Received: 10 January 2024 | Accepted: 23 January 2024

DOI: 10.1111/roie.12733

SPECIAL ISSUE PAPER

WILEY

Country characteristics and trade policy during the COVID-19 pandemic

Bernard Hoekman[1,2,3] | **Filippo Santi**[4] | **Anirudh Shingal**[1,5]

[1]EUI, Fiesole, Italy

[2]CEPR, London, United Kingdom

[3]CITP, Sussex, United Kingdom

[4]Dipartimento di Scienze Economiche, Università di Bologna, Bologna, Italy

[5]SPJIMR, Mumbai, India

Correspondence
Filippo Santi, Dipartimento di Scienze Economiche, Università di Bologna, Bologna, Italy.
Email: filippo.santi6@unibo.it

Abstract

Government policy responses to the COVID-19 pandemic often included changes to trade policies. This article uses detailed data on trade policy measures targeting medical products during the first 18 months of the pandemic (January 2020–June 2021) compiled by the Global Trade Alert to analyze the relationship between national trade policy activism and pre-pandemic trade patterns, import protection and international integration. The focus is on both potential country-specific drivers of unilateral trade policies and the duration of implemented measures. We find significant heterogeneity in the relationships between trade policy actions and country characteristics. The likelihood of import liberalization was more prevalent among net exporters of medical products, whereas net importers were more inclined to impose export restrictions. The results suggest trade policy responses to the challenges raised by the COVID-19 pandemic are only partially explained by extant theory.

KEYWORDS

COVID-19, export restrictions, import liberalization, production subsidies, trade policy

JEL CLASSIFICATION

F13, F52, I18

We are grateful to Doug Nelson and participants in the June 2023 EUI conference on Global governance, social welfare, and inclusive trade policy for helpful comments and suggestions on an earlier draft.

1 | INTRODUCTION

The COVID-19 pandemic started in early 2020 and began being considered a serious threat to public health worldwide in February 2020. Following an initial period in which most countries did not take any special countermeasures, many governments implemented measures to reduce the spread of the disease through contagion, most notably lockdowns and associated work/schooling-from-home policies, severely limiting international travel and implementing quarantine requirements. The combination of the disease and domestic policy measures to control its spread led to a sharp decline in global economic activity (World Bank and WTO, 2022). Access to medical products became central to the public discourse, reflecting a very large imbalance between global supply and demand for essential supplies (WTO, 2022).

Many governments also resorted to trade policy as part of their policy response to the crisis, reflecting a desire to improve the supply of medical products. This included import liberalization as well as export restrictions of critical products such as personal protective equipment (PPE) and other medical products (Evenett, 2020; Fiorini et al., 2020; Hayakawa & Imai, 2022; Vo & Le, 2022). Trade policy activism was not universal. Many countries refrained from changing their trade policies. Trade policy responses were heterogeneous, not only in terms of the use of trade policy instruments but also the types of measures implemented and their duration.

Trade policy, and more broadly industrial policy, may be used by governments in preparing for a possible pandemic event and more generally major exogenous shocks that may affect the supply of critical supplies by bolstering national capacity to produce or source essential products (Athey et al., 2022). Trade policy can play a role by eliminating barriers to imports of necessary medical supplies and allowing inputs to move where they are needed for production of final goods (Greenaway & Nelson, 2022). During the first 6 months of the COVID-19 pandemic many governments sought to alleviate shortages of critical medical supplies and equipment through a mix of export controls and import facilitation policies, complemented by production subsidies to support a rapid scaling up of output of protective equipment, medical devices, and the development of vaccines. Export controls justified by public health concerns had negative international repercussions. While incentives to restrict trade in final products may be attenuated in instances where the associated medical product supply chains require foreign inputs, for countries without domestic production capacity reliant on imports, export controls imposed by producers of medical products were unambiguously detrimental by reducing availability and increasing prices.

In this article we build on and extend Evenett et al. (2022) to analyze the relationship between national trade policy activism, pre-pandemic trade patterns, import protection and international integration, employing an updated version of the database constructed by the Global Trade Alert.[1] We consider both potential country-specific drivers of unilateral trade policy measures and the duration of the implemented measures in our analysis. Countries that were more affected (both in terms of cases and deaths) may have been more likely to resort to trade policy to ensure the availability of critical medical products. We therefore control for the severity of COVID-19 incidence and the lockdown and related measures taken to curb it (Dong et al., 2020; Hale et al., 2021). Given that mortality rates and domestic policy responses will be positively correlated, countries that were more active in implementing domestic measures to contain contagion may have also been more active in terms of trade policy.

We find significant heterogeneity in the relationships between trade policy actions and country characteristics. The likelihood of import liberalization was more prevalent among net

exporters of medical products, whereas net importers were more inclined to impose export restrictions. The results suggest trade policy responses to the challenges raised by the Covid-19 pandemic are only partially explained by extant theory.

The rest of the article is organized as follows. Section 2 briefly reviews the limited extant literature on trade policy during the COVID-19 pandemic. Section 3 discusses patterns of trade policy changes during 2020–2021, providing an overview of the different measures employed by countries, including their duration, and distilling several hypotheses regarding potential drivers of trade policy during the pandemic that inform the empirical analysis. Section 4 presents the empirical framework and the estimation results. Section 5 concludes.

2 | CONTEXT AND RELATED LITERATURE

There has been extensive analysis of the impacts of COVID-19 and the associated policy responses on international trade. Global trade fell because of the combination of the simultaneous drop in demand and supply, driven by COVID-19 cases and mortality and lockdown policies. The trade effects were large, with greater impacts on trade between high income economies and more open economies with more extensive participation in global value chains and preferential trade agreements. The literature finds there was significant heterogeneity across products and country-pairs, and that the trade effects were of relatively short duration (e.g., Liu et al., 2022). In part the relative resilience of trade in goods reflected a major reallocation of expenditure away from in-person services activities towards consumer durables during the pandemic (Tauber & Van Zandweghe, 2021). Trade in services fell by 20 percent (Ando & Hayakawa, 2022; Shingal, 2020), driven by a precipitous decline in travel and tourism. Developing countries specialized in these activities were particularly affected, with services trade declines more pronounced in low-income and less-integrated economies (Shingal, 2023).

Most of the empirical literature on COVID-19 and trade has focused on assessing (and disentangling) the impacts of the pandemic-induced demand and supply shocks and the associated domestic policy responses.[2] Less attention has been devoted in the academic literature to the role trade policy played in governments' policy responses.[3] Governments may intervene in trade during a pandemic motivated by a desire to increase domestic supply of essential products by restricting exports and facilitating imports of such goods. The pandemic led to a large increase in worldwide demand for essential medical products, including personal protective equipment, therapeutic drugs, and medical devices such as ventilators, with an associated jump in prices for such goods. Since supply responds with a lag, trade became both a channel for propagation of the pandemic shock and for addressing demand for critical supplies. Much depended on national domestic production capacity and the timing and severity of the public health repercussions of COVID-19 across countries. For example, excess demand in foreign nations induced greater exports from countries with supply capacity that were less affected at a given point in time by the disease, reducing availability at home. Shortages were mitigated by taxing exports, liberalizing imports, relaxing public procurement rules to accelerate and enable direct purchases of critical products at market prices, and subsidizing domestic production.

Evenett et al. (2022) document the pattern and dynamics of trade policy during the first year of the pandemic, drawing on an initiative by the Global Trade Alert to track trade policy towards medical products on a weekly basis. This revealed wide variation in the use of trade policy. Shingal and Agarwal (2021) use these data to investigate the association between trade policy changes and trade flows accounting for differences in country size, per capita income, government

effectiveness, GVC-participation, and political economy factors. Hoekman et al. (2022) utilize the same dataset to assess the relationship between the use of trade policy instruments and attributes of pre- pandemic public procurement regulation. Controlling for country size, government effectiveness and economic factors, they find that export restrictions targeting medical products were strongly correlated with the total number of steps and average time required to complete procurement processes.

Several recent articles study the rationale for using different types of trade policy instruments in a pandemic and develop modeling frameworks to estimate optimal levels of intervention in trade to ensure greater domestic supply of critical products. These articles have a normative focus, exploring the role trade and industrial policy can play ex ante, before a crisis such as a pandemic hits a country. Examples include Bown et al. (2022), Grossman et al. (2023) and Traiberman and Rotemberg (2023). Leibovici and Santacreu (2023) focus on optimal trade policies during the pandemic, highlighting the incentives for governments to impose export taxes on essential products, subsidize imports of such goods, and provide financial support to firms to expand domestic supply capacity. In their model joint use of these instruments has the largest positive effect on national welfare. This is because the potential "foreign leakage" effect of high global prices and production subsidies is offset by export taxes, while access by consumers to critical goods is enhanced by lowering the cost of imports. Leibovici and Santacreu (2023) calibrate their model to the US economy but argue that their framework is consistent with observed cross country patterns of trade interventions during the pandemic, noting that deficit countries (net importers) impose more export restrictions and import liberalization measures than countries with a surplus (net exporters, a proxy for productive capacity).

When using trade-related policies during a pandemic, governments may ignore the consequences of their interventions on other countries, without regard for potential negative international spillovers. The likelihood of such a policy stance may however be lower in countries that have made extensive commitments to maintain an open trade regime by maintaining low MFN tariffs and participating in many preferential trade agreements (PTAs). Moreover, the short-run incentives for unilateral trade policy interventions are likely to be smaller if there is mutual dependence in the production of essential medical products, reflected in patterns of specialization along international supply chains (Bown & Bollyky, 2022; Evenett et al., 2021).[4] A country that is a supplier of key inputs or feedstocks used in the production of critical medical goods can respond to export controls in a downstream country in which final production occurs with restrictions on exports of key inputs or semi-processed materials. This will impede the ability of the nation in which final production occurs to ramp up output and may constrain the use of zero-sum export controls along the supply chain. We therefore also consider the extent to which interdependence (reflecting value chain and PTA participation) is correlated with the type and duration of trade policy measures imposed during the pandemic.

3 | PATTERNS OF TRADE POLICY DURING JANUARY 2020–JUNE 2021 AND HYPOTHESES

We draw on the *Essential Goods Initiative* + database, which tracks all the trade policy measures targeting food and medical products adopted worldwide in response to the challenges posed by the Covid-19 pandemic.[5] The dataset covers all interventions made by governments targeting trade in medical products or the productive capacity of the country (supported for instance by policies to stimulate investment by producers of critical medical products).[6] We explore the

trade policy response along four distinct country-specific dimensions: (i) income per capita; (ii) domestic production capacity, proxied by GDP and a country's net trade position with respect to medical products[7]; (iii) the pre-pandemic level of import tariffs on medical products; and (iv) the degree of global integration, proxied by national GVC participation and the number of PTAs a country is party to.[8]

Both the extent of trade policy activism (measured by the number of trade-related interventions imposed after January 2020) and their duration—average length of time (weeks) the adopted measures remained in place—are positively correlated with per capita income. High income nations were more likely to target exports (Figure 1, top panel) and to subsidize medical products compared to low-income and middle-income countries (MICs),[9] which conversely were more likely to reduce import barriers. The average duration of export restricting measures imposed by high-income countries was greater than that observed in MICs,[10] where export controls, if imposed, were rapidly removed. Import liberalizing measures were maintained for a longer period in upper middle-income countries than in high income ones. A similar pattern is observed for production subsidies, which tended to last less long in rich countries.

Net exporters of medical products were less prone to use trade policy to address medical shortages than net importers (Figure 2, top panel), and when intervening, tended to resort more frequently to production subsidies to increase domestic output. Net importers tended to resort to import liberalization more often than to export controls or production subsidies, although both instruments were also used frequently. In general net importers were more active trade policy users. Countries with domestic productive capacity (proxied by net exporter status) appear to make less intensive use of trade policy, instead relying more on production subsidies to bolster existing capacity.

For net importers, reductions in import tariffs, together with production subsidies may reflect an effort to retain stocks of key medical products for domestic use in the short run while building up home-based industrial capacity in the longer run. The duration of interventions tended to be somewhat longer lasting in net importing nations. Countries that are less integrated into medical products value chains (red bars) tended to use trade policy more and for longer than more integrated ones (blue bars), irrespective of whether they were net exporters or net importers (Figure 2, middle and bottom panels). However, the duration of use of subsidies by net exporters was invariant to the level of integration. Overall, the depth of integration into medical product value chains does not appear to be associated with the direction of trade policy activism (i.e., towards liberalization or towards restricting trade).

The pre-pandemic level of import tariffs on medical products appears to be associated with policy responses to the pandemic. Figure 3 distinguishes between countries with above and below median levels of import protection for anti-pandemic medical products. Countries with higher pre-pandemic tariffs implement more export restrictions and import liberalizing measures and adopt fewer production subsidies than more open countries, which more frequently implement subsidy programs (Figure 3, top panel). Moreover, the duration of trade policy measures appears to be somewhat shorter in countries with lower pre-pandemic average tariff rates (Figure 3, lower panel).

Number of PTA memberships appears to be associated with both the direction and the duration of trade policy activism (Figure 4, top panel). Countries that were members of more PTAs (top panel, shaded blue) imposed a larger number of restrictions on exports and subsidized domestic production more frequently than countries that were less integrated into PTAs (top panel, shaded red); the latter engaged more in import liberalization of essential medical supplies. In terms of average duration, import liberalizations and production subsidies adopted by states with fewer

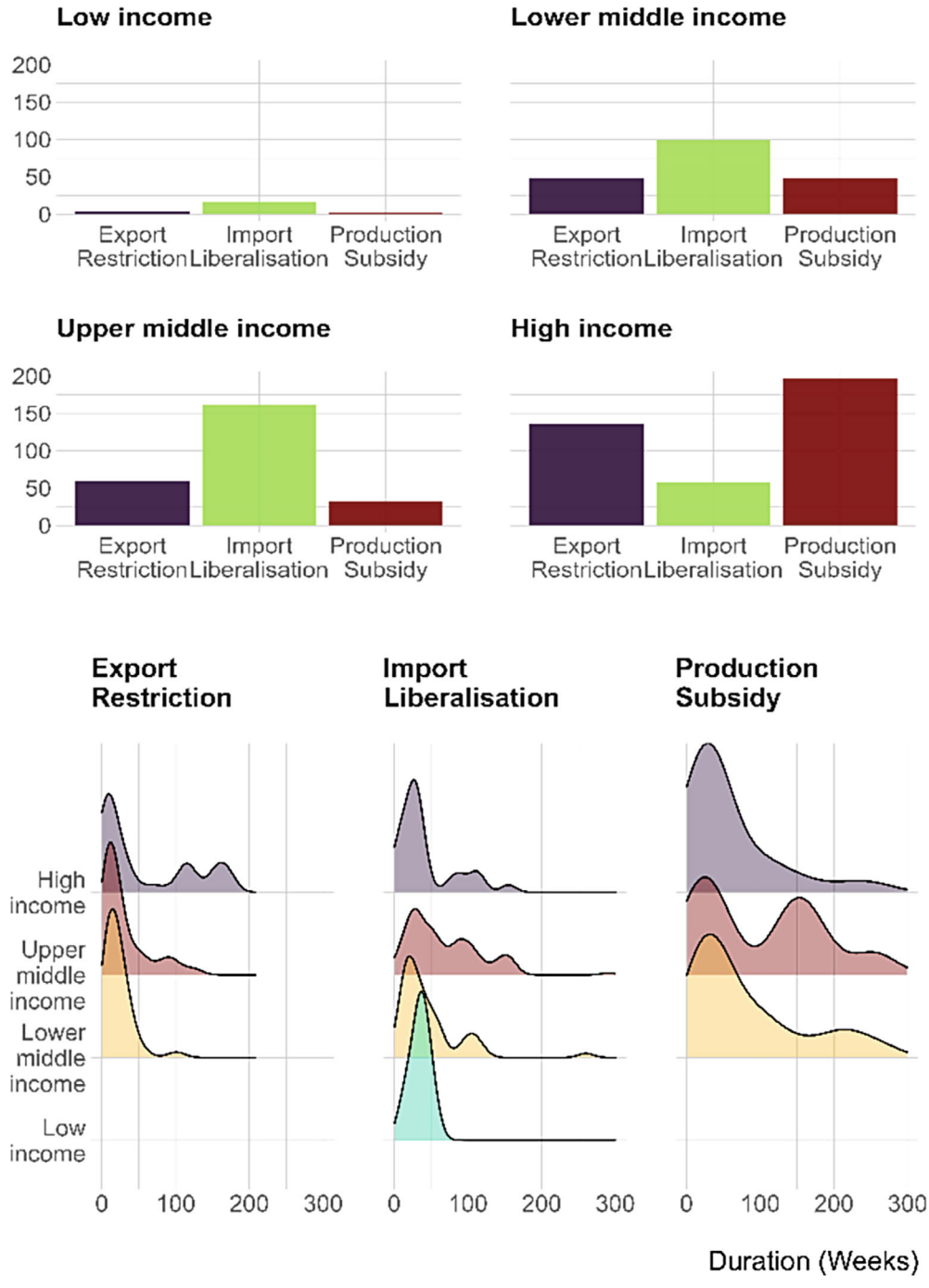

FIGURE 1 Number and average duration of measures by income group. *Source*: Essential Goods Initiative database. Income group definitions from World Bank. Appendix Figure A1 reports the correlation between GDP and the number and type of trade policy measures imposed by a country. [Colour figure can be viewed at wileyonlinelibrary.com]

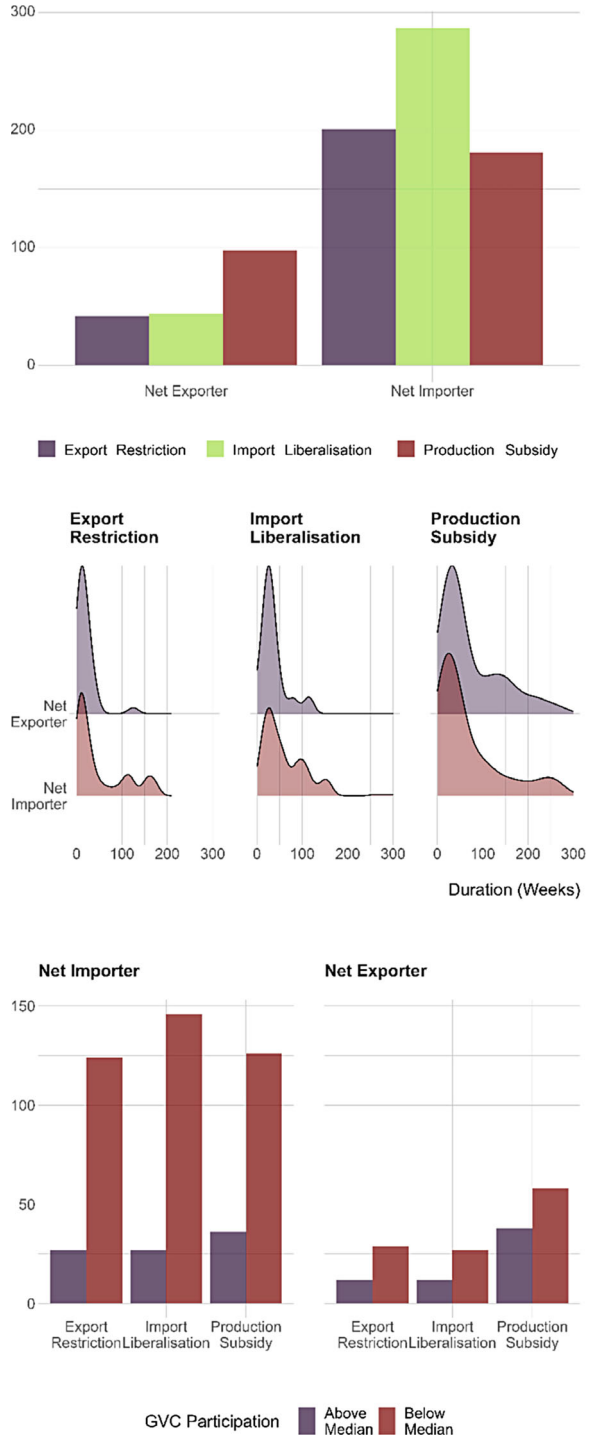

FIGURE 2 Number and duration of measures by type and net trade position. *Source*: Essential Goods Initiative+ database. Trade in medical products aggregated from CEPII (BACI) using the definitions in the methodological note to the Essential Goods Initiative database. See Appendix Table A1. [Colour figure can be viewed at wileyonlinelibrary.com]

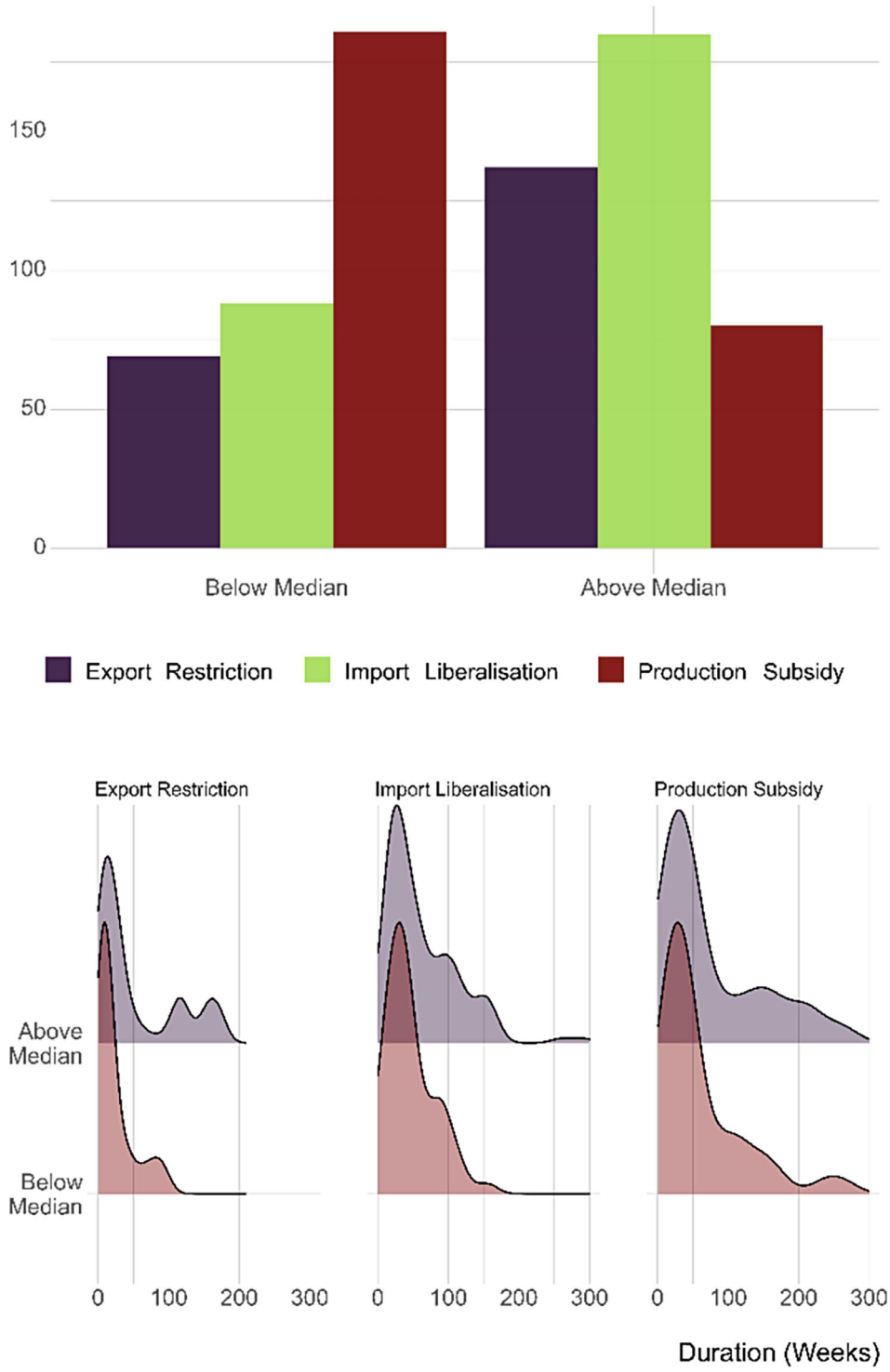

FIGURE 3 Number and average duration of measures and pre-pandemic import tariffs. [Colour figure can be viewed at wileyonlinelibrary.com]

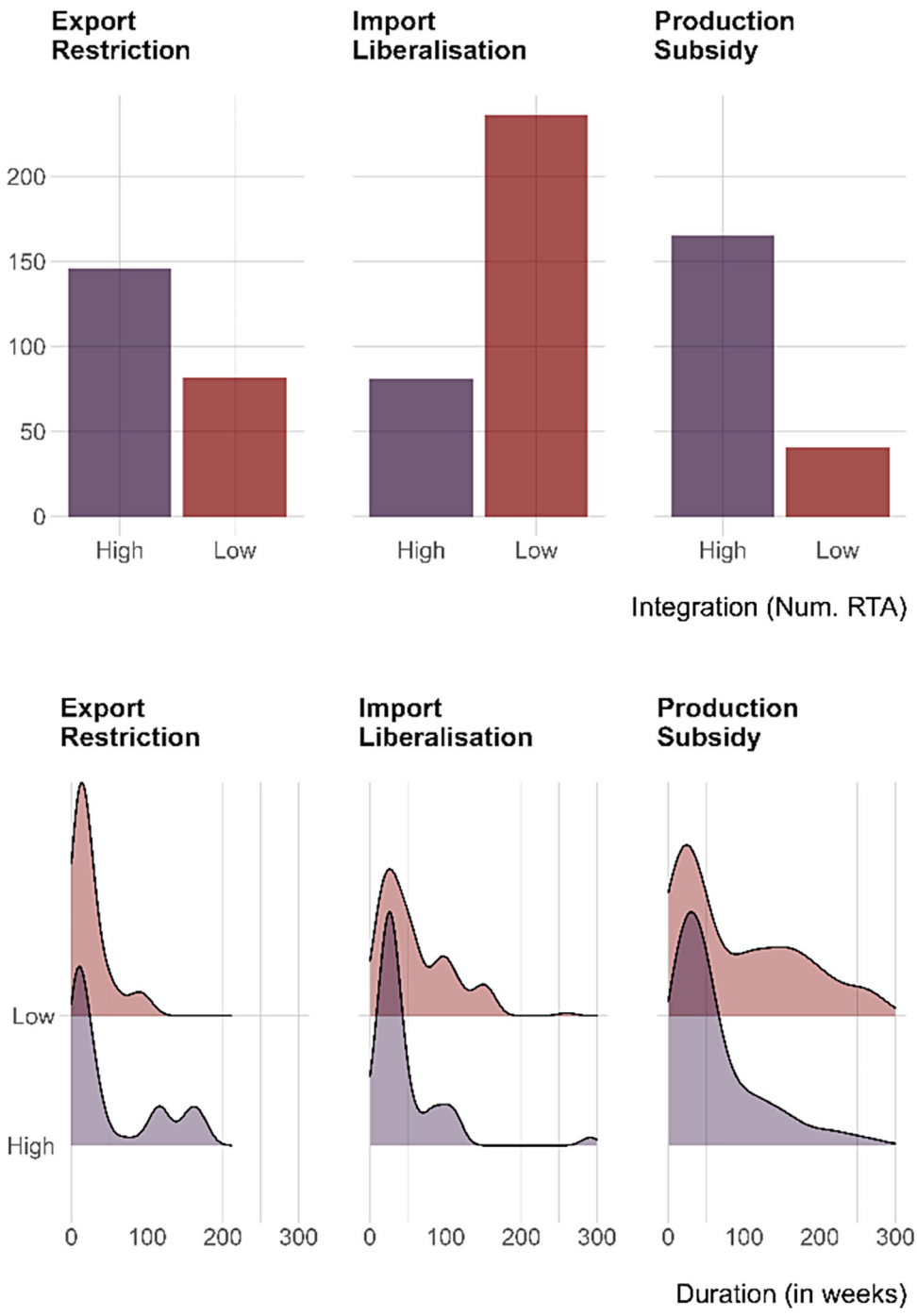

FIGURE 4 Number/average duration of measures and participation in PTAs. Essential Goods Initiative database. PTA information sourced from Conte et al. (2022). [Colour figure can be viewed at wileyonlinelibrary.com]

PTAs were longer-lasting than those adopted by countries with above average PTA participation (Figure 4, bottom panel).

3.1 | Hypotheses

The stylized facts described above suggest that policy responses to COVID-19 were heterogeneous, with three broad sets of interventions observed most frequently: (i) efforts to improve access to critical products by reducing import tariffs and related barriers; (ii) restricting or controlling exports through export bans, quotas or licensing requirements; and (iii) supporting greater production by subsidizing investment by national firms to expand supply.[11]

As discussed in Section 2, countries hit by a severe, unexpected, public health shock may use trade policy to both facilitate imports of critical medical products and to curb (re-)exports of such goods to increase domestic availability. Given that producers in countries with a comparative advantage and thus established supply capacity can be expected to ship goods where they can realize the highest prices, the increase in world prices for critical medical supplies may induce an increase in exports. To direct domestic supply to the domestic market, governments may then act to curb exports to ensure that domestic stocks are used to satisfy domestic needs. In addition, fiscal space permitting, governments may support investment in increasing domestic production of critical goods by offering subsidies to local producers.[12]

The use of these three types of policies may be temporary—limited to the duration of the crisis—but changes in trade policies may also be longer lasting. Export restrictions are likely to be short lived because net exporters that are specialized in medical products will have incentive and the capacity to sell medical supplies to foreign customers once the acute stage of a crisis has passed, while countries that do not have comparative advantage in medical products will not have domestic industries to impose export controls on. This need not be the case, however, if governments are induced to take action to increase domestic supply in anticipation of future shocks. Governments may decide to foster greater domestic production capacity in the medium term through production subsidies and higher import tariffs to protect domestic firms. In such instances, policy design is likely to be influenced by the domestic availability of key inputs and the supply chains involved in the production of critical goods. Moreover, the ability to impose export and import barriers will also be conditioned by the extent of a country's participation in PTAs.

During the emergency, a decision to lift temporary export curbs, if these were used, will depend on the domestic situation (balance between demand and supply; incidence of the disease). Net importers (countries with limited domestic supply capacity) have no incentive to impose export restrictions in the medium run once domestic stocks are depleted, but, depending on whether they decide to pursue industrial policies following the pandemic, may increase import duties once the severity of the crisis has attenuated. Lower-income states with higher levels on import protection may have greater scope to lower import barriers than to use production subsidies in the short run, given more binding fiscal constraints.

The foregoing discussion gives rise to the following hypotheses:

1. Independent of initial domestic production capacity, states can be expected to liberalize imports of critical products during a pandemic.

1a. Countries characterized by a higher-than-median initial tariff level are more likely to respond with trade-liberalizing measures compared to less protectionist states given that this will have a larger impact.
1b. Countries characterized by a higher-than-median initial tariff level are more likely to reimpose barriers once mortality rates and disease incidence (cases) have declined substantially.

2. Countries with productive capacity (comparative advantage) in medical products are more likely to restrict exports of critical medical products than net importers.

2a. In producing countries, export restrictions are likely to be limited to the immediate period during which domestic demand exceeds domestic supply.
2b. Use of export restrictions will be conditional on the extent to which the industry concerned relies on inputs from abroad—the more GVC-intensive production, the lower the prospect of export restrictions.

3. All states can be expected to support an expansion in supply using subsidies to accelerate and encourage domestic investment in capacity to produce critical medical supplies.

3a. In the initial pandemic period, subsidies will be used more by countries with existing capacity.
3b. Production subsidies are less likely to be used by lower-income nations without pre-existing production capacity.

4. The number and the average duration of measures supporting domestic production (new production subsidies and export controls) will depend on the extent of international policy commitments to open markets, as proxied by the extent of participation in PTAs.

4 | EMPIRICAL FRAMEWORK AND RESULTS

Our objective is to identify the extent to which country-specific factors shaped the pattern of trade policy activism in response to Covid-19 and the duration of the measures imposed. To do so, we exploit the high frequency data that is available for both trade policy and Covid incidence, and analyze the imposition of trade policy measures on medical products during the first 18 months of the pandemic (from January 2020 to June 2021) using the following baseline specification:

$$CTP^{i}_{cmt} = \beta_1 Mort\_sh_{cmt} + \beta_2 OSI_{cmt} + \beta_3 Dur^{i}_{cmt} + \Omega_c + \Psi_m + Þ_t + \varepsilon_{cmt}, \quad (1)$$

where CTP^{i}_{cmt} is a binary dummy that takes the value one if country ***c*** adopted one of three types of trade-related policy measures i (either import liberalizing, export restricting, or a production subsidy) on medical products in month m of year t; OSI_{cmt} is an index of the stringency of containment measures imposed by country c in month m of year t (Hale et al., 2021); $Mort\_sh_{cmt}$ is the share of COVID-19-related deaths in COVID-19 cases in country c in month m of year t (Dong et al., 2020); Dur^{i}_{cmt} captures the number of months a trade measure i was in place; Ω_c, Ψ_m and P_t are country, month and year fixed effects to control for all other observed and unobserved country- and time-specific determinants of trade policy imposition; and ε_{cmt} is the error term.

TABLE 1 Summary statistics, selected variables.

	Obs.	Sum	Avg	Min	Max
Number of countries[a]	134	988	7.37	1.00	96.00
Duration (Days)	95	27,521	289.69	23.00	1826.00
GDP (US$ million)	128	97,156,410	759034.45	872.13	21060473.61
Tariffs (%)	98	454	4.64	0.00	22.99
Medical product exports (US$ million)	132	1812	13.73	0.00	609.04
Medical products imports (US$ million)	132	1689	12.80	0.01	478.61
Subsidies (% of GDP)	83	171	2.07	0.00	7.41
Number of Trade Agreements	131	2031	16	1	46

Note: Computed on the estimation sample. Obs. refers to the number of non-zero, non-missing information.
[a]Countries implementing at least one trade-related policy measure of interest during Jan 2020-June 2021.

In additional regressions we also explore the sensitivity of the duration of trade policy measures to Covid-19 incidence via interaction terms:

$$CTP^{i}_{cmt} = \beta_1 Mort\_sh_{cmt} + \beta_2 OSI_{cmt} + \beta_3 Mort\_sh_{cmt} \times Dur^{i}_{cmt} + \beta_4 OSI_{cmt} \times Dur^{i}_{cmt} + \beta_5 Dur^{i}_{cmt} + \Omega_c + \Psi_m + \text{Þ}_t + \varepsilon_{cmt}. \quad (2)$$

All equations are estimated using the linear probability model, with standard errors clustered at the country-month-year level. To evaluate the role of the country characteristics, we split the sample to differentiate between net exporters and net importers of medical products using the BACI database (Gaulier & Zignago, 2010) and between countries with above and below median levels of initial tariffs on medical goods (taken from UNCTAD TRAINS)[13]; size (GDP) and per capita income (both sourced from the World Bank World Development Indicators); GVC participation (based on OECD Inter-Country Input–Output data)[14] and number of PTA memberships (Conte et al., 2022). We adopt this approach to more directly assess the hypotheses presented in the previous section as opposed to including interaction terms between the Covid-19 incidence measures and a vector of country characteristics.[15] For data on all the country type attributes, we consider the last pre-pandemic year available, that is, 2018. Table 1 reports summary statistics for various country characteristics of interest and trade policy-related dependent and control variables.

4.1 | Results

Table 2 reports the baseline results obtained from estimating Equation 1. Without accounting for the duration of the imposed measures, the results reveal no relationship between policy changes and disease incidence or lockdown policies (columns 1–3). However, the size of the coefficient estimates increases once we control for duration of measures and become statistically significant in the case of import liberalization and export restrictions (columns 4–6). If, additionally, disease incidence is interacted with the duration of the respective interventions, the magnitude of coefficient estimates increases further and that for production subsidies becomes significant at the 5% level. Moreover, the coefficient estimates in columns (7)–(9) suggest that, in the short term,

TABLE 2 Baseline regressions—import liberalization, export restrictions and subsidy measures.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	**IMP_LIB**	**EXP_RES**	**SUB**	**IMP_LIB**	**EXP_RES**	**SUB**	**IMP_LIB**	**EXP_RES**	**SUB**
$Mort\_sh_{cmt}$	−0.175	0.214	−0.388	−0.653***	0.638***	−0.546	−2.014***	2.294***	1.472**
	(0.350)	(0.490)	(0.279)	(0.242)	(0.242)	(0.386)	(0.672)	(0.640)	(0.680)
OSI_{cmt}	−0.001	0.000	0.000	−0.000	0.001	−0.002	−0.005	0.010*	−0.013**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.006)	(0.006)	(0.006)
Dur_{cmt}				0.016	−0.082***	0.045**	−0.043	0.030	−0.050
				(0.016)	(0.019)	(0.021)	(0.057)	(0.057)	(0.060)
$Mort\_sh_{cmt}*Dur_{cmt}$							0.354*	−0.430**	−0.525***
							(0.188)	(0.189)	(0.188)
$OSI_{cmt}*Dur_{cmt}$							0.001	−0.002*	0.002*
							(0.001)	(0.001)	(0.001)
Observations	820	820	820	410	410	410	410	410	410
R-squared	0.382	0.475	0.378	0.594	0.651	0.453	0.598	0.661	0.474
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: All estimations include country, month and year fixed effects. Standard errors are clustered by country-month-year. Significance levels: *10%; **5%; ***1%.
Abbreviations: EXP RES, export restrictions; IMP LIB, import liberalization; SUB, subsidies.

countries were more likely to implement export restrictions and subsidy policies and less likely to liberalize imports. The interaction results indicate that Covid-19 incidence was negatively associated with the propensity to impose longer duration export restrictions and production subsidies (columns 8 and 9) and weakly related to the likelihood of long-term import liberalization (column 7). These findings are consistent with the theoretical predictions discussed in the literature review. Note that in all the results reported in columns (4)–(9), the key driver is the mortality share; there is no relationship between trade policy use and domestic lockdown actions.[16]

To further assess the hypotheses discussed in Section 3.1, we split the sample according to a country's net trade position with respect to medical products (i.e. distinguishing between net medical importers and exporters) as a proxy for domestic production capacity; initial level of protection of medical products (proxied by the 2018 import tariff for medical products); size of the economy (GDP); level of development (income per capita); and two indicators of depth of international integration: participation in medical product GVCs and intensity of participation in PTAs. Table 3 reports the results from estimating Equation 1 for our three measures of trade policy differentiating between the different country categories, controlling for mortality rates, lockdown-type policies, and the duration of measures. Table 4 does the same for regressions that include interactions between mortality and lockdown intensity and duration of measures.

In the case of import liberalization, our findings are inconsistent with the expectation that the initial stages of the pandemic will be characterized by reductions in import barriers for medical products across all countries (Table 3, top panel). There is a statistically strong relationship with mortality shares for countries that are net exporters, had higher initial levels of import tariffs, larger economies, higher per capita incomes, lower GVC participation and greater participation in PTAs. However, net importers were not more likely to reduce import barriers; instead, this is observed only for net exporting economies. There is a similar pattern for countries with higher pre-pandemic tariffs relative to more open economies and for larger countries.[17] Although countries with higher-than-median tariff levels were more likely to facilitate imports compared to less protectionist states (consistent with Hypothesis 1a), there is substantial heterogeneity associated with economic and policy indicators. We also observe this in estimates of the relationship between import liberalization and the two integration indicators. While there is a positive association between liberalization and the number of PTA memberships of a country, this is not observed for economies with above-median GVC participation. This may be because high PTA-memberships imply lower tariffs ex ante, but the same does not hold for high GVC-integration.[18] The contradiction in the PTA and GVC results is striking, given that research suggests deepening of PTA participation is associated with higher levels of GVC production (e.g., Baccini et al., 2023).[19]

A similar pattern of statistically significant associations across country categories is found for the likelihood of using export restrictions, with coefficient estimates now positive in sign, consistent with Hypothesis 2 (Table 3, middle panel). Countries with productive capacity in medical products (proxied by net exporter status) were likely to restrict exports of critical medical products, whereas net importers were not. As was found for import liberalization, market size/income appears to matter, with larger and richer countries more likely to control exports. Consistent with Hypothesis 2b, lower levels on GVC integration are associated with a greater propensity to apply export restrictions. However, countries with high PTA participation reveal a higher likelihood of having resorted to export controls, inconsistent with the presumption that more integrated countries that have made more binding commitments to open markets would be less likely to resort to export controls (Hypothesis 4). The latter result suggests that deeper trade integration may not constrain short term interventions in trade, with countries invoking exceptions in provisions to secure critical supplies.[20]

TABLE 3 Trade policy activism and country characteristics.

Variables	(1) Net exporters	(2) Net importers	(3) High tariff	(4) Low tariff	(5) Large	(6) Small	(7) High income	(8) Low income	(9) High GVC	(10) Low GVC	(11) High PTA	(12) Low PTA
						Import liberalizing measures						
$Mort\_sh_{cmt}$	−1.009***	−0.125	−0.798***	−0.376	−0.856***	0.286	−0.606**	−1.391	−0.359	−0.599**	−0.626**	−2.274
	(0.326)	(0.671)	(0.296)	(0.458)	(0.302)	(0.603)	(0.253)	(2.016)	(0.619)	(0.256)	(0.300)	(2.295)
OSI_{cmt}	−0.003	0.001	−0.002	0.001	−0.003	0.002	−0.000	0.002	−0.002	0.001	−0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Dur_{cmt}	−0.057	0.036**	0.004	0.026	0.024	0.017	0.003	0.040	−0.010	0.030	−0.006	0.062*
	(0.035)	(0.017)	(0.020)	(0.031)	(0.036)	(0.017)	(0.011)	(0.038)	(0.036)	(0.019)	(0.016)	(0.036)
R^2	0.483	0.654	0.512	0.667	0.570	0.636	0.716	0.462	0.505	0.734	0.546	0.505
						Export restrictive measures						
$Mort\_sh_{cmt}$	0.795***	−0.592	0.795***	0.195	0.609***	−1.495*	0.623**	0.346	0.631	0.755***	0.626***	1.208
	(0.228)	(0.750)	(0.270)	(0.607)	(0.193)	(0.800)	(0.280)	(1.808)	(0.698)	(0.187)	(0.236)	(1.934)
OSI_{cmt}	−0.000	0.000	0.000	0.003	0.001	−0.002	0.001	−0.002	0.002	−0.001	0.001	−0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Dur_{cmt}	−0.144***	−0.054***	−0.063***	−0.113***	−0.145***	−0.037*	−0.053**	−0.142***	−0.143***	−0.031*	−0.092***	−0.066*
	(0.029)	(0.019)	(0.023)	(0.037)	(0.027)	(0.020)	(0.020)	(0.028)	(0.028)	(0.017)	(0.024)	(0.037)
R^2	0.639	0.685	0.663	0.477	0.535	0.732	0.791	0.480	0.612	0.758	0.689	0.557
						Subsidy measures						
$Mort\_sh_{cmt}$	−0.103	−0.847	−0.043	−2.886***	−0.014	−1.491**	−0.533	0.203	−2.751***	−0.329	−0.471	0.347
	(0.577)	(1.117)	(0.267)	(0.652)	(0.322)	(0.653)	(0.337)	(1.462)	(0.842)	(0.213)	(0.460)	(1.477)
OSI_{cmt}	0.002	−0.003**	−0.000	−0.003	−0.002	−0.001	−0.005*	−0.001	−0.000	−0.002	−0.000	−0.003
	(0.003)	(0.001)	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)
Dur_{cmt}	0.146***	0.007	0.052**	0.069	0.104**	0.012	0.016	0.097***	0.129***	−0.009	0.069**	0.008
	(0.048)	(0.015)	(0.025)	(0.043)	(0.044)	(0.013)	(0.021)	(0.034)	(0.036)	(0.014)	(0.027)	(0.034)
R^2	0.471	0.514	0.342	0.637	0.431	0.592	0.630	0.337	0.507	0.567	0.526	0.299
Observations	100	306	234	176	176	232	179	229	218	192	215	191

Note: All estimations include country, month and year fixed effects. Standard errors are clustered by country-month-year. Significance levels: *10%; **5%; ***1%.

TABLE 4 Trade policy activism, duration and country type.

	Import liberalizing measures											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables	Net exporters	Net importers	High protection	Low protection	Large	Small	High income	Low income	High GVC	Low GVC	High PTA	Low PTA
$Mort\_sh_{cmt}$	−3.165***	−1.999	−4.527***	−0.962	−3.106**	−4.268	−1.726***	−16.067**	−1.736	−4.355***	−2.407***	−6.262
	(0.922)	(2.756)	(1.268)	(2.378)	(1.273)	(7.471)	(0.539)	(7.093)	(3.228)	(1.141)	(0.777)	(9.016)
OSI_{cmt}	−0.000	−0.009	−0.003	−0.011	−0.000	−0.011	−0.004	−0.003	−0.006	−0.007	−0.007	−0.007
	(0.009)	(0.007)	(0.006)	(0.012)	(0.010)	(0.007)	(0.007)	(0.011)	(0.008)	(0.009)	(0.005)	(0.012)
Dur_{cmt}	−0.054	−0.074	−0.026	−0.097	0.040	−0.134*	−0.040	−0.092	−0.059	−0.048	−0.059	−0.057
	(0.108)	(0.065)	(0.064)	(0.108)	(0.118)	(0.074)	(0.070)	(0.139)	(0.090)	(0.079)	(0.053)	(0.127)
$Mort\_sh_{cmt}*Dur_{cmt}$	0.572**	0.318	1.127***	0.115	0.667*	0.677	0.298**	2.645**	0.232	1.154***	0.471**	0.618
	(0.261)	(0.548)	(0.402)	(0.373)	(0.395)	(1.107)	(0.148)	(1.187)	(0.521)	(0.397)	(0.217)	(1.723)
$OSI_{cmt}*Dur_{cmt}$	−0.001	0.002	0.000	0.002	−0.001	0.002*	0.001	0.001	0.001	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	100	306	234	176	176	232	179	229	218	192	215	191
R-squared	0.506	0.660	0.525	0.673	0.577	0.646	0.724	0.477	0.507	0.749	0.560	0.509
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

TABLE 4 (Continued)

	Export restrictive measures											
Variables	**(1) Net exporters**	**(2) Net importers**	**(3) High protection**	**(4) Low protection**	**(5) Large**	**(6) Small**	**(7) High income**	**(8) Low income**	**(9) High GVC**	**(10) Low GVC**	**(11) High PTA**	**(12) Low PTA**
$Mort\_sh_{cmt}$	0.745	4.921**	3.795***	4.085*	2.102**	−1.233	2.642***	3.194	2.229	4.613***	2.114**	4.032
	(1.065)	(2.079)	(1.203)	(2.223)	(1.058)	(8.537)	(0.703)	(7.022)	(2.779)	(1.184)	(0.810)	(9.166)
OSI_{cmt}	0.004	0.008	0.013*	0.007	0.006	0.008	0.006	0.004	0.013*	0.003	0.017***	0.001
	(0.008)	(0.008)	(0.007)	(0.011)	(0.007)	(0.008)	(0.006)	(0.010)	(0.007)	(0.009)	(0.006)	(0.013)
Dur_{cmt}	−0.105	0.045	0.083	−0.049	−0.086	0.072	0.004	−0.054	−0.012	0.013	0.077	−0.012
	(0.085)	(0.071)	(0.073)	(0.092)	(0.076)	(0.081)	(0.054)	(0.122)	(0.080)	(0.074)	(0.056)	(0.128)
$Mort\_sh_{cmt}*Dur_{cmt}$	0.008	−1.073**	−0.913**	−0.640*	−0.443	−0.035	−0.536**	−0.441	−0.275	−1.182***	−0.401	−0.481
	(0.313)	(0.424)	(0.383)	(0.356)	(0.319)	(1.257)	(0.205)	(1.259)	(0.427)	(0.378)	(0.243)	(1.740)
$OSI_{cmt}*Dur_{cmt}$	−0.001	−0.001	−0.002*	−0.001	−0.001	−0.002	−0.001	−0.001	−0.002	−0.000	−0.003***	−0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	100	306	234	176	176	232	179	229	218	192	215	191
R-squared	0.640	0.695	0.680	0.486	0.540	0.737	0.803	0.483	0.621	0.771	0.711	0.559
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

TABLE 4 (Continued)

	Subsidy measures											
Variables	(1) Net exporters	(2) Net importers	(3) High protection	(4) Low protection	(5) Large	(6) Small	(7) High income	(8) Low income	(9) High GVC	(10) Low GVC	(11) High PTA	(12) Low PTA
$Mort\_sh_{cmt}$	4.099***	−2.265	1.247	−5.964**	1.929	2.549	0.625	11.185**	−1.574	0.136	2.360***	2.139
	(1.105)	(2.780)	(0.951)	(2.813)	(1.479)	(3.411)	(0.806)	(4.608)	(2.851)	(1.033)	(0.835)	(4.783)
OSI_{cmt}	−0.006	−0.010***	−0.015**	−0.002	−0.019**	−0.001	−0.002	−0.012	−0.010	−0.007	−0.012	−0.011**
	(0.007)	(0.003)	(0.007)	(0.008)	(0.009)	(0.003)	(0.008)	(0.008)	(0.007)	(0.005)	(0.007)	(0.005)
Dur_{cmt}	0.095	−0.062*	−0.094	0.056	−0.061	0.028	0.050	0.026	0.023	−0.055	−0.035	−0.058
	(0.095)	(0.036)	(0.077)	(0.096)	(0.111)	(0.037)	(0.069)	(0.098)	(0.081)	(0.044)	(0.078)	(0.083)
$Mort\_sh_{cmt}*Dur_{cmt}$	−1.108***	0.250	−0.381	0.500	−0.576	−0.605	−0.308	−2.176***	−0.185	−0.138	−0.738***	−0.456
	(0.308)	(0.517)	(0.317)	(0.422)	(0.451)	(0.462)	(0.231)	(0.735)	(0.454)	(0.353)	(0.233)	(0.787)
$OSI_{cmt}*Dur_{cmt}$	0.002	0.001*	0.003*	−0.000	0.003*	−0.000	−0.000	0.002	0.002	0.001	0.002	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	100	306	234	176	176	232	179	229	218	192	215	191
R-squared	0.553	0.520	0.377	0.640	0.460	0.594	0.636	0.376	0.516	0.572	0.562	0.308
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: All estimations include country, month and year fixed effects. Standard errors are clustered by country-month-year. Significance levels: *10%; **5%; ***1%.

Turning to subsidy measures, the hypothesis that all states can be expected to implement production subsidies to accelerate and expand domestic investment in production capacity for critical supplies is rejected. We find no difference between net exporters and net importers: estimates for both sets of countries are statistically insignificant. We find significant associations between the likelihood of resorting to subsidies and below average pre-crisis levels of import protection, small economic size and above median GVC participation. The sign of the significant coefficient estimates in the case of subsidies is negative in low tariff countries (Table 3, bottom panel, column 4), that is, the likelihood of these categories of countries using subsidies was lower. A similar result is obtained for countries with higher integration in GVCs, possibly indicative of coordination failures or concerns about "leakage" of subsidy responses. Contrary to expectations, there is no association between production subsidies and higher GDP, per capita income, and net exporter status. The probability that production subsidies will be used more by countries with existing capacity is not observed in the data, although the results indicate that production subsidies are less likely to be used by lower-income and net importing nations, consistent with Hypothesis 3b.

Table 4 reports the results from estimating Equation (2) for the three types of trade interventions, now including the interaction between COVID-19 incidence and domestic lockdown and related anti-contagion policies and the duration of trade policy measures. For both import liberalizing and export restricting measures, the results in Table 4 suggest that the negative and positive correlations observed for the respective measures in Table 3 are driven by short-term policies implemented by countries. In contrast, the interaction coefficients with duration of measures change signs in the longer-term, becoming positive for import-liberalizing and negative for export-restrictive policies, again showing consistency with the theoretical priors in the literature review.

Comparing results in Tables 3 and 4, the significance and signs of most coefficient estimates for import liberalization and export restrictions are similar. One important difference, however, pertains to estimates for net exporters and net importers. Controlling for the interaction between duration and disease incidence, the positive association between export controls and net export status no longer obtains. Higher mortality in net exporters is again associated with reductions in import barriers in the short-term, as expected (Table 4, panel 1, column 1), but higher mortality in net importers now is more likely to be correlated with an *increase* in the likelihood of using export restrictions in the short-term (Table 4, panel 2, column 2), whereas no relationship was found in Table 3. The absence of a relationship between net export status and export controls, irrespective of their duration, is not consistent with our hypotheses. The finding for net importing countries and the likelihood of use of export controls, also inconsistent with our hypothesis, may reflect efforts to address initial excess demand for medical supplies, a response limited in duration as indicated by the negative significant interaction coefficient (Table 4, panel 2, column 2). Low-income countries stand out in terms of the magnitude of the coefficient estimate for import tariff liberalization associated with higher Covid-19 mortality rates. Similarly, the likelihood of longer-term import liberalization increases with the number of PTA memberships of a country. Consistent with Hypothesis 1b, countries with above-median pre-pandemic tariff levels were more likely to reimpose import tariffs once disease incidence had declined substantially (Table 4, panel 1, column 3).

Turning to subsidies, inclusion of interaction effects results in a strongly significant positive association between the likelihood of using production subsidies in the short term and being a net exporter (Table 4, panel 3, column 1) although the relationship is reversed in the longer term. These results are consistent with the expectation that countries with existing capacity

have incentives to support investment to increase production as an immediate response to an exogenous shock like the pandemic but not in the long run. We now also obtain significant, positive coefficient estimates for lower-income and high PTA membership countries, but negative coefficients of the interaction terms in each case, again suggestive of the absence of a possible longer-term industrial policy response. The estimate in column (11) of Table 4 (panel 3) also indicates that more highly integrated countries—as reflected in PTA memberships—were not constrained by coordination or free riding concerns in their use of subsidies as part of their response to the pandemic but that such measures were of short duration.

Overall, the results reported in Tables 3 and 4 offer a more nuanced picture than that suggested by our hypotheses and the extant literature on 'optimal' trade policy responses to a pandemic or similar global shock. Many of the estimates reported are consistent with our hypotheses, but some are not. Thus, for example, in contrast to expectations, net importer status was not associated with greater use of import liberalization. Similarly, the use of subsidies was either ad-hoc or counter-intuitive (though low-income, more-PTA-intensive, and net exporters were more likely to subsidize the production of medical goods on a short-term basis). The imposition of export restrictive measures was more along expected lines. Large, high-income, more-protectionist and less-GVC-intensive countries displayed a greater propensity to impose such measures on a short-term basis while the same set of countries were less likely to restrict exports on a longer-term basis.

Further disaggregated analysis by type of medical product (consumables, drugs, equipment, or vaccines) reveals that our results are driven by measures targeting medical consumable goods such as masks, reagents, and disinfectants. Relationships between the imposition of trade policy measures and COVID-19-incidence (including mortality rates and lockdown policies) were much weaker or nonexistent for other types of medical products (defined in Appendix Table A1) across sample heterogeneities.[21]

5 | CONCLUSION

Trade policy responses to Covid-19 exhibited significant heterogeneity. Wealthier countries exhibited a more pronounced use of trade and industrial policies compared to developing nations. The duration of trade measures also displayed heterogeneity. The descriptive evidence summarized in Evenett et al. (2022) and Section 3 above suggests countries exporting medical products employed trade policies less frequently and for a shorter time than importing countries. Additionally, exporting countries appeared to rely more on production subsidies than interventions targeting trade directly. Countries more integrated into medical value chains appeared to resort less to trade policy, while those participating in a greater number of preferential trade agreements demonstrated above average trade policy activism.

In this article we revisit the pattern of observed trade policy changes during the COVID-19 pandemic to assess commonly hypothesized relationships between the characteristics of countries and the probability of observing specific trade policy responses using a simple fixed effects regression approach. Considering all countries for which data are available, we find that countries resorted to import liberalization, export restrictions, and production subsidies in ways that were not necessarily consistent with the conceptual framework proposed in the literature (e.g., Leibovici & Santacreu, 2023). We also find significant heterogeneities in relationships across country categories, again not always consistent with theoretical priors or the hypotheses presented in Section 2. Examples include the likelihood of import liberalization, which is found to be more

prevalent among net exporters of medical products than net importers, whereas net importers were more inclined to impose export restrictions than net exporting countries.

Moreover, the duration of the policy measures matters. Without accounting for the duration of the imposed measures, our results reveal no relationship between trade policy changes and disease incidence or lockdown policies. At the same time, there are significant differences in the way countries used trade policies in the short-term, as part of an immediate response to the pandemic-induced shock, and compared to when the public health situation had begun to stabilize. For instance, in the short term, countries were more likely to restrict exports and use subsidy policies and less likely to liberalize imports, but these propensities were reversed once disease incidence declined, suggesting the absence of a longer-term industrial policy-type response to the pandemic.

The diversity in trade policy responses across country categories was also duration dependent. For instance, while net exporters might have employed tariffs pre-COVID to bolster domestic capacity, suggesting the presence of some type of industrial policy, they were inclined to liberalize imports only after the health situation began to improve. Similarly, larger and higher income economies may have had greater flexibility to reduce tariffs on medical products to improve access to critical goods while addressing the surge in prices for those goods. But again, they showed a higher propensity for import liberalization only in the longer run. Smaller countries were less likely to curb their exports than larger and wealthier ones, suggesting that market power may also have played a role in driving trade policy choices, but this propensity was observed only in the short run.

Being a member of many PTAs was found to be correlated with a higher probability of imposing restrictions on the export of medical goods, suggesting that binding policy commitments might not hold and that national interest rules, but only in the short run. Finally, we found fewer systematic differences in the probability of using production subsidies along almost all the relevant country characteristics considered, although low-income, more-PTA-intensive, and net exporting countries were more likely to subsidize the production of medical goods on a short-term basis (again this propensity was reversed in the longer term).

Our results suggest responses to the challenges raised by the Covid-19 pandemic are only partially explained by extant theory regarding optimal use of trade policy to help address a global public health crisis. Moreover, openness and integration do not appear to induce countries to behave differently in times of crisis indicating a need to for further research that considers the complexity of specific medical product value chains, national political economy dynamics and the role that international cooperation in guiding (constraining) trade policy actions. This also applies to understanding longer term responses once disease incidence is no longer acute. The focus of our analysis is on trade policy during the crisis and the duration of interventions. Clearly governments may decide to pursue industrial policies in anticipation of a future pandemic. While the period covered by our data does not permit such analysis, this is another important subject for further research.

ACKNOWLEDGMENT

We are grateful to Doug Nelson and participants in the June 2023 EUI conference on Global governance, social welfare, and inclusive trade policy for helpful comments and suggestions on an earlier draft.

DATA AVAILABILITY STATEMENT

Upon reasonable request from corresponding author.

ORCID

Bernard Hoekman https://orcid.org/0000-0002-6839-7142
Anirudh Shingal https://orcid.org/0000-0001-8007-7531

ENDNOTES

[1] https://www.globaltradealert.org/.

[2] Contributions to this literature include Barbero et al. (2021), Hayakawa and Mukunoki (2021), Liu et al. (2022), Cerdeiro and Komaromi (2022), Amador et al. (2023), Egger et al. (2023) and Nicita and Tresa (2023).

[3] This is not the case for policy-focused research. See for example, Evenett (2020) and the contributions in Baldwin and Evenett (2020).

[4] See Kersan-Škabić (2022) for a review.

[5] The initial 2020 COVID-19 Trade Policy Database has been expanded over time and is now called the Essential Goods Initiative+ database. See https://www.globaltradealert.org/reports/54.

[6] We focus exclusively on medical products. Evenett et al. (2022) and Shingal and Agarwal (2021) discuss food-related trade policy during COVID-19. Evenett and Fritz (2023) discuss policies targeting critical raw materials.

[7] Appendix Table A1 reports the set of products included in this classification. This is drawn from the Methodological note to the Essential Goods Database at https://www.globaltradealert.org/reports/54.

[8] Data are sourced from CEPII, OECD, the World Bank, and WITS.

[9] The left panel of Figure 1 reports the average duration of the measures with a planned or passed removal date. See Evenett et al. (2021) for a discussion on the incidence of open-ended measures.

[10] Appendix Figure A2 shows that a higher pre-pandemic share of government spending dedicated to subsidies is correlated with a greater number and longer-lasting interventions targeting exports.

[11] Another response that will not be considered in this paper because of lack of data is to temporarily relax public procurement regulations. This can be regarded as a combination of facilitating imports and subsidizing producers, the aim being to enable public purchases of medical products more rapidly without following standard procedures such as open competitive bidding and evaluation of bids to minimize cost. Hoekman et al. (2022) analyze the interaction of procurement regimes and trade policy during the pandemic.

[12] Subsidies may also be offered to firms operating in other countries, although this will be subject to the threat that governments of the jurisdictions concerned impose export restrictions. In the empirical analysis, subsidies are mostly directed to local (national) production, but also includes subsidies for production in foreign countries. This is not important for the issue of interest here, which concerns the relationship between the use of different types of policy instruments and country characteristics.

[13] https://trainsonline.unctad.org/.

[14] https://www.oecd.org/sti/ind/inter-country-input-output-tables.htm.

[15] Interpreting estimated coefficients in the presence of multiple interaction terms can be complex in the context of determining overall effects (Amendolagine et al., 2019).

[16] This reflects the high correlation between mortality rates and intensity of lockdown and distancing regulations in most countries.

[17] As reported in Appendix Figure A3, there is a positive correlation between net trade and import tariffs, suggesting that net exporters may use tariffs to assist domestic industry. The results may also be indicative of market power-cum-terms of trade incentives influencing import tariff levels.

[18] There is a negative correlation between number of PTA memberships and the level of pre-pandemic import tariffs, but this is not observed for GVC participation (see Appendix Figure A3).

[19] Using the EORA GVC data, which have wider country coverage than the OECD inter-country input–output data, generates results that are qualitatively similar.

[20] The initial responses of several EU member states, arguably the deepest extant PTA, illustrated the relative weakness of PTA commitments as a constraint on unilateral action to restrain exports. See for example, Fiorini et al. (2020).

[21] Estimates from Equations (1) and (2) for each product category subsample are available upon request.

REFERENCES

Amador, J., Melo Gouveia, C., & Pimenta, C. (2023). COVID-19, lockdowns and international trade: Evidence from firm-level data. *Empirical Economics*, *65*, 1–40.

Amendolagine, V., Presbitero, A., Rabellotti, R., & Sanfilippo, M. (2019). Local sourcing in developing countries: The role of FDI and global value chains. *World Development*, *113*, 73–88.

Ando, M., & Hayakawa, K. (2022). Impact of COVID-19 on trade in services. *Japan and the World Economy*, *62*, 101131.

Athey, S., Castillo, J., Chaudhuri, E., Kremer, M., Simoes Gomes, A., & Snyder, C. (2022). Expanding capacity for vaccines against COVID-19 and future pandemics: A review of economic issues. *Oxford Review of Economic Policy*, *38*(4), 742–770.

Baccini, L., Bondi, A., Fiorini, M., Hoekman, B., Altomonte, C., & Colantone, I. (2023). Global value chains and the design of trade agreements. EUI Robert Schuman Working Paper 2023/56.

Baldwin, B., & Evenett, S. (Eds.). (2020). *COVID-19 and trade policy: Why turning inward won't work*. CEPR.

Barbero, J., de Lucio, J., & Rodriguez-Crespo, E. (2021). Effects of COVID-19 on trade flows: Measuring their impact through government policy responses. *PLoS One*, *16*(10), e0258356.

Bown, C., & Bollyky, T. (2022). How COVID-19 vaccine supply chains emerged in the midst of a pandemic. *The World Economy*, *45*(2), 468–522.

Bown, C., Snyder, C., & Staiger, R. (2022). Vaccine supply chain resilience and international cooperation. Dartmouth College Economics Department working paper.

Cerdeiro, D., & Komaromi, A. (2022). Supply spillovers during the pandemic: Evidence from high-frequency shipping data. *The World Economy*, *45*(11), 3451–3474.

Conte, M., Cotterlaz, P., & Mayer, T. (2022). The CEPII gravity database. http://cepii.fr/PDF_PUB/wp/2022/wp2022-05.pdf

Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. *The Lancet Infectious Diseases*, *20*(5), 533–534.

Egger, P., Masllorens, G., Rocha, N., & Ruta, M. (2023). Scarcity nationalism during COVID-9: Identifying the impact on trade costs. *Economics Letters*, *223*, 110973.

Evenett, S. (2020). Sicken thy neighbour: The initial trade policy response to COVID-19. *The World Economy*, *43*(4), 828–839.

Evenett, S., Fiorini, M., Fritz, J., Hoekman, B., Lukaszuk, P., Rocha, N., Ruta, M., Santi, F., & Shingal, A. (2022). Trade policy responses to the COVID-19 pandemic crisis: Evidence from a new data set. *The World Economy*, *45*(2), 342–364.

Evenett, S., & Fritz, J. (2023). *The scramble for critical raw materials: Time to take stock?* 31st Global Trade Alert report.

Evenett, S., Hoekman, B., Rocha, N., & Ruta, M. (2021). The COVID-19 vaccine production club: will value chains temper nationalism? EUI RSC Working Paper 2021/36.

Fiorini, M., Hoekman, B., & Yildirim, A. (2020). *COVID-19: Expanding access to essential supplies in a value chain world*. In R. Baldwin & S. Evenett (Eds.), *COVID-19 and trade policy: Why turning inward won't work*. CEPR.

Gaulier, G., & Zignago, S. (2010). *BACI: International trade database at the product-level*. CEPII.

Greenaway, D., & Nelson, D. (2022). COVID-19, trade and trade policy. *The World Economy*, *45*(2), 338–341.

Grossman, G., Helpman, E., & Lhuillier, H. (2023). Supply chain resilience: Should policy promote international diversification or reshoring? *Journal of Political Economy*, *131*(12), 3462–3496.

Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., & Tatlow, H. (2021). A global panel database of pandemic policies (Oxford COVID-19 government response tracker). *Nature Human Behavior*, *5*(4), 529–538.

Hayakawa, K., & Imai, K. (2022). Who sends me face masks? Evidence for the impacts of COVID-19 on international trade in medical goods. *The World Economy*, *45*(2), 365–385.

Hayakawa, K., & Mukunoki, H. (2021). The impact of COVID-19 on international trade: Evidence from the first shock. *Journal of the Japanese and International Economies*, *60*, 101135.

Hoekman, B., Shingal, A., Eknath, V., & Ereshchenko, V. (2022). COVID-19, public procurement regimes and trade policy. *The World Economy*, *45*(2), 409–429.

Kersan-Škabić, I. (2022). The COVID-19 pandemic and the internationalization of production: A review of the literature. *Development Policy Review*, *40*(2), e12560.

Leibovici, F., & Santacreu, A. (2023). Shortages of critical goods in a global economy: Optimal trade and industrial policy. Federal Reserve Board St. Louis working paper (December).
Liu, X., Ornelas, E., & Shi, H. (2022). The trade impact of the Covid-19 pandemic. *The World Economy*, *45*(12), 3751–3779.
Nicita, A., & Tresa, E. (2023). The heterogeneous effects of trade policy on trade resilience during the 2020 trade downturn. *The World Economy.*, *46*(10), 3048–3056.
Shingal, A. (2020). Services Trade and COVID-19. https://cepr.org/voxeu/columns/services-trade-and-covid-19
Shingal, A. (2023). The COVID-19 shock and services trade decline: Potential for digitalization matters. *Applied Economics*, 1–22. https://doi.org/10.1080/00036846.2023.2206616
Shingal, A., & Agarwal, P. (2021). COVID-era trade policy passthrough to trade flows: Idiosyncratic or not? *COVID Economics*, *78*, 159–191.
Tauber, K., & Van Zandweghe, W. (2021). Why has durable goods spending been so strong during the COVID-19 pandemic? *Economic commentary*, Federal Reserve Bank of Cleveland (2021–16).
Traiberman, S., & Rotemberg, M. (2023). Precautionary protectionism. *Journal of International Economics*, *145*, 103836.
Vo, L., & Le, T. (2022). COVID-19 test-kit trade and trade policy: Implications for developing countries. *The World Economy*, *45*(10), 3246–3268.
World Bank and WTO. (2022). *Trade therapy: Deepening cooperation to strengthen pandemic defenses*. World Bank.
WTO. (2022). *Trade in medical goods in the context of tackling COVID-19: Developments in 2019–21*. World Trade Organization.

How to cite this article: Hoekman, B., Santi, F., & Shingal, A. (2025). Country characteristics and trade policy during the COVID-19 pandemic. *Review of International Economics*, *33*(1), 99–124. https://doi.org/10.1111/roie.12733

APPENDIX A

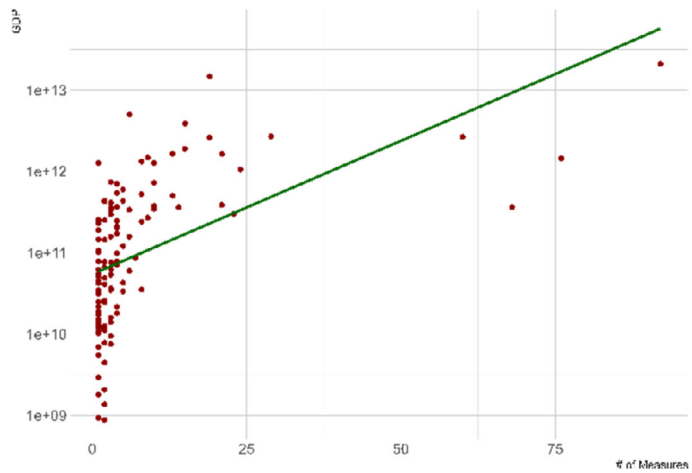

FIGURE A1 Correlation between trade policy activism (all measures) and 2018 GDP. *Source*: Authors' elaboration from the Essential Goods Initiative database. GDP data sourced from the World Bank World Development Indicators database. [Colour figure can be viewed at wileyonlinelibrary.com]

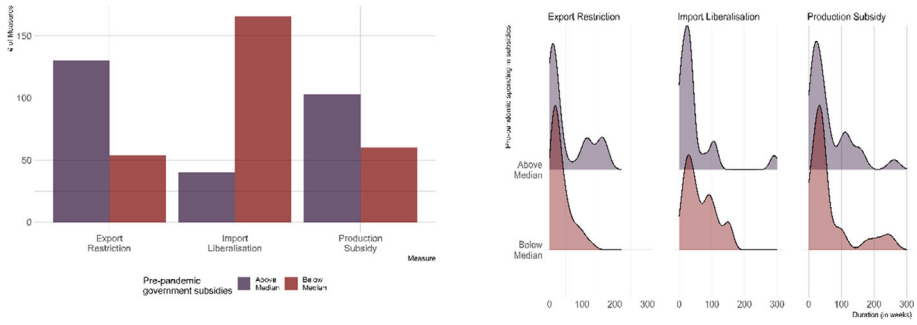

FIGURE A2 Number and average duration of measures by level of pre-pandemic government spending on production subsidies. *Source*: IMF Government Finance Statistics database. [Colour figure can be viewed at wileyonlinelibrary.com]

FIGURE A3 Pairwise correlation plot—Country characteristics. Pairwise correlations among the main classification variables used in Tables 2 and 3. [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE A1 Medical products.

Product category	HS codes
Medical consumables	220,710, 220,890, 284,700, 290,512, 340,111, 340,130, 340,212, 340,213, 340,220, 350,400, 380,894, 382,499, 390,421, 391,610, 391,620, 391,690, 481,810, 481,890, 560,311, 560,312, 560,313, 560,314, 560,391, 560,392, 560,393, 560,394, 560,410, 560,600, 600,240, 600,290, 621,790, 630,790, 721,790, 732,690, 760,410, 760,429, 761,699, 390,210
Medical equipment	300,213, 300,120, 300,190, 300,212, 300,214, 300,215, 300,219, 300,290, 300,510, 300,590, 300,610, 300,620, 300,630, 300,650, 300,670, 350,790, 370,110, 370,210, 382,100, 382,200, 392,329, 392,390, 392,620, 392,690, 401,490, 401,511, 401,519, 401,590, 590,700, 611,300, 611,420, 611,430, 611,490, 611,610, 621,010, 621,020, 621,030, 621,040, 621,050, 621,132, 621,133, 621,139, 621,142, 621,143, 621,149, 621,600, 650,500, 650,610, 701,710, 701,720, 701,790, 841,391, 841,920, 842,129, 842,139, 842,199, 847,989, 900,490, 901,050, 901,110, 901,180, 901,811, 901,812, 901,813, 901,814, 901,819, 901,820, 901,831, 901,832, 901,839, 901,890, 901,920, 902,000, 902,150, 902,212, 902,214, 902,219, 902,221, 902,229, 902,230, 902,290, 902,511, 902,519, 902,780, 903,020, 940,290
Medicines and drugs	300,310, 300,320, 300,331, 300,339, 300,341, 300,342, 300,343, 300,349, 300,360, 300,390, 300,410, 300,420, 300,431, 300,432, 300,439, 300,441, 300,442, 300,443, 300,449, 300,450, 300,460, 300,490
Vaccines	300,220

Note: Medical products by category, as defined in the Methodological Note to the Essential Goods Initiative database. HS codes refer to the HS12 revision.