum_{h=0}^H ((\Psi_h \Sigma)_{j,k})^2}{\sum_{h=0}^H (\Psi_h \Sigma \Psi_h')_{j,j}}, \quad (2)$$

where Ψ_h is a coefficients matrix ($n \times n$) with lag h in parallel. The σ_{kk} is equal to the sum of (k, k) . The input of the system variable k -th to the forecast error variance of j element is denoted by $(\theta_H)_{j,k}$. The variable shocks are non-orthogonalised. Hence, the total of each row of $(\theta_H)_{j,k}$ is usually $\neq 1$. So, by dividing the sum of the rows, each element in the decomposition matrix can be normalised as follows:

$$(\theta_H)_{j,k} = \frac{(\theta_H)_{j,k}}{\sum_{k=1}^n (\theta_H)_{j,k}}, \text{ with } \sum_{k=1}^n (\tilde{\theta}_H)_{j,k} = 1 \text{ and } \sum_{i,k=1}^n (\tilde{\theta}_H)_{j,k} = N \quad (3)$$

Then, as in the forecasts, the variance share is produced by elements other than the forecast errors themselves, or, equally, as a percentage of the sum of the off-diagonal elements to the whole matrix sum:

$$C_H = \frac{\sum_{j \neq k} (\tilde{\theta}_H)_{j,k}}{\sum (\tilde{\theta}_H)_{j,k}} \times 100 = \left(1 - \frac{Tr\{\tilde{\theta}_H\}}{\sum (\tilde{\theta}_H)_{j,k}} \right) \times 100 \quad (4)$$

where the trace operator is denoted by $Tr\{\cdot\}$. The term C_H measures the total system connectedness. The study also estimates the directional spillovers received by j market from all other k markets and by k market from all other j markets. The net volatility spillovers are the difference between the directional spillovers received from and to the markets. The pairwise spillover results are used to construct the edge of the network.

Third, the study then analyses the impact of the pandemic at the disaggregate level by analysing the firms included in the major stock market indices of ASEAN. To do this, the study adopts the two-step procedure. In the first step, critical events related to the coronavirus outbreak are identified using linear and non-linear endogenous structural break models and news sources. The event-study analysis (hereafter ESA) follows in the second step. A brief methodology is explained below.

The linear endogenous structural break of Bai and Perron (2003, hereafter BP) is based on the general-to-specific estimation procedure under a linear framework. The BP test's key feature is that it allows us to identify multiple structural breaks at unknown dates. Specifically, the basic premise of the BP test is to identify the unknown structural break date based on the $\sup F_T(k, n)$ test, which tests the null hypothesis of no structural break ($n = 0$) against the alternative of a structural break ($n = k$). The null hypothesis remains the same for the double maximum and sequential test criteria, which also add a methodological dimension to the structural breaks.

For the nonlinear structural break model, the study relies on the Markov Switching (MS-DR (dynamic regression)) of Doornik (2013). The study specifies the MS-DR model with switching intercept (means) and variance:

$$r_t = \alpha_i(S_t)r_{t-i} + \mu(S_t) + \varepsilon_t \quad (5)$$

$$\varepsilon_t \sim iid[0, \sigma^2(S_t)], S_t = 1, 2$$

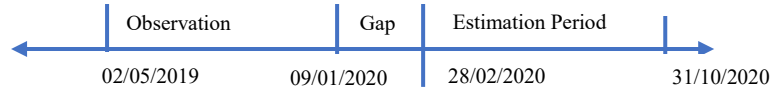
where the market return r_t is generated as an autoregression of order k with regime-switching in intercept (mean) μ and variance (σ^2). α_i is the model parameter, and ε_t is the residual term. S_t represents the regimes, which take values 0 and 1, respectively, for regime 1 (bearish) and regime 2 (bullish). The study applies the structural break tests on the growth of total deaths due to the coronavirus outbreak and broad indices of sample countries. The appropriate sample is decided based on the availability of data. Finally, the study applies the ESM to investigate the event-specific impact on firms in consideration. Kim et al. (2020) also adopt the ESM procedure for their analysis. The study uses the ESM to measure the abnormal returns (AR) and cumulative abnormal returns (CAR) to capture the firm-specific event-related effects. The market model is as follows:

$$ExR_{it} = \alpha_{it} + \beta(R_{mt} - R_{ft}) + \gamma CHINA_t + \delta JAPAN_t + \varepsilon_{it} \quad (6)$$

where ExR_{it} is the excess return of stock i at time t , R_{mt} is the market index return, R_{ft} is the risk-free return at time t , $CHINA_t$ and $JAPAN_t$ respectively the excess

market returns of China and Japan at time t , and $\epsilon_{i,t}$ is the error term. α , β , γ , and δ are estimated parameters.

The study evaluates 175 trading days with a 30-trading day gap from the observation period.



Event Timeline

Utilising the estimated market model, AR and the CAR values are calculated:

$$AR_{it} = R_{it} - E(R_{it}) \quad (7)$$

$$CAR_i = \sum_{t=t_0}^{t_1} AR_{it} \quad (8)$$

where R_{it} is the actual return of firm i at time t , and $E(R_{it})$ is the estimated return using the computed market model. CAR_i is then computed by taking the sum of the ARs over the chosen event window. To better isolate the event-specific abnormalities, short event windows of $[-1, +1]$ are considered.

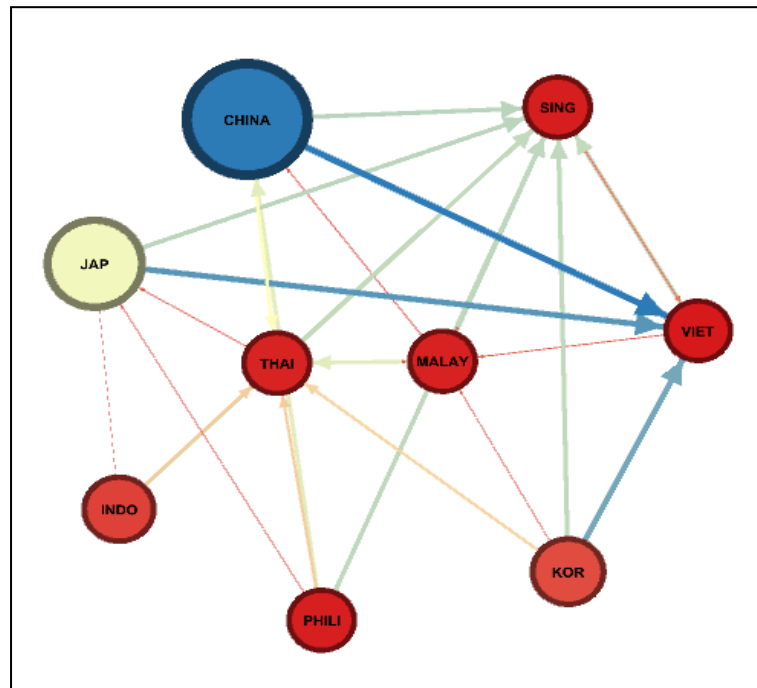
4. Results and Discussion

4.1. Aggregate-level analysis

The results are analysed to explore the nature and direction of economic integration. Using the sample data from 20 March–15 October 2020, the overall network is constructed. Figure 2 shows the network. It can be observed that Singapore experiences the maximum spillover moving from China, Japan, Thailand, Korea, and the Philippines. The strongest stringency effect is observed for Viet Nam coming from Japan, China, and Korea. Overall, the network chart helps conclude that the stringency measures taken to curb the coronavirus outbreak significantly impacted the economic integration amongst the ASEAN-6 nations and between

ASEAN and non-member nations like China, Japan, and Korea. The study also constructs the causal network moving from the stringency index to bilateral exports to disentangle the above findings as trade relations are critical determinants of economic integration in Southeast Asia.

Figure 2. Directional Spillover (Stringency Index)

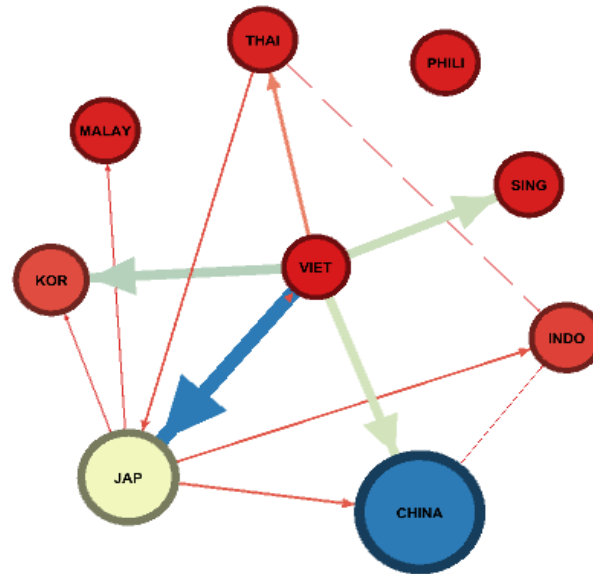


Note: The node shows the size of the economy, which is the average GDP for these countries for the last 5 years. The largest node shows the largest economy in the sample. The edge shows the directional spillover and direction of the spillover. The colour scheme is as follows: The sky-blue colour shows the largest (node) and strongest (edge) in the network, and the red shows the smallest (node) and weakest spillover. The degree of spillover goes down with the faded sky-blue colour turning into yellow, faded yellow, and pink.

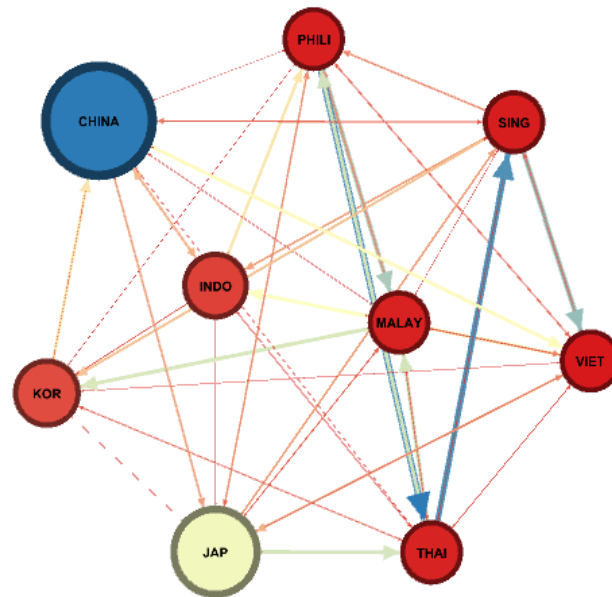
Source: Calculated and prepared by the authors.

From Figure 3, the stringency index strongly causes the bilateral exports between Viet Nam and Japan, followed by Viet Nam and Korea, and between Viet Nam to Singapore and Viet Nam to China. These observations suggest that the stringency measures taken by Viet Nam have impacted most of its trading partners. This observation is a crucial explanation for why Viet Nam experienced a limited impact from the pandemic compared to the rest of Southeast Asia. The network chart also shows the effect of stringency measures on Japan's bilateral exports to Korea, Malaysia, Indonesia, and China.

Figure 3. Causal Network Between Bidirectional Exports and the Stringency Index of ASEAN-6 Member States



Panel (a) Stringency to exports



Panel (b) Exports to stringency

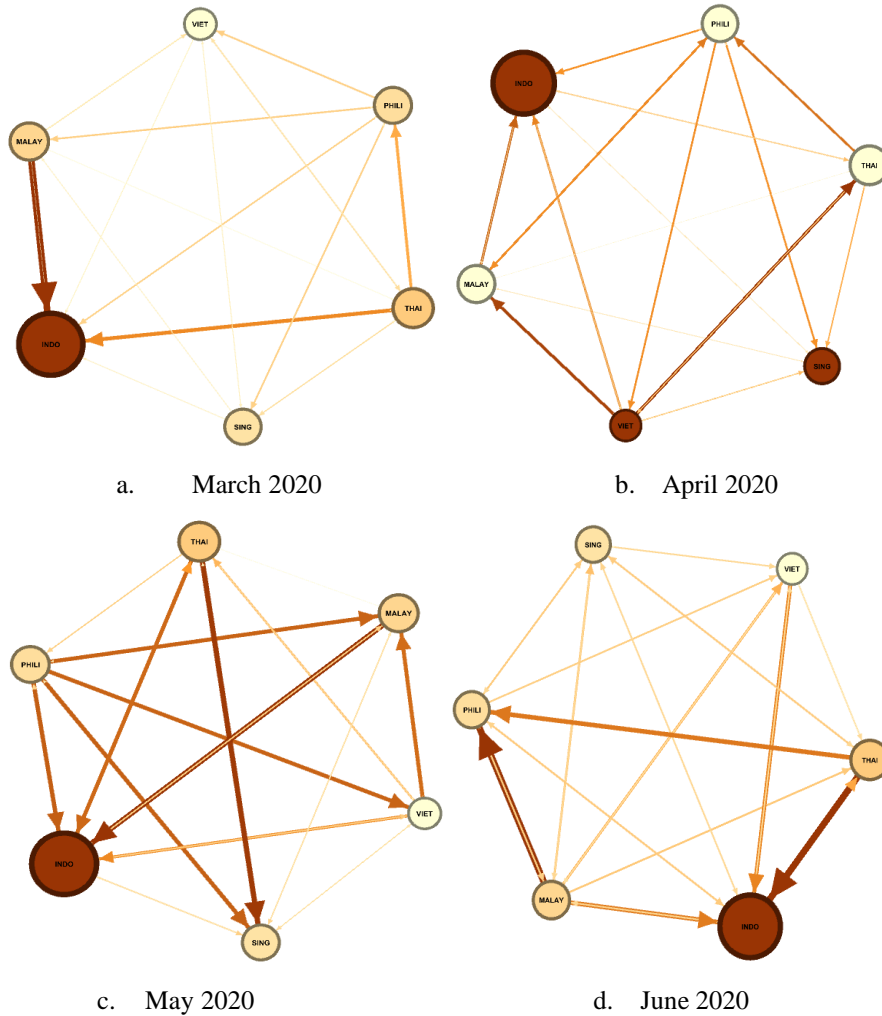
Note: The node shows the size of the economy, which is the average GDP of these countries for the last five years. The largest node shows the largest economy in the sample. The edge shows the magnitude of the F-statistics (for the level of significance). The colour scheme is as follows. The sky-blue colour shows the largest (node) and strongest (edge) in the network, and the red shows the smallest (node) and weakest causal relationship. The degree of the causal relationship goes down with the faded sky-blue colour turning into yellow, faded yellow, and pink. Panel (a) reports the effect of stringency measures on exports, whereas panel (b) reports the effect of exports on stringency.

Source: Calculated and prepared by the authors.

Overall, the findings suggest that the lockdowns, travel, and cross-border restrictions significantly impacted the bilateral exports of ASEAN-6 nations. The significant impact of China, Japan, and Korea also validates these countries' inclusion in the analysis. The study also constructs the Granger-causality network moving bilateral exports to the stringency index. It appears that the bilateral exports also significantly impacted the stringency measures undertaken by Thailand, Singapore, and the Philippines. The strong trade moving from Thailand to Singapore and from the Philippines to Thailand signifies the critical role of trade and intra-ASEAN trade.

The study further analyses the above scenarios by introducing bilateral exports and examining intra-ASEAN-6 trade channels over the 4 months from March to June 2020 (Figure 4). The study constructs the export network using actual data on bilateral exports, extracted from the Thomson DataStream. There were limited bilateral exports between ASEAN-6 nations during March due to stringency measures, such as lockdowns and travel restrictions. With the exceptions of Malaysia and Indonesia, the volume of bilateral exports was meagre and negligible. From April onwards, export networks were visible and continued in May and June, although the trade networks of Singapore and Viet Nam are not as appealing as other nations. In June, there was a significant decline in bilateral exports. The reason could be because of the rise in the number of coronavirus cases and sufficient exports of produced products during April and May. The resumption of full-fledged exports may take some time as the stringency measures have broken production lines and labour availability.

Figure 4. Periodic Networks of Bilateral Exports Amongst ASEAN-6 Nations



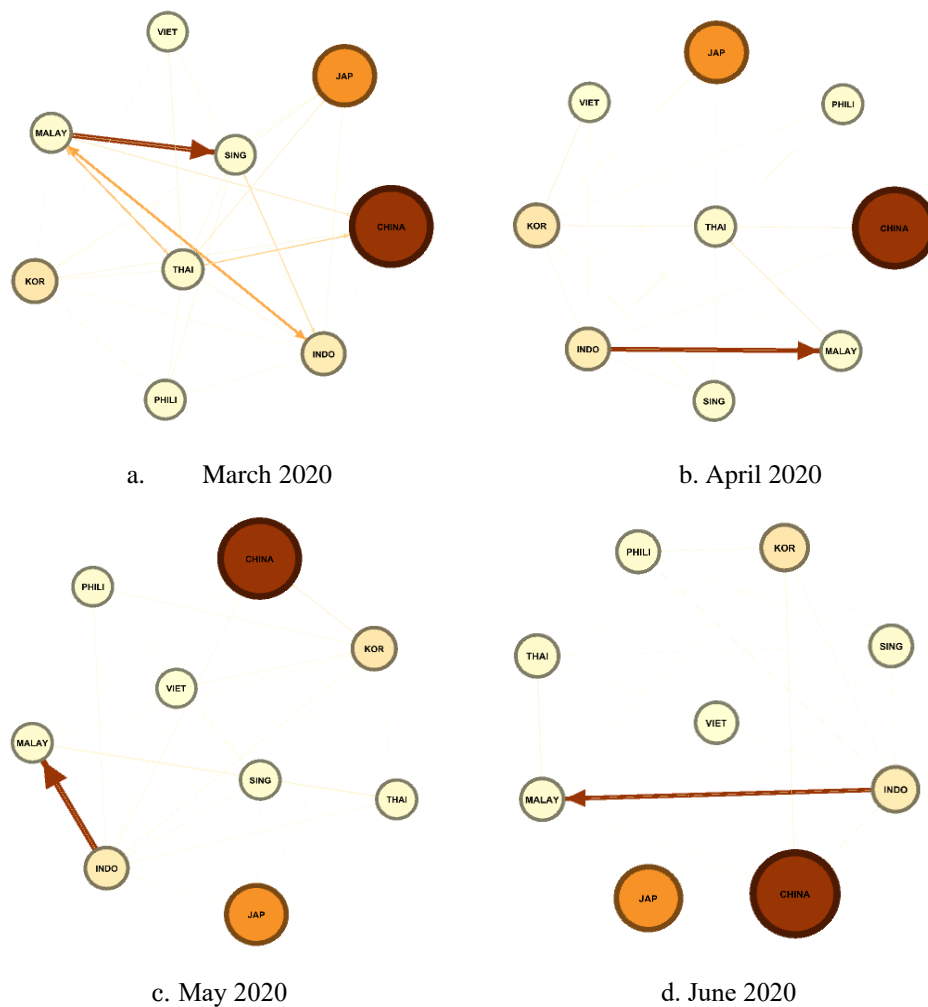
Note: The node shows the size of the economy, which is the average GDP of these countries for the last five years. The largest node shows the largest economy in the sample. The edge shows the magnitude of bilateral exports. The colour scheme is as follows. The dark-brown colour shows the largest (node) and strongest (edge) in the network, and the faded orange (wheat) colour the smallest (node) and weakest connectedness. The degree of causal relationship goes down with the faded brown colour turning into orange and faded orange. Panel (a) represents the month of March 2020, Panel (b) represents the month of April 2020, Panel (c) represents the month of May 2020, and Panel (d) represents the month of June 2020.

Source: Calculated and prepared by the authors.

Like the previous exercise, the study also analyses the state of bilateral tourists' arrivals and constructs the networks for the 4 months of March, April, May, and June. According to ASEAN (2021), travel and tourism account for 12.6% of ASEAN's economy. It is also observed that since March 2020, bilateral tourist arrivals have been the lowest. Figure 5 reveals that tourist arrivals continued from Indonesia to Malaysia despite the pandemic restrictions. The network also shows that amongst the sample of ASEAN-6 nations, Singapore, Thailand, the Philippines,

and Viet Nam seem to have controlled the flow of tourists, which may have impacted these economies dearly. However, from the coronavirus outbreak perspective, these measures helped these economies tame infection rates. The strong connectedness indicates the substantial economic impact concerning domestic measures such as lockdowns and the closing of borders, flights, and consignments, etc.

Figure 5. Periodic Networks of Bilateral Tourist Arrivals Amongst ASEAN-6 Nations



Note: The node shows the size of the economy, which is the average GDP of these countries for the last 5 years. The largest node shows the largest economy in the sample. The edge shows the magnitude of bilateral tourist arrivals (in actual numbers). The colour scheme is as follows. The dark-brown colour shows the largest (node) and strongest (edge) in the network, and the faded orange (wheat) colour the smallest (node) and weakest connectedness. The degree of causal relationship goes down with the faded brown colour turning into orange and faded orange. Panel (a) represents the month of March 2020, panel (b) represents the month of April 2020, panel (c) represents the month of May 2020, and panel (d) represents the month of June 2020.

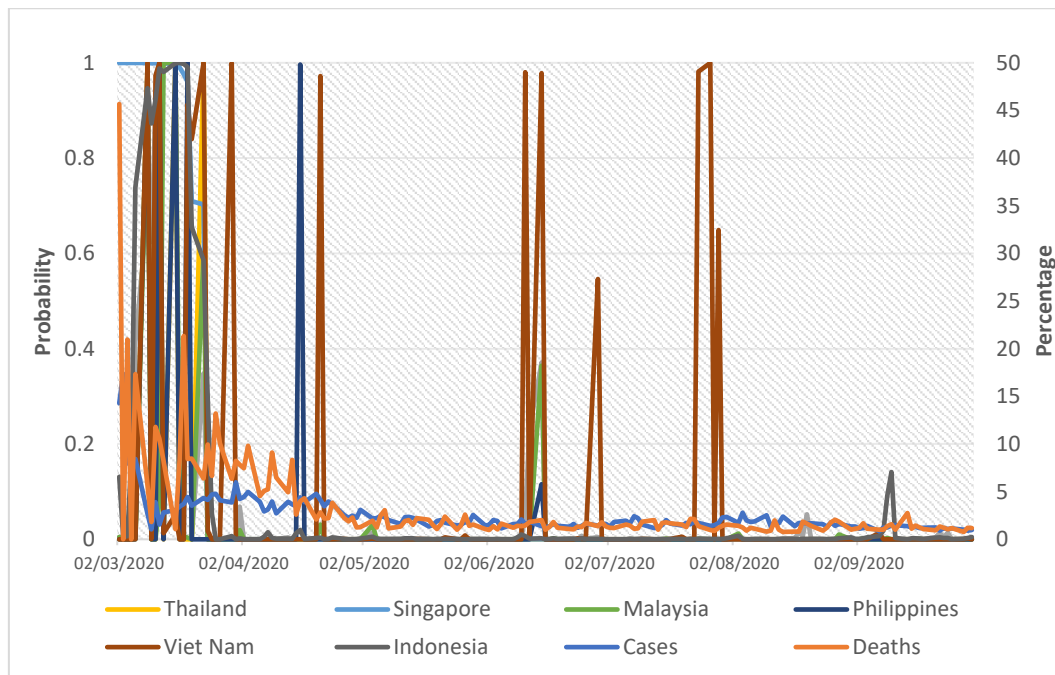
Source: Calculated and prepared by the authors.

Overall, the analysis of bilateral exports and bilateral tourism arrivals reveals the infection rate patterns in ASEAN-6 economies. From the analysis, Indonesia, Malaysia, and Singapore appear to be the most vulnerable countries. Viet Nam, Thailand, and, to some extent, the Philippines fall in the category of less-infected countries. The most striking finding is the tourist bilateral flow, signifying that the analysis has rightfully drawn the Southeast Asian region's contours.

4.2. Disaggregate-level analysis

This subsection analyses the events identified by the linear and nonlinear endogenous structural breaks. The Bai-Perron (2003) structural break test identifies the major events reported in Table 2. The results indicate that the pandemic had major impacts in March and April. This result is further confirmed by the plots of smoothed probabilities of major stock markets against the growth in deaths and cases related to the coronavirus. Figure 6 shows the plot of MSM. Owing to the reports of the highest numbers of deaths and cases during March and April, the stock markets also witnessed a bearish regime. The related events are listed in Table 2.

Figure 6. Performance of ASEAN Stock Markets During the Pandemic



Note: The primary axis shows the smoothed probabilities of the stock markets being in a bearish regime, and the secondary axis shows the percentage growth of the total number of coronavirus cases and deaths in the ASEAN nations.

Table 2. Events Identified Using the Multiple Structural Breaks Model

Event Date	Events	Source
18 March 2020	Nationwide lockdown announced in Malaysia. Goods and services between Malaysia and Singapore were affected. European Union banned travel. China reported zero local infections. Malaysia introduces movement controls to curb the spread of the virus.	Straits Times, South China Morning Post, and CSIS
27 March 2020	Postponement of summer Olympics in Tokyo to 2021. The United States (US) announced a mega stimulus package. Restrictions on public gatherings in Hong Kong. Japan gave a 1-year grace period.	Straits Times and CSIS
3 April 2020	Announcement of ‘circuit breaker’ by Singaporean authority. Cases crossed 1 million.	Straits Times and CSIS
14 April 2020	The cases of the S11 dormitory and PPT Lodge 1A in Singapore. Global economy slides towards recession. International Monetary Fund predicted the growth of the global economy by 3%. Philippines approved US\$1 billion wage subsidy package.	Straits Times and CSIS
30 April 2020	Changi Airport Terminal 2 suspended flight operations. Airline services resumed in the US and other countries. Viet Nam began exporting domestically produced kits and medical equipment.	Straits Times and CSIS
27 May 2020	Singapore announced a US\$33 billion fortitude budget. COVID-19 related deaths crossed 100,000 people. Singapore took measures to phase out lockdown. Indonesia deployed the army and police personnel to implement pandemic-related protocols.	Straits Times and CSIS
26 August 2020	Singapore and Indonesia initiated talks to open their travel corridor. Malaysia reverses the travel entry ban on expats. Thailand approved its stimulus package. Indonesia imposed travel restrictions in Bali. Indonesia launched an economic relief measure for small businesses.	Straits Times and CSIS
10 September 2020	Singapore implemented a ‘multi-layered strategy’ to detect new cases of the coronavirus. ASEAN–US Foreign Ministers’ Meeting focussed on health and human development. Viet Nam announced revised quarantine rules for foreign travellers. Philippines announced US\$3.4 billion pandemic relief package. Rating agencies predicted an economic contraction of 8% for the Philippines. Enforcement of pandemic-related protocols in Indonesia; armies and national police were deployed.	Straits Times and CSIS

Note: CSIS is the Centre for Strategic and International Studies. The Straits Times is an English-language daily broadsheet newspaper based in Singapore.

Source: Compiled by the authors.

After analysing the country-specific parameters for better growth and development, the study performs a micro-analysis and confirms whether the pandemic's impacts have been symmetric across firms. For each event date, the abnormal returns (ARs) and cumulative abnormal returns (CARs) are calculated using Eqns. 7–8. The significance of each event date is decided based on the t-statistics. To infer the significance of the event dates, the AR and CAR values are sorted based on their magnitude. Table 3 shows the AR and CAR values based on their size. The firms are sorted based on their size using 5 years of market capitalisation as a criterion. Panels A–F show the rankings of ASEAN-6 countries. To conserve space, the results for $[+1, -1]$ days only are reported.

Table 3. Top 10 Large and Small Companies Based on Size

Panel A: Indonesia

Sectors	Firms (Large)	AR	CAR
Banks	Bank Rakyat Indonesia	0.000	0.002
Fixed line telecommunications	Telekomunikasi Indonesia (Persero)	-0.009	-0.007
Personal goods	Unilever Indonesia	-0.046	-0.091
Chemicals	Chandra Asri Petroch.	0.027	-0.124
Pharmaceuticals and biotechnology	Kalbe Farma	0.091	0.172
General retailers	ACE Hardware Indonesia	-0.007	-0.121
Mining	Adaro Energy TBK	-0.013	-0.035
Banks	Bank Danamon Indonesia	-0.038	-0.079
Banks	Bank Mayapada Intl.	0.021	0.118
Banks	Bank Mega	0.031	-0.055
Banks	Bank Negara Indonesia	-0.026	-0.008
Sectors	Firms (Small)	AR	CAR
Real estate investment and services	Bekasi Asri Pemula	0.022	0.099
Industrial metals and mining	Jakarta KyoeI Steel Works	0.002	0.008
Financial services (sector)	Nusantara Inti Corpora	-0.007	0.096
Industrial transportation	Armada Berjaya Trans	-0.048	-0.170
Mining	Perdana Karya Pekasa	-0.012	-0.063
Software and computer services	Tanah Laut	0.024	0.131
Travel and leisure	Hotel Fitra International PT	-0.040	-0.084
Construction and materials	Darmi Bersaudara	0.033	0.268
-	Wahana Pronatural	0.019	0.067
Industrial transportation	Eka Sari Lorena	0.114	0.120

Panel B: Malaysia

Sectors	Firms (Large)	AR	CAR
Health care equipment and services	Top Glove Corporation	-0.010	0.010
Health care equipment and services	Hartalega Holdings	0.010	0.078
Oil equipment and services	Dialog Group	0.036	0.070
Industrial metals and mining	Press Metal Aluminium Holdings	-0.109	-0.151
Real estate investment trusts	KLCC Property Holdings Stapled Units	0.006	-0.001
Banks	Hong Leong Financial Group	0.039	-0.037
Fixed line telecommunications	Telekom Malaysia	0.035	0.044
Banks	RHB Bank Berhad	-0.019	-0.082
General industrials	Hap Seng Consolidated	-0.019	0.001
Property and diversified group	PPB Group	0.005	0.026
Sectors	Firms (Small)	AR	CAR
Banks	Malayan Banking	-0.008	-0.014
Banks	Public Bank	-0.050	-0.077
Electricity	Tenaga Nasional	0.035	0.073
Chemicals	Petronas Chemicals Group	0.025	0.007
Health care equipment and services	IHH Healthcare	0.043	0.094
Banks	CIMB Group Holdings	-0.029	-0.096
Fixed line telecommunications	Maxis	0.027	-0.051
Fixed line telecommunications	Axiata Group	-0.027	-0.064
Industrial engineering	Sime Darby	-0.005	0.068
Gas, water, and multiutilities	Petronas Gas	0.023	0.066

Panel C: Philippines

Sectors	Firms (Large)	AR	CAR
General retailers	SM Investments	-0.019	-0.062
Real estate investment and services	SM Prime Holdings	-0.064	-0.014
Real estate investment and services	Ayala Land Inc.	-0.009	-0.015
Banks	BDO Unibank	-0.097	-0.035
Real estate investment and services	Ayala Corporation	0.044	0.003
General industrials	JG Summit Holdings Inc.	0.000	-0.022
Banks	Bank of the Philippine Islands	0.088	0.064
Electricity	Manila Electric Company	0.045	-0.004
Food producers	Universal Robina Corporation	0.036	-0.033
General industrials	Aboitiz Equity Ventures	0.084	0.168
Sectors	Firms (Small)	AR	CAR

Electricity	First Gen	0.018	-0.015
Travel and leisure	Bloomberry Resorts Corp.	0.069	0.219
Food and drug retailers	Puregold Price Club	0.139	0.122
General retailers	Robinsons Retail Holdings, Inc.	0.049	0.133
Real estate investment and services	Robinsons Land Corporation	0.067	0.133
Beverages	Emperador	0.167	0.117
Banks	Security Bank Corporation	0.002	-0.093
General industrials	Alliance Global Group, Inc.	0.041	0.011
Real estate investment and services	Megaworld Corporation	0.039	0.136
Banks	LT Group, Inc.	0.066	0.105

Panel D: Singapore

Sectors	Firms (Large)	AR	CAR
Beverages	Thai Beverage	0.015	-0.138
General industrials	Jardine Strategic	-0.028	-0.186
General industrials	Jardine Matheson Hdg.	0.002	0.046
Real estate investment and services	Hongkong Land HLDGS	-0.016	0.034
Food and drug retailers	Dairy Farm International	0.035	0.064
Fixed line telecommunications	Singapore Telecom	0.013	0.001
Banks	DBS Group Holdings	-0.016	0.027
Banks	Oversea-Chinese Bkg.	0.000	0.004
Banks	United Overseas Bank	0.005	0.037
Industrial transportation	Yangzijiang Shipbuilding Group	-0.016	0.139

Sectors	Firms (Small)	AR	CAR
Real estate investment trusts	Mapletree Industrial Trust	-0.010	-0.162
Real estate investment and services	Mapletree Logistics Trust	0.037	-0.117
Technology services	Venture Corporation Limited	-0.030	0.056
Real estate investment trusts	Mapletree Com	0.048	-0.024
Gas, water, and multiutilities	Sembcorp Industries	-0.019	0.121
Aviation	SATS LTD	0.012	-0.084
Travel and leisure	ComfortDelGro Corporation	0.022	-0.017
Real estate investment and services	UOL Group Limited	-0.017	0.057
Real estate investment trusts	CapitaLand Commercial Trust	0.031	-0.048
Real estate investment trusts	Ascendas	0.036	-0.052

Panel E: Viet Nam

Sectors	Firms (Large)	AR	CAR
Food producers	Vietnam Dairy Products	-0.012	-0.044
Gas, water, and multiutilities	Petrovietnam Gas	-0.032	-0.021
Real estate investment and services	Vinhomes	-0.011	-0.011
Beverages	Saigon Beer Beverage	-0.041	-0.142
General retailers	Vincom Retail	-0.003	-0.036
Travel and leisure	Vietjet Aviation	-0.005	-0.007
Food producers	Masan Group	0.000	0.031
General industrials	HOA Phat Group	0.024	0.039
Travel and leisure	Vietnam Airlines	-0.024	-0.002
Real estate investment and services	NO VA Land Investment Group	-0.014	0.003
Sectors (small)	Firms (Small)	AR	CAR
Support services	Petrolimex International Trading	0.021	0.048
Construction and materials	HUD3 Investment & Const.	0.000	0.036
Real estate investment and services	COTEC Inv.& LD.-HSE.DEV.	0.061	0.165
Real estate investment and services	HUD1 Inv.& Construction	0.003	-0.026
General retailers	Thai Duong Petrol	0.058	0.083
Construction and materials	Petroleum Pipe & TNK. Con.	-0.018	0.024
Industrial engineering	COMA 18	0.068	0.063
Financial services (sector)	Anphat Securities	-0.013	-0.032
Mining	Laocai Mineral	0.000	0.066
Real estate investment and services	Ninh Van Bay Real Estate	-0.082	-0.190

Panel F: Thailand

Sectors	Firms (Large)	AR	CAR
Oil and gas producers	PPT	0.007	-0.024
Industrial transportation	Airports of Thailand	-0.023	-0.062
Food and drug retailers	CP All PCL	-0.007	-0.005
Construction and materials	SIAM Cement Public	-0.004	0.034
Fixed line telecoms	Advanced Info. Service	0.031	0.100
Banks	SIAM Commercial Bank	-0.024	-0.007
Banks	Kasikornbank	0.000	-0.009

Oil and gas producers	PTT Exploration & Production	-0.030	-0.065
Health care equipment and services	Bangkok Dusit Medical Services	0.035	0.008
Banks	Bangkok Bank Limited	0.012	-0.066
Sectors	Firms (Small)	AR	CAR
Household goods	Fancy Wood Industries	0.122	0.168
-	CPL Group PCL	0.127	0.255
General retailers	Copperwired PCL	-0.019	-0.015
Construction and materials	Capital Engineering	-0.094	0.009
-	CPT Drives and Power	-0.006	0.019
-	Bangkok Commercial Property	-0.018	0.003
Industrial engineering	Alla PCL	0.007	-0.033
Food Producers	Chumporn Palm Oil Industries	0.021	0.127
Industrial Metal and Mining	ASIA Metal	0.001	0.029
Industrial Metal and Mining	Bangsaphan Barmill	0.013	0.089

AR = abnormal returns, CAR = cumulative abnormal returns.

Note: Panels A –F show the AR and CAR values of ASEAN-6 countries. 18 March 2020 is considered as the date of sorting the firms based on their size (average of the last 5 years' market capitalisation). Values in bold indicate statistically significant values.

Source: Authors' calculations.

The CAR values are significant for all the firms, suggesting the considerable impact of the coronavirus outbreak. More precisely, for large firms, the CAR values of most of the firms are negative and statistically significant, indicating an adverse effect on these firms.

Similarly, for small firms, the CAR values are negative and statistically significant for most of the firms, providing an impression that the unprecedented shock of the coronavirus outbreak impacted these firms adversely. However, in the case of small firms, those from the Philippines and Malaysia exhibit a greater sensitivity to the shock of the pandemic than the rest of the countries. A possible explanation could be because of the lower number of firms listed on the stock exchange.

However, a comparative analysis reveals that the sectors that became more sensitive to the coronavirus outbreak are personal goods, banks, industrial metal and mining, industrial transportation, general industrials, and others. Most of the sectors appear to be sensitive to country-specific events. To summarise, it is apparent that the pandemic has impacted both large and small firms, and, hence,

these countries may have to chalk out special packages to revive these firms. Special attention may be given to small firms in Indonesia, Viet Nam, and Thailand. Singapore, Malaysia, and the Philippines should focus more on large firms compared to small firms.

The study now analyses the firms based on the number of employees, keeping in mind their employment capabilities. The main purpose is to provide a comparative overview of the employment loss of the firms. It is expected that the results from the previous analysis may be different in this case as the ranking of small firms may also vary. There may be an overlap of few firms, but a cautious effort has been made to showcase the findings in the context of the coronavirus pandemic. In Table 4, panels A–F show the top 10 large and small firms based on the number of employees. Firms in Malaysia (large and small) seem to have faced substantial impacts compared to other firms, suggesting that the government’s stimulus plan should include both types of firms. However, for Malaysia, the impact seems to be more visible for the small firms as the AR and CAR values are more negative than the large firms. Therefore, policy experts must be cautious in undertaking rescue measures and provide extra incentives to small firms.

Table 4: Top 10 Large and Small Companies Based on the Number of Employees

Panel A: Indonesia

Sectors	Firms (Large)	AR	CAR
Automobiles and parts	Astra International	0.013	0.023
Food producers	Indofood Sukses Makmur	0.020	0.000
Banks	Bank Rakyat Indonesia	0.000	0.002
Food and drug retailers	Sumber Alfaria Trijaya	0.016	0.074
Banks	Bank Mandiri	-0.031	-0.032
Food producers	Astra Agro Lestari	-0.055	-0.141
Tobacco	Gudang Garam	0.014	0.041
Food producers	Indofood CBP Sukses Mkm.	-0.024	-0.061
-	United Tractors	0.027	0.010
Banks	Bank Danamon Indonesia	-0.038	-0.079
Sectors	Firms (Small)	AR	CAR
Industrial transportation	Buana Lintas Lautan	0.009	0.018
Gas, water, and multiutilities	Rukun Raharja	-0.035	-0.091
Real estate investment and	Ristia Bintang Mahko	0.016	0.050

services				
Real estate investment and services	Pollux Properti	0.059	0.052	
Nonlife insurance	Asuransi Kresna Mitra	0.012	-0.042	
Real estate investment and services	Bekasi Fajar Indl. Est	0.004	0.027	
Personal goods	Roda Vivatex	0.040	0.190	
-	Waskita Beton Precast	-0.030	-0.040	
Fixed line telecommunications	PT Bali Towerindo Sentra	0.123	0.144	
Industrial transportation	Transcoal Pacific	0.068	0.139	

Panel B: Malaysia

Sectors	Firms (Large)	AR	CAR
Gas, water, and multiutilities	Petronas Dagangan	0.0634	0.119
Fixed line telecommunications	Digitale Com	0.0392	0.083
Gas, water, and multiutilities	Petronas Gas	0.0226	0.066
Oil equipment and services	Dialog Group	0.0360	0.070
Fixed line telecommunications	Maxis	0.0266	-0.051
General industrials	Hap Seng Consolidated	-0.0193	0.001
Property and diversified groups	PPB Group	0.0045	0.026
Chemicals	Petronas Chemicals Group	0.0254	0.007
Food producers	Nestle (Malaysia)	0.0254	0.051
Industrial metals and mining	Press Metal Aluminium Holdings	-0.1089	-0.151
Sectors	Firms (Small)	AR	CAR
Food producers	Sime Darby Plantation	-0.0025	0.068
Industrial engineering	Sime Darby	-0.0051	0.068
Travel and leisure	Genting	-0.0216	-0.138
Banks	Malayan Banking	-0.0080	-0.014
Banks	CIMB Group Holdings	-0.0290	-0.096
Electricity	Tenaga Nasional	0.0349	0.073
Health care equipment and services	IHH Healthcare	0.0425	0.094
Fixed line telecommunications	Telekom Malaysia	0.0348	0.044
Travel and leisure	Genting Malaysia	0.0276	-0.044
Banks	Public Bank	-0.0499	-0.077

Panel C: Philippines

Sectors	Firms (Large)	AR	CAR
General retailers	SM Investments	-0.019	-0.062
General industrials	Alliance Global Group, Inc	0.041	0.012
Banks	BDO Unibank	-0.097	-0.035
General industrials	San Miguel Corporation	0.037	0.043
General industrials	JG Summit Holdings, Inc	0.000	-0.022
Real estate investment and	GT Capital Holdings Inc.	-0.003	-0.116

services				
Fixed line telecommunications	PLDT, Inc.	0.023	0.079	
Banks	Bank of the Philippine Islands	0.088	0.064	
Real estate investment and services	Ayala Land, Inc	0.044	-0.015	
Travel and leisure	Jollibee	0.066	0.033	
Sectors	Firms (Small)	AR	CAR	
General industrials	DMCI Holdings, Inc.	0.016	0.042	
Gas, water, and multiutilities	Metro Pacific Invest. Corporation.	-0.021	-0.039	
General industrials	Aboitiz Equity Ventures	0.084	0.168	
Real estate investment and services	Ayala Land, Inc.	-0.009	-0.015	
Real estate investment and services	Megaworld Corporation	0.039	0.136	
Electricity	First Gen	0.018	-0.015	
Beverages	Emperador	0.167	0.117	
Real estate investment and services	Robinsons Land Corporation	0.067	0.090	
Electricity	Aboitiz Power Corporation	-0.120	-0.115	
Banks	Security Bank Corporation	0.002	-0.093	

Panel D: Singapore

Sectors	Firms (Large)	AR	CAR	
Real estate investment trusts	CapitaLand Commercial Trust	0.031	-0.048	
Real estate investment and services	Mapletree Logistics Trust	0.037	-0.117	
Real estate investment and services	City Developments Limited	-0.003	-0.074	
Real estate investment trusts	CapitaLand Malls	0.040	-0.073	
Financial services (sector)	Singapore Exchange Limited	-0.004	0.055	
Real estate investment and services	Hongkong Land HLDGS	-0.016	0.034	
Real estate investment and services	UOL Group Limited	-0.017	0.057	
Real estate investment and services	CapitaLand Commercial Trust	-0.006	-0.054	
Gas, water, and multiutilities	Sembcorp Industries	-0.019	0.121	
Travel and leisure	Genting Singapore PLC	0.059	-0.173	
Sectors	Firms (Small)	AR	CAR	
General industrials	Jardine Matheson Hdq.	0.002	0.046	
Automobiles and parts	Jardine Cycle & Carriage Ltd.	0.013	-0.139	
Food and drug retailers	Dairy Farm International	0.035	0.064	
Food processing	Wilmar International Limited	-0.002	0.000	
Banks	Oversea-Chinese Banking Corp.	0.000	0.004	

Banks	United Overseas Bank	0.005	0.037
Travel and leisure	Singapore Airlines	-0.078	-0.049
Fixed line telecommunications	Singapore Telecom	0.013	0.001
Banks	DBS Group Holdings	-0.016	0.027
Travel and leisure	ComfortDelGro Corporation	0.022	-0.017

Panel E: Viet Nam

Sectors	Firms (Large)	AR	CAR
Technology, hardware, and equipment	Mobile World Invest.	0.014	0.023
Fixed line telecommunications	FPT Corporation	-0.004	0.029
Travel and leisure	Vietnam Airlines	-0.024	-0.002
Banks	Saigon Thu. Tin Commercial	-0.021	0.004
General industrials	Hoa Phat group	0.024	0.039
Food producers	Masan Group Corporation	0.000	0.031
Banks	Ho Chi Minh CTDEV. JST. CMLBK.	0.067	0.035
Personal goods	Song Hong Garment	0.006	-0.029
Beverages	Saigon Beer Alcohol Beverage	-0.041	-0.142
Construction and materials	Hoa Binh Construction Group	0.005	0.064
Sectors	Firms (Small)	AR	CAR
Chemicals	Yen Bai Industry Mineral	0.074	0.046
General retailers	Ben Thanh Trading & Service	0.066	0.073
Construction and materials	Dong A Plastic Group	0.004	0.009
Industrial transportation	Superdong Fast Fe. Kien Giang	-0.003	0.017
Construction and materials	FLC Mining Investment	0.029	0.027
Industrial transportation	Hai And Transport & STEVD.	0.017	0.034
Financial services (sector)	Viet Dragon Securities	0.000	-0.073
Mining	Fecon Mining	0.030	0.025
Industrial metals and mining	Son Ha Sai Gon	0.000	0.027
Health care equipment and services	Japan Vtm. Med. Instrument	-0.021	-0.075

Panel F: Thailand

Sectors	Firms (Large)	AR	CAR
Travel and leisure	Minor International	-0.116	-0.230
Construction and materials	SIAM Cement Public	-0.004	0.034
Food and drug retailers	CP All PCL	-0.007	-0.005
Health care equipment and services	Bangkok Dusit Med. Svs.	0.035	0.008
General industrials	Berli Jucker PCL	0.042	0.128
Banks	Bangkok Bank Limited	0.012	-0.066
Oil and gas producers	PTT	0.007	-0.024

Banks	SIAM Commercial Bank	-0.024	-0.007
-	CAL-COMP ELTN. (THAI.)	0.012	-0.005
Banks	Krung Thai Bank	0.004	-0.004
Sectors	Firms (Small)	AR	CAR
Electricity	Ratch Group PCL	-0.022	0.083
Electricity	Energy Absolute PCL	-0.006	0.056
Construction and materials	Dcon Products	-0.009	0.062
Electricity	CK Power	-0.013	0.041
Gas, water, and multiutilities	Eastern Water Resources Dev.& Man.	0.014	-0.029
Financial services (sector)	Eastern Coml. Leasing	0.023	0.115
Technology hardware and equipment	ALT Telecom PCL	-0.006	0.086
General retailers	Autocorp Holding	0.068	0.143
General retailers	FN Factory Outlet	-0.052	-0.001
Real estate investment and services	Everland PCL	-0.014	0.024

AR = abnormal returns, CAR = cumulative abnormal returns.

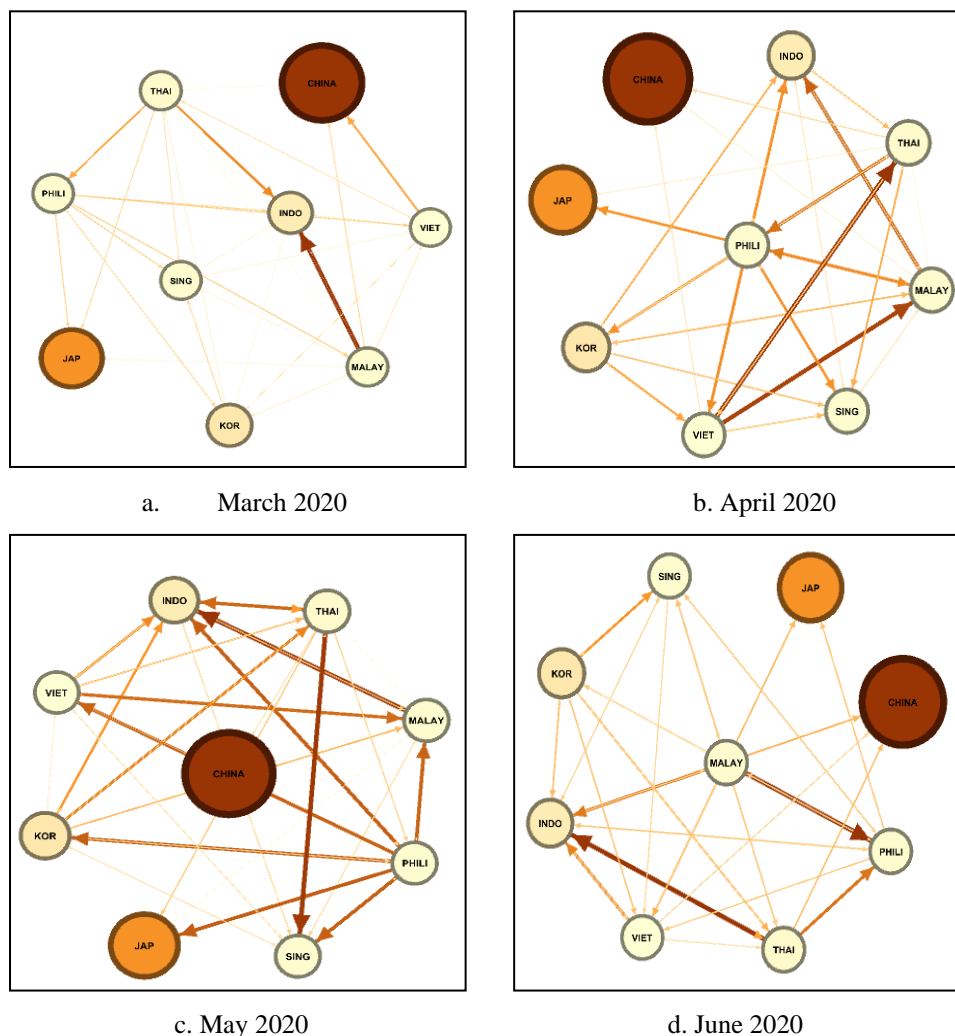
Note: Panels A –F show the AR and CAR values of ASEAN-6 countries. 18 March 2020 is considered as the date of sorting the firms based on their size (average of the last 5 years' market capitalisation). Values in bold indicate statistically significant values. Source: Authors calculated.

In the case of Viet Nam, large firms are more vulnerable to the coronavirus pandemic's effects than small firms, although the AR and CAR values are not uniformly significant. In Singapore, large firms are impacted by the pandemic more than small firms. Overall, a comparative analysis of both sizes (market capitalisation and the number of employees) reveals a differential impact of the coronavirus pandemic across firms, and the effect is more severe and uniform for both large and small firms based only on the size (market capitalisation). However, the ranking based on the number of employees does not wilfully substantiate the findings based on size.

5. Comparative Analysis of ASEAN-6 and China, Japan, and the Republic of Korea

For any empirical exercise, it is always recommended to do a comparative analysis. In this context, the study considers China, Japan, Korea, and the ASEAN-6 nations. The main motivation to include these countries is that these nations play a crucial role in economic integration and are amongst the major trade and tourism partners. A periodic network graph for the months of March, April, May, and June is developed for bilateral exports and bilateral tourist arrivals to keep this in mind. Figure 7 shows the bilateral export networks of ASEAN-6 and China, Japan, and Korea. During March, the export network from Malaysia to Indonesia was more active compared to other nations. Viet Nam also shows export dependence on China. Thailand shows export dependence on the Philippines and Indonesia. Overall, during March, the network plot reveals the sub-optimal level of export connectedness. China's export networks with Japan and Korea do not reflect strong inflows and outflows of trade goods. However, in April, the trade networks were revived as more networks are strongly visible. Viet Nam is strongly connected to Thailand and Malaysia, followed by the Philippines to Viet Nam and the Philippines to Indonesia. The trade network between ASEAN-6 and the three nations of China, Japan, and Korea seemed weaker than the intra-ASEAN-6 trade. In May, the economic revival continued, and it is observed that the bilateral exports between ASEAN-6 and the three nations strengthened during this period. The most robust connections were from Thailand to Singapore and from Malaysia to Indonesia. The revival of trade networks could be because of the imports and exports of medical equipment and food items. In June, the trade networks seemed to have stabilised as intra-ASEAN-6 trade is more visible than for the three nations.

Figure 7. Periodic Networks of Bilateral Exports for ASEAN-6 and China, Japan, and the Republic of Korea



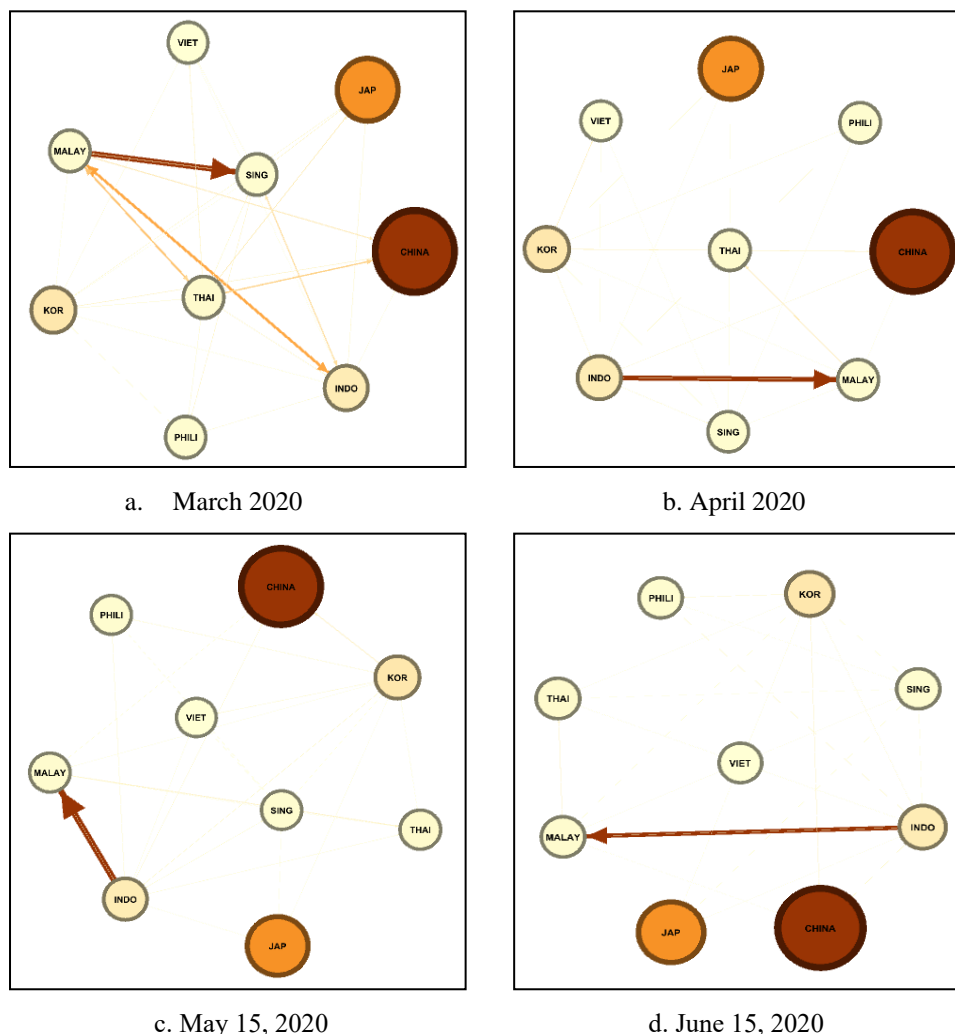
Note: The node shows the size of the economy, which is the average GDP of these countries for the last 5 years. The largest node shows the largest economy in the sample. The edge shows the magnitude of bilateral exports. The colour scheme is as follows. The dark-brown colour shows the largest (node) and strongest (edge) in the network, and the faded orange (wheat) colour shows the smallest (node) and weakest connectedness. The degree of the directional relationship goes down with the faded brown colour turning into orange and faded orange. Panel (a) represents the month of March 2020, panel (b) represents the month of April 2020, panel (c) represents the month of May 2020, and panel (d) represents the month of June 2020.

Source: calculated and prepared by the authors.

However, the coronavirus pandemic's impacts affected the bilateral exports between ASEAN-6 and China, Japan, and Korea, and this became visible during March 2020. From April onwards, the trade networks started reviving with the economy's opening and excess exports and imports of medical supplies and equipment. Overall, it is observed that during the pandemic, intra-ASEAN trade remained a backbone.

As aforementioned, the tourism sector is the backbone of some of the ASEAN-6 economies. The study constructs the networks of ASEAN-6 and China, Japan, and Korea's bilateral tourist arrivals (see Figure 8). During March 2020, intra-ASEAN-6 nations had inflows and outflows of tourists, but not from China, Japan, or Singapore. There were tourist inflows between Malaysia and Singapore and between Malaysia and Indonesia. However, in the other months (April, May, and June), inflows are seen from Indonesia to Malaysia and nowhere else. The actual data also reveal that the tourist arrivals in some months were zero for some countries.

Figure 8. Periodic Networks of Bilateral Tourist Arrivals for ASEAN-6 and China, Japan, and the Republic of Korea



Note: The node shows the size of the economy, which is the average GDP of these countries for the last 5 years. The largest node shows the largest economy in the sample. The edge shows the magnitude of bilateral tourist arrivals. The colour scheme is as follows. The dark-brown colour shows the largest (node) and strongest (edge) in the network, and the faded orange (wheat) colour shows the smallest (node) and weakest connectedness. The degree of the directional relationship goes down with the faded brown colour turning into orange and faded orange. Panel (a) represents the month of March 2020, panel (b) represents the month of April 2020, panel (c) represents the month of May 2020, and panel (d) represents the month of June 2020.

Source: Calculated and prepared by the authors.

Overall, it is apparent from the above analysis that even after incorporating China, Japan, and Korea, the trade networks and tourism sector outlook do not change, signifying the critical role of stringency measures and the outbreak of the coronavirus. The coronavirus pandemic has wholly stopped economic prosperity

and the thriving region of ASEAN. The analysis also shows the impact of the pandemic on economic integration.

6. Conclusion and Policy Implications

ASEAN nations enjoy a greater extent of homogeneity concerning socio-cultural and economic development, which is reflected in the analysis of this study. At the aggregate level, the coronavirus outbreak seemed to have impacted all the economies uniformly as, during March 2020, the outbreak struck all the economic activities; thus, trade and tourism inflows were at their lowest levels except for few countries, including Indonesia and Malaysia. From April onwards, the stringency measures were, to some extent, relaxed, and as a result, bilateral trade amongst ASEAN nations restarted. However, the tourism sector remained a major cause of concern due to the rising number of cases and travel restrictions from China, Japan, and Korea. The travel restrictions in China also impacted the ASEAN-6 nations.

Overall, the aggregate and disaggregate analyses using trade, tourism, and firm-level data provide sufficient insights into the pandemic's implications for the region's economic integration. The findings may also provide a valuable direction for firms operating in the trade and travel and leisure sectors. Policy experts should now be able to promote the tourism sector so that some economies may have better employment generation opportunities. The causal networks find that Viet Nam and Singapore exhibit a strong effect for directional dependence, suggesting high intra-ASEAN economic integration and economic integration with China, Japan, and Korea. However, the trade networks' results should be analysed cautiously as trade could have started only for healthcare and medical equipment. A detailed analysis could be conducted to discern the commodity-specific details during this period.

The major contribution of this study is to provide a firm-level perspective that may become a significant contribution. The event-study analysis of large and small firms based on their size and employment potential suggests that the coronavirus pandemic has uniformly impacted large and small firms. However, the extent of the coronavirus impact differs across ASEAN-6.

Better prospects for economic integration are possible in the following direction. First, the ASEAN-6 economies should immediately create funds to procure vaccines so that the relatively disadvantaged nations will have the opportunity to participate in the recovery process. Second, ASEAN nations should also create separate funds to revive trade-sensitive firms, and policy measures should be taken to streamline the initial hurdles of freeing these firms from the perpetuation of excess borrowing channels. Third, ASEAN nations should also create a regulatory body to look after trade distortions and work on creating a level playing field. Fourth, to revive the tourism sector, the ASEAN nations should invest in a global campaign that can highlight the measures taken by these economies to ensure safe and secure holidays. The visa-on-arrival system should be extended to more countries where coronavirus cases are lower. A regulatory body should be set up to design the network and scheme of implementation. Fifth and last, the ASEAN nations should also undertake financing measures that could be explored through special window borrowing from the Asian Development Bank or by introducing a long-term callable bond that could be sold to bilateral institutions for a certain period.

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