ERIA Discussion Paper Series

No. 384

The Impact of COVID-19 on Business Activities and Supply Chains in the ASEAN Member States and India

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June 2021

Abstract: *This study uncovers the impact of the coronavirus disease (COVID-19) on the business performance, outlook, and regional supply chains of manufacturing and non-manufacturing firms in the Association of Southeast Asian Nations (ASEAN) Member States and India. To address the aim, we conducted an extensive questionnaire survey via internet from November 2020 to February 2021 and received effective replies from 1,789 companies – comprising local firms, including large and small and medium-sized enterprises and multinational firms in all 11 countries. The results show vigorous private dynamism in the region. Firms' business performance during the pandemic was distributed widely from positive to negative, and the firms that were adaptive to the COVID-19 shock – in terms of quickly arranging their supply chains – were more likely to perform well and have a better outlook. Many firms restructured their supply chains to a certain extent in response to the COVID-19 shock. Furthermore, most of the supply chain adjustments are unlikely to be reversed. The COVID-19 outbreak resulted in a number of reduced transaction links in the regional supply chains, while it delivered almost the same number of expanding transaction links. A somewhat disappointing outcome was that the least selected supply chain measure in the wake of the COVID-19 outbreak was supply chain digitalisation, which should have been an accelerator of digital transformation in the regional economy.*

1. Introduction

The coronavirus disease (COVID-19) pandemic has brought unprecedented challenges to the Association of Southeast Asian Nations (ASEAN) Member States (AMS) and India's regional economies. Lockdown measures, including closing businesses and work-from-home orders, disrupted the movement of goods and services in the region and forced firms to change their way of running their businesses. In addition, the uncertainty regarding the timing of the end of the pandemic has put pressure on the regions' economic activities. The impact of COVID-19 on the region is significant. According to the International Monetary Fund, the gross domestic product (GDP) growth rates of ASEAN and India in 2020 plummeted to −3.3% and −8.0% from 4.7% and 4.0% in the previous year (IMF, 2021a). The ASEAN growth rate of −3.3% is the lowest since the Asian financial crisis of 1997–1998.

The ASEAN and Indian economies have experienced three types of economic shock caused by the COVID-19 pandemic. The first one is negative supply shocks to international production networks. As seen in the Great East Japan Earthquake case, direct damage in one place, including a reduction in production or closing businesses, causes indirect damage to companies in other places through supply chains. For instance, suppose company X's production is stopped in one country. In that case, its customer company Y's output production in another country that uses the parts produced by company X will also be stopped or decline. The impact will be even more significant if the parts are difficult to replace. Moreover, its supplier company Z's production will also jam because of the reduction in company X's demand. In January and February 2020, the AMS economies experienced and responded to a shortage of intermediate inputs originating in China (Kimura, 2020). At the beginning of the COVID-19 pandemic, the COVID-19 impact was negative supply shocks.

The second one is negative demand shocks to the macroeconomy. A typical example is the global financial crisis shock in 2007–2009. The crisis started in the United States and spread to other advanced economies, followed by its negative impact on emerging economies (Kose, Otrok, and Prasad, 2012). The subprime mortgage problem affected the soundness of financial institutions, and governments

had to bail out some financial institutions. The financial sector's vulnerability impacted the real economy through negative wealth effects (sharp drops in housing and stock prices), consumer confidence decreases, and a credit crunch. Moreover, small open economies faced decreases in demand for exports and difficulty in securing external funding (Brzoza-Brzezina and Makarski, 2011). These phenomena are considered as negative demand shocks on the macroeconomy. Regarding the case of COVID-19, even negative supply shocks caused by lockdown measures can bring a demand shortage, leading to recessions (Guerrieri et al., 2020). This demand shortage can be interpreted as negative demand shocks.[1] Additionally, even if an economy contains COVID-19 when other foreign economies struggle with the containment of the disease, the economy will suffer negative demand shocks for exports. COVID-19 spread globally in March 2020 and has continued suppressing economic activities in the world. As such, the AMS and Indian economies have experienced negative demand shocks since the global spread of COVID-19.

The third one is positive demand shocks to the goods and services needed to respond to the COVID-19 pandemic. The spread of COVID-19 significantly surged demand for critical supplies and personal protective equipment. The demand spikes brought widespread shortages and pressured healthcare supply chains (Hannah, 2021). The COVID-19 pandemic also brought social distancing and work-from-home requirements to communities, which resulted in a rise in demand for information and communication technology (ICT) equipment and internet-based services (De, Pandey, and Pal, 2020). These positive demand shocks create pressure on the current production network and service suppliers but, at the same time, present opportunities for firms to grow now and after the COVID-19 pandemic.

The existing studies have tackled the degree of the impact of these economic shocks using country-level trade data. Ando (2021) used the monthly data of Japanese bilateral machinery trade, including trade with AMS, during the first wave of the COVID-19 pandemic; and claimed that international production networks in East Asia were robust to negative supply shocks, that the negative demand shocks were confirmed due to the simultaneous declines in quantities and prices of

[1] Guerrieri et al. (2020) called this shock a Keynesian supply shock.

products, and that positive demand shocks were observed for products related to teleworking, disinfection, and stay-at-home activities. Hayakawa and Mukunoki (2021) used worldwide bilateral machinery trade data and pointed out that negative supply shocks to the supply chains were more significant than negative demand shocks in the early stage of the pandemic. These recent studies provided insights into the impact of the shocks caused by COVID-19 on the economies, whereas their industry scope was limited to specific manufacturing industries. In particular, what happened to ICT services attracts researchers and policymakers considering a picture of economic growth in the post-COVID-19 pandemic period. Additionally, country-level data cannot deliver information on how the regional economies reacted to the economic shocks from the firm- or transaction link-level perspectives (e.g. differences in business performance or supply chain measures between large firms and small and medium-sized enterprises (SMEs)).

Based on this motivation, our study aims to unveil the following four categories of questions through a questionnaire survey on the COVID-19 impact on business activities and supply chains to manufacturing and non-manufacturing companies in ASEAN and India. The first is how significantly COVID-19 affected business performance in the region. This category of questions asks respondents about the effect of COVID-19 on sales or operating profits and the business outlook for the next few years. The second is how the COVID-19 shock impacted and is expected to change the regions' supply chain networks. Thirdly, we ask about measures taken to recover from the COVID-19 impact. The fourth is the current status of government assistance and expected support from governments.

To make the aim of our study more concrete, here we present key research questions for this paper. Firstly, how were the firms' sales, exports, and operating profit growth rates in the first year of the COVID-19 pandemic distributed? How about the case of the firms' business outlook? What attributes of firms affected their business performance and outlook? Did any specific pattern of the firms' supply chains influence them? The existing studies about the COVID-19 impact on firms' business performance in the ASEAN and India regions have been less comprehensive in terms of region, industry, size, and local or international entities. By taking advantage of the comprehensiveness of the survey, we show that firms'

business performance during the pandemic was distributed widely from positive to negative, and the firms that were adaptive to the COVID-19 shock – in terms of quickly arranging their supply chains – were more likely to perform well and have a better outlook. Moreover, manufacturing and ICT firms tended to show better performance in 2020 than other industries, which suggests that international production networks in the region have been relatively robust to negative supply shocks and that positive demand shocks have benefitted ICT services.

Secondly, how did or will the firms reconstruct their customer and supplier relationships and production locations in the first year of the COVID-19 outbreak? To what degree? Are the changes temporary or in a medium- or long-term perspective? Did or will the pre-COVID-19 transaction links between customers and suppliers increase, remain, or shrink? For what reason? What attributes of transaction links affected their vulnerability to the COVID-19 shocks? We show that many firms restructured their supply chains to a certain extent in response to the COVID-19 shock. Furthermore, the majority of the supply chain reforms are unlikely to be reversed.

Thirdly, what kind of measures related to the supply chains did firms take in response to the COVID-19 pandemic? Were there any combinations of different measures against COVID-19 that firms preferred to implement? Were there any differences in the attributes of firms that took different measures against COVID-19? We find that the most selected supply chain measure was cost reduction. On the contrary, the least was supply chain digitalisation. Remote operations were not chosen by many respondents. The firms that implemented supply chain digitalisation tend to have implemented both supply chain optimisation and remote operations. If a firm is large, young, or has diversified customers across countries, it is more likely to implement supply chain digitalisation.

Lastly, to what extent have firms in AMS and India received government assistance packages in response to the COVID-19 pandemic? Are the firms satisfied with the government support? What kind of government support do the firms expect to receive? We confirm that the number of firms that received government support and their satisfaction levels varied by country. There was not much difference in whether or not firms received or were satisfied with government assistance in terms

of firm size and industry. Tax cuts were the most preferred government support for firms. Wage subsidies and the expansion of business people's mobility across borders were the firms' second and third preferences for government support. Rent aid was more likely to be preferred by smaller firms as expected government support.

The remainder of this paper is organised as follows. Section 2 describes the outline and method of the survey we conducted as well as the attributes of respondents. Section 3 provides nine major findings (findings 1 to 9) along with the four categories of the survey. Section 4 addresses the key research questions and delivers policy implications to conclude this paper.

2. Questionnaire Survey and Data

The Economic Research Institute for ASEAN and East Asia (ERIA) commissioned Deloitte Consulting Pte Ltd (Deloitte) to conduct a survey on the impact of COVID-19 on business activities and supply chains in the ASEAN and India regions (COVID-19 survey). The primary purpose of the COVID-19 survey is to comprehend the degree of COVID-19 impacts on the supply chains in the East Asia and ASEAN region. We, the authors of this paper, are the members of this survey project.

The COVID-19 survey's target countries are India and the AMS: Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam. The industries covered are both manufacturing and non-manufacturing. The survey does not exclude any firm size. The targeted firms include both local and multinational firms.

The questionnaire comprises three parts. The first part covers the COVID-19 impact on business performance and outlook. More concretely, the questionnaire asks about respondents' sales, exports, and operating profits in 2020; and their outlook for operating profits and employment in the next 1–2 years. The first part also asks whether the COVID-19 pandemic or other factors, including the trade friction between China and the United States (US), caused changes in operating profits.

The second part covers the COVID-19 impact on supply chains in the target regions. The respondents answered questions about their top three customers and suppliers' attributes (including country, industry, and firm size) and whether and why they implemented or planned to change their relationship with customers and suppliers. They also responded to inquiries as to whether they changed or had the intention to change their production locations. As well as the questions about each of the top three customers and suppliers, the survey asks the respondents about their overall customer and supplier relationships. The respondents answered whether they changed or planned to change their overall customer and supplier relationships, the degree of such changes, and the reason for such changes. The second part also includes a question about respondents' supply chain measures against the COVID-19 pandemic. The respondents were required to choose one or more from a list of measures, including cost reduction, changes in supply chains, and digitalisation.

The third part covers the respondents' evaluation of government support in response to COVID-19. All the survey questions are available in the Appendix for readers who are interested in detail. The respondents answered the questionnaire online and spent about 30 minutes completing the survey.

One of the survey's challenges was how to collect respondents to a lengthy questionnaire when firms received several COVID-19-related questionnaire surveys.[2] To respond to this challenge, we designed multiple survey channels to collect respondents.

The first channel was Deloitte's customer network. The primary target firms through this channel were multinational or relatively large-scale companies. Deloitte provides audit, consulting, financial advisory, risk advisory, tax, and related services to public and private clients spanning multiple industries. Deloitte currently has about 330,000 people in more than 150 countries and territories, and serves four out of five Fortune Global 500® companies. Deloitte Touche Tohmatsu

[2] The Asian Development Bank (ADB) conducted a survey of Philippine businesses in April and May 2020 (ADB, 2020). Japan External Trade Organization (JETRO) carried out a survey of Japanese affiliated enterprises in Southeast Asia in August and September 2020 (JETRO, 2021). The American Chamber of Commerce in Indonesia (AmCham Indonesia) and ERIA conducted a rapid survey for AmCham Indonesia's member firms in April 2020 and undertook a more detailed survey of foreign firms in ASEAN in collaboration with 24 chambers and business organisations in September 2020 (AmCham Indonesia and ERIA, 2020).

Limited (DTTL) member firms and each of their related entities form the Deloitte organisation. DTTL and each of its member firms are legally separate and independent entities, but individual Deloitte firms have access to the skills and knowledge of, and the ability to consult within, the Deloitte organisation. Deloitte is a member firm of DTTL and the consulting firm in Singapore, which can leverage the entire DTTL resources. Deloitte sent the online questionnaires to 3,269 companies operating in ASEAN and India, and it collected 412 respondents (12.6%).

The second survey distribution channel is industry associations. We approached several foreign industry associations, including the Japanese and British chambers of commerce in Asia and local industry associations.[3] All the participating industry associations are listed in the Appendix. These industry associations distributed the online questionnaire to their member firms. The international industry associations' target firms were international enterprises, while those of the local industry associations were local domestic firms. The estimated number of firms through the second channel that received the questionnaire was 11,199, and the number of respondents was 93 (0.8%).

The third distribution channel was business-to-business market research companies. The above two channels had access to relatively large-scale companies. We commissioned SIS International Research Inc and Market Xcel Data Matrix Pvt Ltd, which are experienced in the East Asia and ASEAN regions, to expand the coverage to SMEs. These two research companies distributed the questionnaire to 62,620 companies, and they gathered 1,578 respondents (2.5%).

The survey was split into two phases to collect and analyse the responses efficiently. The first phase covered Malaysia, Singapore, and Thailand, which are considered more mature than the other AMS. We also expected to collect a substantial number of these countries' responses to obtain some results representing the ASEAN economies. This first phase was carried out from 17 November 2020

[3] We would like to thank the member institutes of the ERIA Research Institutes Network for inputting the industry associations list.

to 8 January 2021.[4] The second phase targeted the other eight countries and took place from 1 December 2020 to 16 February 2021.

We also interviewed executives from four respondent firms about this questionnaire survey and obtained more detailed comments from the executives. The four firms are a tobacco manufacturing firm in Viet Nam, a personal care manufacturing firm in Indonesia, a pharmaceutical manufacturing firm in the Southeast Asia region, and a premium car wholesale firm in Thailand. The first to the third firms' interviews were conducted on 18 January 2021, and the fourth was done on 20 January 2021.

2.1. Attributes of Respondents

Amongst 2,083 respondents who answered at least one question in the survey, 1,789 firms responded both their sales growth rates in 2020 and employment outlook in the next few years, which are critical to analyse the COVID-19 impact on business performance and outlook. Thus, we consider these 1,789 observations as valid respondents in this survey and briefly summarise their attributes.

Table 1 reports the attributes of respondents from the country and industry perspectives. The larger the economy, the larger the number of respondents in general. The column on the far right of the table shows the total number of respondents of each targeted country. India had the highest number of respondents (717), followed by Indonesia (204) and the Philippines (180). The Lao PDR had the smallest number (15), preceded by Brunei (17). According to the International Monetary Fund (IMF, 2020), India also had the largest GDP ($2,869 billion) in 2019, followed by Indonesia ($1,120 billion), and the Philippines was fourth ($377 billion).[5] The Lao PDR had the second smallest GDP ($19 billion), while Brunei had the smallest GDP $13 billion). Therefore, the countries' order in terms of respondents is roughly the same as that of economic scale.

The respondents' shares of each country by industry roughly reflect their GDP shares. For example, Thailand had the highest number of respondents classified as manufacturing (39.9%) amongst the countries. According to the World Bank's World Development Indicators (accessed 4 April 2021), Thailand's manufacturing share in GDP in 2019 was 25.3%, the largest amongst the countries.

[4] The deadline for responses was 8 January 2021. A few companies responded to the questionnaire after the deadline and we included their responses in our data set.
[5] Thailand had the third largest GDP ($544 billion) in 2019.

The range of the manufacturing respondents' shares was from 6.7% (Lao PDR) to 39.9% (Thailand). The corresponding range of GDP shares in 2019 was from 7.5% (Lao PDR) to 25.3% (Thailand) based on the World Development Indicators. Although we did not examine the breakdown of the respondents by detailed service sector due to data limitations, it can be stated that the respondents approximately represent the industry GDP shares of each country.

Table 1: Breakdown of Respondents by Country and Industry

Country	MAN	WHO	ICT	TRA	BUS	OTH	Total
Brunei	2	1	1	3	8	2	17
	(11.8)	(5.9)	(5.9)	(17.6)	(47.1)	(11.8)	(100.0)
Cambodia	14	7	6	5	14	19	65
	(21.5)	(10.8)	(9.2)	(7.7)	(21.5)	(29.2)	(100.0)
Indonesia	50	17	47	8	42	40	204
	(24.5)	(8.3)	(23.0)	(3.9)	(20.6)	(19.6)	(100.0)
Lao PDR	1	2	2	1	5	4	15
	(6.7)	(13.3)	(13.3)	(6.7)	(33.3)	(26.7)	(100.0)
Malaysia	24	6	18	3	24	28	103
	(23.3)	(5.8)	(17.5)	(2.9)	(23.3)	(27.2)	(100.0)
Myanmar	7	2	8	0	10	7	34
	(20.6)	(5.9)	(23.5)	(0.0)	(29.4)	(20.6)	(100.0)
Philippines	34	25	35	4	46	36	180
	(18.9)	(13.9)	(19.4)	(2.2)	(25.6)	(20.0)	(100.0)
Singapore	47	24	28	15	44	19	177
	(26.6)	(13.6)	(15.8)	(8.5)	(24.9)	(10.7)	(100.0)
Thailand	55	13	23	6	19	22	138
	(39.9)	(9.4)	(16.7)	(4.3)	(13.8)	(15.9)	(100.0)
Viet Nam	39	10	23	5	34	28	139
	(28.1)	(7.2)	(16.5)	(3.6)	(24.5)	(20.1)	(100.0)
India	246	47	171	55	94	104	717
	(34.3)	(6.6)	(23.8)	(7.7)	(13.1)	(14.5)	(100.0)
Total	**519**	**154**	**362**	**105**	**340**	**309**	**1789**
	(29.0)	**(8.6)**	**(20.2)**	**(5.9)**	**(19.0)**	**(17.3)**	**(100.0)**

BUS = business services, ICT = communications and/or software, Lao PDR = Lao People's Democratic Republic, MAN = manufacturing, OTH = other services, TRA = transportation, WHO = wholesale and/or retail,
Note: Industry shares in each country are in parentheses.
Source: Authors.

The survey respondents may have a more significant share of large firms than in the actual economy. Table 2 reports the breakdown of respondents by country and firm size. The share of large firms (with more than 100 employees) in the total sample was 56.6%. Excluding Brunei and the Lao PDR, which have a limited number of samples, the target countries' large firm shares ranged from 43.5% to 72.8%. In contrast to these figures, the mean share of large firms amongst the targeted countries, except Brunei and Singapore, was 23.2% based on the World Bank's Enterprise Surveys (accessed 6 April 2021), whose samples were collected along with the stratification methodology in terms of industry, size, and geographical location. The World Bank's Enterprise Surveys also indicate that the range of large firm shares of the nine countries was 6.6% (Lao PDR) to 31.4% (Malaysia). It should be noted that the share of large firms in the total production or sales is significantly larger compared with the actual case in terms of the number of firms, which means that our analysis of the impact of COVID-19 on the economic situation of the countries is likely to reflect the actual situation in terms of scale.

Table 2: Breakdown of Respondents by Country and Firm Size (%)

Country	Small	Medium	Large
Brunei	58.8	11.8	29.4
Cambodia	25.4	30.2	44.4
Indonesia	21.2	25.1	53.7
Lao PDR	60.0	20.0	20.0
Malaysia	34.0	22.3	43.7
Myanmar	26.5	35.3	38.2
Philippines	23.3	27.2	49.4
Singapore	40.3	24.4	35.2
Thailand	27.5	18.1	54.3
Viet Nam	26.8	29.7	43.5
India	11.3	15.8	72.8
Overall	**22.0**	**21.4**	**56.6**

Lao PDR = Lao People's Democratic Republic.
Notes: Small = less than 20 employees, medium = 20 employees or more and less than 100, large = 100 employees or more. Each cell's value stands for the ratio of the corresponding row country's respondents whose firm size is the corresponding column category to the row total.
Source: Authors.

About 30% of the respondents were multinational companies. Table 3 shows the country or region of ownership of the respondents. The owners of most of the multinational companies were located in Japan, followed by Europe and the US.

Table 3: Country/Region of Ownership of Respondents (%)

Country	Domestic companies	Japan	US	Europe	China	ASEAN	Other countries
Brunei	94.1	0.0	0.0	0.0	0.0	0.0	5.9
Cambodia	61.5	4.6	3.1	7.7	3.1	18.5	1.5
Indonesia	74.5	9.3	2.0	3.9	0.0	5.9	4.4
Lao PDR	66.7	6.7	6.7	6.7	0.0	13.3	0.0
Malaysia	76.7	10.7	1.0	3.9	1.0	4.9	1.9
Myanmar	61.8	2.9	2.9	8.8	2.9	14.7	5.9
Philippines	73.3	7.2	5.0	5.0	1.7	3.9	3.9
Singapore	67.2	15.8	4.0	8.5	0.0	2.3	2.3
Thailand	43.2	28.1	5.0	8.6	3.6	7.2	4.3
Viet Nam	56.8	20.9	2.2	4.3	0.0	8.6	7.2
India	74.2	2.5	10.6	8.6	0.4	0.6	3.1
Overall	**69.3**	**9.1**	**6.2**	**7.0**	**0.8**	**4.1**	**3.6**

ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People's Democratic Republic, US = United States.

Notes: Each cell's value stands for the ratio of the corresponding row country's respondents whose owner locates in the corresponding column country to the total respondents in the row country. The ASEAN column represents ASEAN Member States' companies' shares as foreign investors in each country. Taking Cambodia as an example, 18.5% of the Cambodia respondents were companies whose owners were based in ASEAN Member States other than Cambodia.

Source: Authors.

3. Empirical Findings

3.1. COVID-19 Impact on Business Performance and Outlook

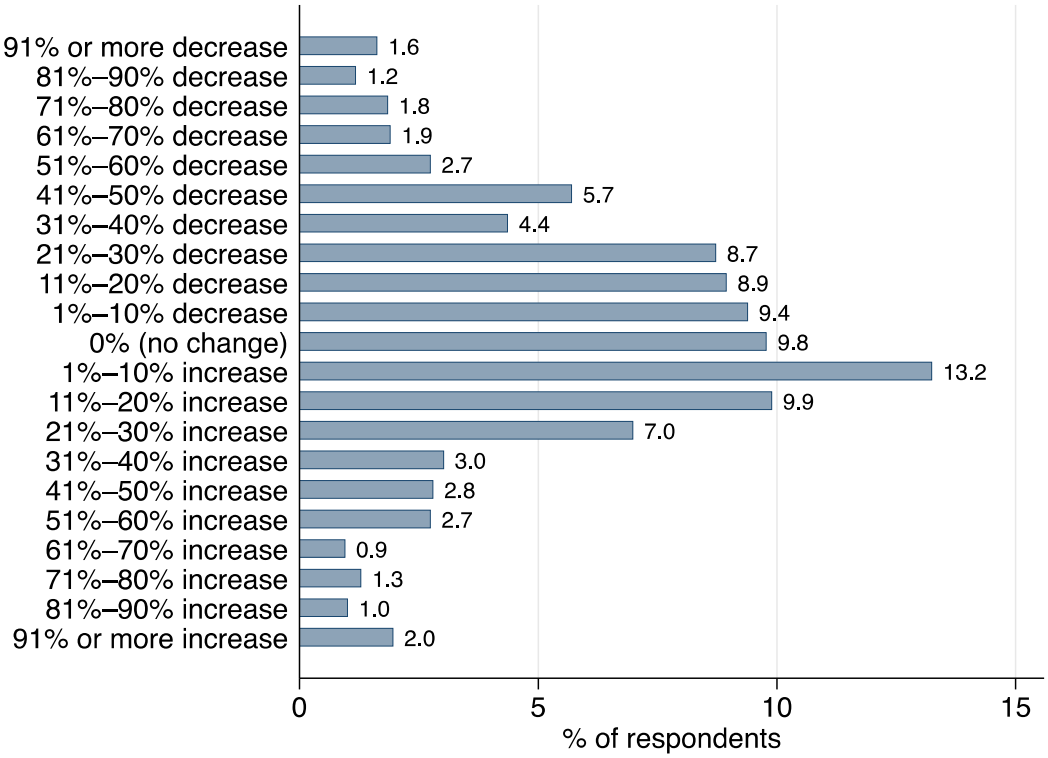
Finding 1: The averages of 2020 sales, exports, and operating profits growth are negative. The growth rates are broadly distributed. These results show that the COVID-19 pandemic negatively affected firms' overall business performance, but the degree of the impact varies greatly from firm to firm – from positive to negative. Regarding the business outlook, firms intend to hire 6.5% more workers on average in the next few years. About a quarter of the firms will decrease their workers, whereas about half of them will increase their number of employees. Firms' business performance during the COVID-19 pandemic and employment outlook after COVID-19 are heterogenous.

The COVID-19 pandemic indeed harmed firms' business performance. It is not valid, however, that all of the firms were equally affected by the pandemic. Figure 1 presents the distribution of all the respondents' sales growth rates in 2020. It may be surprising that most of the respondents chose an increase of 1%–10%. Nevertheless, the number of respondents who chose positive sales growth choices was slightly less than those who chose negative sales growth choices. Table 4 shows the summary statistics of all the respondents' sales in 2020. To calculate the summary statistics, we replaced each increase or decrease range with its centre value. For example, we took an increase of 1%–10% as 5%. As seen in the table, the mean 2020 sales growth rate was −2.73%. Moreover, a quarter of the respondents had less than −25% in sales growth, whereas another quarter had more than 15%.

Table 4 also reports the summary statistics of all the respondents' exports (sales in foreign countries) and operating profits in 2020. As in the case of sales, the results show that the averages of the exports and operating profits growth rates were negative, while their ranges were wide across positive and negative. These results show that the COVID-19 negatively impacted on business performance in the ASEAN region and India in general. However, there were significant differences amongst the firms in terms of the vectors of COVID-19 impacts.

Furthermore, Table 4 indicates firms' intention to hire more workers in the next few years. The mean of the respondents' employment growth outlook was 6.49%; the median was 5%; and the 25th and 75th percentiles were 0% and 15%, respectively. These percentiles imply that about half of the respondents expected their employment growth in the next few years to range from 0% to 15%. They also indicate that only a quarter of respondents chose negative numbers for the employment growth outlook.

Figure 1: 2020 Sales Growth Rates (%, annual)



Source: Authors.

Table 4: Summary Statistics of Sales, Exports, Operating Profits Growth in 2020, and Employee Growth Outlook in the Next Few Years

Variables	Mean	SD	Skew	Kurt	p5	p25	p50	p75	p95
2020 sales	-2.73	36.66	0.09	3.64	-65	-25	0	15	65
2020 exports	-1.11	29.25	-0.11	6.25	-55	-5	0	5	45
2020 profits	-0.96	35.27	0.06	3.94	-65	-15	0	15	65
Emp outlook	6.49	24.37	0.31	7.28	-25	0	5	15	55

p5 = 5th percentile, p25 = 25th percentile, p50 = 50th percentile (median), p75 = 75th percentile, p95 = 95th percentile, Emp outlook = employee growth outlook in the next few years, Kurt = kurtosis, SD = standard deviation, Skew = skewness.
Notes: We replaced each increase/decrease range with its centre value. For example, we took the 1%–10% increase as 5%. We removed the choices of 'return to deficit', 'reduction in deficit', 'fallen into deficit', and 'increase in deficit' for the summary statistics of 2020 operating profits.
Source: Authors.

Finding 2: Firms experienced better business performance during the COVID-19 pandemic on average when their share of full-time workers was high, when they were young, or when they were located in a less mature economy. Firms expanded exports if the owner of the firm was based in a foreign country. Firms had more sales or operating profits if they changed – either towards diversification or concentration – their production allocations across countries during the pandemic. Manufacturing and ICT firms tended to show better performance in 2020 than other industries.

Next, we conduct several regression exercises to find relationships between a firm's business performance during the COVID-19 pandemic and its profile. Table 5 shows the regression results on firm-specific factors, including employment, firm age, parent companies' location, domiciles, and industries. There are six estimation models. The first (1-1) and second (1-2) ones are the regressions of sales in 2020 on firm attributes. The difference between the first and second one is in the foreign-affiliated factor variable. This variable takes unity when an observation's parent company locates overseas and otherwise zero in the first model. In the second model, this factor variable is broken down to Japanese, US, European, Chinese, ASEAN, and other countries' foreign-affiliated firms. The dependent variables of the third (2-1) and fourth (2-2) models are exports in 2020. The fifth (3-1) and sixth (3-2) models' dependent variable is operating profits in 2020.

A notable finding is that the full-time ratio variables are significantly positively correlated with sales, exports, and operating profits. To put it the other way round, a firm with more non-regular employees experienced worse business performance. This result may have something to do with the character of COVID-19 impacts on the economy, as pointed out by Kikuchi, Kitao, and Mikoshiba (2020). They examined Japan's employment status and consumption data, and concluded that low-skilled and contingent employees suffered more from COVID-19 than high-skilled and full-time employees. They asserted that the COVID-19 shock impacted more on industries where many low-skilled and non-regular people work. Our regressions control for industry effects, but the industry classification is still rough (six categories). The finding of Kikuchi, Kitao, and Mikoshiba (2020) can be applied to interpreting the correlation between the full-time ratio and business performance. Note that it is possible that firms may have reduced full-time employment in response to the COVID-19 pandemic – i.e. COVID-19 may have caused decreases in firms' sales, so firms needed to cut full-time employment. It should be noted that, conversely, firms may have reduced non-regular employees first in response to decreases in sales to secure profits or to avoid bankruptcy. We need a panel data set to identify the cause and effect.

A firm's age is also related to its business performance. Columns (1-1) and (1-2) in Table 5 show that the firm age variable is significantly negatively correlated with sales in 2020 at the 0.1 level. Columns (3-1) and (3-2) indicate a negative correlation between the firm age and operating profits at the 0.01 level. This means that the younger the firm, the better the firm's performance. The listed factor variable is also significant at the 0.05 level in the fifth and sixth models. Firms that are listed on the stock market may care more about their operating profits than non-listed firms. The owner-managed, or founder-managed, factor is significantly positively correlated with exports at the 0.05 level. Whether a firm is foreign-affiliated or not also significantly positively affects exports at the 0.05 level. This result may come from the multinational companies' efficient international production networks. Alternatively, multinational firms are more oriented towards exports than local firms, so the result appears to reflect the export motive of multinational firms.

In response to the COVID-19 shock, flexibly changing a firm's group-wide production across multiple countries seems good for firms to increase sales and operating profits. Table 6 shows the regression results of six models for examining the relationship between firms' global supply chain factors and business performance. The regressors include three types of Herfindahl-Hirschman Indexes (HHIs). The survey asked the respondents to indicate the percentage of their customers, suppliers, and production in each country globally for 2019 and 2020, e.g. firm X sold its 30% of its products in Thailand, 40% in Japan, and 30% in the US. The regressor customer-HHI stands for a firm's HHI, calculated by summing all the squared percentages of customer country values for 2019. In the above case, the firm has a customer-HHI of 0.34 (= $0.3^2 + 0.4^2 + 0.3^2$). The smaller the customer-HHI of a firm, the more diversified the suppliers of the firm. Supplier-HHI and production-HHI are calculated in the same way. The value of difference in HHI (DHHI) is obtained by subtracting the HHI for 2019 from the HHI for 2020. Thus, DHHI refers to a firm's change in its supply chains during the first year of the COVID-19 pandemic. Table 5 does not have any significant HHI variables. Consequently, there are no simple relationships between a firm's diversification or concentration 'level' of its customers, suppliers, or production locations and its business performance during the COVID-19 crisis. In contrast, we can find significant production-DHHI^2 variables in the second and sixth models. When the production-DHHI^2 is excluded, the production-DHHI variable is not significant. These results imply a positive relationship between a firm's 'change' – either towards diversification or concentration – in the share of production across multiple countries and its sales and operating profits during the COVID-19 pandemic. Note that we considered a possibility of multicollinearity between the HHI and DHHI, and conducted additional regressions for a robustness check (Table A1 in the Appendices). These additional regressions did not change the results shown in Table 5.

The outcome that a better performing firm is more likely to have changed its share of production across countries may result from the firm's group-wide response to significantly different economic environmental changes across countries due to the COVID-19 pandemic. Note that regarding the questions about

the share of production across countries, when a respondent was a branch office or a subsidiary, it reported its parent firm's opinion. The COVID-19 shock affected the global economy, but its degree, duration, and ebb and flow significantly varied across countries. The COVID-19 shock brought about lockdown measures that limited firms' activity levels from the supply side, including work-from-home requirements. These lockdown measures varied across time and place. The COVID-19 shock also impacted on the demand patterns of products and services. It created a surge in demand for medical products and equipment, but a sharp decrease in demand for face-to-face services. The lockdown measures in response to the COVID-19 pandemic significantly increased the demand for information and communication technology (ICT) services and equipment for working from home. Firms that increased sales or earned more profits may have quickly adjusted their production portfolio to respond to the supply-side requirement and the surge in products and services in high demand during the pandemic.

Table 5 reports on whether the country factor creates significant differences in business performance. The base level of the country factor is India and that of the industry factor is other services industries. The regression results show that in the more mature countries – Malaysia, Thailand, and Singapore – firms have significantly lower business performance than Indian firms. For instance, firms whose domicile is Malaysia register about 10% lower sales growth in 2020 than Indian firms, while Singapore and Thailand's firms have sales growth about 8% and 17% lower than Indian firms. These results may come from the phenomenon whereby more mature countries or those with higher GDP per capita tend to have lower economic growth rates (developed economies vs. catch-up economies).[6]

Table 5 also indicates that the manufacturing, ICT, and business services firms have better performance than the other industry category. It is worth noting that wholesale and/or retail firms have more sales growth in total than the base industry.

[6] In fact, the average growth rates of Malaysia, Singapore, Thailand, and the other targeted countries in 2019 were 4.3%, 0.7%, 2.3%, and 5.6%, respectively, according to IMF (2020).

Table 5: Firm-Specific Factors and Business Performance in 2020

Independent variables	(1-1) Sales growth	(1-2) Sales growth	(2-1) Export growth	(2-2) Export growth	(3-1) Profit growth	(3-2) Profit growth
Log employees	0.66	0.68	0.37	0.41	0.62	0.63
	(0.43)	(0.43)	(0.37)	(0.38)	(0.43)	(0.44)
Full-time ratio	0.12***	0.12***	0.12***	0.12***	0.09***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age	-0.05*	-0.05*	-0.02	-0.02	-0.08***	-0.08***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
Listed	2.96	1.93	3.01	2.85	5.23**	4.38*
	(2.21)	(2.24)	(1.94)	(1.97)	(2.23)	(2.27)
Owner-managed	-0.54	-0.97	3.59**	3.59**	-0.58	-0.85
	(1.88)	(1.88)	(1.57)	(1.59)	(1.97)	(1.99)
Foreign-affiliated	3.21		4.84**		2.18	
	(2.39)		(1.94)		(2.39)	
Japanese-affiliated		-0.56		4.81		0.43
		(3.65)		(3.82)		(4.65)
US-affiliated		3.03		2.10		4.18
		(3.07)		(2.38)		(3.25)
European-affiliated		4.64		5.60		2.08
		(3.70)		(3.43)		(3.63)
Chinese-affiliated		5.97		6.30		6.02
		(11.60)		(3.85)		(8.80)
ASEAN-affiliated		-4.60		1.85		-3.02
		(5.36)		(3.67)		(5.37)
Other-affiliated		12.80***		9.29**		5.35
		(4.71)		(4.08)		(4.74)
Cust-HHI	0.51	5.25	3.86	-8.48	0.07	-1.51
	(4.49)	(20.46)	(4.17)	(20.91)	(4.73)	(22.86)
Cust-HHI^2		-4.21		9.74		0.56
		(15.82)		(15.41)		(17.64)
Supp-HHI	3.36	-6.40	2.08	19.38	1.53	-21.03
	(5.20)	(22.43)	(4.89)	(23.17)	(5.61)	(24.30)
Supp-HHI^2		8.30		-13.23		18.14
		(17.45)		(17.25)		(19.03)
Prod-HHI	6.68	1.51	2.67	-11.20	4.46	14.27
	(4.90)	(21.37)	(4.88)	(20.34)	(5.24)	(24.79)
Prod-HHI^2		3.20		10.65		-8.33
		(16.51)		(15.60)		(19.26)
Cust-DHHI	-11.45	-7.87	-4.58	-3.71	-2.35	1.88

Independent variables	(1-1) Sales growth	(1-2) Sales growth	(2-1) Export growth	(2-2) Export growth	(3-1) Profit growth	(3-2) Profit growth
	(8.01)	(8.78)	(7.99)	(8.63)	(7.70)	(7.87)
Cust-DHHI^2		3.37		1.63		2.34
		(7.49)		(7.57)		(6.47)
Supp-DHHI	1.70	2.38	-4.27	-3.32	-8.06	-7.80
	(6.51)	(6.50)	(6.04)	(6.32)	(6.97)	(7.00)
Supp-DHHI^2		2.75		-1.65		3.53
		(4.39)		(4.63)		(4.27)
Prod-DHHI	11.51	20.36**	8.77	10.75	0.46	10.39
	(8.65)	(9.45)	(7.50)	(8.58)	(9.74)	(10.59)
Prod-DHHI^2		19.12**		7.82		18.67**
		(7.86)		(8.35)		(8.17)
Brunei	6.57	7.60	-3.78	-4.06	18.86*	20.32**
	(9.05)	(8.98)	(6.67)	(6.73)	(10.17)	(10.32)
Cambodia	4.12	6.63	-1.47	-0.79	0.24	2.19
	(6.04)	(6.20)	(4.89)	(5.08)	(5.71)	(5.98)
Indonesia	-0.97	0.08	-0.76	-0.64	0.61	1.42
	(3.39)	(3.42)	(2.71)	(2.77)	(3.34)	(3.34)
Lao PDR	14.72	17.23	7.28	8.04	2.69	4.92
	(11.69)	(11.50)	(9.37)	(9.30)	(12.08)	(12.11)
Malaysia	-10.67**	-9.00**	-7.34**	-7.11**	-7.56*	-6.17
	(4.27)	(4.29)	(3.37)	(3.41)	(4.50)	(4.54)
Myanmar	14.28*	15.88**	5.76	6.41	8.15	9.16
	(7.95)	(8.08)	(6.93)	(6.92)	(9.01)	(9.04)
Philippines	1.53	2.94	0.74	0.99	7.31**	8.40**
	(3.62)	(3.65)	(2.86)	(2.91)	(3.66)	(3.72)
Singapore	-8.64***	-7.02**	-6.21**	-5.92**	-3.04	-1.75
	(3.02)	(3.08)	(2.78)	(2.82)	(3.41)	(3.43)
Thailand	-17.16***	-15.59***	-10.50***	-10.43***	-18.89***	-17.88***
	(3.58)	(3.62)	(3.25)	(3.27)	(4.31)	(4.32)
Viet Nam	-6.88*	-5.42	-3.34	-3.50	-6.05	-4.73
	(3.90)	(4.05)	(2.86)	(3.00)	(3.99)	(4.12)
Manufacturing	10.69***	10.89***	4.79**	4.67*	6.96**	6.93**
	(2.82)	(2.84)	(2.41)	(2.46)	(2.87)	(2.91)
Whole/retail	7.67*	7.29*	-0.82	-1.26	2.62	2.62
	(3.91)	(3.92)	(3.52)	(3.54)	(4.13)	(4.20)
ICT	14.91***	14.78***	5.54**	5.76**	9.95***	9.72***
	(2.97)	(2.98)	(2.38)	(2.39)	(2.96)	(2.97)
Transportation	5.11	5.13	1.01	1.03	0.38	0.55

Independent variables	(1-1) Sales growth	(1-2) Sales growth	(2-1) Export growth	(2-2) Export growth	(3-1) Profit growth	(3-2) Profit growth
	(4.43)	(4.46)	(3.75)	(3.78)	(4.52)	(4.53)
Business services	9.17***	8.99***	4.26*	4.32*	5.60*	5.45*
	(3.09)	(3.09)	(2.36)	(2.38)	(3.09)	(3.11)
Observations	1,723	1,723	1,607	1,607	1,528	1,528
R^2	0.072	0.083	0.055	0.059	0.064	0.073

ASEAN = Association of Southeast Asian Nations, DHHI = difference in Herfindahl-Hirschman Index between 2020 and 2019, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic, US = United States.
Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Owner-managed = a dummy variable that takes unity if a firm is managed or practically controlled by its founder or a major individual shareholder. Foreign-affiliated = a dummy variable that takes unity if a firm is one whose foreign investors hold 10% or more of the firm's shares. All the models control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.
Source: Authors.

Finding 3: The more a firm sold in 2020, the more operating profits growth or employment outlook the firm projects in the next few years, and the more likely to expand its business or the less likely to shrink. The more workers a firm had in 2020, the more operating profits outlook the firm has, and the less employment growth prospects in the next few years. A firm that changed its international supply chains to some degree during the COVID-19 pandemic is likely to earn more profits, expand business, not shrink business, and hire more workers. ICT firms are more likely to expand their businesses and hire more workers than other industries.

Before describing finding 3, we explain the models and methods used in this part. The survey questioned the respondents on the outlook for operating profits in 2021 compared with 2020. The respondents were required to choose the most appropriate answer from the following three options: decrease, remain at the same level, or increase. These options have an increasing order. Thus, we used the ordered logit regression method to estimate the first model shown in Table 6. In the second and third models, dependent variables are dummy variables. The second model's 'expand' variable takes one when a respondent chose the expansion option for the inquiry about its business direction in the next 1–2 years. The third model's 'shrink' variable takes one if a firm selected the downsizing, withdrawal, or return to its parent firm's country option. We regress these two models by ordinary least

squares estimation with robust standard errors (known as linear probability modelling). The fourth model's labour variable can take values in 10% increments from −95% to 95%, following the same replacement method explained in finding 1.

A firm that experienced better business performance during the COVID-19 pandemic tends to expect more operating profits, and is more likely expand its business and employ more workers in the next few years. Table 6 shows that the coefficient of 2020 sales growth is significant in all the models. According to the second model regression results, a firm's probability of expanding its businesses in the next few years will go up by 2% if the firm experienced 10% more sales growth in 2020. The third model implies that the probability of shrinking businesses will decline by 1% when the 2020 sales growth becomes 10% more.

The larger a firm's number of employees, the better its operating profits outlook, whereas the worse its employment outlook in the next few years. A firm with more employees also tends to expand its business. Thus, it can be said that the large-scale firms will recover quickly and even expand their businesses, but we cannot expect them to employ more workers.

Other findings from Table 6 are as follows: The younger a firm, the greater the probability of expanding its business. If a firm is owned by its founder, it is more likely to broaden its business. A foreign-affiliated firm tends to project more operating profits growth in 2021 than a domestic firm.

Further, according to Table 6, similar to finding 2, a firm's diversification level of customer or supplier arrangements across countries does not have a significant relationship with the firm's outlook in operating profits, business expansion, business shrinkage, and employment in the next few years. In contrast, the production-HHI variable is negatively significant, and the production-HHI^2 variable is positively significant for the operating profits and employment models. These results imply that there is a bliss point in terms of maximising the operating profits or employment outlook. Based on the estimated values, the maximum point is obtained when the production-HHI equals about 0.69. This value, for instance, is acquired if a firm produces 80% of its products in country X and 20% in country Y ($0.8^2 + 0.2^2 = 0.68$). It is difficult to obtain a conclusion based on only these results,

but it can be said that firms' diversified production allocation is not always good for future growth after COVID-19.

Regarding changes in supply chains during the COVID-19 pandemic, the customer diversification across countries is positively correlated with firms' business expansion according to Table 6. A firm that broadened supplier arrangements across countries during 2020 is less likely to shrink its business and more likely to hire more workers in the next few years. A firm's operating profits outlook is larger when the firm changed – either towards diversification or concentration – its international supplier relationship or its production allocations in 2020. In addition, concentrating production internationally during the COVID-19 crisis appears to increase the probability of expanding businesses and the employment outlook. It is noted that we executed additional regressions for a robustness check regarding multicollinearity, and these results did not change the conclusion presented here (Tables A2 and A3 in the Appendices).

Table 6 also reports whether any significant country factor is observed. The first to third models imply that Indian firms have a more positive outlook than almost any other country's firms. Nevertheless, the situation looks different when it comes to labour outlook. Only Thailand's firms have significantly lower employment prospects than Indian firms. Table 6 also shows that manufacturing and business services firms expect more operating profits growth in 2021. ICT firms are more likely to expand their businesses than other industries. Wholesale and/or retail or ICT firms plan to hire more employees in the next few years.

Table 6: Country and Industry Factors and Business Outlook

Independent variables	**(1) Profits**	**(2) Expand**	**(3) Shrink**	**(4) Labour**
2020 sales	0.821***	0.216***	-0.101***	0.236***
	(0.146)	(0.033)	(0.027)	(0.021)
Log employees	0.055**	0.011*	0.003	-0.009***
	(0.026)	(0.006)	(0.004)	(0.003)
Full-time ratio	0.007	0.000	-0.000	-0.000
	(0.008)	(0.000)	(0.000)	(0.000)
Age	-0.003	-0.001***	-0.000	-0.000

Independent variables	**(1) Profits**	**(2) Expand**	**(3) Shrink**	**(4) Labour**
	(0.002)	(0.000)	(0.000)	(0.000)
Listed	-0.062	0.015	-0.014	0.005
	(0.129)	(0.032)	(0.022)	(0.015)
Owner-managed	0.093	0.072***	0.025	-0.001
	(0.116)	(0.028)	(0.020)	(0.011)
Foreign-affiliated	0.500***	0.023	-0.014	-0.016
	(0.136)	(0.031)	(0.024)	(0.014)
Customer-HHI	-1.505	-0.415	-0.226	0.162
	(1.307)	(0.293)	(0.223)	(0.121)
Customer-HHI^2	0.956	0.264	0.225	-0.101
	(0.999)	(0.228)	(0.167)	(0.095)
Supplier-HHI	1.185	0.056	0.027	0.057
	(1.376)	(0.337)	(0.270)	(0.138)
Supplier-HHI^2	-0.578	-0.097	-0.028	-0.093
	(1.055)	(0.257)	(0.200)	(0.106)
Production-HHI	2.742**	0.186	-0.375*	0.297**
	(1.251)	(0.331)	(0.225)	(0.146)
Production-HHI^2	-1.995**	-0.185	0.204	-0.215**
	(0.979)	(0.254)	(0.169)	(0.108)
Customer-DHHI	0.491	-0.222**	0.009	-0.016
	(0.467)	(0.108)	(0.074)	(0.046)
Customer-DHHI^2	0.082	0.067	0.056	-0.028
	(0.438)	(0.085)	(0.072)	(0.035)
Supplier-DHHI	0.102	-0.106	0.119*	-0.078*
	(0.419)	(0.096)	(0.065)	(0.042)
Supplier-DHHI^2	0.493*	0.066	-0.031	-0.016
	(0.293)	(0.066)	(0.042)	(0.021)
Production-DHHI	1.066	0.237*	0.016	0.096*
	(0.792)	(0.126)	(0.092)	(0.052)
Production-DHHI^2	1.384*	-0.023	-0.012	0.041
	(0.804)	(0.097)	(0.066)	(0.034)
Brunei	0.169	-0.201*	0.204*	-0.029
	(0.564)	(0.113)	(0.117)	(0.084)
Cambodia	-0.679**	-0.067	0.149***	0.059
	(0.295)	(0.068)	(0.057)	(0.043)

Independent variables	**(1) Profits**	**(2) Expand**	**(3) Shrink**	**(4) Labour**
Indonesia	-0.013	-0.153***	0.064**	-0.005
	(0.180)	(0.042)	(0.030)	(0.021)
Lao PDR	-0.682*	-0.192	-0.010	0.035
	(0.351)	(0.126)	(0.078)	(0.075)
Malaysia	-1.086***	-0.177***	0.216***	-0.042
	(0.250)	(0.057)	(0.049)	(0.026)
Myanmar	-0.687*	-0.132	-0.039	0.096*
	(0.377)	(0.093)	(0.039)	(0.052)
Philippines	-0.054	-0.124***	0.084***	0.019
	(0.181)	(0.043)	(0.032)	(0.021)
Singapore	-0.508***	-0.144***	0.117***	0.020
	(0.187)	(0.046)	(0.035)	(0.020)
Thailand	-0.705***	-0.205***	0.218***	-0.051**
	(0.207)	(0.048)	(0.042)	(0.021)
Viet Nam	-0.197	-0.107**	0.087**	-0.004
	(0.197)	(0.049)	(0.036)	(0.022)
Manufacturing	0.360**	-0.010	-0.036	-0.002
	(0.153)	(0.038)	(0.030)	(0.018)
Wholesale/retail	0.100	-0.051	0.008	0.049**
	(0.218)	(0.052)	(0.041)	(0.024)
ICT	0.074	0.074*	-0.021	0.041**
	(0.159)	(0.039)	(0.031)	(0.020)
Transportation	0.146	-0.027	-0.060	-0.011
	(0.232)	(0.057)	(0.043)	(0.028)
Business services	0.486***	0.023	-0.045	0.000
	(0.162)	(0.039)	(0.031)	(0.019)
Observations	1721	1720	1723	1723
R^2		0.104	0.086	0.179
Pseudo R^2	0.053			

DHHI = difference in Herfindahl-Hirschman Index between 2020 and 2019, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic.

Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. The four models shown in this table control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.

Source: Authors.

3.2. COVID-19 Impact on Supply Chains

Finding 4: The majority of the firms changed or planned to change their customer or supplier relationship in response to the COVID-19 shock. About 70% of firms reviewed customer relationships, and about 60% reconsidered supplier relationships. Almost 50% of firms modified or would modify their production locations. For manufacturing firms, about 40% of them reconstructed or planned to reconstruct their supply chains. Most supply chain rearrangement firms implemented the supply chain reconstruction during the first year of the pandemic. Moreover, many firms changed or expected to change their supply chains by 10%–29% in terms of trade or production value. Concerning the time scope of changes, most of the firms that reviewed their supply chains did or will do in a medium- or long-term perspective. These findings imply that many of the firms in the ASEAN and Indian regions quickly responded to the COVID-19 shock and reconstructed their supply chains to a certain degree. Furthermore, many of the implemented changes in supply chains are unlikely to return to the status before COVID-19.

Tables 7–9 report when and to what degree the surveyed firms will change (changed) their customer and supplier relationship and production locations. The degree of changing supply chains is measured in terms of the relative value of change to the total trade or production. For instance, suppose a firm planned to sell products worth $10 million exclusively to Japan in 2020. The COVID-19 shock happened, and the firm changed its plans to sell half ($5 million) of the products to Japan and half ($5 million) to the US. In this case, the firm will say that it changed its customer relationship by 50% (in the survey, it will choose the 30%–99% option). As seen in Table 7, more than two-thirds of the firms have reconstructed or plan to reconstruct their customer relationships. Amongst the firms that modified or planned to change the customer relationship, the highest relative frequency combination of 21.7% was the change done by 2020 with a degree of 10%–29%. Even for the firms that implemented or planned to implement supply chain changes to a degree of 30% or more (21% of respondents), most of them implemented the changes by 2020.

The number of firms that had no plan to change their supplier relationships was somewhat larger, but more than half of the firms changed or plan to change their supplier connections. Table 8 shows that more than 50% of the respondents changed or plan to change supplier relationships. Similar to the case of customer

relationships, the largest relative frequency combination is also the ‘by 2020’ and ‘10%–29%’ one.

Regarding production location reconstruction, Table 9 indicates that about 47% of firms changed or plan to change. This number is smaller than the customer relationship cases. Nevertheless, the number of firms that changed or have any plan to change is close to 50%.

Table 7: When (Row) and to What Degree (Column) Customer Change is Done

(% of respondents)

Timing	No plan	1–9	10–29	30–99	100	Total
No plan	31.5	0.0	0.0	0.0	0.0	31.5
By 2020	0.0	9.5	21.7	11.5	4.2	46.9
2021 1st half	0.0	3.8	7.6	2.4	1.0	14.8
2021 2nd half	0.0	1.6	2.7	1.6	0.1	6.1
2022 or beyond	0.0	0.3	0.2	0.2	0.1	0.8
Total	**31.5**	**15.2**	**32.3**	**15.6**	**5.4**	**100.0**

Notes: Observations = 1,351. Each cell’s value stands for the ratio of the number of respondents who reported the corresponding row and column category choices to the total. Percentages may not total 100% because of rounding.
Source: Authors.

Table 8: When (Row) and to What Degree (Column) Supplier Change is Done

(% of respondents)

Timing	No plan	1–9	10–29	30–99	100	Total
No plan	39.0	0.0	0.0	0.0	0.0	39.0
By 2020	0.0	13.8	17.1	9.3	3.8	44.0
2021 1st half	0.0	4.0	5.5	1.6	0.7	11.8
2021 2nd half	0.0	0.8	1.5	1.5	0.4	4.1
2022 or beyond	0.0	0.2	0.4	0.4	0.1	1.1
Total	**39.0**	**18.8**	**24.4**	**12.9**	**4.9**	**100.0**

Notes: Observations = 1,305. Each cell’s value stands for the ratio of the number of respondents who reported the corresponding row and column category choices to the total. Percentages may not total 100% because of rounding.
Source: Authors.

Table 9: When (Row) and to What Degree (Column) Production Sites Change is Done

(% of respondents)

Timing	No plan	1–9	10–29	30–99	100	Total
No plan	52.6	0.0	0.0	0.0	0.0	52.6
By 2020	0.0	11.2	13.3	6.4	3.5	34.4
2021 1st half	0.0	2.0	3.7	1.8	0.7	8.2
2021 2nd half	0.0	1.0	1.4	1.1	0.2	3.7
2022 or beyond	0.0	0.1	0.3	0.5	0.2	1.1
Total	**52.6**	**14.3**	**18.6**	**9.8**	**4.7**	**100.0**

Notes: Observations = 1,245. Each cell's value stands for the ratio of the number of respondents who reported the corresponding row and column category choices to the total. Percentages may not total 100% because of rounding.
Source: Authors.

Tables 10–12 indicate the degree of supply chain changes by industry. Focusing on the manufacturing firms, we find that the fraction of 'no plan' firms becomes larger in the order of customer, supplier, and production changes. Table 12 shows that 42% of the manufacturing firms changed or planned to change their production locations. Additionally, 18.4% of them chose '10%–29%' for the degree of changes. Although the number is a little smaller, more than 10% of the firms changed or planned to change production sites to the degree of more than 30%.

Table 10: Degree of Customer Change by Industry (% of respondents)

Industry	No plan	1–9	10–29	30–99	100	Total
Manufacturing	38.7	16.0	30.8	10.7	3.8	100.0
Wholesale/retail	27.6	13.0	35.0	18.7	5.7	100.0
ICT	30.9	13.1	29.8	20.9	5.3	100.0
Transportation	48.8	17.9	20.2	9.5	3.6	100.0
Business services	19.1	15.9	41.4	17.1	6.4	100.0
Other services	29.0	16.1	30.4	16.6	7.8	100.0
Overall	**31.5**	**15.3**	**32.2**	**15.6**	**5.4**	**100.0**

ICT = information and communication technology.
Notes: Observations = 1,350. Each cell's value stands for the ratio of the number of the corresponding row industry's respondents who reported the corresponding column category choice to the row total.
Source: Authors.

Table 11: Degree of Supplier Change by Industry (% of respondents)

Industry	No plan	1–9	10–29	30–99	100	Total
Manufacturing	43.2	18.8	23.0	11.3	3.7	100.0
Wholesale/retail	32.5	14.6	32.5	15.4	4.9	100.0
ICT	41.2	20.2	21.0	12.5	5.1	100.0
Transportation	57.0	13.9	16.5	10.1	2.5	100.0
Business services	31.7	19.8	28.4	14.4	5.8	100.0
Other services	34.0	19.9	25.2	14.1	6.8	100.0
Overall	**39.0**	**18.8**	**24.4**	**12.9**	**4.9**	**100.0**

ICT = information and communication technology.
Notes: Observations = 1,305. Each cell's value stands for the ratio of the number of the corresponding row industry's respondents who reported the corresponding column category choice to the row total.
Source: Authors.

Table 12: Degree of Production Sites Change by Industry (% of respondents)

Industry	No plan	1–9	10–29	30–99	100	Total
Manufacturing	58.0	12.8	18.4	8.2	2.7	100.0
Wholesale/retail	46.8	10.1	27.5	10.1	5.5	100.0
ICT	54.2	15.0	16.5	8.1	6.2	100.0
Transportation	64.0	10.7	13.3	8.0	4.0	100.0
Business services	48.0	15.3	20.1	12.2	4.4	100.0
Other services	43.7	19.1	18.1	12.6	6.5	100.0
Overall	**52.5**	**14.3**	**18.8**	**9.8**	**4.6**	**100.0**

ICT = information and communication technology.
Notes: Observations = 1,248. Each cell's value stands for the ratio of the number of the corresponding row industry's respondents who reported the corresponding column category choice to the row total.
Source: Authors.

Tables 13–15 indicate firms' time scope of changes in customer and supplier relationships and production locations. Notably, firms that chose medium- to long-term changes comprise the majority amongst the firms changing customers, suppliers, and production in terms of relationships or locations. Concerning customer changes, for instance, 27% of manufacturing firms reviewed their relationships in a medium- or long-term perspective, while 19% reviewed their relationships in a temporary perspective. Since the long-term perspective percentage was much larger than the temporary perspective percentage, many of the changes in supply chains caused by the COVID-19 shock may be unlikely to

return to pre-COVID-19 levels.[7] It is also remarkable that a fraction of the firms was not sure of the time scope. This phenomenon may result from the uncertainty in the development of the COVID-19 pandemic.

Table 13: Time Scope of Customer Change by Industry (% of respondents)

Industry	No plan	Temporary	Medium to long term	Not sure	Total
Manufacturing	38.2	19.2	26.9	15.6	100.0
Wholesale/retail	27.0	12.3	42.6	18.0	100.0
ICT	30.8	16.3	35.5	17.4	100.0
Transportation	50.6	9.9	23.5	16.0	100.0
Business services	18.1	19.7	44.2	18.1	100.0
Other services	27.9	17.2	34.9	20.0	100.0
Overall	**31.0**	**17.2**	**34.4**	**17.4**	**100.0**

ICT = information and communication technology.
Notes: Observations = 1,333. Each cell's value stands for the ratio of the number of the corresponding row industry's respondents who reported the corresponding column category choice to the row total.
Source: Authors.

Table 14: Time Scope of Supplier Change by Industry (% of respondents)

Industry	No plan	Temporary	Medium to long term	Not sure	Total
Manufacturing	42.5	17.6	24.6	15.3	100.0
Wholesale/retail	32.0	20.0	32.0	16.0	100.0
ICT	41.0	18.0	29.7	11.3	100.0
Transportation	56.4	11.5	16.7	15.4	100.0
Business services	32.5	22.8	28.7	16.0	100.0
Other services	33.8	20.8	30.0	15.5	100.0
Overall	**38.8**	**19.0**	**27.5**	**14.7**	**100.0**

ICT = information and communication technology.
Notes: Observations = 1,299. Each cell's value stands for the ratio of the number of the corresponding row industry's respondents who reported the corresponding column category choice to the row total.
Source: Authors.

[7] Note that the 'no plan' choices in Tables 13, 14, and 15 correspond to the 'no plan' choices in Tables 7, 8, and 9, respectively. For instance, if a respondent selected 'no plan' for the questionnaire regarding when and to what degree customer change is done (Table 7), the respondent also chose 'no plan' for the questionnaire about the time scope of customer change (Table 13).

Table 15: Time Scope of Production Sites Change by Industry (% of respondents)

Industry	No plan	Temporary	Medium to long term	Not sure	Total
Manufacturing	57.0	15.1	18.3	9.5	100.0
Wholesale/retail	44.6	17.0	30.4	8.0	100.0
ICT	53.3	15.7	22.0	9.0	100.0
Transportation	63.5	9.5	16.2	10.8	100.0
Business services	47.1	20.7	23.3	8.8	100.0
Other services	42.2	18.1	27.1	12.6	100.0
Overall	**51.4**	**16.6**	**22.3**	**9.7**	**100.0**

ICT = information and communication technology.
Notes: Observations = 1,244. Each cell's value stands for the ratio of the number of the corresponding row industry's respondents who reported the corresponding column category choice to the row total.
Source: Authors.

Finding 5: The aggregated transaction link-level data show that increased transactions comprised the largest share (37%) of changes in respondents' transaction links with customers. Meanwhile, in the case of suppliers, 'no changes' provided the largest share (36%). When transactions with customers or suppliers shrank, almost all the respondents chose COVID-19 as the relevant factor. When transactions increased, three-quarters of the firms reported that the changes were due to COVID-19.

The survey asked about firms' top three customers and suppliers, and changes in each of the transaction links in 2020 and thereafter. It also asked about the profiles of the top three customers and suppliers, including their location, number of employees, industry, and capital relations between the firms involved in the links.

Tables 16 and 17 report the relative frequencies of four categories of changes – suspension, decrease, no change, or increase – in respondents' transaction links with their customers and suppliers by the customers and suppliers' country. The very bottom row of Table 16 shows that increased transactions accounted for the largest share of transaction links with customers overall. The bottom row also indicates that the second largest category was 'no change' in transactions with customers. In contrast, according to the very bottom row of Table 17, not changing

the transaction volume comprised the largest proportion of transaction links with suppliers. Increasing trade with suppliers was the second largest amongst them. The finding that the relative frequency of not changing transaction links with customers was smaller than that with suppliers is consistent with one aspect of finding 4 that about 70% of firms changed or planned to change their relationships with customers, and about 60% with suppliers.

Another finding from Table 16 is that the links between respondents with Chinese customers were more likely to be suspended than with the other countries' customers. The relative frequency of the suspended links was 10.7%, which is more than double the average of 4.6%. With 31.0% of decreasing Chinese customer links, more than 40% of the reporting firms' transaction links with Chinese customers shrank or will shrink. The regression analysis below also shows that the transaction links with Chinese customers are more likely to shrink than links with domestic suppliers (Table 20).

Table 17 shows that the transaction links of respondents with Chinese suppliers are more inclined to shrink, similar to the above case of the links with customers. The relative frequency of shrinking – suspending and decreasing – the transaction links of respondents with Chinese suppliers was about 40%, which is the largest value amongst the links with other countries' suppliers. In contrast to the case with customers, however, the regression results in Table 21 do not imply that transaction links with Chinese suppliers are more likely to shrink than links with domestic suppliers.

Table 16: Customer Link Changes in 2020 and After by Customers' Country

(%)

Customers' country	Suspension	Decrease	No change	Increase	Total
Japan	5.5	25.2	38.7	30.7	100.0
China	10.7	31.0	24.6	33.7	100.0
Rep. of Korea	2.6	33.3	28.2	35.9	100.0
ASEAN	5.2	26.9	32.1	35.8	100.0
India	8.3	36.1	19.4	36.1	100.0
Other Asia	4.4	25.7	25.7	44.1	100.0
US	4.2	23.7	27.9	44.3	100.0
Europe	0.4	29.3	26.2	44.1	100.0
Others	4.9	23.3	27.6	44.2	100.0
Domestic	4.4	26.7	33.0	35.8	100.0
Overall	**4.6**	**26.7**	**31.5**	**37.2**	**100.0**

ASEAN = Association of Southeast Asian Nations, US = United States.
Notes: Observations = 4,782. Each cell's value stands for the row relative frequency (percentage) of the number of respondents' transaction links with the corresponding row country customer and the links that changed (or will change) in line with the corresponding column category.
Source: Authors.

Table 17: Supplier Link Changes in 2020 and After by Suppliers' Country

(%)

Suppliers' country	Suspension	Decrease	No change	Increase	Total
Japan	5.7	21.6	40.2	32.5	100.0
China	8.1	31.4	24.4	36.1	100.0
Rep. of Korea	10.0	22.5	27.5	40.0	100.0
ASEAN	8.6	29.2	30.6	31.5	100.0
India	8.3	22.2	13.9	55.6	100.0
Other Asia	3.8	25.0	32.7	38.5	100.0
US	3.2	25.2	34.8	36.8	100.0
Europe	1.8	26.8	32.3	39.1	100.0
Others	9.4	18.8	33.3	38.5	100.0
Domestic	3.6	28.6	39.7	28.1	100.0
Overall	**4.6**	**27.8**	**36.4**	**31.2**	**100.0**

ASEAN = Association of Southeast Asian Nations, US = United States.
Notes: Observations = 4,426. Each cell's value stands for the row relative frequency (percentage) of the number of respondents' transaction links with the corresponding row country customer and the links that changed (or will change) in line with the corresponding column.
Source: Authors.

Tables 18 and 19 report changes in transaction links with customers and suppliers as well as their relevant factors (reasons why firms change their customer or supplier relationship). In the cases of both customer and supplier links, almost all the relevant factors for shrinking links were COVID-19. Meanwhile, regarding the relevant factor for the increasing customer or supplier links, about three-quarters of them were associated with COVID-19, and the others with other factors.

Table 18: Customer Link Changes in 2020 and after and Relevant Factors (%)

Customer link change	COVID-19	Other	Total
Suspension of transaction	97.7	2.3	100.0
Decrease in transaction	95.3	4.7	100.0
No change in transaction	58.4	41.6	100.0
Increase in transaction	76.2	23.8	100.0
Overall	**76.7**	**23.3**	**100.0**

COVID-19 = coronavirus disease.
Notes: Observations = 4,821. Each cell's value stands for the number of respondents who chose the transaction change corresponding to the row category and its relevant factor corresponding to the column category divided by the row total.
Source: Authors.

Table 19: Supplier Link Changes in 2020 and after and Relevant Factors (%)

Supplier link change	COVID-19	Other	Total
Suspension of transaction	95.1	4.9	100.0
Decrease in transaction	94.8	5.2	100.0
No change in transaction	55.9	44.1	100.0
Increase in transaction	75.2	24.8	100.0
Overall	**74.6**	**25.4**	**100.0**

COVID-19 = coronavirus disease.
Notes: Observations = 4,446. Each cell's value stands for the number of respondents who chose the transaction change corresponding to the row category and its relevant factor corresponding to the column category divided by the row total.
Source: Authors.

Finding 6: Regression analyses based on the transaction link-level data show that a young, Japanese foreign-affiliated, or not Chinese foreign-affiliated, firm is less likely to suspend or decrease transactions with its trade partner – customer or supplier – after COVID-19. Interestingly, manufacturing or transportation firms in ASEAN and India are less likely to shrink transactions with their customers or suppliers in general. In contrast, if their customers or suppliers are in the manufacturing or transportation industries, these transactions are likely to shrink. It is also found that a firm is more resilient in trade with its customers when it is larger, more diversified its customers across multiple countries, or more concentrated its production locations before the COVID-19 pandemic. Additionally, a firm's transaction link with a Chinese customer is vulnerable compared with other countries' customers.

Here, we employ the link-level data to examine whether there is any notable relationship between linked firms by regressing the following linear probability model:

$$SHRINK_{ij} = \beta_0 + \beta_1 W_i + \beta_2 X_{ij} + \beta_3 Z_j + \varepsilon_{ij},$$

where W_i, X_{ij}, and Z_j are vectors of variables at the level of the reporting firm i, the supply chain link between i and its supplier or customer j, and the supplier or customer j; and $SHRINK_{ij}$ is the dummy variable for the suspension or decrease in the long-term transaction between i and j in 2020 because of COVID-19 (*Shrink COVID*), and the corresponding dummy variable where the reason for the change is not necessarily COVID-19 (*Shrink all*).

Table 20 shows the regression results of W_i., X_{ij}, and Z_j, in the top, middle, and bottom, respectively. The results shown in the top part of the table indicate that if a respondent firm is larger or younger, the probability of reducing trade with its customer goes down. It can be said that relatively large and young firms are more resilient to the COVID-19 shock in terms of not reducing their trade volumes with their customers in the long run. The significance of the customer-HHI variable for each model is also notable. This means that firms which diversified customer countries before the COVID-19 pandemic are less likely to cut or decrease their customer link after the pandemic. It is also salient that a firm with less diversified

production across countries is more likely to keep the transaction link with a customer. Moreover, the second and fourth models show that Japanese foreign-affiliated firms are significantly less likely to shrink transactions with customers compared with the base other countries, while Chinese foreign-affiliated firms are the opposite.

The top part of Table 20 also indicates that Indonesian firms are less likely to shrink the transactions with their customers compared with the base level country of India. Meanwhile, firms in Malaysia and Thailand tend to lower the transactions with their customers. The top of the table also implies that manufacturing, ICT, transportation, and business services firms are more resilient than the base 'other' services.

The fact that Malaysian firms are more likely to reduce transactions with their customers is consistent with the JETRO (2020) interview with Japanese foreign-affiliated firms. According to JETRO (2020), Japanese foreign-affiliated firms pointed out that Malaysia was the most severe in restricting manufacturing industries amongst AMS. The Malaysian government imposed a movement control order that limited the activities of Malaysian firms, except food and medical equipment firms. JETRO (2020) pointed out that Japanese, European, and US firms cut their suppliers from Malaysia because of the lockdown measures taken by the Malaysian government.

JETRO (2020) also reported Thailand's delayed customs procedures. The Thai government imposed work-from-home requirements on customs officials, and applications for tax refunds or other applications at customs were not accepted. These restrictions on customs procedure would affect international supply chains. This may be why Thai firms are more likely to shrink their trade with their customers.

According to the middle part of Table 20, the link-level data show that firm *i*'s relative size to its customer – whether smaller or larger – does not affect firm *i'*s decision of suspending or reducing the customer link. There are no significant dummy variables for the combination of a small (less than 100 workers) *i* and a large (100 or more workers) customer, and the combination of a large *i* and a small customer. We find a significant dummy variable that takes one if customer firm *j*'s

domicile is the same as firm *i*'s foreign owner's location. This dummy variable, for instance, takes one if a Japanese-affiliated firm in Thailand trades with its customer located in Japan. Additionally, it is notable that when firm *i* is owned by its customer, its transactions are more likely to decline.

The bottom part of Table 20 shows that when we look at the attributes of firm *i*'s customer *j*, if *j* locates in China, the transactions between *i* and *j* tend to shrink after the COVID-19 pandemic, compared with the case that *j* locates in the domestic country. The bottom of the table also implies that if customer *j* is in the manufacturing or transportation industries, the transaction link is less likely to be resilient against the COVID-19 shock. In contrast, firms' transactions with their ICT customers tend to be more resilient. It should be noted that the ICT factor coefficient becomes not significant when we only use observations whose respondents answered that the customer relationship change was due to COVID-19. This outcome may be because these customer ICT firms depend significantly on procurement from firms in the ASEAN region and India or because the ICT customer firms' business performance has been very good since before the COVID-19 pandemic and the COVID-19 shock did not affect these firms.

Table 20: Attributes of Transaction Links with Customers and Transaction Resilience

Independent variable	**(1)** **Shrink COVID**	**(2)** **Shrink COVID**	**(3)** **Shrink all**	**(4)** **Shrink all**
Attributes of firm *i*				
Log employees	-0.010*	-0.011*	-0.011*	-0.012**
	(0.006)	(0.006)	(0.006)	(0.006)
Log age	0.031***	0.033***	0.032***	0.034***
	(0.009)	(0.009)	(0.009)	(0.009)
Customer-HHI	0.095**	0.102**	0.091*	0.097**
	(0.048)	(0.048)	(0.046)	(0.047)
Production-HHI	-0.116***	-0.123***	-0.099**	-0.104**
	(0.043)	(0.043)	(0.046)	(0.046)
Foreign-affiliated	-0.032		-0.019	
	(0.026)		(0.027)	

Independent variable	(1) Shrink COVID	(2) Shrink COVID	(3) Shrink all	(4) Shrink all
Japanese-affiliated		-0.167***		-0.124***
		(0.036)		(0.037)
US-affiliated		0.002		-0.003
		(0.030)		(0.030)
European-affiliated		-0.028		-0.016
		(0.045)		(0.045)
Chinese-affiliated		0.214**		0.209**
		(0.096)		(0.096)
ASEAN-affiliated		-0.020		-0.010
		(0.047)		(0.048)
Other-affiliated		0.015		0.023
		(0.061)		(0.062)
Brunei	-0.059	-0.060	0.008	0.006
	(0.065)	(0.065)	(0.068)	(0.068)
Cambodia	0.054	0.051	0.051	0.048
	(0.041)	(0.041)	(0.040)	(0.041)
Indonesia	-0.076**	-0.068**	-0.071**	-0.065*
	(0.034)	(0.034)	(0.035)	(0.036)
Lao PDR	-0.105	-0.101	0.005	0.008
	(0.127)	(0.126)	(0.137)	(0.135)
Malaysia	0.083*	0.096**	0.123***	0.132***
	(0.045)	(0.047)	(0.044)	(0.047)
Myanmar	-0.034	-0.036	-0.025	-0.029
	(0.051)	(0.055)	(0.054)	(0.058)
Philippines	-0.003	0.004	0.000	0.005
	(0.041)	(0.039)	(0.039)	(0.039)
Singapore	-0.021	-0.004	0.002	0.015
	(0.027)	(0.027)	(0.028)	(0.029)
Thailand	0.041	0.054*	0.067*	0.076**
	(0.036)	(0.031)	(0.035)	(0.031)
Viet Nam	0.001	0.016	0.003	0.014
	(0.036)	(0.036)	(0.036)	(0.036)
Manufacturing	-0.198***	-0.185***	-0.194***	-0.184***
	(0.036)	(0.035)	(0.036)	(0.036)

Independent variable	(1) Shrink COVID	(2) Shrink COVID	(3) Shrink all	(4) Shrink all
Wholesale/retail	-0.084	-0.085	-0.085	-0.087
	(0.061)	(0.059)	(0.059)	(0.058)
ICT	-0.078**	-0.081**	-0.080**	-0.081**
	(0.037)	(0.037)	(0.037)	(0.038)
Transportation	-0.187***	-0.184***	-0.171***	-0.169***
	(0.042)	(0.041)	(0.042)	(0.043)
Business services	-0.117***	-0.119***	-0.120***	-0.122***
	(0.033)	(0.033)	(0.034)	(0.035)
Attributes of link *ij*				
j larger than *i*	0.043	0.040	0.035	0.033
	(0.032)	(0.032)	(0.033)	(0.033)
j smaller than *i*	0.013	0.014	0.015	0.015
	(0.042)	(0.042)	(0.043)	(0.043)
j's = owner's country	-0.070**	-0.081**	-0.077**	-0.084**
	(0.035)	(0.033)	(0.035)	(0.034)
j owns *i*	0.169***	0.170***	0.169***	0.170***
	(0.039)	(0.040)	(0.039)	(0.040)
i owns *j*	-0.038	-0.042	-0.039	-0.042
	(0.031)	(0.031)	(0.031)	(0.031)
Attributes of firm *j*				
Japan	0.023	0.064	0.030	0.061
	(0.048)	(0.051)	(0.047)	(0.050)
China	0.104**	0.093**	0.096**	0.087**
	(0.045)	(0.044)	(0.044)	(0.043)
Korea	0.111	0.103	0.132	0.125
	(0.083)	(0.086)	(0.086)	(0.088)
ASEAN	0.007	0.010	0.009	0.012
	(0.029)	(0.029)	(0.030)	(0.031)
India	0.137	0.132	0.147*	0.144*
	(0.084)	(0.082)	(0.088)	(0.087)
Other Asia	0.022	0.014	0.016	0.010
	(0.056)	(0.056)	(0.056)	(0.056)
US	0.020	0.013	0.029	0.026
	(0.033)	(0.032)	(0.031)	(0.030)

Independent variable	(1) Shrink COVID	(2) Shrink COVID	(3) Shrink all	(4) Shrink all
Europe	0.045	0.034	0.055	0.046
	(0.044)	(0.045)	(0.042)	(0.043)
Others	-0.001	-0.001	0.018	0.018
	(0.041)	(0.040)	(0.045)	(0.044)
Manufacturing	0.073***	0.079***	0.066***	0.071***
	(0.023)	(0.023)	(0.024)	(0.023)
Wholesale/retail	0.080*	0.084*	0.079	0.083*
	(0.048)	(0.047)	(0.048)	(0.047)
ICT	-0.046	-0.045	-0.057**	-0.057**
	(0.028)	(0.028)	(0.029)	(0.029)
Transportation	0.097**	0.100**	0.081*	0.084*
	(0.048)	(0.047)	(0.046)	(0.046)
Medium-sized firm	0.020	0.022	0.027	0.028
	(0.037)	(0.037)	(0.037)	(0.037)
Large firm	-0.049	-0.041	-0.033	-0.028
	(0.035)	(0.036)	(0.036)	(0.037)
Observations	4569	4569	4569	4569
R^2	0.069	0.077	0.065	0.071

ASEAN = Association of Southeast Asian Nations, COVID-19 = coronavirus disease, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic, US = United States.

Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Firm *i* is a respondent of the COVID-19 survey. Firm *j* is a customer of firm *i*. Link *ij* is a transaction link between firm *i* and firm *j*. The medium-sized firm variable takes unity when a respondent has 20 employees or more and less than 100. The large firm variable takes unity when a respondent has 100 employees or more. All the models control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.

Source: Authors.

Table 21 shows the regression results of the links between reporting firm *i* and its supplier *j*. In general, these results show that the supplier link relationship is symmetrical to the customer one. The most different result is that there is no significant correlation between supplier or production diversification and changes in the transaction link after the COVID-19 pandemic.

It is interesting that manufacturing or transportation firms in ASEAN and India are less likely to shrink transactions with their customers or suppliers compared with other industry firms, whereas if their customers or suppliers are in the manufacturing or transportation industries, these transactions are likely to shrink. In other words, if a firm is in the manufacturing or transportation industry, the firm is likely to have resilient transaction partners. However, if a firm has a manufacturing or transportation trade partner, the transaction link is less resilient. This means, for instance, that a manufacturing firm downstream of the supply chains – that delivers its products to a non-manufacturing (tertiary industry) firm – tends to have more resilient transaction links than other firms. It can also be said that even for a firm in the manufacturing industry, if it is upstream or midstream of the supply chains – providing its products to other manufacturing firms – its transaction links with trading partners are less resilient than those of downstream manufacturing firms.

Table 21: Attributes of Transaction Links with Suppliers and Transaction Resilience

Independent variable	**(1)** **Shrink COVID**	**(2)** **Shrink COVID**	**(3)** **Shrink all**	**(4)** **Shrink all**
Attributes of firm *i*				
Log employees	-0.007	-0.008	-0.009	-0.010
	(0.006)	(0.006)	(0.006)	(0.006)
Log age	0.031**	0.033**	0.036***	0.037***
	(0.013)	(0.013)	(0.013)	(0.013)
Supplier-HHI	-0.058	-0.062	-0.067	-0.072
	(0.054)	(0.053)	(0.054)	(0.054)
Production-HHI	-0.051	-0.052	-0.032	-0.032

Independent variable	(1) Shrink COVID	(2) Shrink COVID	(3) Shrink all	(4) Shrink all
	(0.052)	(0.052)	(0.054)	(0.054)
Foreign-affiliated	-0.029		-0.017	
	(0.038)		(0.039)	
Japanese-affiliated		-0.107*		-0.081
		(0.057)		(0.058)
US-affiliated		0.024		0.032
		(0.052)		(0.052)
European-affiliated		-0.029		-0.013
		(0.049)		(0.051)
Chinese-affiliated		0.157*		0.219**
		(0.093)		(0.095)
ASEAN-affiliated		-0.009		-0.006
		(0.057)		(0.059)
Other-affiliated		-0.074		-0.078
		(0.058)		(0.059)
Brunei	-0.166**	-0.162**	-0.124*	-0.120
	(0.075)	(0.077)	(0.074)	(0.076)
Cambodia	-0.025	-0.031	-0.038	-0.045
	(0.066)	(0.064)	(0.066)	(0.065)
Indonesia	-0.119**	-0.113**	-0.113**	-0.107**
	(0.046)	(0.047)	(0.046)	(0.047)
Lao PDR	-0.025	-0.022	0.092	0.096
	(0.137)	(0.137)	(0.161)	(0.160)
Malaysia	0.067	0.073	0.089	0.094*
	(0.048)	(0.049)	(0.054)	(0.056)
Myanmar	-0.109*	-0.110	-0.094	-0.095
	(0.063)	(0.067)	(0.068)	(0.073)
Philippines	-0.041	-0.039	-0.031	-0.030
	(0.039)	(0.038)	(0.038)	(0.037)
Singapore	-0.048	-0.038	-0.046	-0.038
	(0.038)	(0.039)	(0.039)	(0.040)
Thailand	-0.031	-0.024	-0.011	-0.007

Independent variable	(1) Shrink COVID	(2) Shrink COVID	(3) Shrink all	(4) Shrink all
	(0.041)	(0.040)	(0.050)	(0.048)
Viet Nam	0.009	0.023	0.007	0.020
	(0.050)	(0.050)	(0.050)	(0.050)
Manufacturing	-0.163***	-0.158***	-0.157***	-0.153***
	(0.047)	(0.047)	(0.048)	(0.048)
Wholesale/retail	-0.058	-0.056	-0.066	-0.064
	(0.050)	(0.049)	(0.049)	(0.048)
ICT	-0.063	-0.066	-0.073	-0.074
	(0.045)	(0.045)	(0.046)	(0.045)
Transportation	-0.190***	-0.186***	-0.192***	-0.187***
	(0.052)	(0.051)	(0.052)	(0.052)
Business services	-0.088**	-0.090**	-0.094**	-0.095**
	(0.044)	(0.044)	(0.045)	(0.045)
Attributes of link *ij*				
j larger than *i*	-0.039	-0.040	-0.045	-0.045
	(0.040)	(0.041)	(0.040)	(0.041)
j smaller than *i*	0.012	0.012	0.031	0.030
	(0.048)	(0.048)	(0.047)	(0.047)
j's = owner's country	-0.150***	-0.157***	-0.143***	-0.150***
	(0.042)	(0.041)	(0.042)	(0.042)
j owns *i*	0.116***	0.116***	0.124***	0.124***
	(0.041)	(0.040)	(0.039)	(0.039)
i owns *j*	0.035	0.034	0.031	0.030
	(0.047)	(0.046)	(0.047)	(0.046)
Attributes of firm *j*				
Japan	0.027	0.055	0.034	0.056
	(0.051)	(0.052)	(0.052)	(0.055)
China	0.033	0.027	0.055	0.048
	(0.032)	(0.032)	(0.037)	(0.037)
Korea	-0.037	-0.038	-0.020	-0.020
	(0.068)	(0.068)	(0.069)	(0.070)
ASEAN	0.014	0.017	0.022	0.026

Independent variable	(1) Shrink COVID	(2) Shrink COVID	(3) Shrink all	(4) Shrink all
	(0.036)	(0.036)	(0.038)	(0.038)
India	0.036	0.030	0.024	0.022
	(0.084)	(0.084)	(0.085)	(0.085)
Other Asia	-0.057	-0.068	-0.042	-0.052
	(0.053)	(0.053)	(0.052)	(0.053)
US	-0.000	-0.010	0.001	-0.008
	(0.033)	(0.034)	(0.033)	(0.034)
Europe	-0.011	-0.015	0.000	-0.005
	(0.037)	(0.039)	(0.040)	(0.042)
Others	-0.124***	-0.124***	-0.074	-0.073
	(0.041)	(0.041)	(0.050)	(0.051)
Manufacturing	0.057**	0.062**	0.047	0.051*
	(0.027)	(0.027)	(0.029)	(0.029)
Wholesale/retail	0.087*	0.091*	0.078	0.080*
	(0.049)	(0.048)	(0.049)	(0.048)
ICT	-0.032	-0.031	-0.041	-0.040
	(0.038)	(0.037)	(0.038)	(0.037)
Transportation	0.088**	0.088**	0.077*	0.076*
	(0.044)	(0.044)	(0.046)	(0.046)
Medium-sized firm	-0.049*	-0.051*	-0.051*	-0.053*
	(0.027)	(0.027)	(0.028)	(0.028)
Large firm	-0.081*	-0.080*	-0.069	-0.069
	(0.045)	(0.045)	(0.046)	(0.047)
Observations	4229	4229	4229	4229
R^2	0.071	0.075	0.066	0.071

ASEAN = Association of Southeast Asian Nations, COVID-19 = coronavirus disease, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic, US = United States.

Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Firm *i* is a respondent of the COVID-19 survey. Firm *j* is a supplier of firm *i*. Link *ij* is a transaction link between firm *i* and firm *j*. The medium-sized firm variable takes unity when a respondent has 20 employees or more and less than 100. The large firm variable takes unity when a respondent has 100 employees or more. All the models control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.

Source: Authors.

3.3. Firms' Supply Chain Measures Against COVID-19

Finding 7: The most selected supply chain measure in response to COVID-19 was the cost reduction and/or optimisation chosen by 63% of the respondents, while the least was the supply chain digitalisation – inter-firm digitalisation – answered by 23% of respondents. Moreover, 31% – not the least but not many – of the respondents selected the design of remotely manageable operations, considered as intra-firm digitalisation. The firms that implemented supply chain digitalisation tend to have implemented both supply chain optimisation and remote operations. If a firm is large, young, or has internationally diversified customers, it is more likely to take the supply chain digitalisation measure. The remote operations measure tends to be taken by firms that are foreign-affiliated or located in countries with a relatively high internet penetration rate.

The survey asked the respondents what measures they had taken in response to the COVID-19 shock. The options are the following six measures and 'other' measures.

The first one is the 'cost reduction and/or optimisation' measure. This measure enables a firm to reduce or optimise its operating costs. It typically includes cutting marketing, advertising, and promotion budgets; saving employee engagement events and activities; and negotiating property rental fee waivers or discounts.

The second one is the 'rebuilding relationships with customers' measure. This is a firm's measure to change the way a firm carries out business with its customers. This measure frequently includes stopping trading with existing customers, starting trading with new customers, renegotiating financial agreements with distributors (e.g. payment terms), and educating customers more intensively.

The third one is the 'rebuilding relationships with suppliers' option. This is a firm's measure to change the way a firm carries out business with its suppliers. This measure generally includes stopping trading with existing suppliers, starting trading with new suppliers, renegotiating financial agreements with suppliers, and changing logistics arrangements.

The fourth one is the ‘supply chain network optimisation’ option. This measure allows a firm to improve its efficiency in the entire supply chain. It is considered to include optimising its inventory system and improving its supply chain to shorten the lead time to resume operations. This measure is considered to be more advanced and not a short-term effort. In fact, an executive of a personal care manufacturing firm located in Indonesia operating globally said that supply chain network optimisation took place before and during the COVID-19 pandemic and will continue in the post-pandemic period.

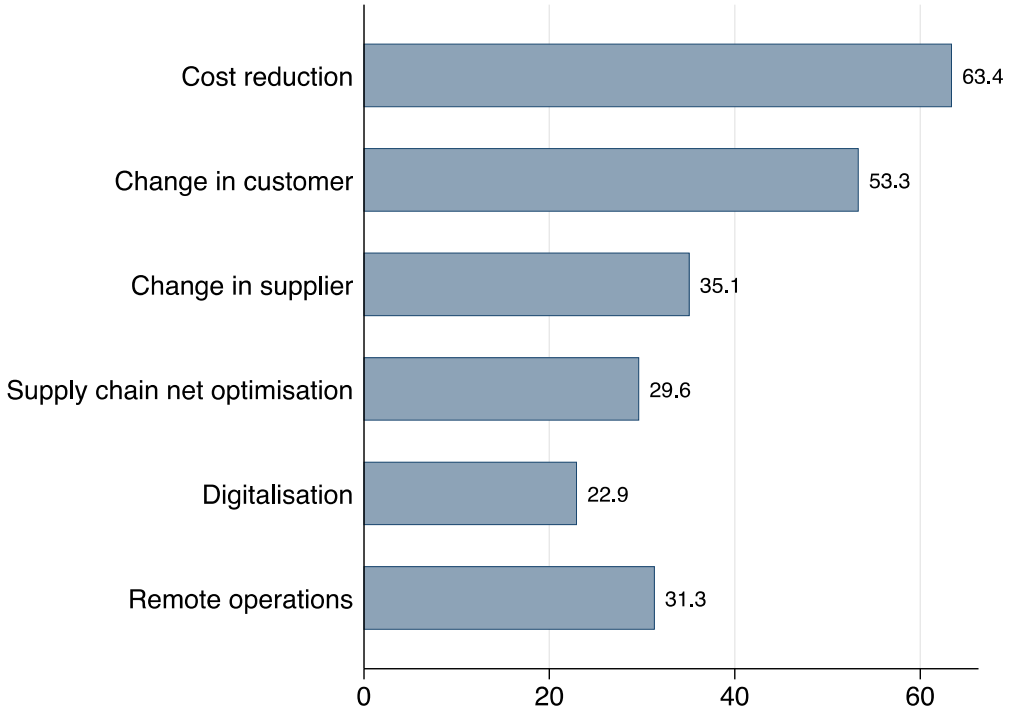
The fifth one is the ‘digitalisation of supply chains’ option. This is a firm’s measure to digitalise its supply chain process, from supplier to customer. This measure typically includes building an online service booking platform, shifting its sales from offline or face-to-face to online, and creating digital product introduction platforms. In fact, an executive of a premium car wholesale firm located in Thailand reported that they accelerated their digital customer presence by launching an online buying platform and introducing digital products. The way in which firms digitalise their supply chain operations determines their industry level of supply chain resilience for both the manufacturing and service industries (Belhadi et al., 2021).

The last one is the ‘designing remote operations’ option. This is a firm’s measure to enable remote operation of a system or machine at a distance. This measure generally includes arranging working from home, utilising digital platforms to support facilitating discussion internally or externally, and using cloud-based data storage to remotely access the firm’s information.

Figure 2 shows the percentage of respondents who chose each of the above six measures. The largest proportion (about two-thirds) of respondents reported that they took cost reduction and/or optimisation measures in response to the COVID-19 pandemic. The second largest share (about half) of the reporting firms chose the rebuilding the customer relationship measure. The third largest share (about one-third) of respondents selected the rebuilding the supplier relationship measure. The order of the shares of ‘change in customer’ and ‘change in supplier’ is consistent with findings 5 and 6 – insisting that firms’ relationships or transaction links with customers were more flexible to change than their relationships or transaction links with suppliers.

According to Figure 2, the smallest proportion (about one-fourth) of respondents chose supply chain digitalisation – in other words, inter-firm digitalisation. Additionally, about 30% of reporting firms chose designing remotely manageable operations, which is considered intra-firm digitalisation. Compared with the non-digitalisation measures, including cost reduction and changing customer relationships, these digitalisation measures were significantly less popular choices.

Figure 2: Supply Chain Measures against COVID-19 (%)



COVID-19 = coronavirus disease.
Notes: Cost reduction = cost reduction and/or optimisation; Change in customer = rebuilding relationship with customer; Change in supplier = rebuilding relationship with supplier; Supply chain net optimisation = supply chain network optimisation; Digitalisation = digitalisation of supply chain; Remote operations = design of remotely manageable operations.
Source: Authors.

Table 22 reports the correlation matrix amongst the six measures. Notably, the cost reduction and/or optimisation measure, which was chosen by most of the firms, was not correlated with the other five measures. This may be because firms tend to have no obstacles to taking the cost reduction measure compared with the

other measures. In fact, there was a not strong but positive correlation (0.222) between supply chain digitalisation and supply chain optimisation. Furthermore, supply chain digitalisation was positively correlated (0.244) with remote operations. Interestingly, there was almost no correlation between supply chain optimisation and remote operations. The firms that took a digitalisation measure tend to take supply chain optimisation and remote operation measures together. Meanwhile, if a firm took a supply chain optimisation measure, they were likely to take a digitalisation measure, but not a remote operations measure. When a firm took a remote operations measure, it was likely to take a digitalisation measure, but not a supply chain measure. Another remarkable finding is that the changing customer relationship measure was positively correlated (0.367) with the changing supplier relationship one. If a firm took a measure in changing the customer relationship, it was likely to change the supplier relationship as well.

Table 22: Correlation Matrix Between Supply Chain Measures Against COVID-19

Supply chain measure	Cost reduction	Change in customer	Change in supplier	Supply chain opt	Digital	Remote
Cost reduction	1.000					
Change in customer	-0.053	1.000				
Change in supplier	0.069	0.367	1.000			
Supply chain opt	0.009	0.092	0.181	1.000		
Digital	0.090	0.140	0.181	0.222	1.000	
Remote	0.138	0.148	0.131	0.056	0.244	1.000

COVID-19 = coronavirus disease.
Notes: Observations = 1,491. Cost reduction = cost reduction and/or optimisation; Change in customer = rebuilding relationship with customer; Change in supplier = rebuilding relationship with supplier; Supply chain opt = supply chain network optimisation; Digital = digitalisation of supply chain; Remote = design of remotely manageable operations.
Source: Authors.

Table 23 reports the results for regressing these six measures on the respondents' attributes. According to Table 23, the firms that took a cost reduction measure are more likely to have experienced less sales in 2020, be older, have

internationally diversified customers before COVID-19, and have internationally concentrated production sites before COVID-19, compared with the firms not taking the measure. The firms that took a changing customer relationship measure tend to be smaller and have concentrated production locations. The firms changing the supplier relationship tend to have diversified suppliers across countries, which is an intuitive result.

The firms that undertook supply chain network optimisation tend to be larger than the other firms. The firms that undertook supply chain digitalisation, or inter-firm digitalisation, tend to have more employees. These results may indicate that SMEs have some difficulty taking these two measures, which are important to increase firms' productivity and resilience to disruptions. It is also found that the customer-HHI variable is negatively significant. This means that the more diversified in terms of their customers across countries firms were in 2019, before the COVID-19 pandemic, the more firms tend to choose inter-firm digitalisation as a measure against the COVID-19 pandemic. The firms undertaking a remote operations measure tend to be foreign-affiliated and have internationally concentrated production sites.

Further, Table 23 indicates that firms that are located in Viet Nam (compared with India) or that engage in the manufacturing or wholesale and/or retail industries are less likely to choose supply chain digitalisation. Meanwhile, the intra-firm digitalisation measure is significantly more chosen by firms that are located in Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam (at a significance level of 0.1) compared with India. Note that the internet penetration rates of all these countries, except Indonesia (based on 2019 World Bank data) were larger than that of India according to Chen (2020).[8] This may suggest that internet accessibility is indispensable for intra-firm digitalisation. Firms that engage in the ICT industry are significantly more likely to select intra-firm digitalisation compared with other services, while wholesale and/or retail firms are significantly less likely to undertake it.

[8] According to Chen (2020), the internet penetration rates (percentage of users amongst the population) of Indonesia, Malaysia, the Philippines, Thailand, Viet Nam, and India were 32.3%, 80.1%, 60.1%, 52.9%, 49.6%, and 34.5%, respectively.

Table 23: Firm-Specific Factors and Supply Chain Measures against COVID-19

Independent variables	Cost reduction	Change in customer	Change in supplier	Supply chain opt	Digital	Remote
2020 sales	-0.128***	0.013	-0.017	-0.012	-0.003	0.036
	(0.035)	(0.037)	(0.036)	(0.031)	(0.031)	(0.035)
Ln employees	0.007	-0.014**	0.003	0.031***	0.013**	0.009
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Age	0.001**	-0.000	0.000	-0.000	-0.001***	0.000
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Foreign-affiliated	-0.009	-0.044	-0.052	-0.001	-0.006	0.096***
	(0.033)	(0.035)	(0.033)	(0.032)	(0.030)	(0.033)
Customer-HHI	-0.169***	-0.016	-0.053	-0.072	-0.124**	-0.056
	(0.063)	(0.066)	(0.066)	(0.063)	(0.057)	(0.062)
Supplier-HHI	-0.087	-0.115	-0.153**	-0.105	-0.056	-0.099
	(0.073)	(0.075)	(0.073)	(0.069)	(0.067)	(0.070)
Product-HHI	0.194***	0.142*	0.046	0.026	0.002	0.128*
	(0.070)	(0.073)	(0.071)	(0.068)	(0.063)	(0.066)
Brunei	0.118	-0.132	-0.007	0.124	0.135	0.146
	(0.165)	(0.151)	(0.151)	(0.145)	(0.136)	(0.153)
Cambodia	0.041	-0.118	0.095	-0.114**	-0.038	0.069
	(0.074)	(0.076)	(0.075)	(0.054)	(0.061)	(0.071)
Indonesia	0.171***	-0.046	-0.050	-0.042	0.051	0.167***
	(0.044)	(0.048)	(0.046)	(0.042)	(0.042)	(0.045)
Lao PDR	0.292**	-0.399***	-0.143	0.185	0.145	0.084
	(0.123)	(0.142)	(0.139)	(0.163)	(0.147)	(0.147)
Malaysia	0.139**	0.048	0.091	-0.058	0.105*	0.176***
	(0.056)	(0.063)	(0.064)	(0.050)	(0.057)	(0.062)
Myanmar	0.187*	-0.126	-0.047	-0.001	0.020	0.114
	(0.097)	(0.103)	(0.094)	(0.089)	(0.092)	(0.098)
Philippines	0.167***	0.047	0.022	-0.010	0.108**	0.283***
	(0.046)	(0.049)	(0.049)	(0.044)	(0.046)	(0.050)
Singapore	0.137***	-0.161***	-0.102**	-0.063	0.037	0.061
	(0.046)	(0.050)	(0.047)	(0.043)	(0.045)	(0.047)
Thailand	0.122**	-0.118**	-0.165***	-0.076	0.010	0.131**
	(0.052)	(0.057)	(0.049)	(0.048)	(0.047)	(0.054)
Viet Nam	0.187***	-0.131**	-0.151***	-0.003	-0.071*	0.080
	(0.048)	(0.056)	(0.049)	(0.048)	(0.039)	(0.052)
Manufacture	0.027	-0.051	0.004	0.046	-0.070*	-0.061
	(0.039)	(0.042)	(0.041)	(0.037)	(0.037)	(0.039)

Independent variables	Cost reduction	Change in customer	Change in supplier	Supply chain opt	Digital	Remote
Whole/retail	0.022	-0.040	0.032	0.162***	-0.085*	-0.091*
	(0.050)	(0.055)	(0.054)	(0.053)	(0.046)	(0.049)
ICT	-0.007	-0.006	-0.000	0.030	-0.017	0.098**
	(0.040)	(0.044)	(0.043)	(0.038)	(0.039)	(0.041)
Transport	0.044	0.037	-0.050	0.087	-0.065	-0.044
	(0.056)	(0.063)	(0.064)	(0.057)	(0.051)	(0.053)
Business	0.014	-0.053	-0.055	-0.022	-0.027	-0.008
	(0.042)	(0.045)	(0.042)	(0.037)	(0.039)	(0.041)
Observations	1443	1443	1443	1443	1443	1443
R^2	0.120	0.057	0.067	0.113	0.067	0.107

HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic.
Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Cost reduction = cost reduction and/or optimisation; Change in customer = rebuilding relationship with customer; Change in supplier = rebuilding relationship with supplier; SC net optimisation = supply chain network optimisation; Digital = digitalisation of supply chain; Remote operations = design of remotely manageable operations. All the models control firm function (sales, procurement, and/or production) factors, firm type (independent, branch office, subsidiary, or holding company) factors.
Source: Authors.

3.4. Evaluation of Government Support

Finding 8: Overall, 18% of the firms in the ASEAN region and India received government assistance and 17% expected to receive government assistance, but their ranges by country were significantly large. In other words, government assistance and its satisfaction levels vary across the countries. The degree of government assistance is relatively proportional to satisfaction, except in Malaysia and Myanmar. There was not much difference as to whether or not firms received or were satisfied with government assistance from the firm size and industry perspectives. Chinese-affiliated firms tend to have received less and been more unsatisfied with government assistance.

Tables 24–27 show the respondents' current government assistance situation. Overall, 18% of the respondents have received and 17% expected to receive a government assistance package. Thus, about one-third of the respondents obtained or expected to obtain government support for overcoming the COVID-19 pandemic. Meanwhile, there were significant differences in the current government assistance status of the respondents. According to Table 24, 55.9% of the surveyed firms in Singapore received a government assistance package, while only 9.7% of Indian

firms received it. Even if expected government support in included, the significant difference amongst countries does not change. More than two-thirds of Singaporean firms had or will have government support, whereas less than 30% of Indian firms received or will receive government assistance.

From the firm size and industry perspectives, there were no significant differences in the share of firms that received government support. Table 25 indicates that the range of the relative frequencies of the respondents that had no plan to receive government assistance by industry was 63.9%–66.3%. Moreover, Table 26 shows that the range of the share of firms by industry that expected to obtain government support was 61.3%–67.6%.

Amongst the foreign-affiliated and domestic firms, there were moderate differences in the share of firms that received government assistance. According to Table 36, more than 70% of the US and European firms had no plan to receive government support, whereas only about 63% of the domestic firms did not expect to receive it. Foreign-affiliated firms, except Japan (and other foreign countries), may not be eligible for government support or may not be familiar with government support information. As a result, the share of foreign-affiliated firms that received government assistance may be smaller than that of domestic firms.

Table 24: Current Status of Government Assistance by Country

Country	Not receiving	Expecting	Receiving
Brunei	54.5	0.0	45.5
Cambodia	70.4	14.8	14.8
Indonesia	57.0	21.2	21.8
Lao PDR	60.0	30.0	10.0
Malaysia	45.0	20.0	35.0
Myanmar	51.7	20.7	27.6
Philippines	77.6	11.2	11.2
Singapore	31.6	12.5	55.9
Thailand	68.1	20.4	11.5
Viet Nam	73.5	12.0	14.5
India	71.4	18.9	9.7
Overall	**64.3**	**17.2**	**18.4**

Lao PDR = Lao People's Democratic Republic.
Notes: 'Not receiving, 'expecting', and 'receiving' refer to government assistance packages.
Source: Authors.

Table 25: Current Status of Government Assistance by Firm Size

Firm size	Not receiving	Expecting	Receiving
Small	66.3	14.4	19.3
Medium-sized	64.2	14.2	21.7
Large	63.9	19.4	16.7
Overall	**64.5**	**17.2**	**18.3**

Notes: 'Not receiving, 'expecting', and 'receiving' refer to government assistance packages. Small = firms with less than 20 employees; medium-sized = firms with 20 or more and less than 100 employees; large = firms with 100 or more employees.
Source: Authors.

Table 26: Current Status of Government Assistance by Industry

Industry	Not receiving	Expecting	Receiving
Manufacturing	61.3	17.5	21.2
Wholesale/retail	64.3	14.3	21.4
ICT	67.6	18.4	13.9
Transportation	66.7	15.6	17.8
Business services	66.8	15.2	18.1
Other services	62.0	20.0	18.0
Overall	**64.3**	**17.3**	**18.4**

ICT = information and communication technology.
Notes: 'Not receiving, 'expecting', and 'receiving' refer to government assistance packages.
Source: Authors.

Table 27: Current Status of Government Assistance by Owner's Location

Owner's country	Not receiving	Expecting	Receiving
Domestic	63.4	18.1	18.6
Japan	60.3	8.6	31.1
US	71.9	17.7	10.4
Europe	71.7	14.2	14.2
China	69.2	15.4	15.4
ASEAN	68.4	21.1	10.5
Others	60.0	27.3	12.7
Overall	**64.3**	**17.2**	**18.4**

ASEAN = Association of Southeast Asian Nations, US = United States.
Notes: 'Not receiving, 'expecting', and 'receiving' refer to government assistance packages.
Source: Authors.

Regarding satisfaction with government assistance, 22% of respondents were satisfied with the assistance overall. Meanwhile, similar to the case of the firms' current situation of government assistance, the range of the relative frequencies of firms reporting that the government assistance level was sufficient was significantly large across the countries. Table 28 shows that 63.6% of respondents in Brunei reported the assistance was sufficient, whereas only 10% of Malaysian firms were satisfied.

Looking into the correlation between receiving government assistance and satisfaction with such support, the degree of assistance is roughly proportional to satisfaction (Tables 24 and 28). Note that this correlation did not apply to Malaysia and Myanmar. A relatively large share of the respondents in these two countries received government assistance, but the number of the respondents satisfied with the assistance was the lowest.

It is not easy to name all the reasons for firms' not being satisfied, but one may be the opaqueness of the implementation of government support. A personal care manufacturing executive in Indonesia noted that the government support package was huge and that the content was not the problem. However, compared with Singapore, it was unclear how the government would implement the support, and which firms were eligible for it. This is not the case in Malaysia or Myanmar. Nevertheless, it is of general importance that governments implement their support with transparency to convince firms of the appropriateness of such support.

Similar to the case of the firms' current status of government assistance, Tables 29 and 30 indicate that there was not a very significant difference in satisfaction with government support across firms by size and industry. Although the difference is not significant, the larger firms were more satisfied with government support according to Table 29. The relative frequencies of large, medium-sized, and small firms that were satisfied with government assistance were 24.1%, 19.9%, and 17.3%, respectively.

Table 31 shows that Chinese-affiliated firms were less satisfied or more unsatisfied with government assistance than domestic and other foreign-affiliated firms. About 60% of Chinese-affiliated firms reported the government assistance was insufficient, and the value was about three times more than that of the US-related firms. The fact that Chinese-affiliated firms received less government support (Table 27) may be one of the reasons for such firms' lack of or low levels of satisfaction. In contrast, limited numbers of European and US firms were

unsatisfied with government assistance (Table 31), while both European- and US-affiliated firms received even less government support than Chinese-affiliated firms (Table 27). European and US firms may tend to have had better financial health during the COVID-19 pandemic.

Table 28: Satisfaction of Government Assistance by Country

Country	Insufficient	Neither	Sufficient
Brunei	9.1	27.3	63.6
Cambodia	37.7	41.5	20.8
Indonesia	33.3	39.5	27.2
Lao PDR	40.0	20.0	40.0
Malaysia	52.5	37.5	10.0
Myanmar	55.6	33.3	11.1
Philippines	48.9	37.8	13.3
Singapore	28.5	29.1	42.4
Thailand	40.0	44.5	15.5
Viet Nam	28.2	47.3	24.5
India	20.1	61.0	18.9
Overall	**30.2**	**48.0**	**21.8**

Lao PDR = Lao People's Democratic Republic.
Note: Insufficient = the government assistance package is insufficient; Neither = the government assistance package is neither insufficient nor sufficient; Sufficient = the government assistance package is sufficient.
Source: Authors.

Table 29: Satisfaction of Government Assistance by Firm Size

Firm size	Insufficient	Neither	Sufficient
Small	36.8	45.9	17.3
Medium-sized	35.0	45.0	19.9
Large	26.3	49.6	24.1
Overall	**30.5**	**47.8**	**21.7**

Notes: Insufficient = the government assistance package is insufficient; Neither = the government assistance package is neither insufficient nor sufficient; Sufficient = the government assistance package is sufficient. Small = firms with less than 20 employees; Medium = firms with 20 or more and less than 100 employees: and Large = firms with 100 or more employees.
Source: Authors.

Table 30: Satisfaction of Government Assistance by Industry

Industry	Insufficient	Neither	Sufficient
Manufacturing	25.3	50.0	24.7
Wholesale/retail	31.4	44.5	24.1
ICT	30.2	46.8	23.1
Transportation	18.4	65.5	16.1
Business services	33.2	45.6	21.2
Other services	38.8	44.6	16.7
Overall	**30.1**	**48.0**	**21.8**

ICT = information and communication technology.
Note: Insufficient = the government assistance package is insufficient; Neither = the government assistance package is neither insufficient nor sufficient; Sufficient = the government assistance package is sufficient.
Source: Authors.

Table 31: Satisfaction of Government Assistance by Owner's Country

Owner's country	Insufficient	Neither	Sufficient
Domestic	33.2	45.9	20.9
Japan	23.1	53.0	23.9
US	16.8	60.0	23.2
Europe	17.0	59.8	23.2
China	58.3	25.0	16.7
ASEAN	35.1	43.9	21.1
Others	30.4	39.3	30.4
Overall	**30.2**	**48.0**	**21.8**

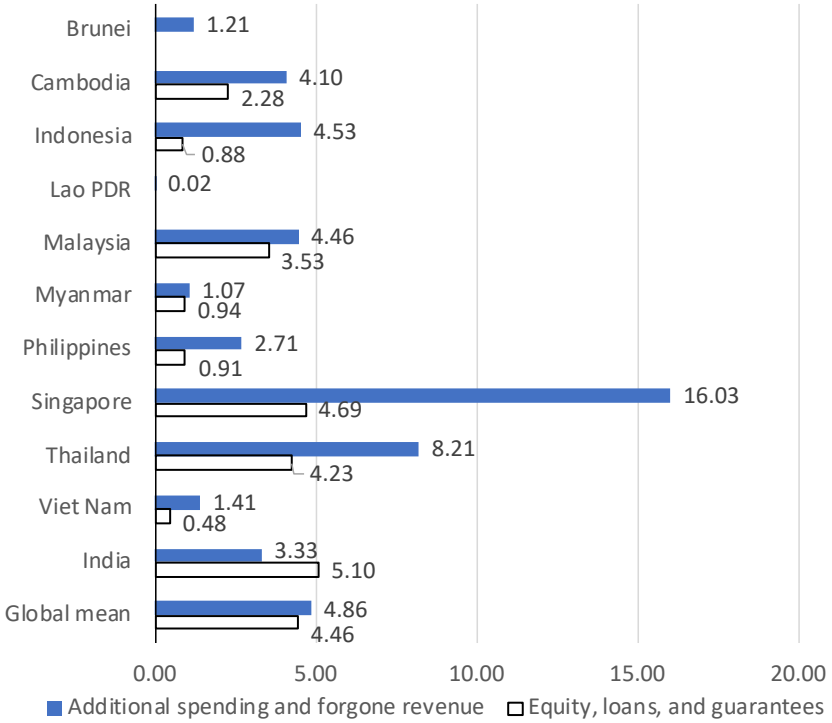
ASEAN = Association of Southeast Asian Nations, US = United States.
Insufficient = the government assistance package is insufficient; Neither = the government assistance package is neither insufficient nor sufficient; Sufficient = the government assistance package is sufficient.
Source: Authors.

As seen above, in general, more firms in Singapore have received government support and are satisfied with it compared with the other targeted countries. The background of these results is considered to come from the differences in the scale of the government measures against the COVID-19 pandemic. Figure 3 shows that the Singaporean government has spent (or decided to spend) about 16% of GDP on discretionary fiscal measures from January 2020, according to IMF (2021b) as of 17 March 2021. Meanwhile, the other countries' fiscal measures in response to

COVID-19 have totalled less than 5% of GDP, except Thailand, at 8% of GDP. Considering that the global mean scale of discretionary fiscal measures is about 5% of GDP, one can say that the scale of the fiscal resources spent by most of the targeted countries on measures in response to COVID-19 was not small. When evaluating the fiscal scale, one cannot forget that the fiscal deficit and larger debt increase the risk of fiscal sustainability. In particular, emerging and developing economies that depend on foreign-currency denominated debt are more likely to face the risk of interest rate increases compared with advanced economies (Cohen-Setton and Oikawa, forthcoming). While necessary measures should be financed, governments should plan to maintain fiscal sustainability (Zen and Kimura, 2020).

Figure 3: Discretionary Fiscal and Liquidity Measures against COVID-19

(% of GDP)



COVID-19 = coronavirus disease, GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic.
Note: The global mean is the arithmetic average of the countries listed in the summary of country fiscal measures in response to the COVID-19 pandemic since January 2020.
Sources: International Monetary Fund (2021b); estimates as of 17 March 2021; authors' calculation.

Finding 9: The most preferred type of government support was tax reduction. The second and third most preferred types of government support were salary support and acceleration of business people's mobility across countries. Smaller firms were more likely to choose rent support as the expected government support. Manufacturing Chinese- or Japanese-affiliated firms were more likely to hope that the government would accelerate business people's mobility and reduce visa conditions.

Tables 32–35 show the issues that the respondents expected governments to address. The very bottom of Table 32 indicates that the largest share (58%) of respondents chose tax reduction support from the government in response to the COVID-19 pandemic. This finding does not change even if looking at the share by country, excluding Brunei. The second largest preference (37%) was salary support. In particular, 61% of Malaysian and 58% of Singaporean firms preferred salary support from the government. The third largest number (32%) was acceleration of business people's mobility between countries. Specifically, 52% of Thai respondents expected business people's mobility acceleration.

Table 33 indicates that smaller firms were more likely to choose rent support as the expected government support. The relative shares of small, medium-sized, and large firms that expected rent support from the government were 31.6%, 24.3%, and 17.1%, respectively. One of the reasons for this may be that the rent cost share amongst the total cost of a firm tends to be larger when the firm is small. Apart from rent support, there were no significant differences in firms' expected government assistance by firm size.

Table 34 shows that there were some differences in the responses to expected government support questions by industry. Regarding business people's mobility, 36.2% of manufacturing firms expected the government to accelerate people's mobility across countries, while 27.9% of business services firms chose this option. Manufacturing firms were also more likely to choose mitigation of visa conditions. The share of manufacturing firms that selected migration mitigation as the preferred government assistance was 22.8%, whereas the shares of other non-manufacturing industries were from 16.1% to 17.3%. In contrast, manufacturing firms were less likely to select wage and rent support as the expected government assistance. In

fact, 29.9% of manufacturing firms chose salary support, while 36.2%–46.0% of non-manufacturing firms selected this option. Rent support was chosen by 15.6% of manufacturing firms and 19.0%–33.3% of non-manufacturing firms. This may be because manufacturing firms' cost share of labour compensation and rent is smaller than that of non-manufacturing firms, since manufacturing firms are more capital-intensive and larger than non-manufacturing firms.

According to Table 35, there were significant differences in the expected government assistance by the owner's country. It is notable that 54.7% of Japanese-affiliated firms selected business people's mobility, while only 28.7% of domestic firms did. Many Chinese-affiliated firms also chose business people's mobility as the desired government assistance. In contrast to these Japanese- and Chinese-affiliated firms, ASEAN and domestic firms gave preference to other issues – including finance, salaries, social security, and rent.

Table 32: Expected Government Support by Country

Country	Mobility	Migration	Finance	Wage	Sosec	Rent	Tax
Brunei	36.4	27.3	36.4	45.5	27.3	27.3	18.2
Cambodia	40.7	24.1	22.2	22.2	35.2	22.2	53.7
Indonesia	36.7	16.9	42.2	39.2	46.4	14.5	68.7
Lao PDR	20.0	40.0	30.0	20.0	30.0	10.0	60.0
Malaysia	43.2	21.0	44.4	60.5	29.6	39.5	75.3
Myanmar	34.5	24.1	20.7	37.9	41.4	31.0	55.2
Philippines	36.4	20.7	36.4	47.1	44.3	25.7	67.1
Singapore	33.1	23.8	29.8	58.3	19.2	42.4	52.3
Thailand	52.2	35.4	26.5	29.2	39.8	18.6	60.2
Viet Nam	40.9	23.5	31.3	34.8	27.8	19.1	63.5
India	22.8	11.3	26.9	30.0	20.0	16.1	52.5
Overall	**32.2**	**18.3**	**30.8**	**37.3**	**28.7**	**21.7**	**58.1**

Lao PDR = Lao People's Democratic Republic.
Notes: Mobility = acceleration of mobility between countries for business people; Migration = mitigation of visa conditions; Finance = financial support for supply chain investment (digital, supply chain network optimisation, etc.); Wage = salary support; Sosec = social security support; Rent = rent support; Tax = tax reduction support.
Source: Authors.

Table 33: Expected Government Support by Firm Size

Firm size	Mobility	Migration	Finance	Wage	Sosec	Rent	Tax
Small	31.9	19.4	28.1	35.3	25.6	31.6	56.9
Medium-sized	33.1	20.2	31.9	43.8	29.7	24.3	63.1
Large	32.3	17.4	31.6	35.7	29.8	17.1	57.4
Overall	**32.2**	**18.3**	**30.8**	**37.3**	**28.7**	**21.7**	**58.1**

Notes: Mobility = acceleration of mobility between countries for business people; Migration = mitigation of visa conditions; Finance = financial support for supply chain investment (digital, supply chain network optimisation, etc.); Wage = salary support; Sosec = social security support; Rent = rent support; Tax = tax reduction support. Small = Firms with less than 20 employees; medium-sized = firms with 20 or more and less than 100 employees; Large = firms with 100 or more employees.
Source: Authors.

Table 34: Expected Government Support by Industry

Industry	Mobility	Migration	Finance	Wage	Sosec	Rent	Tax
Manufacture	36.2	22.8	32.6	29.9	27.2	15.6	59.6
Whole/retail	29.5	17.3	31.7	45.3	32.4	21.6	54.7
ICT	31.7	17.0	33.7	36.2	29.5	22.4	54.5
Transport	31.1	14.4	21.1	37.8	17.8	21.1	58.9
Business	27.9	16.3	30.4	46.0	31.5	33.3	64.5
Others	32.3	16.1	27.4	37.5	29.4	19.0	54.4
Overall	**32.2**	**18.3**	**30.8**	**37.3**	**28.7**	**21.7**	**58.1**

ICT = information and communication technology.
Notes: Mobility = acceleration of mobility between countries for business people; Migration = mitigation of visa conditions; Finance = financial support for supply chain investment (digital, supply chain network optimisation, etc.); Wage = salary support; Sosec = social security support; Rent = rent support; Tax = tax reduction support. Manufacture = manufacturing; Whole/retail = wholesale and/or retail; Transport = transportation; Business = business services; Others = Other services.
Source: Authors.

Table 35: Expected Government Support by Owner's Country

Owner's country	Mobility	Migration	Finance	Wage	Sosec	Rent	Tax
Domestic	28.7	15.1	33.6	40.6	28.6	22.1	57.6
Japan	54.7	35.8	13.5	26.4	27.7	9.5	58.8
US	33.0	18.6	23.7	23.7	20.6	21.6	54.6
Europe	28.3	17.7	31.0	31.0	28.3	31.0	61.9
China	46.2	23.1	23.1	38.5	61.5	7.7	30.8
ASEAN	34.5	20.7	34.5	43.1	36.2	29.3	65.5
Others	38.2	27.3	34.5	34.5	32.7	21.8	63.6
Overall	**32.2**	**18.3**	**30.8**	**37.3**	**28.7**	**21.7**	**58.1**

ASEAN = Association of Southeast Asian Nations, US = United States.
Notes: Mobility = acceleration of mobility between countries for business people; Migration = mitigation of visa conditions; Finance = financial support for supply chain investment (digital, supply chain network optimisation, etc.); Wage = salary support; Sosec = social security support; Rent = rent support; Tax = tax reduction support.
Source: Authors.

4. Discussion and Conclusion

The aim of this paper was to clarify the impact of COVID-19 on firms in AMS and India in terms of their business performance in 2020, the next few years' business outlook, supply chain strategy, and evaluation and expectation of government support through a questionnaire survey. In this last section, we begin by addressing the key research questions and conclude this paper with policy implications.

Q1: How were the firms' sales, exports, and operating profits growth rates distributed in the first year of the COVID-19 pandemic? How about the firms' business outlook? What attributes of firms affected their business performance and outlook? Did any specific pattern of the firms' supply chains influence them?

The COVID-19 pandemic significantly impacted manufacturing and non-manufacturing firms in the AMS and India. The impact was negative overall, but the degree of the impact varies greatly from firm to firm, from positive to negative. Regarding the business outlook, firms intend to hire a substantial number of workers in the next few years.

Furthermore, the firms that were able to adjust trade quickly with their customers and suppliers across countries, and arrange their production globally, tend to have experienced better business performance – even during the COVID-19 pandemic – and have a business expansion outlook for the next few years.

Importantly, manufacturing firms showed better performance in 2020 than other industries, which suggests that international production networks in the region have been relatively robust to negative supply shocks. Additionally, ICT services firms experienced better business outcomes and are more likely to expand their business and hire more employees than other industries. This suggests that positive demand shocks have benefitted the ICT industry and that its growth will continue.

Q2: How did or will the firms reconstruct their customer and supplier relationships and production locations in the year of the COVID-19 outbreak? To what degree? Are the changes temporary or in a medium- or long-term perspective? Did or will the pre-COVID-19 transaction links between customers and suppliers increase, remain, or shrink? For what reason? What attributes of transaction links affected their vulnerability to the COVID-19 shock?

The majority of the firms changed or planned to change their customer and supplier relationships in the wake of the COVID-19 shock. The firms modifying their production locations, including manufacturing firms, were also significant. Further, most of the firms rearranging their supply chains implemented the rearrangement during the first year of the pandemic to a certain extent (10%–30% in trade or production value), in a medium- or long-term perspective.

About a third of the existing links with customers and suppliers increased or are expected to increase, another third of the links kept the same transaction level as before the COVID-19 pandemic, and the remainder shrank. In both the cases of transactions with customers and suppliers, the most important triggering factor for shrinking the transaction links was COVID-19.

A young, Japanese-affiliated, or not Chinese-affiliated firm is less likely to suspend or decrease transactions with its trade partners after COVID-19. Interestingly, manufacturing firms in ASEAN and India are less likely to shrink transactions with their trade partners. Meanwhile, if their partners are in the manufacturing industry, these transactions are likely to shrink. Furthermore, a firm

is more resilient in trade with its customers when it diversified its customers across multiple countries or concentrated its production locations before the COVID-19 pandemic. It should be noted that when a firm is smaller, i.e. an SME, its transactions with its customers are more likely to shrink.

Q3: What kind of measures related to the supply chains did firms take in response to the COVID-19 pandemic? Were there any combinations of different measures against COVID-19 that firms preferred to implement? Were there any differences in the attributes of firms that took different measures in response to COVID-19?

The most selected supply chain measure in the wake of the COVID-19 outbreak was cost reduction and/or optimisation, while the least selected supply chain measure was supply chain digitalisation. Firms that implemented supply chain digitalisation tend to have implemented both supply chain optimisation and remote operations. When a firm is large, young, or has diversified customers across countries, it is more likely to take the supply chain digitalisation measure. The remote operations measure tends to be taken by firms that are foreign-affiliated or located in countries with a relatively high internet penetration rate.

Q4: To what extent have firms in AMS and India received government assistance packages in response to the COVID-19 pandemic? Are the firms satisfied with the government support? What kind of government support do the firms expect to receive?

Overall, 18% of the firms in AMS and India received government assistance and 17% expected to receive government support. The amount of firms that received government support and their satisfaction levels varied by country. There was not much difference as to whether or not firms received or were satisfied with government assistance in terms of firm size and industry.

Tax cuts were the most preferred type of government support. Wage subsidies and the expansion of business people's mobility across borders were the second and third most preferred types of government support. Smaller firms were more likely to prefer rent assistance. Manufacturing firms, Chinese-, or Japanese-affiliated firms were more likely to expect that the government would expedite business travel and ease visa requirements.

What policy implications can we take from the above discussions? We put forth the following three policy recommendations to conclude this paper.

Firstly, the labour market should be flexible so that firms can hire the necessary workers and take the COVID-19 shock as an opportunity for optimising their businesses. As seen above, even during the first year of the COVID-19 outbreak, nearly half of the firms in AMS and India experienced positive growth rates in sales – turning the crisis into an opportunity to expand their businesses. Moreover, many of the firms expect to hire more employees in the next few years. This finding is consistent with Barrero, Bloom, and Davis (2020), who pointed out that the COVID-19 shock brought about not only job destruction but also job creation, based on a survey targeting US firms. In this context, governments should promote the reallocation of the labour force from shrinking sectors or firms to expanding sectors or firms to help the AMS and Indian economies recover smoothly.

Secondly, promoting supply chain resilience is vital to keep and strengthen regional industrial competitiveness during and after the COVID-19 pandemic. As stated before, firms that were able to swiftly adjust the shares of trade with their customers and suppliers across borders and internationally reorganise the distribution of production have had better business results – even during the first year of the COVID-19 pandemic. This suggests that the firms that showed resilience and flexibility to disruptions caused by the COVID-19 crisis experienced better business performance. Belhadi et al. (2021) asserted that coordination and collaboration at a high level amongst the firms participating in the supply chains are required to build resilient supply chains after COVID-19. They also claimed that industry levels of supply chain resilience for the manufacturing and service industries depend on how firms digitalise their supply chain operations. Governments should promote firms' digital investments to strengthen the supply chain in the AMS and India regions. To promote the firms' digitalisation, governments should give special consideration to SMEs, as fewer of them took digitalisation measures in response to the COVID-19 pandemic. Another reason for SME support is that SMEs' transactions with their counterparts in supply chains were more vulnerable to the COVID-19 shock.

Thirdly, human resources development is also important. In particular, strengthening digital skills is essential. As mentioned above, a limited number of firms took digitalisation measures in response to COVID-19. The Japan External Trade Organization surveyed Japanese-affiliated firms running businesses in Asia and Oceania in 2020 and found that many firms faced obstacles in introducing digital technologies in the AMS (JETRO, 2020). According to the JETRO survey, the largest number of firms considered the shortage of human resources familiar with digital technologies inside the firm as the reason why they face difficulties in digitalisation. In this context, governments should provide firms, particularly SMEs, with technical and financial assistance to improve the digital skills of employees through education and training.

Overall, this survey reaffirms the dynamism of corporate firms in ASEAN and India – even in facing this devastating pandemic. Vigorous entrepreneurship and diligent workers have always been at the core of our rapid and inclusive economic growth. To move ahead, we must become more innovative. COVID-19 provides an opportunity for our region to engage in a new phase of economic development.

References

ADB (2020), *The COVID-19 Impact on Philippine Business: Key Findings from the Enterprise Survey*. Manila: Asian Development Bank.

AmCham Indonesia and ERIA (2020), *The Impact of COVID-19 on Foreign Firms in ASEAN*. Jakarta: American Chamber of Commerce in Indonesia and Economic Research Institute for ASEAN and East Asia.

Ando, M. (2021), 'Demand and Supply Shocks of COVID-19 and International Production Networks: Evidence from Japan's Machinery Trade', *ERIA Discussion Paper Series*, No. 366, ERIA-DP-2021-39. Jakarta: Economic Research Institute for ASEAN and East Asia.

Barrero, J.M., N. Bloom, and S.J. Davis (2020), 'COVID-19 Is also a Reallocation Shock', *NBER Working Paper Series*, No. 27137. Cambridge, MA: National Bureau of Economic Research.

Belhadi, A., S. Kamble, C.J. Chiappetta Jabbour, A. Gunasekaran, N.O. Ndubisi, and M. Venkatesh (2021), 'Manufacturing and Service Supply Chain Resilience to the COVID-19 Outbreak: Lessons Learned from the Automobile and Airline Industries', *Technological Forecasting and Social Change*, 163, 120447.

Brzoza-Brzezina, M. and K. Makarski (2011), 'Credit Crunch in a Small Open Economy', *Journal of International Money and Finance*, 30(7), pp.1406–28.

Chen, L. (2020), 'Improving Digital Connectivity for E-commerce: A Policy Framework and Empirical Note', in L. Chen and F. Kimura (eds.) *E-Commerce Connectivity in ASEAN*. Jakarta: Economic Research Institute for ASEAN and East Asia, pp.7–30.

Cohen-Setton, J. and K. Oikawa (forthcoming), 'Japan's Public Debt Sustainability Before and After COVID-19', in B. Ferrarini, J. Pradelli, and M. Giugale (eds.) *The Sustainability of Asia's Debt*. Edward Elgar.

De, R., N. Pandey, and A. Pal (2020), 'Impact of Digital Surge During Covid-19 Pandemic: A Viewpoint on Research and Practice', *International Journal of Information Management*, 55, 102171.

Guerrieri, V., G. Lorenzoni, L. Straub, and I. Werning (2020), 'Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?', *BFI Working Paper*, No. 2020-35. Chicago, IL: Becker Friedman Institute for Research in Economics.

Hannah, D. (2021), 'One Way to Build More Resilient Medical Supply Chains in the US', *Harvard Business Review*, 16 February. https://hbr.org/2021/02/one-way-to-build-more-resilient-medical-supply-chains-in-the-u-s# (accessed 17 May 2021).

Hayakawa, K. and H. Mukunoki (2021), 'Impacts of COVID-19 on Global Value Chains', *The Developing Economies*, 59(2), pp.154–77.

IMF (2020), World Economic Outlook Database, October 2020. https://www.imf.org/en/Publications/WEO/weo-database/2020/October (accessed 5 April 2021).

IMF (2021a), 'World Economic Outlook', April 2021. https://www.imf.org/en/Publications/WEO/weo-database/2021/April (accessed 2 June 2021).

IMF (2021b), Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic, April 2021. https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19 (accessed 6 April 2021).

JETRO (2020), 'Impact of COVID-19 on Supply Chains in the ASEAN Plus Three Region, with Policy Recommendations', ASEAN Plus Three Joint Study – Sub-report of Japan. Tokyo: Japan External Trade Organization.

JETRO (2021), *2020 JETRO Survey on Business Conditions of Japanese Companies Operating Overseas (Asia and Oceania)*. Tokyo: Japan External Trade Organization.

Kikuchi, S., S. Kitao, and M. Mikoshiba (2020), 'Who Suffers from the COVID-19 Shocks? Labor Market Heterogeneity and Welfare Consequences in Japan', *CREPE Discussion Paper Series*, No. 80. Tokyo: Centre for Research and Education in Program Evaluation (CREPE), University of Tokyo.

Kimura, F. (2020), 'Exit Strategies for ASEAN Member States: Keeping Production Networks Alive Despite the Impending Demand Shock', *ERIA Policy Brief*, No. 2020-03. Jakarta: Economic Research Institute for ASEAN and East Asia.

Kose, M. A., C. Otrok, and E. Prasad (2012), 'Global Business Cycles: Convergence or Decoupling?', *International Economic Review*, 53(2), pp.511–38.

OECD (2020), 'Job Retention Schemes During the COVID-19 Lockdown and Beyond', Updated 12 October 2020. Paris: Organisation for Economic Co-operation and Development.

Zen, F. and F. Kimura (2020), 'Maintaining Fiscal Sustainability during the Pandemic Crisis', *ERIA Policy Brief*, No. 2020-04. Jakarta: Economic Research Institute for ASEAN and East Asia.

Appendices

Participating Industry Associations

Association Name	Country
American Chamber of Commerce in Myanmar	Myanmar
Association of Garments, Textiles, Embroidery and Knitting (AGTEK)	Viet Nam
Association of Marine Industries of Malaysia (AMIM)	Malaysia
Association of Small and Medium Enterprises in Southern Viet Nam	Viet Nam
British Chamber of Commerce in Cambodia	Cambodia
British Chamber of Commerce in Indonesia	Indonesia
British Chamber of Commerce Philippines	Philippines
British Chamber of Commerce Thailand	Thailand
British Chamber of Commerce Viet Nam	Viet Nam
British Malaysian Chamber of Commerce	Malaysia
Cambodia Food Manufacturer Association (CFMA)	Cambodia
Chemical Industries Association of the Philippines (SPIK)	Philippines
Chemical Industries Council of Malaysia (CICM)	Malaysia
European Chamber of Commerce and Industry in Lao PDR	Lao PDR
Federation of Thai Industries	Thailand
Fragrances and Flavours Association of India (FAFAI)	India
Garment Manufacturers Association in Cambodia (GMAC)	Cambodia
Indonesia Seaweed Industry Association (ASTRULI)	Indonesia
Indonesian Automotive Parts & Components Industries Association (GIAMM)	Indonesia
Indonesian Food and Beverage Association (GAPMMI)	Indonesia
Indonesian Packaging Federation (IPF)	Indonesia
IT & Business Process Association of the Philippines (IBPAP)	Philippines
Jakarta Japan Club	Indonesia
Japan Chamber of Commerce and Industry in India	India
Japan Chamber of Commerce and Industry, Myanmar	Myanmar
Japanese Business Association of Cambodia	Cambodia
Japanese Chamber of Commerce, Bangkok	Thailand
Japanese Chamber of Commerce & Industry, Singapore	Singapore

Association Name	Country
Japanese Chamber of Commerce and Industry in Ho Chi Minh City	Viet Nam
Japanese Chamber of Commerce and Industry in Viet Nam	Viet Nam
Japanese Chamber of Commerce and Industry, Lao PDR	Lao PDR
Japanese Chamber of Commerce and Industry of the Phils., Inc.	Philippines
Japanese Chamber of Trade & Industry, Malaysia	Malaysia
Korea Chamber of Business in Viet Nam (KORCHAM)	Viet Nam
Malaysia Iron and Steel Industry Federation (MISIF)	Malaysia
Malaysian Footwear Manufacturers' Association (MFMA)	Malaysia
Malaysian Oil & Gas Services Council (MOGSC)	Malaysia
Malaysian Plastics Manufacturers Association (MPMA)	Malaysia
Malaysian Wood Industries Association	Malaysia
National Tech Association of Malaysia (PIKOM)	Malaysia
Philippine Chamber of Food Manufacturers (PCFMI)	Philippines
Philippine Exporters Confederation, Inc. (PHILEXPORT)	Philippines
Philippine Wood Producers Association, Inc.	Philippines
Purchasing and Supply Chain Management Association of Thailand	Thailand
Supply Chain Asia	Singapore
Supply Chain Management Association of the Philippines (SCMAP)	Philippines
Thai Electrical, Electronics and Telecommunication Industries Association	Thailand
Thai Food Processors' Association (TFPA)	Thailand
Thai Machinery Association	Thailand
Thai National Shippers' Council	Thailand
Thai Pharmaceutical Manufacturers Association	Thailand
Viet Nam Fertilizer Association (FAV)	Viet Nam
Viet Nam Logistics Business Association (VLA)	Viet Nam
Viet Nam Logistics Research and Development Institute (VLI)	Viet Nam
Viet Nam Packaging Association	Viet Nam

Source: Authors.

Survey Questions

I Background

(omitted)

II Overview of Your Company

Q1. What is your company's name?

Q2. What is your business/company email address?

Q3.

(1) Which country is your company/entity located in?

Note: If you have selected 'Other', please specify

1. Singapore 2. Thailand 3. Malaysia 4. Indonesia 5. Philippines 6. Viet Nam 7. Cambodia 8. Lao PDR 9. Myanmar 10. Brunei 11. India 12. Other

(2) What is your business/company email address?

Q4. When was your company established? (Use the Western calendar year)

Q5. Which industry is your company's primary business? (Select the number of the most appropriate industry)

Note: Select 'Wholesale and/or retail' if the parent company in Japan is a manufacturer but only engages only in the sale of products in your country and/or region.

Note: If you have selected 'Other service', please specify:

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical
5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal
7. General machinery 8. Electrical machinery 9. Transportation machinery
10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail
13. Communications and/or software 14. Transportation 15. Other services

Q6. Select the appropriate number for each section.

(1) Company type

1. Holding company 2. Branch office 3. Subsidiary 4. Independent company

(2) Business function(s) of your entity (select one or more)

1. Sales function 2. Procurement function 3. Production function

(3) Stock market listing

1. Listed 2. Unlisted

(4) Management type

Note: 'Owner' means the founder; one of the founders; child, grandchild, or relative of the founder; or a major individual shareholder. An 'owner-managed company' is managed or practically controlled by the owner as the president, chairperson, or adviser.

1. Owner-managed company 2. Not an owner-managed company

(5) Ownership

Note: A 'foreign-affiliated company' is one where foreign investors hold 10% or more of the company's shares. If your company is a joint venture and has multiple foreign investors, list all their countries.

1. Domestic company 2. Foreign-affiliated company

Q7. If you chose 'Branch office' or 'Subsidiary' in Q6-1, please provide the following.

Note: If your company is a joint venture, list all your investors and their addresses.

(1) Name of the parent company(ies)

(2) Address of the parent company(ies)

Q8. How many regular employees work for your company?

Note: 'Regular employees' mean paid board members and employees whose employment contract period exceeds 1 month, whether or not they are permanent full-time, part-time, fixed-term, contract, or other employees. 'Permanent full-time employees' are those categorised as permanent full-time employees amongst the company's regular employees.

(1) Number of regular employees

(2) Number of permanent full-time employees amongst them

III Business Activity

Q9. Please provide the following in local currency.

(1) Sales (domestic and overseas sales)

1. 2017 ( ) 2. 2018 ( ) 3. 2019 ( )

(2) Exports

1. 2017 ( ) 2. 2018 ( ) 3. 2019 ( )

(3) Operating profit

1. 2017 ( ) 2. 2018 ( ) 3. 2019 ( )

Q10. What estimated changes do you expect in 2020 (January–December) compared with the previous year? (Select the appropriate option.)

(1) Estimated sales

1. 1%–10% increase 2. 11%–20% increase 3. 21%–30% increase 4. 31%–40% increase
5. 41%–50% increase 6. 51%–60% increase 7. 61%–70% increase 8. 71%–80% increase
9. 81%–90% increase 10. 91% or more increase 11. No change (0%) 12. 1%–10% decrease
13. 11%–20% decrease 14. 21%–30% decrease 15. 31%–40% decrease 16. 41%–50% decrease
17. 51%–60% decrease 18. 61%–70% decrease 19. 71%–80% decrease 20. 81%–90% decrease
21. 91% or more decrease

(2) Estimated exports

1. 1%–10% increase 2. 11%–20% increase 3. 21%–30% increase 4. 31%–40% increase
5. 41%–50% increase 6. 51%–60% increase 7. 61%–70% increase 8. 71%–80% increase
9. 81%–90% increase 10. 91% or more increase 11. No change (0%) 12. 1%–10% decrease
13. 11%–20% decrease 14. 21%–30% decrease 15. 31%–40% decrease 16. 41%–50% decrease

17. 51%–60% decrease 18. 61%–70% decrease 19. 71%–80% decrease 20. 81%–90% decrease
21. 91% or more decrease

(3) Estimated operating profit

1. 1%–10% increase 2. 11%–20% increase 3. 21%–30% increase 4. 31%–40% increase
5. 41%–50% increase 6. 51%–60% increase 7. 61%–70% increase 8. 71%–80% increase
9. 81%–90% increase 10. 91% or more increase 11. Return to profitability 12. Deficit reduction
13. No change (0%) 14. 1%–10% decrease 15. 11%–20% decrease 16. 21%–30% decrease
17. 31%–40% decrease 18. 41%–50% decrease 19. 51%–60% decrease 20. 61%–70% decrease
21. 71%–80% decrease 22. 81%–90% decrease 23. 91% or more decrease 24. Fallen into deficit
25. Increase in deficit

Q11. Related to operating profit increase/decrease, which items listed below are impacted by COVID-19? (Select one or more.)

1. Increase/decrease in sales due to expansion/contraction of exports
2. Increase/decrease in sales in the local market
3. Increase/Reduction in procurement costs
4. Other, please specify in the box on the right

Q12. Related to operating profit increase/decrease, which items listed below are impacted by factors other than COVID-19 (US–China trade tensions, etc.)? (Select one or more.)

1. Increase/decrease in sales due to expansion/contraction of exports
2. Increase/decrease in sales in the local market
3. Increase/Reduction in procurement costs
4. Other, please specify in the box on the right

Q13. What is the outlook for operating profit in 2021, compared with 2020? (Select the most appropriate answer)

1. Increase 2. Remain at the same level 3. Decrease

Q14. What is the optimal direction for your business in the next 1 or 2 years, compared with the time before the COVID-19 pandemic? (Select one or more.)

1. Expansion 2. Maintaining the pre-COVID-19 level 3. Downsizing 4. Withdrawal 5. Transfer to a third country (region) 6. Return to country of incorporation (if your company is a foreign-affiliated company)

Q15. What is the optimal number of employees for your business in the next 1 or 2 years, compared with the time before the COVID-19 pandemic? (Select the most appropriate number.)

1. 1%–10% increase 2. 11%–20% increase 3. 21%–30% increase 4. 31%–40% increase 5. 41%–50% increase 6. 51%–60% increase 7. 61%–70% increase 8. 71%–80% increase 9. 81%–90% increase 10. 91% or more increase 11. No change (0%) 12. 1%–10% decrease 13. 11%–20% decrease 14. 21%–30% decrease 15. 31%–40% decrease 16. 41%–50% decrease 17. 51%–60% decrease 18. 61%–70% decrease 19. 71%–80% decrease 20. 81%–90% decrease 21. 91% or more decrease

IV Supply Chains

Q16. Please answer the following questions about the '**top three customer companies**', based on domestic and overseas sales in 2019.

(1) 1st largest customer company

(i) Country (where the customer company's establishment (plant) to which your company provides products or services is located)

1. Japan 2. China 3. Hong Kong 4. Taiwan 5. Republic of Korea 6. Brunei Darussalam 7. Singapore 8. Thailand 9. Malaysia 10. Indonesia 11. Philippines 12. Viet Nam 13. Cambodia 14. Lao PDR 15. Myanmar 16. India 17. Other Asian countries 18. United States 19. Mexico 20. Europe 21. Middle East 22. Central and South America 23. Other

(ii) Industry (of the customer company's establishment (plant) to which your company provides products or services)

Note: If you have selected ‘Other service’, please specify

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical
5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal
7. General machinery 8. Electrical machinery 9. Transportation machinery
10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail
13. Communications and/or software 14. Transportation 15. Other services

(iii) Number of employees

1. 1–19 2. 20–99 3. 100 or more

(iv) Does your company have ownership in the customer company?

1. Yes 2. No

(v) Does the customer company have ownership in your company?

1. Yes 2. No

(vi-1) In 2020 and after, what changes do you expect in your business relationships with the customer company?

1. Suspension of transactions 2. Decrease in transactions 3. No change in transactions
4. Increase in transactions

(vi-2) What factors are relevant to these changes?

Note: If you have selected ‘Other’, please specify

1. COVID-19 2. Other

(2) 2nd largest customer company

(i) Country (where the customer company’s establishment (plant) to which your company provides products or services is located)

1. Japan 2. China 3. Hong Kong 4. Taiwan 5. Republic of Korea 6. Brunei Darussalam
7. Singapore 8. Thailand 9. Malaysia 10. Indonesia 11. Philippines 12. Viet Nam
13. Cambodia 14. Lao PDR 15. Myanmar 16. India 17. Other Asian countries
18. United States 19. Mexico 20. Europe 21. Middle East 22. Central and South America
23. Other

(ii) Industry (of the customer company’s establishment (plant) to which your company provides products or services)

Note: If you have selected ‘Other service’, please specify

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical
5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal

7. General machinery 8. Electrical machinery 9. Transportation machinery 10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail 13. Communications and/or software 14. Transportation 15. Other services

(iii) Number of employees

1. 1–19 2. 20–99 3. 100 or more

(iv) Does your company have ownership in the customer company?

1. Yes 2. No

(v) Does the customer company have ownership in your company?

1. Yes 2. No

(vi-1) In 2020 and after, what changes do you expect in your business relationships with the customer company?

1. Suspension of transactions 2. Decrease in transactions 3. No change in transactions 4. Increase in transactions

(vi-2) What factors are relevant to these changes?

Note: If you have selected 'Other', please specify

1. COVID-19 2. Other

(3) 3rd largest customer company

(i) Country (where the customer company's establishment (plant) to which your company provides products or services is located)

1. Japan 2. China 3. Hong Kong 4. Taiwan 5. Republic of Korea 6. Brunei Darussalam 7. Singapore 8. Thailand 9. Malaysia 10. Indonesia 11. Philippines 12. Viet Nam 13. Cambodia 14. Lao PDR 15. Myanmar 16. India 17. Other Asian countries 18. United States 19. Mexico 20. Europe 21. Middle East 22. Central and South America 23. Other

(ii) Industry (of the customer company's establishment (plant) to which your company provides products or services)

Note: If you have selected 'Other service', please specify

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical 5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal 7. General machinery 8. Electrical machinery 9. Transportation machinery 10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail 13. Communications and/or Software 14. Transportation 15. Other services

(iii) Number of employees

1. 1–19 2. 20–99 3. 100 or more

(iv) Does your company have ownership in the customer company?

1. Yes 2. No

(v) Does the customer company have ownership in your company?

1. Yes 2. No

(vi-1) In 2020 and after, what changes do you expect in your business relationships with the customer company?

1. Suspension of transactions 2. Decrease in transactions 3. No change in transactions 4. Increase in transactions

(vi-2) What factors are relevant to these changes?

Note: If you have selected 'Other', please specify

1. COVID-19 2. Other

Q17. Please answer the following questions about the '**top three supplier companies**', based on domestic and overseas sales in 2019.

(1) 1st largest supplier company

(i) Country (where the supplier company's establishment (plant) from which your company procures products or services is located)

1. Japan 2. China 3. Hong Kong 4. Taiwan 5. Republic of Korea 6. Brunei Darussalam 7. Singapore 8. Thailand 9. Malaysia 10. Indonesia 11. Philippines 12. Viet Nam 13. Cambodia 14. Lao PDR 15. Myanmar 16. India 17. Other Asian countries 18. United States 19. Mexico 20. Europe 21. Middle East 22. Central and South America 23. Other

(ii) Industry (of the supplier company's establishment (plant) from which your company procures products or services)

Note: If you have selected 'Other service', please specify

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical 5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal 7. General machinery 8. Electrical machinery 9. Transportation machinery 10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail 13. Communications and/or software 14. Transportation 15. Other services

(iii) Number of employees

1. 1–19 2. 20–99 3. 100 or more

(iv) Does your company have ownership in the supplier company?

1. Yes 2. No

(v) Does the supplier company have ownership in your company?

1. Yes 2. No

(vi-1) In 2020 and after, what changes do you expect in your business relationships with the customer company?

1. Suspension of transactions 2. Decrease in transactions 3. No change in transactions 4. Increase in transactions

(vi-2) What factors are relevant to these changes?

Note: If you have selected 'Other', please specify

1. COVID-19 2. Other

(2) 2nd largest supplier company

(i) Country (where the supplier company's establishment (plant) from which your company procures products or services is located)

1. Japan 2. China 3. Hong Kong 4. Taiwan 5. Republic of Korea 6. Brunei Darussalam 7. Singapore 8. Thailand 9. Malaysia 10. Indonesia 11. Philippines 12. Viet Nam 13. Cambodia 14. Lao PDR 15. Myanmar 16. India 17. Other Asian countries 18. United States 19. Mexico 20. Europe 21. Middle East 22. Central and South America 23. Other

(ii) Industry (of the supplier company's establishment (plant) from which your company procures products or services)

Note: If you have selected 'Other service', please specify

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical 5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal 7. General machinery 8. Electrical machinery 9. Transportation machinery 10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail 13. Communications and/or software 14. Transportation 15. Other services

(iii) Number of employees

1. 1–19 2. 20–99 3. 100 or more

(iv) Does your company have ownership in the supplier company?

1. Yes 2. No

(v) Does the supplier company have ownership in your company?

1. Yes 2. No

(vi-1) In 2020 and after, what changes do you expect in your business relationships with the supplier company?

1. Suspension of transactions 2. Decrease in transactions 3. No change in transactions 4. Increase in transactions

(vi-2) What factors are relevant to these changes?

Note: If you have selected 'Other', please specify

1. COVID-19 2. Other

(3) 3rd largest supplier company

(i) Country (where the supplier company's establishment (plant) from which your company procures products or services is located)

1. Japan 2. China 3. Hong Kong 4. Taiwan 5. Republic of Korea 6. Brunei Darussalam 7. Singapore 8. Thailand 9. Malaysia 10. Indonesia 11. Philippines 12. Viet Nam 13. Cambodia 14. Lao PDR 15. Myanmar 16. India 17. Other Asian countries 18. United States 19. Mexico 20. Europe 21. Middle East 22. Central and South America 23. Other

(ii) Industry (of the supplier company's establishment (plant) from which your company procures products or services)

Note: If you have selected 'Other service', please specify

1. Food 2. Textile 3. Wood and/or pulp 4. Chemical and/or pharmaceutical 5. Rubber and/or leather 6. Steel and/or nonferrous metal and/or metal 7. General machinery 8. Electrical machinery 9. Transportation machinery 10. Precision machinery 11. Other manufacturing 12. Wholesale and/or retail 13. Communications and/or software 14. Transportation 15. Other services

(iii) Number of employees

1. 1–19 2. 20–99 3. 100 or more

(iv) Does your company have ownership in the supplier company?

1. Yes 2. No

(v) Does the supplier company have ownership in your company?

1. Yes 2. No

(vi-1) In 2020 and after, what changes do you expect in your business relationships with the supplier company?

1. Suspension of transactions 2. Decrease in transactions 3. No change in transactions 4. Increase in transactions

(vi-2) What factors are relevant to these changes?

Note: If you have selected 'Other', please specify

1. COVID-19 2. Other

Q18. Please answer the following questions about your relationship with '**overall**' customers.

(1) Reasons for changes in your customer relationship (Transaction amount, etc.) (one or more)

1. COVID-19 2. Change in the trade environment (e.g. imposition of additional customs duties, US–China trade friction) 3. Other, please specify in the box on the right 4. No plan to change

(2) When the changes are to be implemented

1. Already implemented 2. By the end of 2020 3. First half of 2021 4. Second half of 2021 5. 2022– 6. Not sure 7. No plan to change

(3) Targeted period of the changes

1. Temporary 2. Medium- to long-term 3. Not sure 4. No plan to change

(4) Scale of the transaction value of the changes

1. Partial (1%–less than 10%) 2. Partial (10%–less than 30%) 3. Partial (30%–less than 100%) 4. Full 5. No plan to change

(5) Top 3 sales (domestic and overseas sales) countries and their proportion (%) in 2019. Please indicate the proportion of total sales that these countries represent. Do not include a percentage sign.

Note: If your company sells in three countries or less, the sum should add up to 100. If your company sells in four or more countries, the sum should be less than 100.

1. Japan ( ) 2. China ( ) 3. Hong Kong ( ) 4. Taiwan ( ) 5. Republic of Korea ( ) 6. Brunei Darussalam ( ) 7. Singapore ( ) 8. Thailand ( ) 9. Malaysia ( ) 10. Indonesia ( ) 11. Philippines ( ) 12. Viet Nam ( ) 13. Cambodia ( ) 14. Lao PDR ( ) 15. Myanmar ( ) 16. India ( ) 17. Other Asian countries ( ) 18. United States ( )

19. Mexico ( ) 20. Europe ( ) 21. Middle East ( ) 22. Central and South America ( )
23. Other ( )

(6) Top 3 sales (domestic and overseas sales) countries and their proportion (%) in 2020 and after. Please indicate the proportion of total sales that these countries represent. Do not include a percentage sign.

Note: If your company sells in three countries or less, the sum should add up to 100. If your company sells in four or more countries, the sum should be less than 100.

1. Japan ( ) 2. China ( ) 3. Hong Kong ( ) 4. Taiwan ( ) 5. Republic of Korea ( )
6. Brunei Darussalam ( ) 7. Singapore ( ) 8. Thailand ( ) 9. Malaysia ( )
10. Indonesia ( ) 11. Philippines ( ) 12. Viet Nam ( ) 13. Cambodia ( ) 14. Lao PDR ( ) 15. Myanmar ( ) 16. India ( ) 17. Other Asian countries ( ) 18. United States ( )
19. Mexico ( ) 20. Europe ( ) 21. Middle East ( ) 22. Central and South America ( )
23. Other ( )

Q19. Please answer the following questions about your relationship with '**overall**' suppliers.

(1) Reasons for changes in your supplier relationship (Transaction amount, etc.) (one or more)

1. COVID-19 2. Change in the trade environment (e.g. imposition of additional customs duties, US–China trade friction) 3. Other, please specify in the box on the right 4. No plan to change

(2) When the changes are to be implemented

1. Already implemented 2. By the end of 2020 3. First half of 2021 4. Second half of 2021
5. 2022– 6. Not sure 7. No plan to change

(3) Targeted period of the changes

1. Temporary 2. Medium- to long-term 3. Not sure
4. No plan to change

(4) Scale of the transaction value of the changes

1. Partial (1%–less than 10%) 2. Partial (10%–less than 30%) 3. Partial (30%–less than 100%)
4. Full 5. No plan to change

(5) Top 3 procurement countries and their proportion (%) in 2019. Please indicate the proportion of total procurement that these countries represent. Do not include a percentage sign.

Note: If your company procures from three countries or less, the sum should add up to 100. If your company procures from four or more countries, the sum should be less than 100.

1. Japan ( ) 2. China ( ) 3. Hong Kong ( ) 4. Taiwan ( ) 5. Republic of Korea ( ) 6. Brunei Darussalam ( ) 7. Singapore ( ) 8. Thailand ( ) 9. Malaysia ( ) 10. Indonesia ( ) 11. Philippines ( ) 12. Viet Nam ( ) 13. Cambodia ( ) 14. Lao PDR ( ) 15. Myanmar ( ) 16. India ( ) 17. Other Asian countries ( ) 18. United States ( ) 19. Mexico ( ) 20. Europe ( ) 21. Middle East ( ) 22. Central and South America ( ) 23. Other ( )

(6) Top 3 procurement countries and their proportion (%) in 2020 and after.

Please indicate the proportion of total procurement that these countries represent.

Do not include a percentage sign.

Note: If your company procures from three countries or less, the sum should add up to 100. If your company procures from four or more countries, the sum should be less than 100.

1. Japan ( ) 2. China ( ) 3. Hong Kong ( ) 4. Taiwan ( ) 5. Republic of Korea ( ) 6. Brunei Darussalam ( ) 7. Singapore ( ) 8. Thailand ( ) 9. Malaysia ( ) 10. Indonesia ( ) 11. Philippines ( ) 12. Viet Nam ( ) 13. Cambodia ( ) 14. Lao PDR ( ) 15. Myanmar ( ) 16. India ( ) 17. Other Asian countries ( ) 18. United States ( ) 19. Mexico ( ) 20. Europe ( ) 21. Middle East ( ) 22. Central and South America ( ) 23. Other ( )

Q20. Please answer the following questions about production location (country).

If your company is a branch office or a subsidiary, indicate your parent company's opinion to the best of your knowledge, including any plans that have already been decided. (Select the appropriate number.)

(1) Reasons for changes in production location (Country) (one or more)

1. COVID-19 2. Change in the trade environment (e.g. imposition of additional customs duties, US–China trade friction) 3. Other, please specify in the box on the right 4. No plan to change

(2) When the changes are to be implemented

1. Already implemented 2. By the end of 2020 3. The first half of 2021 4. Second half of 2021 5. 2022– 6. Not sure 7. No plan to change

(3) Targeted period of the changes

1. Temporary 2. Medium- to long-term 3. Not sure 4. No plan to change

(4) Scale of the transaction value of the changes

1. Partial (1%–less than 10%) 2. Partial (10%–less than 30%) 3. Partial (30%–less than 100%) 4. Full 5. No plan to change

(5) Top 3 production countries and their proportion (%) in 2019. Please indicate the proportion of total factory production that these countries represent. Do not include a percentage sign.

Note: If your company produces in three countries or less, the sum should add up to 100. If your company produces in four or more countries, the sum should be less than 100.

1. Japan ( ) 2. China ( ) 3. Hong Kong ( ) 4. Taiwan ( ) 5. Republic of Korea ( ) 6. Brunei Darussalam ( ) 7. Singapore ( ) 8. Thailand ( ) 9. Malaysia ( ) 10. Indonesia ( ) 11. Philippines ( ) 12. Viet Nam ( ) 13. Cambodia ( ) 14. Lao PDR ( ) 15. Myanmar ( ) 16. India ( ) 17. Other Asian countries ( ) 18. United States ( ) 19. Mexico ( ) 20. Europe ( ) 21. Middle East ( ) 22. Central and South America ( ) 23. Other ( )

(6) Top 3 production countries and their proportion (%) in 2020 and after. Please indicate the proportion of total factory production that these countries represent. Do not include a percentage sign.

Note: If your company produces in three countries or less, the sum should add up to 100. If your company produces in four or more countries, the sum should be less than 100.

1. Japan ( ) 2. China ( ) 3. Hong Kong ( ) 4. Taiwan ( ) 5. Republic of Korea ( ) 6. Brunei Darussalam ( ) 7. Singapore ( ) 8. Thailand ( ) 9. Malaysia ( ) 10. Indonesia ( ) 11. Philippines ( ) 12. Viet Nam ( ) 13. Cambodia ( ) 14. Lao PDR ( ) 15. Myanmar ( ) 16. India ( ) 17. Other Asian countries ( ) 18. United States ( ) 19. Mexico ( ) 20. Europe ( ) 21. Middle East ( ) 22. Central and South America ( ) 23. Other ( )

(7) If you have any plans to move your production site from one country to another, please provide the ‘from’ and ‘to’ country (up to 3 plans)

1. From ( ) To ( )
2. From ( ) To ( )
3. From ( ) To ( )

Q21. In response to the COVID-19 pandemic, what measures has your company taken regarding the supply chain? (Select one or more.)

1. Cost reduction/optimisation
2. Rebuilding relationship with customers (e.g. conditions revision/negotiation with current customers, new customer development, etc.)
3. Rebuilding relationship with suppliers (e.g. use general-purpose components instead of custom-made components, revision of dealer/supplier supporting scheme, etc.)
4. Supply chain network optimisation
5. Digitisation of supply chain (e.g. replace component trade with information technology services, such as 3-D printing)
6. Design of remotely manage-enable operations
7. Other, please specify in the box on the right

V Impact of the COVID-19 Pandemic

Q22. Have funding difficulties delayed your company's or a business partner's payment? (Select one.)

1. There have been no funding difficulties 2. Funding difficulties have not affected payments
3. Payment from your company to a business partner (supplier of components and/or materials, goods, or services) has been delayed.
4. Payment from a business partner (who purchased goods or services) to your company has been delayed.

Q23. When do you expect business activities to return to the pre-COVID-19 pandemic level? (Select one.)

1. Already returned to normal 2. By the end of 2020 3. The first half of 2021
4. Second half of 2021 5. 2022-
6. No prospect of business activities returning to the pre-COVID-19 level

Q24. Is your company receiving or expecting to receive a government assistance package (e.g. financing support, benefits, tax relief, deferred utility payments) in response to the COVID-19 pandemic? (Select one)

1. Receiving assistance package 2. Expecting to receive assistance package

3. Not receiving assistance package

Q25. Do you consider the government's assistance package where the respondent is located (e.g. financing support, benefits, tax relief, deferred utility payments) in response to the COVID-19 pandemic to be sufficient? (Select one.)

1. Sufficient 2. Insufficient 3. Neither sufficient nor insufficient

Q26. What do you expect from the government's response to the COVID-19 pandemic?

1. Acceleration of mobility between countries for the business people
2. Mitigation of visa condition
3. Financial support for supply chain investment (digital, supply chain network optimisation, etc.)
4. Salary support
5. Social security support
6. Rent support
7. Tax reduction support
8. Other, please specify in the box on the right

Auxiliary Regression Results

Table A1: Firm-Specific Factors and Business Performance in 2020 (for Robustness Check)

Independent variables	(1-3) Sales growth	(1-4) Sales growth	(2-3) Export growth	(2-4) Export growth	(3-3) Profit growth	(3-4) Profit growth
Log employees	0.65	0.62	0.37	0.37	0.56	0.60
	(0.43)	(0.43)	(0.38)	(0.37)	(0.44)	(0.44)
Full-time ratio	0.12***	0.12***	0.12***	0.12***	0.09***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age	-0.05*	-0.05*	-0.02	-0.03	-0.08***	-0.08***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
Listed	2.34	1.84	2.91	2.59	4.74**	4.32*
	(2.23)	(2.23)	(1.95)	(1.95)	(2.23)	(2.25)
Owner-managed	-1.08	-0.99	3.55**	3.64**	-0.96	-0.88
	(1.89)	(1.88)	(1.58)	(1.59)	(1.98)	(1.98)
Foreign-affiliated						
Japanese FA	-0.13	-1.17	4.98	4.47	0.56	-0.04
	(3.62)	(3.63)	(3.79)	(3.77)	(4.64)	(4.62)
US FA	3.61	2.75	2.47	1.80	5.30*	3.94
	(3.00)	(3.04)	(2.33)	(2.38)	(3.19)	(3.22)
European FA	4.72	4.04	5.74*	5.23	2.69	1.59
	(3.66)	(3.66)	(3.39)	(3.37)	(3.61)	(3.57)
Chinese FA	5.77	5.75	6.39*	6.40*	5.65	5.76
	(11.54)	(11.61)	(3.83)	(3.88)	(8.67)	(8.76)
ASEAN FA	-4.25	-5.15	2.12	1.55	-2.73	-3.63
	(5.45)	(5.38)	(3.75)	(3.66)	(5.45)	(5.36)
Other FA	12.42***	12.17***	9.28**	8.66**	4.98	5.21
	(4.73)	(4.68)	(4.10)	(4.10)	(4.70)	(4.68)
Customer-HHI	8.27		-8.55		-3.04	

Independent variables	(1-3) Sales growth	(1-4) Sales growth	(2-3) Export growth	(2-4) Export growth	(3-3) Profit growth	(3-4) Profit growth
	(19.84)		(20.31)		(22.52)	
Cust-HHI^2	-3.78		10.14		1.79	
	(15.59)		(15.28)		(17.51)	
Supp-HHI	-10.83		20.68		-19.53	
	(21.58)		(22.22)		(23.37)	
Supp-HHI^2	10.74		-13.76		18.45	
	(17.07)		(16.86)		(18.65)	
Prod-HHI	-0.05		-13.16		15.94	
	(19.89)		(19.03)		(22.73)	
Prod-HHI^2	3.40		11.36		-9.69	
	(15.75)		(15.00)		(18.07)	
Cust-DHHI		-7.43		-5.21		1.90
		(8.38)		(8.12)		(7.49)
Cust-DHHI^2		3.49		2.13		2.04
		(7.47)		(7.57)		(6.50)
Supp-DHHI		1.02		-4.34		-8.10
		(5.84)		(5.68)		(6.21)
Supp-DHHI^2		3.20		-0.77		3.78
		(4.26)		(4.58)		(4.14)
Prod-DHHI		17.02*		10.07		7.46
		(8.73)		(7.90)		(9.75)
Prod-DHHI^2		19.55**		7.77		19.18**
		(7.72)		(8.17)		(8.11)
Brunei	6.86	6.96	-4.22	-3.90	19.47*	19.47*
	(8.83)	(8.81)	(6.63)	(6.68)	(10.19)	(10.07)
Cambodia	5.98	6.56	-0.61	-0.99	1.41	2.22
	(6.13)	(6.14)	(5.03)	(5.05)	(5.90)	(5.91)
Indonesia	-0.38	0.22	-0.55	-0.69	1.08	1.63
	(3.43)	(3.40)	(2.77)	(2.74)	(3.36)	(3.33)
Lao PDR	16.37	17.14	8.24	8.49	4.01	4.81
	(11.45)	(11.33)	(9.24)	(9.17)	(12.04)	(11.91)

Independent variables	(1-3) Sales growth	(1-4) Sales growth	(2-3) Export growth	(2-4) Export growth	(3-3) Profit growth	(3-4) Profit growth
Malaysia	-9.28**	-8.87**	-6.86**	-7.21**	-7.19	-6.04
	(4.26)	(4.26)	(3.35)	(3.40)	(4.51)	(4.51)
Myanmar	15.32*	15.37*	6.41	5.74	8.25	9.01
	(8.11)	(8.14)	(6.94)	(6.98)	(9.10)	(9.10)
Philippines	2.25	2.98	1.03	0.92	7.56**	8.50**
	(3.63)	(3.60)	(2.88)	(2.87)	(3.69)	(3.66)
Singapore	-7.63**	-7.39**	-5.88**	-6.64**	-2.72	-1.76
	(3.06)	(2.98)	(2.79)	(2.76)	(3.41)	(3.33)
Thailand	-16.07***	-15.78***	-10.22***	-10.66***	-18.40***	-17.94***
	(3.62)	(3.63)	(3.20)	(3.28)	(4.29)	(4.32)
Viet Nam	-5.23	-5.67	-3.21	-3.70	-4.73	-4.90
	(4.11)	(3.98)	(3.01)	(2.97)	(4.23)	(4.03)
Manufacturing	11.04***	10.64***	4.73*	4.40*	6.97**	6.82**
	(2.86)	(2.81)	(2.46)	(2.43)	(2.93)	(2.89)
Whole/retail	7.08*	7.08*	-1.29	-1.34	2.48	2.45
	(3.92)	(3.93)	(3.55)	(3.57)	(4.18)	(4.19)
ICT	14.66***	14.64***	5.71**	5.47**	9.67***	9.79***
	(2.98)	(2.96)	(2.37)	(2.38)	(2.96)	(2.95)
Transportation	4.95	5.05	0.75	0.81	0.67	0.53
	(4.40)	(4.45)	(3.75)	(3.77)	(4.47)	(4.53)
Business services	8.87***	9.38***	4.40*	4.40*	5.35*	5.71*
	(3.10)	(3.09)	(2.37)	(2.36)	(3.10)	(3.10)
Observations	1,723	1,723	1,607	1,607	1,528	1,528
R^2	0.074	0.081	0.056	0.055	0.064	0.072

ASEAN = Association of Southeast Asian Nations, DHHI = difference in Herfindahl-Hirschman Index between 2020 and 2019, FA = Foreign-affiliated, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic, US = United States.

Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Owner-managed = a dummy variable that takes unity if a firm is managed or practically controlled by its founder or a major individual shareholder. Foreign-affiliated = a dummy variable that takes unity if a firm is one whose foreign investors hold 10% or more of the firm's shares. All the models control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.

Source: Authors.

Table A2: Firm-Specific Factors and Business Outlook 1

(for Robustness Check)

Independent variables	(1-2) Profits	(1-3) Profits	(2-2) Expand	(2-3) Expand
2020 sales	0.840***	0.820***	0.223***	0.211***
	(0.144)	(0.144)	(0.032)	(0.033)
Log employees	0.057**	0.053**	0.011*	0.013**
	(0.026)	(0.026)	(0.006)	(0.006)
Full-time ratio	0.008	0.007	0.000	0.000
	(0.009)	(0.007)	(0.000)	(0.000)
Age	-0.003	-0.003	-0.001***	-0.001***
	(0.002)	(0.002)	(0.000)	(0.000)
Listed	-0.039	-0.079	0.016	0.017
	(0.129)	(0.129)	(0.032)	(0.032)
Owner-managed	0.110	0.106	0.070**	0.071**
	(0.115)	(0.115)	(0.028)	(0.028)
Foreign-affiliated	0.487***	0.482***	0.027	0.033
	(0.135)	(0.133)	(0.031)	(0.031)
Customer-HHI	-1.614		-0.390	
	(1.305)		(0.293)	
Customer-HHI^2	1.085		0.296	
	(1.001)		(0.228)	
Supplier-HHI	1.120		0.076	
	(1.353)		(0.334)	
Supplier-HHI^2	-0.583		-0.105	
	(1.049)		(0.256)	
Production-HHI	2.964**		0.179	
	(1.187)		(0.327)	
Production-HHI^2	-2.100**		-0.224	
	(0.950)		(0.256)	
Customer-DHHI		0.654		-0.188*
		(0.445)		(0.099)

Independent variables	(1-2) Profits	(1-3) Profits	(2-2) Expand	(2-3) Expand
Customer-DHHI^2		0.054		0.060
		(0.439)		(0.084)
Supplier-DHHI		-0.113		-0.086
		(0.381)		(0.088)
Supplier-DHHI^2		0.508*		0.046
		(0.291)		(0.064)
Production-DHHI		0.704		0.255**
		(0.803)		(0.117)
Production-DHHI^2		1.407*		-0.019
		(0.823)		(0.097)
Brunei	0.155	0.160	-0.211*	-0.192*
	(0.557)	(0.559)	(0.113)	(0.115)
Cambodia	-0.696**	-0.663**	-0.055	-0.061
	(0.290)	(0.289)	(0.068)	(0.068)
Indonesia	-0.028	0.026	-0.148***	-0.150***
	(0.180)	(0.177)	(0.042)	(0.042)
Lao PDR	-0.749**	-0.693**	-0.189	-0.195
	(0.358)	(0.336)	(0.128)	(0.127)
Malaysia	-1.062***	-1.018***	-0.168***	-0.173***
	(0.245)	(0.247)	(0.056)	(0.056)
Myanmar	-0.679*	-0.725**	-0.135	-0.121
	(0.380)	(0.368)	(0.094)	(0.095)
Philippines	-0.067	-0.029	-0.116***	-0.118***
	(0.178)	(0.178)	(0.042)	(0.043)
Singapore	-0.520***	-0.490***	-0.132***	-0.125***
	(0.185)	(0.180)	(0.046)	(0.045)
Thailand	-0.681***	-0.680***	-0.195***	-0.200***
	(0.205)	(0.204)	(0.047)	(0.048)
Viet Nam	-0.198	-0.174	-0.087*	-0.096**

Independent variables	(1-2) Profits	(1-3) Profits	(2-2) Expand	(2-3) Expand
	(0.193)	(0.193)	(0.049)	(0.049)
Manufacturing	0.354**	0.362**	-0.011	-0.001
	(0.152)	(0.153)	(0.038)	(0.038)
Wholesale/retail	0.116	0.104	-0.056	-0.044
	(0.212)	(0.217)	(0.051)	(0.052)
ICT	0.072	0.096	0.073*	0.082**
	(0.159)	(0.157)	(0.039)	(0.039)
Transportation	0.155	0.163	-0.030	-0.023
	(0.228)	(0.229)	(0.058)	(0.058)
Business services	0.484***	0.508***	0.021	0.019
	(0.161)	(0.160)	(0.039)	(0.039)
Observations	1,721	1,721	1,720	1,720
R^2			0.095	0.097
Pseudo R^2	0.048	0.051		

DHHI = difference in Herfindahl-Hirschman Index between 2020 and 2019, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic.
Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. All the models control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.
Source: Authors.

Table A.3: Firm-Specific Factors and Business Outlook 2

(for Robustness Check)

Independent variables	(3-2) Shrink	(3-3) Shrink	(4-2) Labour	(4-3) Labor
2020 sales	-0.101***	-0.103***	0.237***	0.236***
	(0.026)	(0.027)	(0.021)	(0.022)
Log employees	0.003	0.003	-0.009***	-0.009***
	(0.004)	(0.004)	(0.003)	(0.003)
Full-time ratio	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Listed	-0.015	-0.012	0.005	0.004
	(0.022)	(0.022)	(0.014)	(0.015)
Owner-managed	0.023	0.022	-0.002	0.001
	(0.020)	(0.020)	(0.011)	(0.011)
Foreign-affiliated	-0.014	-0.011	-0.015	-0.015
	(0.024)	(0.024)	(0.014)	(0.014)
Customer-HHI	-0.163		0.144	
	(0.221)		(0.118)	
Customer-HHI^2	0.175		-0.092	
	(0.166)		(0.092)	
Supplier-HHI	-0.026		0.104	
	(0.270)		(0.137)	
Supplier-HHI^2	-0.010		-0.112	
	(0.201)		(0.106)	
Production-HHI	-0.389*		0.254*	
	(0.217)		(0.136)	
Production-HHI^2	0.223		-0.197*	
	(0.165)		(0.102)	
Customer-DHHI		-0.033		-0.031
		(0.070)		(0.043)

Independent variables	(3-2) Shrink	(3-3) Shrink	(4-2) Labour	(4-3) Labor
Customer-DHHI^2		0.058		-0.027
		(0.072)		(0.036)
Supplier-DHHI		0.112*		-0.043
		(0.060)		(0.038)
Supplier-DHHI^2		-0.024		-0.012
		(0.041)		(0.021)
Production-DHHI		0.115		0.060
		(0.088)		(0.049)
Production-DHHI^2		-0.023		0.038
		(0.066)		(0.033)
Brunei	0.212*	0.207*	-0.029	-0.018
	(0.115)	(0.117)	(0.084)	(0.083)
Cambodia	0.136**	0.139**	0.067	0.066
	(0.057)	(0.057)	(0.042)	(0.042)
Indonesia	0.064**	0.055*	-0.001	0.002
	(0.030)	(0.030)	(0.020)	(0.021)
Lao PDR	-0.009	-0.010	0.040	0.043
	(0.077)	(0.077)	(0.075)	(0.075)
Malaysia	0.215***	0.204***	-0.037	-0.037
	(0.049)	(0.049)	(0.026)	(0.026)
Myanmar	-0.049	-0.038	0.101*	0.101*
	(0.040)	(0.038)	(0.052)	(0.052)
Philippines	0.080**	0.077**	0.023	0.023
	(0.032)	(0.031)	(0.021)	(0.021)
Singapore	0.112***	0.109***	0.025	0.023
	(0.035)	(0.034)	(0.020)	(0.020)
Thailand	0.212***	0.214***	-0.046**	-0.048**
	(0.042)	(0.042)	(0.020)	(0.021)
Viet Nam	0.084**	0.078**	0.002	0.004

Independent variables	(3-2) Shrink	(3-3) Shrink	(4-2) Labour	(4-3) Labor
	(0.036)	(0.036)	(0.022)	(0.022)
Manufacturing	-0.035	-0.036	-0.003	-0.002
	(0.030)	(0.030)	(0.018)	(0.018)
Wholesale/retail	0.004	0.010	0.049**	0.049**
	(0.041)	(0.041)	(0.024)	(0.024)
ICT	-0.020	-0.024	0.040**	0.041**
	(0.031)	(0.030)	(0.019)	(0.019)
Transportation	-0.056	-0.063	-0.015	-0.009
	(0.042)	(0.043)	(0.028)	(0.029)
Business services	-0.047	-0.050	0.001	-0.002
	(0.031)	(0.031)	(0.019)	(0.019)
Observations	1,723	1,723	1,723	1,723
R^2	0.080	0.080	0.175	0.172

DHHI = difference in Herfindahl-Hirschman Index between 2020 and 2019, HHI = Herfindahl-Hirschman Index, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic.
Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. All the models control for firm function (sales, procurement, and/or production) factors; and firm type (independent, branch office, subsidiary, or holding company) factors.
Source: Authors.

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