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Keywords: COVID-19; International trade; Lockdown
JEL Classification: F15; F53

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Impacts of Lockdown Policies on International Trade[§]

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Abstract: The aim of this study is to quantify how lockdown policies implemented in response to the COVID-19 pandemic affected international trade in the first half of 2020. We examine monthly world trade data between January and June in both 2019 and 2020. Our findings can be summarized as follows. Stay-at-home orders did not have significant and robust effects on trade. Negative effects were found in only some industries, including those producing durable products and essential products. However, workplace closures had significantly negative effects on trade, except for intra-Asian trade. These effects of workplace closures can be found in most industries.

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1. Introduction

To slow the ongoing spread of the coronavirus disease 2019 (hereinafter, COVID-19), many countries have imposed some degree of restrictions on people and businesses. According to the website of the World Health Organization (WHO), as of 13 August 2020, more than 700 thousand deaths from COVID-19 have been reported worldwide. To prevent the further spread of COVID-19, several countries imposed citywide or nationwide lockdowns. These included workplace closure orders, which mandated the closure of all-but-essential workplaces (e.g., grocery stores). Additionally, stay-at-home orders required people to remain in their homes with exceptions for only daily exercise, grocery shopping, and "essential" trips. Such lockdown policies have been in effect since April 2020. For example, Japanese car manufacturers suspended production in Japan for several days per month starting in April 2020.

These policies surely resulted in a reduction in international trade. Even during

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lockdowns, people are allowed to go out to purchase essential supplies such as food, sanitation products, and medicine. However, because large department stores and retail shops are closed, it becomes more difficult to purchase goods that are not available at grocery stores. As a result, the consumption of these goods will decrease. Similarly, if a factory must shut down because of a workplace closure order, production activities will be completely stopped. While many countries have attempted to sustain economic activity by introducing telecommuting systems, such a solution is nearly impossible for manufacturing activities and closing manufacturing facilities leads to a decrease in the supply of goods. Thus, stay-at-home orders and workplace closures can be expected to decrease imports and exports, respectively.

The aim of this study is to quantify how much these policies affected international trade in the first half of 2020. To that end, we examine monthly world trade data from January to June in both 2019 and 2020. Our observations include trade data for 170 countries. We then regress the amount of trade on the existence of the stay-at-home and workplace closure orders at the country-pair-month level. Moreover, we compare these impacts between Asian trade and non-Asian trade. Although countries around the world have introduced both workplace closure and stay-at-home measures, the number of deaths from COVID-19 has been rather small in Asia compared with other regions. As of the end of June, the simple average numbers of deaths per 1,000 people was 0.02 in Asia, 0.07 in the Americas, and 0.17 in Europe.[1] Due to the less serious situation in Asia, the impacts of lockdown policies might also differ between Asia and the rest of the world.

Our findings can be summarized as follows. Stay-at-home orders did not have significant and robust effects on trade. Negative effects can be found only in some industries, including not only those producing durable products (e.g., transport equipment) but also those producing essential products (e.g., agricultural goods). In contrast, the workplace closures had significant negative effects on trade, except for intra-Asian trade. That is, although workplace closure orders did not reduce intra-Asian trade, they decreased trade significantly in the other regions. One possible reason for the small effect observed in Asia is that many Asian countries allowed factories in some specific industries to continue to operate. Such exceptions may have minimized the negative effects of workplace closures in exporting countries. These effects of the workplace closure orders can be found in most industries.

The number of studies on the economic impacts of COVID-19 is growing rapidly. Our study is closely related to two areas of research. One is the literature on the lockdown for

[1] These numbers are obtained by using COVID-19 data from the European Centre for Disease Prevention and Control. The definition of country coverage in each continent is based on those data. Note that the definition of "Asia" in our estimation is different from that above. It includes the 10 the ASEAN countries as well as Australia, China, India, Japan, Korea, and New Zealand, which are potential members of the regional comprehensive economic partnership agreement.

COVID-19, which includes several studies. Inoue and Todo (2020) and Pichler et al. (2020) simulated the impacts of lockdown policies in Tokyo and the UK on supply chains.[2] Gonzalez-Eiras and Niepelt (2020) simulated the optimal lockdown intensity and duration by using a canonical epidemiological model, whereas Acemoglu et al. (2020) used the SIR model and suggested that differential lockdown policies on groups with differential risks reduced mortality rates and economic damage. Some studies investigated how lockdown policies affected the number of confirmed cases (Ullah and Ajala, 2020; Askitas et al., 2020; Ghosh, 2020) and the number of deaths (Conyon et al., 2020). Also, some papers examined the impacts of lockdown policies on employment (Aum et al., 2020), unemployment insurance claims (Kong and Prinz, 2020), household spending and macroeconomic expectations (Coibion et al., 2020), and indicators of economic activity, such as nitrogen dioxide emissions (Dang et al., 2020; Deb et al., 2020). However, no studies have investigated the impacts of lockdown policies on international trade directly by using trade data observed during the lockdowns.

The other area of research is the literature on the international trade-COVID-19 nexus. Leibovici and Santacreu (2020) numerically illustrated the role of international trade of essential goods and found that the welfare losses of their net importers are lower in a world with high trade barriers, while the reverse is the case for their net exporters. Fuchs et al. (2020) examined the trade impacts of Covid-19 by using export data in China. Specifically, they empirically investigate whether previous economic linkages established through trade and investment as well as political relations are associated with China's export pattern of critical medical goods. Hayakawa and Mukunoki (2020a) investigated trade among 186 countries in the first quarter of 2020. They found that the COVID-19 burden (measured by cases or deaths) has a significantly negative effect on trade in exporting countries, but not in importing countries. Hayakawa and Mukunoki (2020b) further examined the role of COVID-19 burden on suppliers of machinery parts by focusing on the exports of finished machinery products. Their main finding is that exports significantly decrease when the COVID-19 burden is more serious not only in exporting countries but also in countries that export machinery parts to those exporting countries. In contrast, the present paper investigates the effects of lockdown policies on trade by employing worldwide trade data.

The remainder of this paper is organized as follows. Section 2 discusses the conceptual framework of possible effects of lockdown policies on trade. After explaining our empirical framework in Section 3, we report our estimation results in Section 4. Lastly, Section 5 concludes the paper.

[2] Murakami and Otsuka (2020) presents an excellent review of existing studies on global value chains.

2. Conceptual Framework

In this section, we discuss the possible effects of stay-at-home and workplace closure orders on international trade. We focus on stay-at-home orders in importing countries and workplace closures in exporting countries because the former influences the demand side of the economy and the latter influences the supply side.

Nearly every country introduced a stay-at-home order that prohibited people from going out for a certain period. During this period, people were allowed to go out to purchase essential supplies such as food, sanitation products (e.g., face masks or hand sanitizer), and medicine. Thus, the demand for these products may rise due to the increased fear of COVID-19 infection. The resulting upward shifts of demand curves increased imports of these products. In contrast, while stay-at-home orders were in effect, large department stores and retail shops were closed, making it more difficult to purchase goods such as clothes, home appliances, and automobiles, which are not available at grocery stores. As a result, the consumption of these goods will decrease. Although online shopping is rapidly growing in many countries, its growth is not enough to offset the decrease in brick-and-mortar shopping. These decreases in consumption due to stay-at-home orders lead to downward shifts in demand curves, which decrease imports as well.

On the other hand, if business operations are halted by a workplace closure order, production activities will be completely stopped. While many countries have attempted to sustain economic activity by introducing telecommuting systems, such a solution is nearly impossible for manufacturing activities, and closing manufacturing facilities leads to a decrease in the supply of goods. For instance, Dingel and Neiman (2020) estimate that only 22% of jobs in manufacturing can be done at home in the United States. However, operations in all industries are not necessarily banned. Some industries are permitted to operate if adequate infection control measures are taken.[3] First, operations are likely to be allowed in the medical supplies and equipment industry and the food industry. Namely, the suppliers of essential products are permitted to operate. Second, export-oriented companies or firms in Special Economic Zones may be allowed to work in some countries (e.g., Argentina, India, or the Philippines). Third, operations may be permitted in industries that require production to maintain the supply chain, such as electrical and electronic parts, as found in, for example, China, Malaysia, India, and Mexico. Finally, operations may be allowed in the country's key industries (e.g., mining in Peru) or based on inspections and permits by the government (e.g., Myanmar or Sri Lanka).

Even if exemptions are granted for operations to continue, it may not necessarily be easy to return to pre-pandemic production levels. First, the number of employees may be

[3] The case studies discussed below are drawn from the website of the Japan External Trade Organization: https://www.jetro.go.jp/world/covid-19/.

limited as a condition for re-starting operations. For example, in Malaysia, businesses were required to reduce the number of employees in offices/factories to less than 50% of the pre-pandemic number. Even without such restrictions, there are many workers who are unable to come to work because school closures force them to be absent from work so that they can care for their children or because public transportation is stopped. Second, for the same reason, there are shortages of truck drivers and port laborers, which delays logistics and prevents smooth procurement and delivery. Third, if approval from the government or related organizations is required for operation, it may not be possible to obtain prompt permission due to personnel constraints in government agencies. Fourth, productivity may decline due to the introduction of infection control measures (e.g., social distancing) in the factory. Negative productivity shocks decrease not only the amount of exports but also the number of exporters, as Metitz (2003) indicates. Finally, even if downstream manufacturers are allowed to operate, they cannot produce their products unless upstream manufacturers also continue to operate, as observed in Malaysia. Thus, workplace closure orders more or less lead to downward shifts of supply curves, which decreases exports.

In summary, stay-at-home and workplace closure orders are expected to decrease imports and exports, respectively. In addition, the decrease in production due to the workplace closures may reduce people's earnings and incomes, decreasing aggregate demand unless the government provides sufficient benefits to cover the loss in earnings. This drop in demand contributes to a decrease in imports of all products. Also, the closure of factories may decrease imports of capital goods such as machine tools. On the other hand, as mentioned above, because the stay-at-home order does not allow people to go to work, the decrease in the labor supply shrinks production output and consequently exports. In short, stay-at-home and workplace closure orders can also decrease exports and imports, respectively.

3. Empirical Framework

This section presents our empirical framework for investigating the impacts of the lockdown policies on international trade. We examine these impacts by exploring monthly-level data on bilateral trade from January to June in both 2019 and 2020. Our trade model is as follows.

$$Trade_{ijym} = \exp\{\alpha_1 Workplace_{iym} + \beta_1 Stay_{jym} + \delta_{ijy} + \delta_{ijm} + \delta_{ym}\} + \epsilon_{ijym} \qquad (1)$$

$Trade_{ijym}$ is the export value from countries i to j in month m year y. As explained in more details later, $Workplace_{iym}$ is the extent of the workplace closure order in exporting country i in month m year y. Similarly, $Stay_{jym}$ is the extent of the stay-at-home order in

importing country i in month m year y. We control for three kinds of fixed effects (δ_{ijy}, δ_{ijm}, and δ_{ym}). ϵ_{ijt} is a disturbance term. We estimate this equation by the Poisson pseudo maximum likelihood (PPML) method.

A set of our fixed effects controls various elements. δ_{ijy} is country-pair year fixed effects, which control for the standard gravity variables such as geographical distance, linguistic commonality, border sharing, and cultural similarity between the two countries. In addition, these capture the effects of trade agreements, countries' annual average of multilateral resistance terms, the annual average of the exporter's factor prices, and the annual average of the importer's demand size. δ_{ijm} is country-pair month fixed effects. This type of fixed effect controls for not only again the gravity variables but also the seasonality of trade between the two countries. δ_{ym} is year-month fixed effects, which control for variations in the world income. Furthermore, given that most of the countries started to close their borders to foreign travelers starting around the latter half of March 2020, this type of fixed effects may also control for the effects of people's cross-border movements worldwide.

Our study time period is January to June in 2019 and 2020. We obtained monthly data on trade values from the Global Trade Atlas maintained by IHS Markit.[4] We use data on both exports and imports in reporting countries from the Global Trade Atlas. As mentioned below, due to the different nature of export data and import data, we do not mix these two kinds of trade data in the estimation. That is, we estimate equation (1) by using export and import data separately. The 26 reporting countries and their 170 partner countries in our dataset are listed in Appendix A.

The data on variables for $Workplace_{iym}$ and $Stay_{jym}$ are obtained from the Oxford COVID-19 Government Response Tracker (OxCGRT) (Hale et al., 2020). The OxCGRT systematically collects information on several different common policy responses that governments have taken to respond to the pandemic on 17 indicators for more than 160 countries. As a measure of $Workplace_{iym}$, we use "C2 Workplace closure," which includes "1 - recommend closure (or recommend work from home)," "2 - require closure (or work from home) for some sectors or categories of workers," and "3 - require closure (or work from home) for all but essential workplaces (e.g., grocery stores, hospitals)." The measure $Stay_{jym}$ is constructed using "C6 Stay-at-home requirements," which includes "1 - recommend not leaving home," "2 - require not leaving home, with exceptions for daily exercise, grocery shopping, and 'essential' trips," and "3 - require not leaving home with minimal exceptions (e.g., allowed to leave once a week, only one person can leave at a time, etc.)."

Because our analytical dimension is monthly, $Workplace_{iym}$ and $Stay_{jym}$ are measured as the shares of days when workplace closure and stay-at-home orders are in

[4] https://connect.ihsmarkit.com/gta/home

effect, respectively. Thus, these variables lie in a unit interval [0, 1]. More specifically, we try three kinds of variables to categorize the level of strictness. $Workplace1_{iym}$ is defined as the share of days when a country orders workplace closures 1, 2, or 3. Likewise, $Workplace2_{iym}$ is the share of days during workplace closures 2 or 3, and $Workplace3_{iym}$ is the share of days during workplace closure 3. The variable with a higher number indicates the stricter closing policy. We define in a similar way, $Stay1_{jym}$, $Stay2_{jym}$, and $Stay3_{jym}$.

There are two more issues with our variables of $Workplace_{iym}$ and $Stay_{jym}$. One is the timing of these variables. The export statistics record the month that products left ports in exporting countries, whereas the month of arrival in importing countries is recorded in the import statistics. A key issue is that in some country pairs, it takes more than one month to transport by sea (e.g., between Japan and the UK). Thus, despite goods being produced in and leaving exporting countries in April, the import statistics record the trade of those goods in May. If we use $Workplace_{iym}$ in exporting countries in May for this case, it does not reflect the workplace closure measures during the production period. To overcome this inconsistency due to the use of monthly trade data, we use one-month lagged $Workplace_{iym}$ and $Stay_{jym}$ when we examine imports (i.e., when we use import statistics). However, when we use export statistics, we do not factor in the lag of these variables.

The other issue is the country in each variable. We examine the workplace closure order in an exporting country and the stay-at-home order in an importing country. These choices are based on our discussion in Section 2 that stay-at-home and workplace closure orders are expected to decrease imports and exports, respectively. However, there are also some paths through which these policies can decrease trade in the opposite direction. For example, the decrease in labor supply due to the stay-at-home order reduces production size and consequently exports. The decrease in earnings due to workplace closure orders in importing countries reduces demand and consequently imports. Nevertheless, workplace closure and stay-at-home orders are the main factors that affect exports and imports, respectively. Thus, we use $Workplace_{iym}$ in an exporting country and $Stay_{jym}$ in an importing country. In addition, although some industries or firms may be exempted from the workplace closure orders, it is difficult to operate at full scale because of external factors such as productivity loss due to infection control measures. Thus, under the workplace closure order, those industries or firms are also expected to decrease their production.

Before reporting our estimation results, we conduct an overview of our variables on lockdown policies. Figure 1 shows the average number of days that each policy was effective. Note that in the estimation, these variables are divided by the total number of days in each month. We show the average among 178 countries that are available in the OxCGRT, which indicates that the introduction of these policies starts in March and increases dramatically in April. We can see that most of the countries restricted to some extent the ability of people to leave home and go to work for nearly all of April and May. However, it also shows that

the strictest restrictions were lifted in May (see Workplace3). Also, the stay-at-home order becomes a "recommendation" rather than a "requirement" in May. However, mandatory workplace closures were still in effect for many days in June.

=== Figure 1 ===

4. Empirical Results

This section reports our estimation results. The standard errors are clustered by country pairs. The baseline results are shown in Table 1. Columns (I)-(III) report the results based on the export statistics. The "Degree" row indicates the strictness of the order using variables. For example, in column with "≥2," we use $Workplace2_{iym}$ and $Stay2_{jym}$. The results show that both the coefficients for *Stay* and *Workplace* are estimated to be significantly negative in all three columns. Thus, as discussed before, the stay-at-home and workplace closure orders resulted in decreased imports and exports, respectively. Although we may expect that the absolute magnitude of the coefficients increases as the degree rises, we do not find such a relationship in either *Stay* or *Workplace*. This implies that the effects of the recommendations are not smaller than those of the mandatory orders.

=== Table 1 ===

The estimation results based on the import statistics are shown in columns (IV)-(VI) in Table 1. Although the coefficients for *Workplace* are again estimated to be significantly negative, those for *Stay* were insignificant in all three columns. The latter result indicates that the negative effect of the stay-at-home order is not robust. One reason for this might be the rise in demand for essential products. Another reason, which is a statistical one, might be a possible inconsistency in the timing between the order month and the month in the import statistics. Such an inconsistency depends heavily on the transportation mode (e.g., air or sea) and geographical distance between countries. It becomes larger when importing from more distant countries by sea (Hayakawa, 2020). Although we incorporate a one-month lag in the case of import statistics, it might be longer or shorter, depending on the trading partners and transportation mode. Here also, we find no clear relationship between *Workplace* and its degree.

Next, we examine whether the impacts of these lockdown policies on trade differ between Asia and other regions. As mentioned in the Introduction, the number of deaths by COVID-19 is rather small in Asia compared with other regions. Therefore, the effects of the lockdowns may also differ between Asia and other regions. In this examination, we define

Asia as the 16 countries that have negotiated a regional comprehensive economic partnership, including the 10 ASEAN countries as well as Australia, China, India, Japan, South Korea, and New Zealand. We introduce the interaction terms of lockdown variables with an Asian dummy (*Asia*), which takes a value of one if both countries *i* and *j* are Asian countries and zero otherwise, as defined below.

$$Trade_{ijym} = \exp\{\alpha_1 Workplace_{iym} + \alpha_2 Asia_{ij} \cdot Workplace_{iym} + \beta_1 Stay_{jym} + \beta_2 Asia_{ij} \cdot Stay_{jym} + \delta_{ijy} + \delta_{ijm} + \delta_{ym}\} + \epsilon_{ijym} \quad (2)$$

We again estimate this model using the PPML method.

The results are shown in Table 2. Non-interacted variables have similar results to those in Table 1. That is, whereas the coefficients for *Stay* are not significantly robust, *Workplace* has significantly negative coefficients. Interestingly, although the coefficients for the interaction terms with *Stay* are not significant, those with *Workplace* are significantly positive. The former results indicate that regardless of region, the stay-at-home orders in importing countries do not have significant and robust impacts on trade. However, in the latter results, the sign and significance do not change across the degree/strictness of workplace closure orders and between the import and export statistics. Furthermore, the absolute magnitude is larger in the interaction term compared with the non-interacted variable. At the very least, this magnitude relation implies that workplace closure orders do not reduce intra-Asian trade but decreases trade significantly in other regions.[5]

=== Table 2 ===

There are some possible reasons for the insignificant impacts of workplace closure orders on intra-Asian trade. First, inventory adjustment might enable manufacturing firms in Asia to export without the need for production operations. Many manufacturing firms reacted to workplace closure orders by adjusting their inventories. For example, during the COVID-19 pandemic period, 52%, 53%, and 42% of Japanese manufacturing firms carried out inventory adjustment measures in Malaysia, Indonesia, and the Philippines, respectively.[6] By reducing their inventories, Asian firms might have been able to keep exporting for some period even under the workplace closure order.

Another reason may be that many Asian countries permitted factory operations for some specific industries if adequate infection control measures (e.g., social distancing) are taken. As mentioned in Section 2, those industries are not limited to those producing

[5] This result does not change even if we exclude China from our study countries.

[6] These numbers are based on the questionnaire surveys by JETRO and some organizations. Those for Malaysia are for the 138 Japanese manufacturing firms in Malaysia, which were conducted by JETRO and the Japanese Chamber of Trade & Industry, Malaysia during 12-15 May. Those for Indonesia and the Philippines are, respectively, for the 205 Japanese manufacturing firms in Indonesia during 8-16 June and the 101 Japanese manufacturing firms in the Philippines during 8-11 June.

essential products, such as the medical supplies and equipment industry or food industry. Some countries also allowed operations in export-oriented companies, firms in Special Economic Zones, or industries whose production was required to maintain supply chains. Permission for continued operations in these industries can be found in some Asian countries, including China, India, Malaysia, and the Philippines. Such exemptions may minimize the negative effects of workplace closure orders on trade in exporting countries. Indeed, in Malaysia, "C2 Workplace closures" takes a value of 3 from 18 March to 3 May and a value of 2 from 4 May. Nevertheless, 33% of Japanese manufacturing firms in Malaysia were allowed to operate even after 18 March. Before 4 May, 81% of them had already restarted operations.[7]

Last, we estimate equation (2) by industry. In this estimation, we define the harmonized system (HS) tariff section classification as industries. Table 3 shows the estimation results by industry. We report here those with *Stay1* and *Workplace1* in the export statistics.[8] The negative and large effects of the stay-at-home order can be found in agricultural goods, mineral products, leather goods, and transport equipment. Particularly in intra-Asian trade, precious metals show a very large and negative coefficient, whereas mineral products and plastics products do not show a large negative effect. However, in the case of the workplace closure orders, positive effects can be found in agricultural goods. Most other industries show similar results as those for total trade. That is, in many industries, workplace closure orders decrease trade but there was no effect on intra-Asian trade.

=== Table 3 ===

The results by industry illustrate the impacts of lockdown policies. The positive results of workplace closure orders for agricultural goods might be because the production operation of essential products is exempted in most countries. Some countries such as Australia encouraged agricultural exports. Furthermore, some countries such as Colombia and Saudi Arabia reduced tariffs for agricultural goods or supported the importers of such goods. These policy measures may have led to the observed positive effects because most of these countries consistently implemented workplace closure orders in April and May. However, the results of stay-at-home orders are more complicated. Its negative effects on agricultural goods may be due to the hesitation of many people to go to restaurants, which dramatically reduced the demand of restaurants for agricultural goods.[9] The negative

[7] These numbers are based on the above-mentioned questionnaire survey for the 138 Japanese manufacturing firms in Malaysia.

[8] The results for the import statistics and their standard errors shown in Table 3 are available in Appendix B.

[9] Therefore, the trade of essential products is not a reason for the insignificant result in *Stay* in the case of the import statistics shown in Table 1. In Table 3, we can find that the interaction terms of *Stay* with

effects on durable products (e.g., leather goods, precious metals, or transport equipment) are also understandable because their consumption can be postponed.[10]

The impacts on medical products might be worth noting. These products tend to be free from restrictions of the lockdown policies in most countries. Medical products are categorized mainly into Section 6 (chemical products) or Section 11 (textiles). The estimation results show that the effects of the lockdown policies on these industries are insignificant. The only positive results from workplace closures were found in intra-Asian trade. The insignificant results worldwide would be that many countries encouraged imports of medical products by removing tariffs or exempting import licenses but, at the same time, restricted the exports of those products (e.g., Turkey, Brazil, or Colombia). However, some Asian countries also removed tariffs for such products (e.g., Thailand or India) or exempted the import license charge of those products (e.g., Myanmar), whereas some countries such as China aggressively increased the production and export of medical products (Fuchs et al., 2020). These differences may have created contrasting results in the medical goods industries between Asia and the rest of the world.

5. Concluding Remarks

This paper used monthly data to investigate how the two types of lockdown policies, stay-at-home and workplace closure orders, affected international trade. We hypothesize that stay-at-home orders reduce trade by decreasing import demand, and that the workplace closure orders decrease export supplies. Our empirical findings suggest that the negative effects on international trade due to workplace closure orders in exporting countries are significant and are found in most industries. However, workplace closure orders do not affect intra-Asian trade. The negative effects due to stay-at-home orders in importing countries are not significant and can be found only in some industries. These industries include firms that manufacture durable products and essential products. These results imply that the supply-side effects are more important for evaluating the trade effects of lockdown policies, although the demand-side effects are also important in some industries. The insignificant effects on intra-Asian trade might be the result of Asian countries exempting some industries from their lockdown policies. This indicates that, to mitigate the negative impacts of lockdown policies on trade, different lockdown policies

the Asian dummy have positive coefficients in many industries, although they are not significant. Thus, the small effects in Asia may lead to the insignificant results shown in Table 1.

[10] When a country is hit by negative demand shocks, spending on durable goods decreases more than that on non-durable goods (Eaton et al., 2016). Indeed, Carvalho et al. (2020) found that the COVID-19 lockdown policies in Spain decreased the market share of durable goods such as automobiles, computers, and furniture while that of food increased.

may be required for different industries in consideration of their respective vulnerabilities to lockdowns.

References

Acemoglu, Daron, Victor Chernozhukov, Iván Werning, and Michael D. Whinston, 2020, Optimal Targeted Lockdowns in a Multi-Group SIR Model, NBER Working Paper No. 27102.

Askitas, Nikos, Konstantinos Tatsiramos, and Bertrand Verheyden, 2020, Lockdown Strategies, Mobility Patterns and Covid-19, *Covid Economics*, 23: 263-302.

Aum, Sangmin, Sang Yoon (Tim) Lee, and Yongseok Shin, 2020, COVID-19 Doesn't Need Lockdowns to Destroy Jobs: The Effect of Local Outbreaks in Korea, NBER Working Papers 27264, National Bureau of Economic Research, Inc.

Carvalho, Vasco, Juan Ramón García, Stephen Hansen, Alvaro Ortiz, Tomasa Rodrigo, José V. Rodríguez Mora, and Pep Ruiz, 2020. Tracking the Covid-19 Crisis with High-Resolution Transaction Data, CEPR DP14642.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber, 2020, Lockdowns, Macroeconomic Expectations, and Consumer Spending, *Covid Economics*, 20: 1-15.

Conyon, Martin J., Lerong He, and Steen Thomsen, 2020, Lockdowns and COVID-19 Deaths in Scandinavia, *Covid Economics*, 26: 17-42.

Dang, Hai-Anh H. and Trong-Anh Trinh, 2020, Does the COVID-19 Pandemic Improve Global Air Quality? New Cross-National Evidence on Its Unintended Consequences, IZA DP No. 13480.

Deb, Pragyan, Davide Furceri, Jonathan D. Ostry, and Nour Tawk, 2020, The Economic Effects of Covid-19 Containment Measures, *Covid Economics*, 24: 32-75.

Dingel, Jonathan I. and Brent Neiman, 2020, How Many Jobs Can Be Done at Home?, *Journal of Public Economics*, 189: 104235.

Eaton, Jonathan, Samuel Kortum, Brent Neiman, and John Romalis, 2016, Trade and the Global Recession, *American Economic Review*, 106(11): 3401-3438.

Fuchs, Andreas, Lennart Kaplan, Krisztina Kis-Katos, Sebastian S. Schmidt, Felix Turbanisch, and Feicheng Wang, 2020, Mask Wars: China's exports of medical goods in times of COVID-19, *Covid Economics*, 42: 26-64.

Ghosh, Saibal, 2020, Lockdown, Pandemics and Quarantine: Assessing the Indian Evidence, *Covid Economics*, 37: 73-99.

Gonzalez-Eiras, Martín and Dirk Niepelt, 2020, On the Optimal "Lockdown" during an Epidemic, *Covid Economics*, 7: 68-87.

Hale, Thomas, Sam Webster, Anna Petherick, Toby Phillips, and Beatriz Kira, 2020, *Oxford COVID-19 Government Response Tracker*, Blavatnik School of Government.

Hayakawa, Kazunobu, 2020, Departure Months and Discrepancy in Mirror Trade Data, IDE Discussion Papers No.795.

Hayakawa, Kazunobu and Hiroshi Mukunoki, 2020a, Impacts of COVID-19 on International Trade: Evidence from the First Quarter of 2020, IDE Discussion Papers No.791.

Hayakawa, Kazunobu and Hiroshi Mukunoki, 2020b, Impacts of COVID-19 on Global Value Chains, IDE Discussion Papers No.797.

Inoue, Hiroyasu and Yasuyuki Todo, 2020, The Propagation of the Economic Impact through Supply Chains: The Case of a Mega-city Lockdown to Contain the Spread of Covid-19, *Covid Economics*, 2: 43-59.

Kong, Edward and Daniel Prinz, 2020, The Impact of Shutdown Policies on Unemployment during a Pandemic, *Covid Economics*, 17: 24-72.

Leibovici, Fernando and Ana Maria Santacreu, 2020, International Trade of Essential Goods during a Pandemic, *Covid Economics*, 21: 59-99.

Melitz, Marc. J., 2003, The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, *Econometrica*, 71(6): 1695-1725.

Murakami, Yoshimichi and Keijiro Otsuka 2020, Governance, Information Spillovers, and Productivity of Local Firms: Toward an Integrated Approach to Foreign Direct Investment and Global Value Chains, *The Developing Economies*, 58(2): 134-174.

Pichler, Anton, Marco Pangallo, R. Maria del Rio-Chanona, François Lafond, and J. Doyne Farmer, 2020, Production Networks and Epidemic Spreading: How to Restart the UK Economy?, *Covid Economics*, 23: 79-151.

Ullah, Akbar and Olubunmi Agift Ajala, 2020, Do Lockdown and Testing Help in Curbing Covid-19 Transmission?, *Covid Economics*, 13: 138-156.

Table 1. Estimation Results by the PPML Method

	(I)	(II)	(III)	(IV)	(V)	(VI)
Stay	-0.090***	-0.136***	-0.095**	-0.005	-0.043	0.035
	[0.028]	[0.036]	[0.038]	[0.026]	[0.033]	[0.029]
Workplace	-0.103***	-0.060**	-0.138***	-0.131***	-0.089***	-0.096***
	[0.032]	[0.028]	[0.030]	[0.036]	[0.029]	[0.023]
Flow	Export	Export	Export	Import	Import	Import
Degree	≥1	≥2	≥3	≥1	≥2	≥3
Log pseudolikelihood	-7.7E+10	-7.6E+10	-7.6E+10	-7.8E+10	-7.8E+10	-7.8E+10
Pseudo R-squared	0.9972	0.9972	0.9972	0.9971	0.9971	0.9971
Number of observations	48,640	48,640	48,640	48,156	48,156	48,156

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate, respectively, the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. "Flow" indicates the data we used in the estimation, namely, the export statistics or the import statistics. In "Degree," a higher number indicates a stricter closure measure.

Table 2. Estimation Results: Interaction with Asian Dummy

	(I)	(II)	(III)	(IV)	(V)	(VI)
Stay	-0.067*	-0.115**	-0.059	0.011	-0.045	0.071
	[0.037]	[0.045]	[0.058]	[0.035]	[0.046]	[0.044]
Stay * Asia	0.014	-0.017	-0.009	0.003	0.047	-0.027
	[0.062]	[0.068]	[0.079]	[0.044]	[0.054]	[0.054]
Workplace	-0.220***	-0.154***	-0.305***	-0.249***	-0.187***	-0.182***
	[0.049]	[0.040]	[0.050]	[0.051]	[0.043]	[0.041]
Workplace * Asia	0.321***	0.352***	0.348***	0.240***	0.244***	0.193***
	[0.055]	[0.058]	[0.054]	[0.042]	[0.046]	[0.044]
Flow	Export	Export	Export	Import	Import	Import
Degree	≥1	≥2	≥3	≥1	≥2	≥3
Log pseudolikelihood	-7.2E+10	-7.1E+10	-7.3E+10	-7.5E+10	-7.5E+10	-7.7E+10
Pseudo R-squared	0.9974	0.9974	0.9973	0.9973	0.9973	0.9972
Number of observations	48,640	48,640	48,640	48,156	48,156	48,156

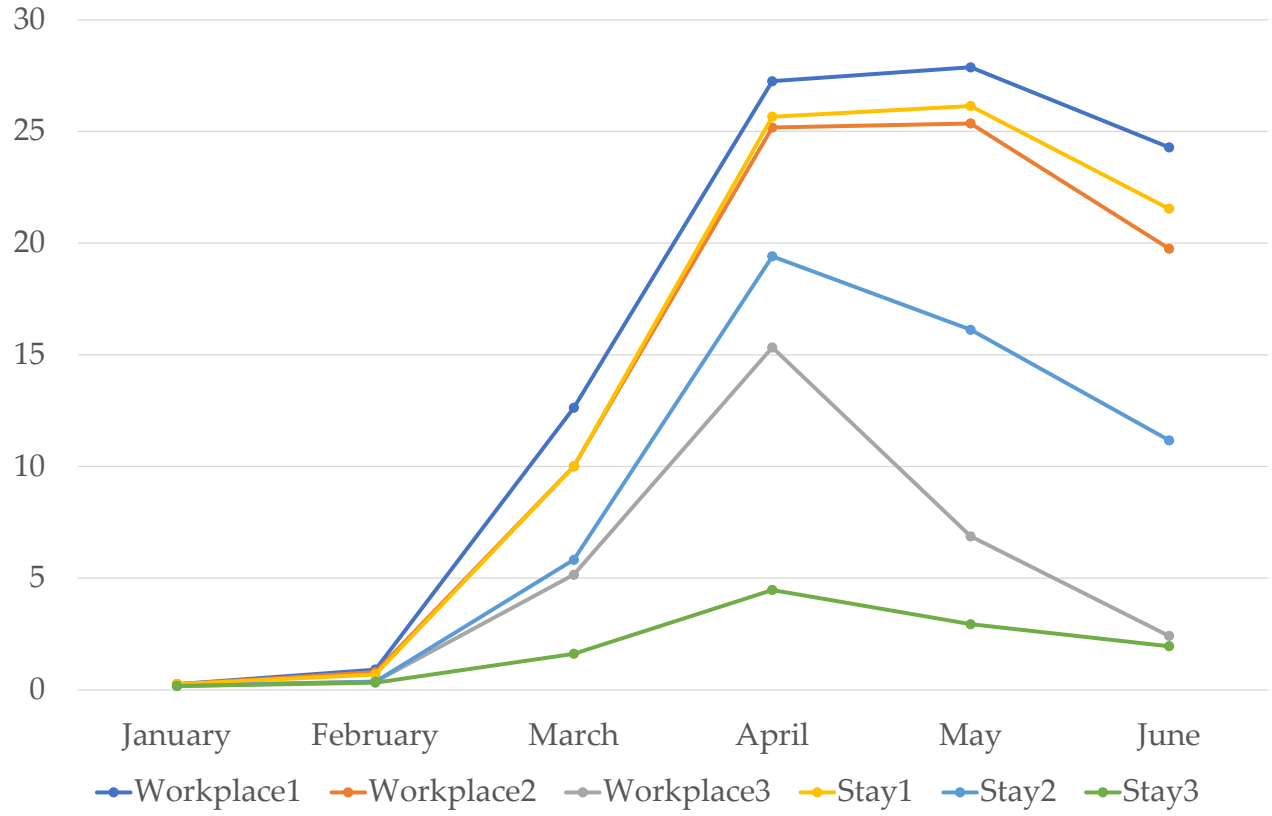
Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. "Flow" indicates the data we used in the estimation, namely, the export statistics or the import statistics. In "Degree," a higher number indicates a stricter closure measure.

Table 3. Estimation Results by HS Sections

	Stay		Workplace	
		* Asia		* Asia
Live animals	-0.160***	0.105*	0.117*	0.061
Vegetable products	-0.189**	0.007	0.175*	0.123
Animal/vegetable fats and oils	-0.082	-0.299***	0.143	0.01
Food products	-0.037	0.03	0.037	0.129***
Mineral products	-0.357***	0.195*	0.015	0.169
Chemical products	0.003	0.037	0.01	0.096**
Plastics and rubber	-0.113**	0.049	-0.092	0.243***
Leather products	-0.249***	0.133	0.083	0.398***
Wood products	-0.149***	0.06	0.052	0.280***
Paper products	-0.029	0.026	0.015	0.147***
Textiles	0.048	0.029	-0.428***	0.712***
Footwear	-0.131***	0.132	0.100*	0.517***
Plastic or glass products	-0.107**	0.160**	-0.195***	0.541***
Precious metals	0.390*	-0.736***	-0.617***	0.283
Base Metal	-0.054	-0.044	-0.117**	0.319***
Machinery	-0.044	0.053	-0.208***	0.274***
Transport equipment	-0.279***	0.17	-0.465***	0.578***
Precision machinery	-0.088**	0.073	-0.209***	0.284***
Miscellaneous	-0.021	0.041	-0.330***	0.571***

Notes: This table reports the estimation results of *Stay1* and *Workplace1* by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. In the estimation, we use the export statistics. More detailed results are shown in Appendix B.

Figure 1. Average Number of Days Under Lockdown



Source: Authors' compilation, based on the OxCGRT.

Appendix A. Study Countries

26 Reporting Countries:

ARG, AUS, BRA, CAN, CHE, CHN, CIV, DEU, ESP, FRA, GBR, GRC, HKG, IDN, IRL, JPN, KOR, MEX, PHL, PRT, RUS, SGP, THA, TWN, USA, ZAF

170 Partner Countries:

ABW, AFG, AGO, ALB, AND, ARE, ARG, AUS, AUT, AZE, BDI, BEL, BEN, BFA, BGD, BGR, BHR, BIH, BLR, BLZ, BMU, BOL, BRA, BRB, BRN, BTN, BWA, CAF, CAN, CHE, CHL, CHN, CIV, CMR, COG, COL, CPV, CRI, CUB, CYP, CZE, DEU, DJI, DMA, DNK, DOM, DZA, ECU, EGY, ERI, ESP, EST, ETH, FIN, FJI, FRA, GAB, GBR, GEO, GHA, GIB, GIN, GMB, GRC, GRL, GTM, GUY, HKG, HND, HRV, HTI, HUN, IDN, IND, IRL, IRN, IRQ, ISL, ISR, ITA, JAM, JOR, JPN, KAZ, KEN, KGZ, KHM, KOR, KWT, LAO, LBN, LBR, LBY, LKA, LSO, LTU, LUX, LVA, MAC, MAR, MDA, MDG, MEX, MLI, MMR, MNG, MOZ, MRT, MUS, MWI, MYS, NAM, NER, NGA, NIC, NLD, NOR, NPL, NZL, OMN, PAK, PAN, PER, PHL, PNG, POL, PRI, PRT, PRY, QAT, RUS, RWA, SAU, SDN, SEN, SGP, SLB, SLE, SLV, SMR, SOM, SUR, SVK, SVN, SWE, SWZ, SYC, SYR, TCD, TGO, THA, TJK, TKM, TTO, TUN, TUR, TWN, TZA, UGA, UKR, URY, USA, UZB, VEN, VNM, VUT, YEM, ZAF, ZMB, ZWE

Appendix B. Other Estimation Results.

Table B1. HS Tariff Section

Section	Description
1	Live animals
2	Vegetable products
3	Animal/vegetable fats and oils
4	Food products
5	Mineral products
6	Chemical products
7	Plastics and rubber
8	Leather products
9	Wood products
10	Paper products
11	Textiles
12	Footwear
13	Plastic or glass products
14	Precious metals
15	Base Metal
16	Machinery
17	Transport equipment
18	Precision machinery
19	Miscellaneous

Table B2. Estimation Results in the Export Statistics by Industry (1-10)

Section	1	2	3	4	5	6	7	8	9	10
Stay	-0.160***	-0.189**	-0.082	-0.037	-0.357***	0.003	-0.113**	-0.249***	-0.149***	-0.029
	[0.056]	[0.089]	[0.102]	[0.028]	[0.073]	[0.028]	[0.045]	[0.073]	[0.052]	[0.031]
Stay * Asia	0.105*	0.007	-0.299***	0.03	0.195*	0.037	0.049	0.133	0.06	0.026
	[0.061]	[0.131]	[0.101]	[0.040]	[0.102]	[0.042]	[0.065]	[0.132]	[0.071]	[0.059]
Workplace	0.117*	0.175*	0.143	0.037	0.015	0.01	-0.092	0.083	0.052	0.015
	[0.060]	[0.094]	[0.101]	[0.032]	[0.098]	[0.047]	[0.056]	[0.089]	[0.055]	[0.047]
Workplace * Asia	0.061	0.123	0.01	0.129***	0.169	0.096**	0.243***	0.398***	0.280***	0.147***
	[0.061]	[0.099]	[0.087]	[0.037]	[0.109]	[0.045]	[0.059]	[0.081]	[0.069]	[0.052]
Log pseudolikelihood	-4.38E+09	-6.47E+09	-1.90E+09	-4.18E+09	-2.36E+10	-1.06E+10	-2.69E+09	-1.02E+09	-7.09E+08	-1.44E+09
Pseudo R-squared	0.9927	0.9912	0.9829	0.994	0.9908	0.9962	0.9978	0.9933	0.9963	0.9961
Number of observations	27,240	30,092	18,688	35,688	26,026	40,656	39,428	26,592	24,554	34,744

Notes: This table reports the estimation results of *Stay1* and *Workplace1* by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. The description of the HS Section is available in Table B1.

Table B3. Estimation Results in the Export Statistics by Industry (11-19)

Section	11	12	13	14	15	16	17	18	19
Stay	0.048	-0.131***	-0.107**	0.390*	-0.054	-0.044	-0.279***	-0.088**	-0.021
	[0.079]	[0.045]	[0.047]	[0.218]	[0.037]	[0.047]	[0.082]	[0.036]	[0.063]
Stay * Asia	0.029	0.132	0.160**	-0.736***	-0.044	0.053	0.17	0.073	0.041
	[0.188]	[0.144]	[0.071]	[0.261]	[0.055]	[0.076]	[0.108]	[0.054]	[0.092]
Workplace	-0.428***	0.100*	-0.195***	-0.617***	-0.117**	-0.208***	-0.465***	-0.209***	-0.330***
	[0.108]	[0.053]	[0.055]	[0.174]	[0.046]	[0.062]	[0.141]	[0.046]	[0.067]
Workplace * Asia	0.712***	0.517***	0.541***	0.283	0.319***	0.274***	0.578***	0.284***	0.571***
	[0.092]	[0.049]	[0.067]	[0.176]	[0.051]	[0.069]	[0.098]	[0.052]	[0.092]
Log pseudolikelihood	-5.72E+09	-9.10E+08	-9.52E+08	-2.54E+10	-7.29E+09	-1.74E+10	-3.12E+10	-3.24E+09	-8.12E+09
Pseudo R-squared	0.9952	0.9963	0.9967	0.9785	0.9954	0.9982	0.9903	0.9974	0.9943
Number of observations	36,386	26,382	31,070	21,054	38,052	43,922	35,944	37,696	39,624

Notes: This table reports the estimation results of *Stay1* and *Workplace1* by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. The description of the HS Section is available in Table B1.

Table B4. Estimation Results in the Import Statistics by Industry (1-10)

Section	1	2	3	4	5	6	7	8	9	10
Stay	0.015	-0.076	-0.097	-0.013	-0.1	0.015	-0.064	-0.066	-0.022	0.07
	[0.054]	[0.102]	[0.089]	[0.027]	[0.078]	[0.049]	[0.039]	[0.098]	[0.057]	[0.058]
Stay * Asia	0.107**	0.119	0.017	0.068*	0.131	0.003	0.110**	0.179**	0.082	0.151***
	[0.042]	[0.225]	[0.098]	[0.039]	[0.099]	[0.035]	[0.045]	[0.078]	[0.063]	[0.054]
Workplace	-0.137**	0.123	0.173	-0.031	-0.227*	-0.098*	-0.135*	-0.215***	-0.066	-0.049
	[0.062]	[0.088]	[0.116]	[0.039]	[0.124]	[0.057]	[0.073]	[0.081]	[0.071]	[0.070]
Workplace * Asia	0.035	0.073	-0.055	0.052*	0.258***	0.099**	0.131***	0.002	-0.156**	-0.034
	[0.050]	[0.142]	[0.090]	[0.030]	[0.084]	[0.041]	[0.046]	[0.079]	[0.072]	[0.047]
Log pseudolikelihood	-2.81E+09	-5.13E+09	-1.15E+09	-3.31E+09	-3.99E+10	-1.13E+10	-1.98E+09	-8.02E+08	-8.71E+08	-1.11E+09
Pseudo R-squared	0.9946	0.9934	0.987	0.9955	0.9885	0.9957	0.9982	0.9949	0.996	0.9969
Number of observations	24,852	30,192	16,618	31,740	22,694	31,420	29,774	24,208	22,770	26,190

Notes: This table reports the estimation results of *Stay1* and *Workplace1* by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. The description of the HS Section is available in Table B1.

Table B5. Estimation Results in the Import Statistics by Industry (11-19)

Section	11	12	13	14	15	16	17	18	19
Stay	0.151	-0.085	-0.089**	0.174	-0.027	-0.007	-0.209*	-0.009	-0.202***
	[0.131]	[0.069]	[0.043]	[0.148]	[0.038]	[0.040]	[0.107]	[0.047]	[0.068]
Stay * Asia	-0.199	0.249***	0.146**	-0.738***	0.090*	0.104**	0.126	0.122**	0.166**
	[0.142]	[0.077]	[0.057]	[0.207]	[0.053]	[0.046]	[0.111]	[0.054]	[0.082]
Workplace	-0.790***	-0.295***	-0.101*	-0.356**	-0.118*	-0.228***	0.094	-0.236***	-0.318***
	[0.147]	[0.070]	[0.058]	[0.177]	[0.065]	[0.046]	[0.194]	[0.070]	[0.110]
Workplace * Asia	0.659***	0.150**	0.066	-0.089	0.132***	0.243***	0.251***	0.210***	0.228***
	[0.147]	[0.059]	[0.045]	[0.159]	[0.045]	[0.043]	[0.078]	[0.050]	[0.081]
Log pseudolikelihood	-5.74E+09	-8.48E+08	-6.84E+08	-2.36E+10	-7.24E+09	-1.29E+10	-1.97E+10	-2.48E+09	-5.30E+09
Pseudo R-squared	0.995	0.9971	0.997	0.9796	0.9951	0.9987	0.9931	0.9978	0.9961
Number of observations	34,240	23,394	22,816	21,128	31,722	37,084	24,750	28,702	33,432

Notes: This table reports the estimation results of *Stay1* and *Workplace1* by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair-year fixed effects, country-pair-month fixed effects, and year-month fixed effects. The description of the HS Section is available in Table B1.