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ADBI Working Paper Series

MEASURING THE IMPACT OF COVID-19 AND GOVERNMENT POLICY RESPONSES ON TRADE FLOW: THE CASE OF ASEAN COUNTRIES

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Abstract

The epidemic caused by the coronavirus disease (COVID-19) has affected international trade activities between Asian developing and emerging economies, especially the ASEAN region. This paper aims to examine and measure the impact of COVID-19 and government responses on trade flow using the gravity model of trade. Using the trade records of ten ASEAN countries exporting all over the world from January 2020 to December 2022, we find a negative impact of the COVID-19 pandemic on trade flow. However, ASEAN countries that participate in regional trade agreements (RTAs) have stronger trade flows than countries that do not participate. Finally, countries implementing effective COVID-19 policy responses exhibit a more favorable trade performance and improve their overall economic stability, particularly in the face of increasing COVID-19 burdens.

Keywords: COVID-19 policy responses, economic stability, emerging economies, regional trade agreement (RTA), trade flow

JEL Classification: F14, C54, D78, I18, O24

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1. INTRODUCTION

The pandemic has hit emerging economies hard, with income losses showing and worsening existing economic weaknesses (World Bank 2022). Economically, the coronavirus pandemic has affected economies in many different ways. These include the rise in unemployment and poverty, disruption in the supply chain and production leading to an increase in inflation, travel restrictions, and lockdowns resulting in trade deficit inflation. The global economy has reached a point where economies are facing either an economic crisis or civil unrest. This is especially concerning for economies that rely heavily on exports, travel, and leisure (Wasim Ahmad et al. 2022).

In terms of international trade, the impact of COVID-19 (number of cases and deaths) could significantly alter global trade patterns. Firstly, a high COVID-19 burden in an exporting country can reduce production, leading to a lower export supply. Secondly, the pandemic affects importing countries as well, with decreased aggregate demand because individuals and households spend less and save more due to future uncertainties or income loss (Richard and Eiichi 2020). Thirdly, a country's trade can be influenced by the COVID-19 situation in neighboring countries. A drop in exports from one country can create opportunities for its neighbors, while a production shock in one nation can disrupt production in neighboring countries through supply chains (Hayakawa and Mukunoki 2020). Nuno (2020) notes that supply chain disruptions and the decline in global trade due to the pandemic put additional strain on countries reliant on foreign trade. Lukasz (2020) examines the pandemic's impact on international trade, both short- and long-term, suggesting that while there may be a short-term decline, long-term adjustments and structural changes will occur as businesses adapt to economic globalization.

ASEAN consists of 10 nations, including Viet Nam, Indonesia, Malaysia, Singapore, Thailand, Cambodia, the Lao PDR, and Myanmar, which are considered fast-growing countries outperformers (MGI 2018). These emerging economies are deeply interconnected and heavily reliant on exports, travel, and tourism. ASEAN plays a vital role in international cooperation, contributing significantly to the global economy, with a regional economy valued at USD1.73 trillion in 2021. This contribution stems from the value of intra-ASEAN export trade, which accounts for about 20% of global trade value. The coronavirus pandemic has severely impacted these nations due to their high economic integration and reliance on exports. The pandemic has also led to immediate disruptions such as lockdowns, community quarantines, temporary business and school closures, and the need for social protection for vulnerable populations and support for SMEs and other affected businesses. As a result, 73% of households have seena decline in income.

Prior to COVID-19, ASEAN economies experienced a growth rate of 4.7% in 2019. However, in 2020, the region's economy shrank by 3.3%, marking its first contraction in 22 years. Travel, which accounted for 33% of ASEAN's total service exports in 2019, dropped significantly to 10.3% in 2020, a substantial decrease from previous years.

To address the pandemic, the governments of member countries haveimplemented numerous measures and policies. These have included school closures, travel bans, public gathering prohibitions, emergency education funding, social subsidies, tax reductions, health policies, fiscal measures, alternative methods of delivering social services, and various other steps to prevent the spread of the virus and mitigate its impact. These measures have affected trade flow remarkably among countries. This study attempts to indicate the impact of the COVID-19 pandemic on ASEAN's international trade, how ASEAN's policies have responded to COVID-19, and how these

responses impact on trade flow. From there, lessons can be drawn on effective policy responses to maintain stability and economic growth in developing and emerging economies in Asia, especially on macroeconomic stability, business development, and social well-being in the recovery from the COVID-19 pandemic and in the face of geopolitical turbulence and global shocks.

2. LITERATURE REVIEW

Recent studies have shown that the impact of COVID-19 has negatively affected trade flow (Phan 2023: Barbero et al. 2021: Muhammad Tarig Majeed and Sidra Sohail 2022). as well as causing global supply chain disruptions, triggering supply and demand shocks (Obavelu, Edewor, and Ogbe, 2021) inducing the demand and supply shocks (Büchel et al. 2020), and depression of the global economy (Onyeaka 2021). To prevent the impacts of COVID-19 on trade flows, many governments have responded with trade policies such as reducing barriers to imports but restricting and controlling export volumes for items agricultural. such as medical. and food products to prioritize serving the domestic market (Evenett et al. 2022). Policies on export restrictions for such important items have been implemented by countries to promptly respond to the COVID-19 pandemic, especially in the EU region and Asian countries such as Indonesia, Kazakhstan, and Viet Nam (Carreño et al. 2020).

In order to measure the impact of COVID-19 on trade flow, many studies use the gravity model with the PPML estimator by collecting monthly data. Barbero, Lucio, and Rodriguez-Crespo (2021) and Phan (2023) used the gravity model employing the Poisson pseudo-maximum likelihood (PPML) estimator, which is widely used. The PPML estimator effectively eliminates heteroscedasticity by avoiding the logarithmic transformation of trade flows and permits the inclusion of zero trade values in the regression, thereby ensuring consistent estimation. Notably, the baseline model of this study does not use the GDP variable for the gravity model, which is typically a crucial variable in the seminal gravity model due to its ability to measure country size. This is due to the fact that GDP data will usually be expressed quarterly or yearly, and will probably lead to collinearity with figures related to monthly import. Brodzicki (2021) also uses a semi-mixed-effect model and the PPML estimator to obtain unbiased results, and escape some standard problems such as heteroscedasticity and zero trade flow adjustments. Dong and Truong (2022) used the PPML estimator to study the effects of COVID-19 and the government's pandemic response policies on total exports with monthly data.

Moreover, multiple variables are used to measure the effects of COVID-19 on trade flows through government policy responses. The dependent variable often used is exports and imports representing trade flows (Barbero, Lucio, and Rodriguez-Crespo 2021; Phan 2023; Zhang et al. 2022), or only exports at aggregate and sectoral levels (Dong and Truong 2022). Szabo et al. (2021) included additional dependent variables such as exports, imports, and trade values from UN trade statistics, as well as COVID-19 cases and deaths from the WHO COVID-19 dashboard. With regard to the policy response index, Barbero, Lucio, and Rodriguez-Crespo (2021) use four key indicators mainly from the Oxford COVID-19 Government Response Tracker (OxCGRT), namely the stringency index (degree of lockdown policies), the containment and health index (lockdown measures combined with health policies such as testing and mask mandates), the economic support index (income support for the unemployed), and the overall government response index (all government responses to the pandemic). Similarly, Szabo et al. (2021) also use stringency policies like school closures, stay-at-

home requirements, and testing measures. De Lucio et al. (2022) and Kejžar et al. (2021) also adopt the stringency index to analyze policy responses.

In terms of study results, some studies show that the value of imports and exports has a positive correlation with health-related policies expressed through the containment and health index variable, and has a negative correlation with stringency measures such as school closures, stay-at-home requirements, and testing policy measures, etc. Szabo et al. (2021), Barbero Lucio, and Rodriguez-Crespo (2021), and Brodzicki (2021) suggest that stringency, economic support, and containment and health measures are negatively correlated with exports, while Kejžar et al. (2021) also show the negative correlation between stringency index and total export including intermediate goods, consumer goods, and capital goods.

At the country level, COVID-19 deaths have been found to negatively and significantly impact both exports and imports in the People's Republic of China (PRC) and the United States (US). This effect has contributed to the PRC's stringent lockdown policies in response to rising death rates during the global epidemic. For the US, there is a demonstrated causal relationship between COVID-19 cases and deaths and the country's exports and imports. Increasing numbers of COVID-19 cases and deaths have affected the United States' economic potential, including its global trade flows. Additionally, global lockdown policies have led to a significant decline in the production and export performance of various US sectors, including oil, gas, apparel, and the auto industry (Zhang et al. 2022).

Moreover, in the first year of the epidemic (2020), COVID-19 negatively impacted Viet Nam's total export turnover (Dong and Truong 2022). In the case of Switzerland, Büchel et al. (2020) showed that the trade collapse during the ongoing COVID-19 pandemic was greater than the Lehman Brothers' bankruptcy that led to financial crisis because the "protectionism" during the pandemic among countries, such as the stringency index, had a negative correlation with Swiss exports and imports. Product diversity potentially helped to prevent even greater losses: Goods from the chemical or pharmaceutical industry were notably resilient, whereas other sectors declined drastically during the period in Switzerland.

In addition, the impact of COVID-19 seriously affected Africa's trade, causing a supply-demand shock in the continent. The application of containment measures or stringency methods such as export and import prohibition and border closures negatively affected Africa's trade flows Obayelu, Edewor, and Ogbe (2021) and De Lucio et al. (2022) pointed out that the value of exports to partner countries fell sharply with strict containment measures; while the value of imports did not appear to be affected, strict containment measures would increase the likelihood of businesses or Spain stopping trade with partners.

In terms of solutions for trade policies, such as in Africa, Brenton and Chemutai (2020) made recommendations to limit the impact of COVID-19 on trade in Africa by promoting trade policy reforms such as reducing tax and administrative burdens on importers and exporters, reducing cost, and improving the availability of COVID-19 goods and services. Brenton and Chemutai (2020); Obayelu, Edewor, and Ogbe (2021); and Zhang et al. (2022) suggest that the impact of COVID-19 on trade flows is significant, indicating the need to prioritize and align health policy with the continuity of smooth trade flows. Additionally, policies concerning trade-related COVID-19 products should be liberalized. shocks То counteract the negative on global trade. it is crucial to implement subsidies and remove tariff and nontariff barriers, or at least minimize stringent measures for multilateral trade (Dong and Truong2022).

Tariff and nontariff barriers should be removed to maintain a more effective global supply chain, or trade-related COVID-19 products should be liberalized, and the role of government in facilitating COVID-19 vaccination is crucial in the contemporary global economy (Zhang et al. 2022). Moreover, countries may need to alleviate the trade shock due to COVID-19 by encouraging private investment, and strengthening and rebuilding multilateral trade relationships among countries (Barbero, Lucio, and Rodríguez-Crespo 2021).

3. DATA

Our sample includes data from ten countries exporting worldwide between January 2020 and December 2022. Given the specific monthly nature of the COVID-19 shock, we used monthly bilateral trade flows from UN Comtrade. Based on the availability of monthly trade flow data for these countries, our analysis encompasses aggregate trade flows. The data we collected for trade flows contain no missing values.

Variables related to the COVID-19 government response were obtained from the systematic dataset of policy measures created by the Blavatnik School of Government at Oxford University (Hale et al. 2021). These indices encompass government response, health measures, stringency, and economic measures, all ranging from 0 to 100, with higher values representing stronger responses to COVID-19. Given that these indicators are collected daily, they are converted to monthly averages for analysis. Other variables, such as institutional, geographical, and regional trade agreements between exporter and importer countries, were obtained from the Centre d'Études Prospectives et d'Informations Internationales (CEPII) Gravity Database (Mayer and Zignago 2011). Table 1 presents the main descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Exports (\$)	36,930	1.311e+11	7.016e+11	0.702	1.518e+13
COVID-19	36,924	1.039	1.007	0	8.527
Stringency index	36,930	23.585	9.741	0	100
Government response index	36,930	40.229	10.075	0	81.567
Containment and health index	36,930	39.284	8.785	0	82.566
Economic support index	36,930	46.842	42.457	0	100
Colony	36,930	0.003	0.058	0	1
Distance (in kilometers)	36,930	9,449.935	4,475.622	211	19,819
Common language	36,752	0.089	0.285	0	1
Regional trade agreement	36,930	0.226	0.418	0	1

Table 1: Main Variable	Descriptive Statistics
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The gravity equation generally employs both export and import values and is a widely used model in international economics for predicting trade flows between countries. The fundamental concept behind the gravity equation is that the trade volume between two countries is positively correlated with their economic sizes (typically measured by GDP) and negatively correlated with the distance between them (measured by geographic distance or similar proxies). In panel regression analysis, the gravity equation can be estimated using export values, import values, or both.

Tinbergen (1962) and Pöyhönen (1963) were pioneers in utilizing the gravity equation to examine international trade flows. Since their groundbreaking work, the gravity model has become an extensively used method in empirical studies of foreign trade. This model

has been successfully applied to analyze various flows, including migration and foreign direct investment, with a particular emphasis on international trade. It posits that exports from country i to country j are determined by factors such as their economic sizes (measured by GDP or GNP), populations, direct geographical distances, and several dummy variables that account for specific institutional characteristics.

Initially, theoretical support for this research was limited, but since the mid-1970s, several theoretical developments have emerged to support the gravity model. The generalized gravity model of trade suggests that the export volume between pairs of countries, X_{ij} , is a function of their incomes (GDPs), populations, geographical distance, and a set of dummy variables.

4. EMPIRICAL STRATEGY

The aim of our empirical exercise is to investigate whether there is a causal relationship between COVID-19 and the bilateral trade flow of countries in ASEAN. In addition to evaluating the positive impacts of select policy responses in mitigating the effects COVID-19, our study also aimed to discern the limitations inherent in these policies and measures. Recognizing the constraints is vital, as they can significantly influence trade flows. Consequently, our analysis sought to delineate the specific short-term and longterm effects of both beneficial and restrictive policies, offering deeper insights into their nuanced impacts on the dynamics of international trade, and these insights could serve as valuable lessons for post-COVID-19 recovery endeavors. To this end, we adopt a two-step strategy. First, we test the significance of the relationship between COVID-19 and export value in our sample of ASEAN countries, by adopting a gravity model and using the Poisson pseudo-maximum likelihood method. Then, we test a further expanded version of the above relationship including indicators of policy response as well as the stringency index, the economic support index, the health index, and the overall government response index. In all the empirical exercises, we control for trading characteristics of the two countries, omitted bias, and reverse causality.

In the first step, we adopt the following version of the gravity model to estimate the impact of COVID-19 on bilateral trade flows:

$$X_{ijt} = exp\{\beta_1 COVID_{it} + \beta_2 DIST_{ij} + \beta_3 LANG_{ij} + \beta_4 COLONY_{ij} + \beta_5 GDP_{ijt} + \beta_6 POP_{ijt} + \beta_7 RTA_{ijt} + \delta_i + \delta_t\} x \epsilon_{ijt,}$$
(1)

where i, j, and t denote exporter, importer, and time (monthly), respectively:

- X_{ijt} represents the export values from country i to country j at time t.
- *COVID_{it}* is the ratio of confirmed deaths to confirmed cases in the exporter country at time t, considered the COVID burden variable.
- $DIST_{ij}$ is the geographical distance between the exporter and importer countries.
- *LANG_{ij}* is a dummy variable indicating if the exporter and importer share a common language.
- *CONLONY_{ij}* is a dummy variable that takes the value 1 when exporter and importer country share past colonial linkages, and 0 otherwise.
- *GDP_{iit}* is the gross domestic products of exporter and importer country at time t.

- POP_{ijt} is the population of exporter and importer country at time t.
- *RTA_{ijt}* is a control variable that takes the value 1 if the exporter and importer have a trade agreement in force before time t, and 0 otherwise, indicating the presence and nature of trade agreements.

In addition to these explanatory variables, we also consider other control δ_i and δ_t , which are exporter and month fixed effects, respectively, to capture bias due to unobserved factors. Lastly, the error term is presented by ϵ_{ijt} . All variables are in logs except for dummies and percentages. A full description of the variables used in the empirical analysis is provided in Table 1 in the Appendix.

The rationale for incorporating these variables is supported by existing literature, and the explanation is as follows: To assess the impact of the ongoing COVID-19 shock on trade, COVID-19-related variables are introduced, as they are expected to have negative effects. Government actions are anticipated to reduce the duration and intensity of the COVID-19 shock, facilitating a smoother transition to a post-pandemic scenario, although they may cause a short-term economic downturn due to restrictions on economic activity and increased government spending. Geographical factors such as adjacency and distance are included because they significantly impact trade patterns (Anderson and Yotov 2010). Adjacency is considered due to the border effect, where countries tend to trade more with nearby partners, leading to higher trade flows with greater adjacency. Distance is included in gravity models based on early studies (Gross and Friedmann 1964) because countries generally prefer trading with closer partners, implying a negative coefficient for distance. Common language is included to reflect the extensive literature on the role of institutions in trade, where institutions help reduce trade costs and facilitate trade. Finally, the rapid growth of regional trade agreements in the context of globalization and trade liberalization is recognized, as they help reduce trade costs and enhance trade (Carrère 2006; Rodrik 2018).

To evaluate the impact of COVID-19 government response indices, we introduce Equation (2) as follows:

$$X_{ijt} = \exp(\beta_0 + \beta_1 COVID_{it} + \beta_2 POLICY_i x COVID_{it} + \beta_3 DIST_{ij} + \beta_4 LANG_{ij} + \beta_5 COLONY_{ij} + \beta_6 GDP_{ijt} + \beta_7 POP_{ijt} + \beta_8 RTA_{ij} + \delta_t) x \epsilon_{ijt}$$
(2)

Here, POLICY, represents COVID-19 government response indices, which are measured using four indicators. The stringency index measures the extent of lockdown policies designed to control the pandemic by limiting social activities. It includes data on school and university closures, public transport and workplace shutdowns, cancellation of public events, restrictions on gatherings, internal movement limitations, and stay-at-home orders. The economic support index encompasses public expenditure measures, such as income support for those who lose their jobs or cannot work, debt relief for households, fiscal measures, and financial aid to other countries. The containment and health index combines lockdown measures with health policies, including the scope of testing policies for symptomatic and asymptomatic individuals, the extent of contact tracing. mandatorv facial coverina policies. and investments in healthcare and vaccines. The overall government response index aggregates all government responses to COVID-19, evaluating whether they have intensified or weakened over time. It includes all variables from both the containment and health index and the economic support index.

We employ the Poisson pseudo-maximum likelihood (PPML) estimator to assess the gravity model. The widespread utilization of the PPML estimator in gravity literature is attributed to its capability to eliminate heteroscedasticity when dealing with logarithms of trade flows. Additionally, it facilitates the incorporation of zeros in the regression. ensuring a reliable and consistent estimation process (Silva and Tenreyro 2006). In (1), we introduced importer fixed effects and time fixed effects to systematically examine the overarching impact of COVID-19 on ASEAN countries. This strategic inclusion allowed for meticulous control over uncontrollable and time-invariant variables linked to importing partners. Furthermore, the application of fixed effects facilitated a nuanced consideration of the dynamic trends characterizing the evolution of the COVID-19 pandemic throughout duration the studv. In systematically examined the of (2), we the interaction between the COVID-19 burden variable and the policy response index to assess the impact of these policies amid escalating COVID-19 burdens. Our methodology exclusively integrated time fixed effects to account for temporal variations, enabling a discerning evaluation of the distinct effects of both the COVID-19 burden and policy measures at various time points. This analytical approach adheres to the conventions of academic research, emphasizing a rigorous investigation and meticulous control of pertinent variables. It aims to offer a nuanced understanding of the implications of COVID-19 and the corresponding policy responses.

Furthermore, to ensure the accuracy of our estimates, we conducted a unit root test (ADF and PP test, results provided in the Appendix) during the data analysis process. This statistical test helped ascertain the stationarity of the variables and ensured that the conclusions drawn from the analysis provided a robust basis for our study on the relationship between COVID-19 and bilateral trade flows of ASEAN countries.

5. RESULTS

This section is separated into two subsections. First, we present a benchmark analysis and then we show the main results obtained for the four different COVID-19 government policy response indices.

5.1 Benchmark Analysis

This section reviews three specifications of the gravity equation. The three columns in Table 1 include the COVID-19 variable, which is the ratio of confirmed deaths to confirmed cases from January 2020 to December 2022. This result departs from Equation (1), with Column (I) introducing exporter-month fixed effects, while Column (II) includes month fixed effects, and exporter fixed effects are presented in Column (III).

Different specifications clearly demonstrate the destructive effect of the COVID-19 pandemic on trade value. While the magnitude of the COVID-19 coefficient in Column (II) is the largest (-0.0166), the size decreases when we include exporter fixed effects. The COVID-19 pandemic has indeed cast a significant shadow over global trade, with emerging countries in ASEAN facing heightened challenges due to their reliance on exports. The disruption in international supply chains, travel restrictions, and economic downturns have resulted in a more severe impact on trade flow for these nations. According to the World Trade Organization (WTO), the global merchandise trade volume contracted by 5.3% in 2020, marking a substantial decline. Within ASEAN, countries such as Viet Nam, Thailand, and Malaysia, which depend heavily on exports, experienced a notable decline in trade activities. For instance, Viet Nam's exports contracted by 2.0% in 2020, highlighting the strain on these economies. The vulnerability

of emerging ASEAN nations to external shocks emphasizes the need for resilient trade policies and diversification strategies to mitigate the adverse effects of future global disruptions. The figure for RTA is positive and significant at 1% in all three columns. This can be interpreted as an increase in trade value made by regional trade agreements among ASEAN countries. De Soyres, Maire, Sublet (2019) also found that RTAs are associated with an increase in trade within the region and a decrease in inflows to the region. This can be understood as trade creation and trade diversion due to a shift in demand associated with the lower trade barriers within the region and rules of origin as an implicit trade barrier for imports from the rest of the world. In contrast, many landlocked countries restrict trade in the very services that connect them with the rest of the world. Borchert et al. (2012) argue that such policies result in more concentrated market structures and restricted access to services in these countries, even when considering factors such as geography, income levels, and the potential endogeneity of policy. Similar policies in both industrial and developing nations also hinder competition in international transport services. Consequently, "trade-facilitating" investments under various "aid-for-trade" initiatives are likely to yield low returns unless they are paired with substantial reforms in these service sectors.

	(I) Log of Trade Value	(II) Log of Trade Value	(III) Log of Trade Value
COVID-19	-0.0152***	-0.0166***	-0.0136***
	(-23.49)	(-23.81)	(-21.32)
Log of distance	-0.213***	-0.0649***	-0.220***
	(-34.49)	(-32.75)	(-35.42)
Common language	-0.157***	-0.0867***	-0.160***
	(-35.30)	(-22.69)	(-35.77)
Colony	0.0439**	0.0327*	0.0414**
	(2.99)	(2.26)	(2.85)
Log of exporter GDP	0.215***	0.197***	0.212***
	(149.90)	(144.18)	(148.95)
Log of importer GDP	0.158***	0.0637***	-0.411***
	(4.07)	(63.81)	(-15.60)
Log of exporter population	-0.0964***	-0.0855***	-0.0967***
	(-86.04)	(-78.66)	(-86.93)
Log of importer population	0	-0.00840***	0
	(.)	(-8.09)	(.)
RTA	0.0351***	0.0661***	0.0305***
	(7.48)	(18.85)	(6.58)
Constant	-3.155**	-1.651***	11.48***
	(–3.18)	(-42.14)	(17.09)
Exporter controls	Yes	No	Yes
Time controls	Yes	Yes	No
Observations	29,995	29,995	29,995
Pseudo R2	0.1426	0.1255	0.1398

t-statistics in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001.

The remaining variables exhibit the predicted coefficients based on theoretical understanding and gravity model forecasts. The figure for the common language coefficient might be contrary to previous findings on the impact of the common official language variable on the value of trade. This can be explained by the fact that the number of countries that share the same official language account for a small percentage among observed countries. Of the remaining geographical and historical variables, all except the common colony dummy have the expected positively signed coefficient and are statistically significant at the 5% level or better regardless of the fixed effect. This finding is aligned with previous studies on the impact of colonialism on trade. Kleinman is commonly thought to be the first to write explicitly on the impact of colonialism on trade. His 1976 study analyzed the effect of independence on trade and the decline of colonialism from 1960 to 1970. Kleinman uses the share of ex-colonizers' overall trade derived from former colonies to test the hypothesized trade domination commonly attributed to colonization. Kleinman noted that independence resulted in a rapid decrease in overall trade dependency, though this dependency was still present in 1970. These conclusions reinforce the belief that despite independence, ex-colonizers may still dictate trade with former colonies, potentially to the point of exploitation.

5.2 Policy Responses to COVID-19

In this section, we use Equation (2) to estimate our results, introducing the four COVID-19 government response indices with month fixed effects. Table 2 shows that the effect of COVID-19 on trade is negative and significant for all specifications considered. Our results for ASEAN countries provide more evidence for previous findings indicating the detrimental effects of COVID-19 on trade flows (e.g., Espitia et al. 2022). To examine the impact of government policy response, we interact the COVID-19 variable with four indices presenting policy measures to tackle COVID-19. Interestingly, our research found that only the economic support index showed a positive correlation with trade flow. This suggests that while other policy responses may have dampened trade, economic support measures might have played a mitigating role. The stringency index includes lockdown measures restricting movement, closures of businesses and public transport. likelv disrupted supply chains, and reduced demand for imported goods, hindering trade flow. The containment and health index focuses on restricting contacts and travel, along with limitations on production that could have hampered both imports and exports. The overall government response index combines these restrictive measures and strengthens the argument that overall government responses, while necessary for public health, have likely had a negative impact on trade flow, whereas economic support measures such as income support and debt relief might have helped maintain consumer spending power, potentially offsetting some of the decline in trade caused by social distancing and other limitations. By bolstering businesses, these measures might have helped them weather the storm and maintain their import and export activities to some extent. Nations with higher scores on this index are likely to be perceived as more resilient and reliable trading partners, fostering trust and mitigating uncertainties in global trade networks. Overall, policy responses impact trade flows more favorably in the context of increasing COVID-19 burdens.

	(I) Log of Trade Value	(II) Log of Trade Value	(III) Log of Trade Value	(IV) Log of Trade Value
COVID-19	-0.00629***	-0.00983***	-0.0203***	-0.0184***
	(-7.66)	(–10.85)	(–21.29)	(–18.90)
Colony	0.0909***	0.0920***	0.0901***	0.0901***
	(5.65)	(5.73)	(5.69)	(5.61)
Log of exporter GDP	0.176***	0.174***	0.181***	0.172***
	(127.41)	(123.95)	(137.28)	(121.52)
Log of importer GDP	0.0565***	0.0565***	0.0561***	0.0566***
	(57.29)	(57.39)	(56.81)	(57.85)
Log of exporter population	-0.0615***	-0.0579***	-0.0805***	-0.0535***
	(-53.84)	(-48.05)	(-70.87)	(–44.51)
Log of importer population	-0.000328	-0.000348	-0.000349	-0.000380
	(-0.32)	(-0.34)	(-0.34)	(-0.37)
RTA	0.124***	0.123***	0.129***	0.123***
	(42.15)	(41.71)	(43.19)	(42.01)
Stringency*COVID-19	-0.000673***			
	(-28.14)			
Government Response*COVID-19		-0.000904***		
		(–29.11)		
Economic Support*COVID-19			0.000493***	
			(19.19)	
Containment and Health*COVID-19				-0.00108***
				(–35.86)
Constant	-2.051***	-2.038***	-1.896***	-2.057***
	(-50.92)	(-50.36)	(-48.72)	(-50.77)
Observations	30109	30109	30109	30109
Pseudo R2	0.1225	0.1226	0.1212	0.1243

Table 3: Results by PPML Estimation Using COVID-19 Government Response Indicator

t-statistics in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001.

All specifications are controlled for month fixed effect.

We also find that results do not vary substantially across the RTA variable as they range between 0.123, for government response and containment and health, and 0.129, for economic support. Although estimated parameters are not statistically different from each other, this might indicate that RTA is beneficial even during the COVID-19 period. As disruptions caused by the pandemic affect the global supply chain, countries participating in regional trade agreements exhibit greater resilience in their trade flows than those not engaged in such agreements. By fostering regional economic integration and collaboration, RTAs create a framework that mitigates the adverse effects of global supply chain disruptions. Countries engaged in RTAs often experience enhanced trade resilience, as the agreements facilitate smoother coordination, reduced trade barriers, and streamlined processes, thereby insulating member nations from the worst impacts of external shocks. Consequently, advocating and supporting RTA policies during the COVID-19 period can emerge as a pragmatic approach for nations seeking to fortify their economies and maintain a more robust and adaptable position within the evolving global trade landscape.

6. CONCLUSION

In conclusion, our study reveals a significant and detrimental impact of the COVID-19 pandemic on the bilateral trade flows among the ASEAN countries from January 2020 to December 2022. The disruptions caused by the pandemic have led to a considerable reduction in trade activities, reflecting the challenges posed by the unprecedented health crisis. However. our findinas also shed liaht on the crucial role of policy responses in mitigating the adverse effects of the pandemic on trade flows. While some policy responses may not directly benefit trade flows, economic support policies have demonstrably helped maintain high purchasing power and stimulate production. As a result, countries implementing effective policies exhibit a more favorable trade performance, particularly in the face of increasing COVID-19 burdens. This underscores the importance of proactive and well-designed policy measures in supporting economic resilience and trade continuity during times of global crises. Furthermore, our study underscores the resilience of countries engaged in regional trade agreements amid the disruptions caused by the pandemic. As global supply chains experience significant disturbances, the collaborative frameworks established within regional trade agreements contribute to the greater stability of trade flows. The results suggest that participation in such agreements provides a buffer against the adverse effects of external shocks, offering a pathway for countries to navigate the challenges posed by the ongoing health crisis.

It is important to note that the effective development of strategies and policies to cope with pandemics or catastrophes in the future will contribute to building confidence within the community at large and among businesses. This, in turn, fosters trust with the international community, thereby maintaining the flow of trade and investment amid global impacts and crises. While our research identified economic support as the sole positive influence on trade flow compared to stringency, containment and health, and overall response indexes, the explanation is multifaceted. Economic support has likely boosted consumer and business purchasing power, enabling continued import spending and potentially even increasing it. Additionally, such support might have helped businesses maintain their production capacity and operational costs, ensuring a steady supply of exportable goods. Furthermore, economic recovery in one nation can have a ripple effect on global trade. Building on these findings, policymakers can design targeted economic support programs for trade-reliant sectors like manufacturing and logistics. Additionally, trade facilitation measures and international cooperation on economic recovery efforts could further amplify the positive impact on trade flows. Finally, long-term investments in economic resilience through promoting innovation and supply chain diversification can offer additional support in the face of future disruptions. By implementing a combination of these strategies, policymakers can leverage the power of economic support to significantly enhance trade flows and bolster global economic well-being.

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APPENDIX

Table: Unit Root Test

	Α	DF Test	PP Test	
Variables	Level	First Difference	Level	First Difference
Exports	-1.927	-25.991***	-0.764	-31.590***
COVID-19	-10.593***	-48.798***	-10.904***	-36.107***
Stringency index	-6.973***	-11.067***	-7.308***	-10.792***
Government response index	-9.554***	-11.107***	-9.278***	-10.843***
Containment and health index	-9.698***	-11.089***	-9.389***	-10.844***
Economic support index	-2.948**	-14.485***	-2.992**	-14.492***