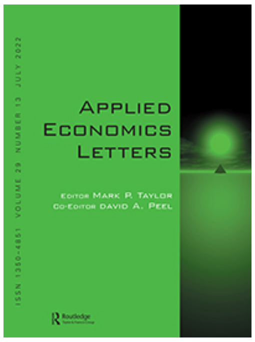

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Profiting from growth: Trade, investment and the ASEAN-China technology gap

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Profiting from growth: Trade, investment and the ASEAN-China technology gap

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ABSTRACT
While outward FDI inflows have increased since 2008, the volume of Southeast Asia's exports to China has slowed down, prompting discussion about whether this will affect Southeast Asia's growth. This article empirically tests China's impact on Southeast Asia's growth using a nonlinear framework, and finds that economic linkages between Southeast Asia and China have been changing since the mid-1990s, especially during the 1997 and 2008 financial crises and the 2012 bilateral diplomatic change; that FDI is more important to economic growth than exports across Southeast Asia; and that there is no industrial technology gap between Southeast Asia and China.

KEYWORDS
Southeast Asia; export-led growth; foreign direct investment; economic cointegration

JEL CLASSIFICATION
F14; F15; O53

I. Introduction

Southeast Asia's trade and investment have become increasingly intertwined across national boundaries, with China seen as playing a crucial role in integrating these regional economies (Wong 1984) with China-centred production networks (Hong et al. 2020). Since 2008 many of Southeast Asian countries' exports to China have slowed down. Explanations for this include the facts that China has graduated from labour-intensive production (Devadason 2011; Sznajderska and Kapuściński 2020), and that its move up the value chain (Azhar and Elliott 2006; Kee and Tang 2016) has reduced its reliance on Southeast Asia. As China's imports from Southeast Asia have been commonly seen as important for the latter's growth, a common view worries that it may significantly affect economic growth in Southeast Asia. The decreasing exports, however, have been accompanied not only by the falling prices of China's domestic industrial materials but also by the rise in its outward FDI to Southeast Asia. China appears to have started trading with Southeast Asia in parts – not only final goods – and investing in producing components in vertical industrial spread (Kojima 1978).

While it is believed that export and FDI links with China are helping to anchor regional growth in Southeast Asia, it is still unconvincing to conclude that Southeast Asia's growth has been China-led. This article is inspired by studies that empirically analyse the nexus in question. The common methodologies used in existing studies are linear-based (e.g. spatial panel models). But if nexus in question is not linear, these empirics may have overlooked some nonlinear complications (e.g. periodic factors), leading to incomplete conclusions. This article revisits Southeast Asia's economic ties with China using both linear and nonlinear methodologies, with the aim of filling the gap in the scholarship.

The empirical findings in this article prove the nonlinear hypothesis true:

(a) There is no linear causation between Southeast Asia's exports to China and its own growth; Unlike exports, FDI is of higher importance across Southeast Asian countries.
(b) Chinese FDI is concentrated in countries with good or high levels of industrial development in Southeast Asia, using their existing economic externalities to increase profit margins.
(c) Southeast Asia's growth has been affected more by global economic and political fluctuations, as the nonlinear tipping events are found around the 1997 and 2008 financial crises and at the time of China's changing diplomatic stance towards Southeast Asia since 2012.

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Section II, below, explains the date and methodology used; Section III discusses the empirical findings, and Section IV concludes this paper.

II. Data and methodology

Basic setup and data description

The factors investigated here are Southeast Asia's economic links to China $\Pi_t \in \{X_t, K_t\}$, estimated by the growth rate of Southeast Asia's exports to China X_t and share of Chinese capital in the Southeast Asia's FDI market K_t. Southeast Asia's growth, Y_t, is estimated by its real GDP growth rate. Official data from the *China Statistical Yearbook*, the World Bank's World Development Indicators and the *ASEAN Statistical Yearbook* are used. Linear and non-linear autoregressive distributed lag (*ARDL*) methods are selected to ascertaining the nexus in question from 1995 to 2019.[1]

ARDL model and causality test

Following Pesaran, Shin, and Smith (2001), Equations (1–3) were formally investigated for cointegration:

$$\Delta Y_t = c + \begin{cases} \alpha_{11}Y_{t-1} + \alpha_{12}X_{t-1} + \sum_{i=1}^{p}\gamma_{1i}\Delta Y_{t-i} + \sum_{i=0}^{q}\delta_{1i}\Delta X_{t-i} + e_{1t} & (1) \\ \alpha_{21}Y_{t-1} + \alpha_{22}K_{t-1} + \sum_{i=1}^{p}\gamma_{2i}\Delta Y_{t-i} + \sum_{i=0}^{q}\theta_{2i}\Delta K_{t-i} + e_{2t} & (2) \\ \alpha_{31}Y_{t-1} + \alpha_{32}X_{t-1} + \alpha_{33}K_{t-1} + \sum_{i=1}^{p}\gamma_{3i}\Delta Y_{t-i} & \\ + \sum_{i=0}^{q}\delta_{3i}\Delta X_{t-i} + \sum_{i=0}^{q}\theta_{3i}\Delta K_{t-i} + e_{3t} & (3) \end{cases}$$

The underlying error correction models (*ECM*) (Boswijk 1994) are associated with the long-run estimates as follows:

$$\Delta Y_t = c + \begin{cases} \sum_{i=1}^{p}\gamma_{1i}\Delta Y_{t-i} + \sum_{i=0}^{q}\delta_{1i}\Delta X_{t-i} + \lambda_1\varepsilon^{x}_{t-1} + e_{1t} & (4) \\ \sum_{i=1}^{p}\gamma_{2i}\Delta Y_{t-i} + \sum_{i=1}^{q}\theta_{2i}\Delta K_{t-i} + \lambda_2\varepsilon^{k}_{t-1} + e_{2t} \quad . & (5) \\ \sum_{i=1}^{p}\gamma_{3i}\Delta Y_{t-i} + \sum_{i=1}^{q}\delta_{3i}\Delta X_{t-i} + \sum_{i=1}^{q}\theta_{3i}\Delta K_{t-i} + \lambda_3\varepsilon^{x,k}_{t-1} + e_{3t} & (6) \end{cases}$$

Further, threshold *ARDL* model from Li and Lee (2010) was conducted, in Equations (7–9), to examine if there exist regime switch effects:

$$\Delta Y_t = c + \begin{cases} (\alpha_{11}Y_{t-1} + \alpha_{12}X_{t-1})I^{x}_{1t} + (\alpha_{13}Y_{t-1} + \alpha_{14}X_{t-1})I'^{x}_{1t} & \\ + \sum_{i=1}^{p}\gamma_{1i}\Delta Y_{t-1} + \sum_{i=0}^{q}\delta_{1i}\Delta X_{t-i} + e_{1t} & (7) \\ (\alpha_{21}Y_{t-1} + \alpha_{22}K_{t-1})I^{k}_{2t} + (\alpha_{23}Y_{t-1} + \alpha_{24}K_{t-1})I'^{k}_{2t} & \\ + \sum_{i=1}^{p}\gamma_{2i}\Delta Y_{t-1} + \sum_{i=0}^{q}\theta_{2i}\Delta K_{t-i} + e_{2t} & (8) \\ (\alpha_{31}Y_{t-1} + \alpha_{32}X_{t-1} + \alpha_{33}K_{t-1})I^{x,k}_{3t} & \\ + (\alpha_{34}Y_{t-1} + \alpha_{35}X_{t-1} + \alpha_{36}K_{t-1})I'^{x,k}_{3t} & \\ + \sum_{i=1}^{p}\gamma_{3i}\Delta Y_{t-1} + \sum_{i=0}^{q}\delta_{3i}\Delta X_{t-i} + \sum_{i=0}^{q}\theta_{3i}\Delta K_{t-i} + e_{3t} & (9) \end{cases}$$

Here depicts the threshold values: $I^{x,k}_{it}$ can either be $I^{x,k}_{it} = I\left(\mu^{x,k}_{t-1} < \mu^{x,k*}_{t-1}(\tau)\right)$, or $I'^{x,k}_{it} = 1 - I^{x,k}_{it} = I\left(\Delta\mu^{x,k}_{t-1} < \Delta\mu^{x,k*}_{t-1}(\tau)\right)$. After the nonlinear cointegration establishes, Equations (10–12) estimate the threshold *ECM*:

$$\Delta Y_t = c + \begin{cases} \sum_{i=1}^{n}\gamma_{1i}\Delta Y_{t-i} + \sum_{i=0}^{n}\delta_{1i}\Delta X_{t-i} + \lambda_{11}\varepsilon^{x+}_{t-1} + \lambda_{12}\varepsilon^{x-}_{t-1} + e_{1t} & (10) \\ \sum_{i=1}^{n}\gamma_{2i}\Delta Y_{t-i} + \sum_{i=1}^{n}\theta_{2i}\Delta K_{t-i} + \lambda_{21}\varepsilon^{k+}_{t-1} + \lambda_{22}\varepsilon^{k-}_{t-1} + e_{2t} & (11) \\ \sum_{i=1}^{p}\gamma_{3i}\Delta Y_{t-i} + \sum_{i=1}^{q}\delta_{3i}\Delta X_{t-i} + \sum_{i=1}^{q}\theta_{3i}\Delta K_{t-i} & \\ + \lambda_{31}\varepsilon^{x,k+}_{t-1} + \lambda_{32}\varepsilon^{x,k-}_{t-1} + e_{3t} & (12) \end{cases}$$

III. Econometric results and discussion

Tests for linear and threshold cointegration

Using equations $(1-3)$ with FDI (K_{it}), and export and FDI ($X_{it} + K_{it}$) as independent variables, the *F*-statistics (F_x=5.76 and F_{xk}=5.21 respectively) are higher than the critical value of 4.78 at 90% confidence (Pesaran, Shin, and Smith 2001).[2] However, when exports (X_{it}) is the dependent variable, the F_x=3.94 shows results insignificant. Consequently, linear cointegration could only be established for equations (2) and (3).

Considering the nonlinear possibility mentioned above, equations (7–9) are tested for threshold *ARDL*. At the 99% confidence level, all results of *BO* statistics surpass 23.88 critical value (Li and Lee 2010), indicating threshold cointegration established for Equations (7–9).

[1]See Appendix A for the data description and unit root tests.
[2]See Appendix B for the linear and nonlinear *ARDL* cointegration test results.

Table 1. Linear and threshold causalities from China's exports and FDI to Southeast Asia's growth, 1995–2019.

Panel (*A*): GDP vs. EXPO		Panel (*B*): GDP vs. FDI				Panel (*C*): GDP vs. EXPO+FDI			
	Nonlinear		Linear		Nonlinear		Linear		Nonlinear
	dY_t (1)		dY_t (2)		dY_t 2(3)		dY_t (4)		dY_t (5)
dY_{t-1}	0.4288	dY_{t-1}	0.2423	dY_{t-1}	0.3551	dY_{t-1}	0.3431	dY_{t-1}	0.5108*
	(0.2819)		(0.2418)		(0.2508)		(0.2503)		(0.2617)
dX_{t-1}	−0.0818*	dK_t	−0.3244	dK_{t-1}	0.2547	dX_t	0.0771**	dX_{t-1}	−0.0956**
	(0.2819)		(0.2418)		(0.2508)		(0.2503)		(0.2617)
dX_{t-1}	−0.0818*	dK_t	−0.3244	dK_{t-1}	0.2547	dX_t	0.0771**	dX_{t-1}	−0.0956**
	(0.0415)		(0.3888)		(0.3897)		(0.0340)		(0.0441)
		dK_{t-1}	−0.0046			dX_{t-1}	−0.0691	dK_{t-1}	−0.0388
			(0.3984)				(0.0462)		(0.3861)
						dK_t	0.2632		
							(0.3938)		
						dK_{t-1}	0.0900		
							(0.3669)		
Errorterms									
$\varepsilon^{x}_{t-1} \cdot I^{x}$	−1.3278	ε^{k}_{t-1}	−1.0539a	$\varepsilon^{k}_{t-1} \cdot I^{k}$	−1.3180a	$\varepsilon^{x,k}_{t-1}$	−1.2455a	$\varepsilon^{x,k}_{t-1} \cdot I^{x,k}$	−1.6064a
	(0.4052)		(0.3233)		(0.3651)		(0.3514)		(0.4032)
$\varepsilon^{x}_{t-1} \cdot I'^{x}$	−0.7429			$\varepsilon^{k}_{t-1} \cdot I'^{k}$	−0.5469			$\varepsilon^{x,k}_{t-1} \cdot I'^{x,k}$	−0.8712
	(0.6400)				(0.7410)				(0.6749)
Constant	−0.3952		0.0303		−0.7104		−0.2736		−0.4448
	(0.7610)		(0.7156)		(0.9350)		(0.6316)		(0.7374)
Causality									
Shortrun	−1.9725*		0.4123		0.6535		3.1847**		2.6486
Longrun	6.6466		−3.2604		7.3865		−3.5448		9.1513
*Strong*1	5.8322**		4.8820**		6.5482		5.3606		5.9434
*Strong*2	2.4154				0.6984				1.8637
Thresholdyears	Y1998/99 Y2012				Y1998/99 Y2009/10 Y2012 Y2014				Y1998/99 Y2009 Y2012
τ	−1.3831				−0.9558				−1.4323
$\bar{R}^2$	0.3833		0.3992		0.4019		0.5452		0.4557
AIC	5.3471		5.3209		5.3165		5.0992		5.2526
LM(2)	0.0297[0.9708]		1.5140[0.2518]		0.8278[0.4560]		3.2520[0.0716]		0.0746[0.9285]
ARCH(2)	0.2206[0.8043]		0.1381[0.8720]		0.3125[0.7357]		2.5799[0.1051]		0.4609[0.6384]
JB	43.2487[0.0000]		12.1161[0.0000]		62.6986[0.0000]		82.4210[0.0000]		17.7347[0.0001]

*** $p < 0.01$, significant at 1%; ** $p < 0.05$, significant at 5%; * $p < 0.1$, significant at 10%.

Identifying causalities between Southeast Asia's growth and its economic ties with China

Accordingly, the *ECM*s are tested for causalities. The results, in Table 1, confirm that under the linear framework: *a*) no linear causality is found from Southeast Asia's exports to China and the former's domestic growth; *b)* there is no short-run causation for FDI (column 2), *c)* but there is a weak causation for the combination of exports and FDI (column 4).

Furthermore, using nonlinear *ARDL*, estimations of exports, of FDI and of both combined in Southeast Asia's GDP growth indicates negative coefficients of all error correction terms $\varepsilon^{k+,-}_{t-1}$. This implies Southeast Asia's adjustment to shocks from Chinese economy has been effective. The underlying threshold causalities confirm that: *a)* in the short run, exports have a weak causal effect on Southeast Asia (column 1); *b)* in the long run strong causalities are present for all exports, FDI, and both combined in Southeast Asia's GDP, *c)* with FDI the strongest regressor. The tipping years for Southeast Asian-Chinese economic relations are 1998–1999, 2009–2010, 2012–2014 (columns 1, 3 and 5), all around the times of the 1997 and 2008 financial crises and China's shift in attitude to Southeast Asia in 2012.

Table 2. Export- and FDI-driven growth in Southeast Asia.

	GDP vs. EXPO	GDP vs. FDI
	(1)	(2)
ASEAN-6		
Indonesia	Yes	Yes
Malaysia	Yes	Yes
Singapore	Yes	Yes
Brunei	–	Yes
Thailand	–	Yes
Philippines	–	–
CLMV		
Cambodia	Yes	Yes
Vietnam	Yes	Yes
Laos	–	–
Myanmar	–	–

Source: Compiled by the authors based on the results in Appendix B.

Discussion

Empirically Southeast Asia's absorption of China's FDI is showing a stronger impact on GDP than its exports to China. Naturally, the rise in FDI, accompanied by slowing exports soon aroused concern within Southeast Asia: China may have moved up the industrial technology chain and begun increasing capital investment in organizing manufacturing networks in Southeast Asia.

Considering that the different specific effects on the individual countries of Southeast Asia may cancel each other out, hence affecting the result for Southeast Asia as a whole, the process in Equations (10) and (11) is repeated for each Southeast Asian country. Table 2 reports the results.[3] As it shows, exports to China play a determining role in the GDP growth of five Southeast Asian member states (column 1). FDI inflows from China are generally significant in most of Southeast Asia's member states, and particularly the ASEAN-6 (column 2). Apparently these countries, which are mostly developed and/or fastest-developing Southeast Asian economies, have had a favourable industrial basis for China's trade and FDI.

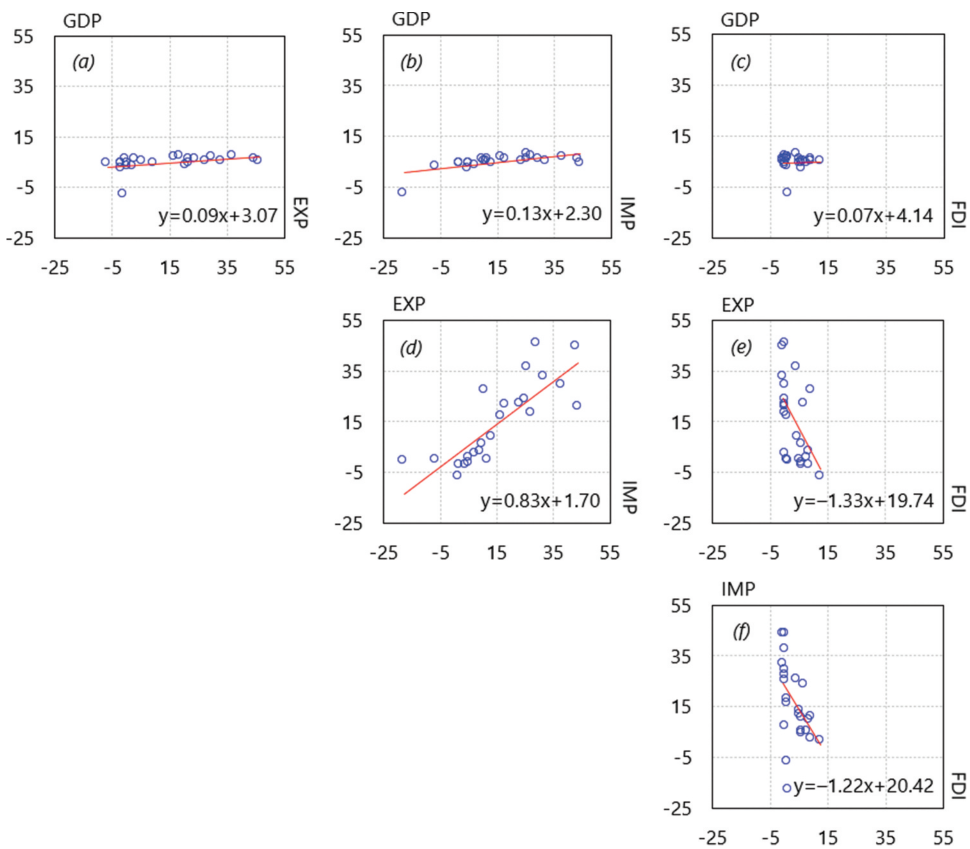

Figure 1. Southeast Asia's economic links to China and domestic GDP growth. Sources: ASEAN Statistical Yearbook; China Statistical Yearbook; World Development Indicators.

[3]See Appendix C.

Benefiting from the same industrial diffusion from Japan, China is not largely advanced in manufacturing efficiency and is thus less likely to enhance the productivity of labour and capital in Southeast Asian hosting countries. This explains why, in Figure 1, Southeast Asia's GDP growth is not sensitive to China's trade and FDI, although significant in empirical tests (Table 1).

By contrast, the Southeast Asia-China economic nexus seems to be much more sensitive to economic and political international instability. Events in the year obtained in Table 1 identify 1998/99, 2009/10 and 2012 as three tipping points in bilateral economic relations when China increased investment to catch the plummeting asset price in Southeast Asia after the 1997 and 2008 financial crises, and when bilateral relationship deteriorated due to the territorial dispute in the South China Sea since 2012.

Thus, although China's efforts to promote industrial upgrading have somewhat reduced its reliance on imported inputs for production and Chinese manufacturers now have a more domestic-based supply chain and are moving into higher value-added production, the effects on Southeast Asia's economic growth are not yet evident.

IV. Conclusion

With regime-switching effects, this article establishes strong causal links between Southeast Asia's economic ties with China and its domestic growth. The enhanced power of the nonlinear analysis however implies that such ties are not linear: rather the two have been changing all the time.

Following individual country-based analysis, this investigation finds that there is no significant technology gap between Southeast Asia and China. Thus, rather than cultivating local growth, China's trade with and FDI to partner Southeast Asian countries are likely to make use of existing externalities in their industries, pursuing trade profits and investment returns in Southeast Asia.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendices

Appendix A. Summary statistics and unit root tests.

		Southeast Asia's GDP, growth rate % (Y_t)	Southeast Asia's export to China, growth rate % (X_t)	Share of China in Southeast Asia's FDI inflows, % (K_t)
		(1)	(2)	(3)
Panel (A): Summary statistics				
Observation		24	24	24
Mean		4.6123	13.9017	3.8201
Standard deviation		2.9519	16.2300	3.8597
Minimum		−7.7745	−9.4541	−0.5667
Maximum		7.7597	48.9411	12.3070
Panel (B): Unit root tests				
Level	(*i*)	−4.2627***	−3.7206**	−0.8958
	(*ii*)	−4.6263***	−4.3018**	−3.2596*
	(*iii*)	−1.8920*	−2.5897**	0.1457
First differences	(*i*)	−13.8043***	−10.4793***	−7.5751***
	(*ii*)	−13.2896***	−10.6832***	−7.4814***
	(*iii*)	−14.4180***	−10.5913***	−6.6472***

Note: Phillips-Perron unit root tests are applied in Appendix A to ensure the robustness of serial correlation. All three versions with *a*) constant, *b*) with constant and trend, and *c*) with no constant or tend are included in the model specifications; the optimal lag lengths are chosen based on Schwartz Criterion (SC). *** $p < 0.01$, significant at 1%; ** $p < 0.05$, significant at 5%; * $p < 0.1$, significant at 10%.

Appendix B. Linear and threshold cointegration tests on Southeast Asia's economic ties with China, 1995–2019.

	Panel (*A*): GDP vs. EXPO				Panel (*B*): GDP vs. FDI				Panel (*C*): GDP vs. EXPO and FDI		
	Linear		Nonlinear		Linear		Nonlinear		Linear		Nonlinear
	dY^t		dY_t		dY_t		dY_t		dY_t		dY_t
	(1)		(2)		(3)		(4)		(5)		(6)
Y_{t-1}	−0.8648**	$Y_{t-1}I^x$	−1.9880***	Y_{t-1}	−1.0837***	$Y_{t-1}I^K$	−1.5783***	Y_{t-1}	−1.2314***	$Y_{t-1}I^{x,K}$	−1.4661***
	(0.3599)		(0.4741)		(0.3357)		(0.2992)		(0.3469)		(0.2533)
X_{t-1}	0.0782	$Y_{t-1}I'^x$	0.6576	$Y_{t-1}I'^x$	0.1318	$Y_{t-1}I'^x$	−0.2266	$Y_{t-1}I'^x$	0.2756***	$Y_{t-1}I'^{x,K}$	0.0832
	(0.0626)		(0.5820)		(0.1990)		(0.3666)		(0.0910)		(0.3557)
dY_{t-1}	0.1479	$X_{t-1}I^x$	0.6488**	dY_{t-1}	0.2518	dY_{t-1}	1.1708***	K_{t-1}	0.6998**	$X_{t-1}I^{x,K}$	0.0593
	(0.2845)		(0.2720)		(0.2480)		(0.3867)		(0.2561)		(0.1543)
dX_t	0.0784	$X_{t-1}I'^x$	0.0565	dK_t	−0.2845	$K_{t-1}I'^K$	0.0066	$K_{t-1}I'^K$	0.2374	$X_{t-1}I'^{x,K}$	0.1364**
	(0.0479)		(0.0505)		(0.4053)		(0.1604)		(0.2523)		(0.0589)
dX_{t-1}	−0.0432	dX_t	0.1231**	dX_t	−0.0510	dX_t	−0.3438	dX_t	0.1462**	$K_{t-1}I^{x,K}$	1.8307***
	(0.0446)		(0.0430)		(0.4175)		(0.3214)		(0.0522)		(0.3460)
		dY_t	0.1473			dY_t	0.2063	dX_{t-1}	−0.1158**	$K_{t-1}I'^{x,K}$	0.2908
			(0.2266)				(0.1993)		(0.0507)		(0.1676)
		dX_{t-1}	−0.0518			dK_{t-1}	0.0348	dK_{t-1}	0.6804	dK_{t-1}	0.1394***
			(0.0358)				(0.3381)		(0.4372)		(0.0312)
								dK_{t-1}	0.1204	dK_{t-1}	0.2818
									(0.3659)		(0.2636)
										dY_{t-1}	0.0910
											(0.1475)
										dX_{t-1}	−0.0561
											(0.0320)
										dK_{t-1}	0.1742
											(0.2314)
Constant	2.8050		−4.5142		4.5300**		0.7008		−1.3320		−3.9509**
	(2.0295)		(2.9701)		(1.6363)		(1.6906)		(2.3302)		(1.5975)
Cointegration											
WaldF-Stat	3.9430				5.2116*				5.7630**		
Waldχ^2*-stat*			24.3396***				29.1031***				84.7644***
$\bar{R}^2$	0.4622		0.6649		0.3718		0.6149		0.5861		0.8677
AIC	5.2405		4.8156		5.3959		4.9548		5.0437		3.9135
LM(1) [a]	0.8166[0.3805]		0.9009[0.3599]		0.0001[0.9941]		0.2221[0.6453]		0.0389[0.8469]		5.3069[0.0467]
LM(2)	2.6863[0.1029]		0.4166[0.6685]		1.6805[0.2218]		0.1813[0.8364]		0.1364[0.8740]		4.0206[0.0619]
ARCH(1) [b]	0.0801[0.7802]		0.8395[0.3710]		0.6122[0.4436]		0.0160[0.9007]		0.0686[0.7962]		0.0353[0.8529]
ARCH(2)	2.9999[0.0766]		0.7248[0.4988]		0.0711[0.9316]		0.3114[0.7365]		0.5157[0.6061]		3.3557[0.0591]
JB [c]	129.4889[0.0000]		1.5818[0.4534]		91.6590[0.0000]		2.9859[0.2247]		15.9091[0.0004]		2.1031[0.3494]

Notes: [a] Breusch-Godfrey serial correlation LM test; [b] ARCH heteroscedasticity test; [c] Jacque-Bera normality test; Standard errors are reported in parentheses, while ρ -values in brackets.
*** p<0.01, significant at 1%; ** p<0.05, significant at 5%; * p<0.1, significant at 10%.

Appendix C. Threshold causalities from China's exports and FDI to Southeast Asia's economic growth, by country 1995–2019.

	ASEAN-6					CLMV				
	Brunei	Indonesia	Malaysia	Philippines	Singapore	Thailand	Cambodia	Laos	Myanmar	Vietnam
	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel (*A*): GDP vs. EXPO										
dY_{t-1}	–	1.1923***	0.5462**	–	0.5257**	–	0.3794	–	–	0.4303**
	–	(0.3780)	(0.2318)	–	(0.2461)	–	(0.2229)	–	–	(0.1818)
dX_{t-1}	–	−0.0160	−0.0796*	–	−0.1696***	–	−0.0029	–	–	−0.0009
	–	(0.0344)	(0.0444)	–	(0.0460)	–	(0.0032)	–	–	(0.0030)
Errorterms										
$\varepsilon^x_{t-1} \cdot I^x$	–	−2.2886***	−2.0450***	–	−1.5828***	–	−0.9000**	–	–	−1.0224***
	–	(0.5033)	(0.3450)	–	(0.3435)	–	(0.3891)	–	–	(0.2347)
$\varepsilon^x_{t-1} \cdot I'^x$	–	1.7717*	−0.9597	–	−1.3721**	–	−0.7736**	–	–	−0.5565*
	–	(0.9181)	(0.7756)	–	(0.5799)	–	(0.2802)	–	–	(0.3141)
Constant	–	−2.5160**	−1.0887	–	−0.4269	–	0.1535	–	–	−0.1886
	–	(1.0711)	(0.8464)	–	(0.8713)	–	(0.5767)	–	–	(0.1545)
Causality										
Shortrun	–	−0.4658	−1.7947*	–	−3.6854***	–	−0.9080	–	–	−0.2964
Longrun	–	12.1127***	18.5041***	–	11.5977***	–	5.8545**	–	–	11.0592***
*Strong*1	–	10.6993***	17.6063***	–	12.7275***	–	3.1693*	–	–	9.5038***
*Strong*2	–	2.5080	1.8524	–	8.3053***	–	5.0598**	–	–	1.6805
τ	–	−1.3070	−1.3169	–	1.0212	–	−2.9350	–	–	−0.1561
$\bar{R}^2$	–	0.5263	0.6779	–	0.6006	–	0.3299	–	–	0.4689
AIC	–	5.5296	5.3109	–	5.6195	–	4.8567	–	–	2.2429
LM(1) [a]		0.7399[0.4024]	2.2839[0.1502]		0.0121[0.9137]		1.2680[0.2767]			0.2861[0.6001]
LM(1)	–	0.6086[0.5570]	1.6885[0.2181]	–	0.9857[0.3961]	–	0.6806[0.5213]	–	–	0.2908[0.7518]
ARCH(1) [b]		1.4197[0.2481]	0.5938[0.4504]		0.3080[0.5854]		0.0887[0.7691]			0.6934[0.4154]
ARCH(2)	–	0.0200[0.9802]	0.3714[0.6952]	–	0.3641[0.7001]	–	0.0930[0.9116]	–	–	5.5537[0.0139]
JB [c]	–	40.6846[0.0000]	9.0553[0.0108]	–	1.4502[0.4842]	–	7.7320[0.0209]	–	–	1.1518[0.5622]

(*Continued*)

Appendix C. (Continued).

	Panel (*B*): GDP vs. FDI									
	ASEAN-6					CLMV				
	Brunei	Indonesia	Malaysia	Philippines	Singapore	Thailand	Cambodia	Laos	Myanmar	Vietnam
	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t	dY_t
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
dY_{t-1}	0.4422*	0.7189*	0.5394**	–	0.1445	0.1567	0.4159*	–	–	0.3962**
	(0.2377)	(0.3506)	(0.1880)	–	(0.2616)	(0.2315)	(0.2203)	–	–	(0.1795)
dK_{t-1}	−0.0393**	−0.0624	0.2207	–	0.0127	0.0274	−0.0129	–	–	0.0221
	(0.0158)	(0.1138)	(0.2420)	–	(0.1910)	(0.0905)	(0.0445)	–	–	(0.0825)
Errorterms										
$\varepsilon^k_{t-1} \cdot I'^k$	−0.6826**	−1.7152***	−1.9534***	–	−1.3637**	−0.8301**	−1.2198***	–	–	−0.8303***
	(0.2879)	(0.4968)	(0.2974)	–	(0.5096)	(0.3148)	(0.3271)	–	–	(0.1978)
$\varepsilon^k_{t-1} \cdot I'^k$	−1.1768**	0.9391	−1.7227**	–	−1.2658**	−1.1442*	−0.5492	–	–	−3.7344
	(0.4968)	(0.9600)	(0.8059)	–	(0.4718)	(0.5457)	(0.4536)	–	–	(3.5351)
Constant	0.3195	−1.6367	−0.8141	–	−0.2990	0.4484	−0.2916	–	–	−0.1378
	(0.5009)	(1.1319)	(0.9608)	–	(1.1189)	(0.9314)	(0.7187)	–	–	(0.1573)
Causality										
Shortrun	−2.4917**	−0.5480	0.9121	–	0.0666	0.3026	−0.2906	–	–	0.2683
Longrun	5.1083**	7.3233***	22.2693***	–	6.0734**	5.0916**	7.7815***	–	–	9.0603***
*Strong*1	5.0384**	6.3212***	21.5680***	–	4.1151**	3.4931*	6.9545***	–	–	8.8280***
*Strong*2	4.8490**	0.4786	3.4164*	–	3.8994**	2.3310	0.7355	–	–	0.6099
τ	1.1819	−1.2776	−2.1574	–	−1.8305	−2.3883	−0.6744	–	–	0.7337
$\bar{R}^2$	0.3139	0.3828	0.7145	–	0.4503	0.3333	0.3589	–	–	0.4092
AIC	4.5123	5.7944	5.1903	–	5.9389	5.5560	4.8125	–	–	2.3494
LM(1) [a]	0.8003[0.3843]	0.0233[0.8806]	3.5031[0.0797]		4.3436[0.0535]	16.2078[0.0010]	1.1319[0.3032]			1.5012[0.2382]
LM(2)	0.6233[0.5495]	0.1787[0.8381]	2.1891[0.1465]	–	2.1208[0.1545]	7.7229[0.0049]	0.7852[0.4739]	–	–	1.0766[0.3657]
ARCH(1) [b]	0.6324[0.4363]	0.3055[0.5869]	0.2074[0.6539]		0.7567[0.3952]	2.9188[0.1038]	0.2537[0.6203]			0.3383[0.5676]
ARCH(2)	0.7660[0.4803]	0.0998[0.9056]	0.3107[0.7370]	–	0.3690[0.6969]	5.5378[0.0141]	0.1131[0.8937]	–	–	6.8228[0.0067]
JB [c]	1.2469[0.5361]	109.4851[0.0000]	12.6003[0.0018]	–	0.5090[0.7753]	4.5841[0.1011]	0.7835[0.6759]	–	–	1.7182[0.4236]

Notes: [a] Breusch-Godfrey serial correlation LM test; [b] ARCH heteroscedasticity test; [c] Jacque-Bera normality test; Standard errors are reported in parentheses, while *p*-values in brackets.
*** p<0.01, significant at 1%; ** p<0.05, significant at 5%; * p<0.1, significant at 10%.