COVID-19, Public Procurement Regimes, and Trade Policy

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Abstract

This paper analyzes a prominent dimension of the initial policy response to the COVID-19 pandemic observed in many countries: the imposition of export restrictions and actions to facilitate imports. Weekly data on the use of trade policy instruments during the first seven months of the COVID-19 pandemic (January-July 2020) are used to assess the relationship between the use of trade policy instruments and attributes of pre-crisis public procurement regulation. Controlling for country size, government effectiveness and economic factors, the analysis finds that use of export restrictions targeting medical products is strongly positively correlated with the total number of steps and time required to complete procurement processes in the pre-crisis period. Membership in trade agreements encompassing public procurement disciplines is associated with actions to facilitate trade in medical products. These findings suggest that future empirical assessments of the drivers of trade policy during the pandemic should consider public procurement systems.

COVID-19, Public Procurement Regimes, and Trade Policy[*]

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1. Introduction

One element of the policy response to the COVID-19 pandemic by governments was to greatly expand public procurement (PP) of critical medical supplies, notably personal protective equipment (masks, gloves, face-shields, respirators), ventilators, laboratory equipment (kits, reagents, swabs, laboratory consumables) and medicines. In some countries, this procurement response included requisitioning of available stocks of such products and a ban on their export. Many countries made active use of trade policy instruments to enhance access to essential supplies, involving a mix of measures to facilitate imports (lowering taxes and import tariffs and creating "green channels" at borders to speed through imports) and export controls (Baldwin and Evenett, 2020). WTO rules permit the use of trade restrictions in public emergencies, but require these to be temporary, lasting only for the duration of a crisis. The reason is that use of export controls can give rise to negative spillovers, including by constraining the ability of firms to ramp up production, leading to increased prices, and impeding the ability of other countries to import supplies (Atkinson et al. 2020; Evenett, 2020; Gereffi, 2020; Hoekman et al. 2020).

In many countries, government procurement of goods and services is subject to regulations that seek to ensure 'value for money', maximizing efficiency and effectiveness. This is also reflected in requirements and processes that enhance transparency, assure due process and accountability, and prevent corrupt practices and/or collusion among bidders. A core feature of PP processes is to mimic the market by encouraging (requiring) competition through open calls for tender.[6] International agreements that cover procurement practices – such as the Treaty on the Functioning of the European Union that applies to EU member states, the WTO Agreement on Government Procurement (GPA) and recent vintage preferential trade agreements (PTAs) – embody not only generally accepted good PP practices but require that foreign firms be treated the same as national bidders. The main thrust of such agreements is to open procurement markets to foreign competition.

As do all trade agreements, national procurement regulations and international agreements that discipline PP practices include exceptions that allow governments to respond rapidly to emergencies in ways that may be inconsistent with the rules that apply in normal times. This might take the form of direct contracting for supplies from producers without going through the processes that normally would be used (Baxter and Casady, 2020). At the time of writing it is not yet possible to investigate the extent and effectiveness of emergency procurement measures taken by different jurisdictions.[7] Instead, we examine the relationship between pre-crisis attributes of public procurement regimes as reflected in indicators compiled by the World Bank and the trade policy behavior of countries in the first seven months of the COVID-19 pandemic. Most trade policy activism was observed in the initial months of the pandemic, reflecting the feasibility of applying trade policy instruments very rapidly. Similarly, trade measures can also be removed rapidly—and in principle should be to abide by WTO rules. Global excess demand for protective equipment and COVID-19 medical supplies was met with a massive supply response, attenuating the rationale for using trade policy instruments for an extended period.

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[6] The basic features of good administrative practice in public procurement are summarized in UNCITRAL (2014) and World Bank (2017).

[7] Comprehensive and comparable information on whether and how governments diverged from normal practices in procuring supplies does not exist. Cocciolo et al. (2020) and OECD (2020a) discuss procurement challenges and experiences during the first seven months of the COVID-19 pandemic.

We analyze the relationship between PP regimes and trade policy activism during the first seven months of the COVID-19 pandemic using cross-country information on attributes of pre-crisis national public procurement regimes (World Bank, 2020), the coverage of PP in trade agreements (Shingal and Ereshchenko, 2020) and data on changes in trade policy for medical products implemented by governments during January-July 2020 (Evenett et al., 2020). A key feature of the trade policy data is that information is available on a weekly basis, permitting analysis of when trade liberalizing and restrictive policy instruments were imposed and removed.

Our results suggest that after controlling for country size, government effectiveness, economic factors and the incidence of COVID-19 cases, restrictions on exports of medical products and import liberalization are positively correlated with pre-crisis attributes of PP regimes. The total number of steps, in particular, and time taken to complete procurement processes are strongly associated with reducing import barriers and imposition of export controls. Membership of trade agreements with public procurement disciplines – both PTAs and the WTO GPA – is associated with greater openness, reflected in actions to facilitate trade in medical products.

The rest of the paper is structured as follows. Section 2 briefly discusses related literature. Section 3 provides an overview of the use of trade policy between January and July 2020. Section 4 presents the empirical methodology. Section 5 discusses the data sources for the explanatory and control variables and provides some descriptive statistics for these variables. Section 6 discusses the estimation results. Section 7 concludes.

2. Related literature and hypotheses

We are not aware of studies that analyze the relationship between public procurement and trade policy responses during public health emergencies. The extant studies on public procurement and COVID-19 include a focus on strategies procuring authorities can (should) use to rapidly ramp up purchases of essential products needed by public health authorities and care providers. Procurement of health care-related products usually involves a prolonged multi-stage process that takes time. In times of crisis procuring agencies may need to dispense with normal practices to meet urgent needs for critical equipment and supplies (Sanchez-Graells, 2020). This could include responding to firms that make unsolicited proposals (Baxter and Casady, 2020) and partnership-based approaches with the private sector or other governments (Vecchi et al. 2020). In the case of the EU, the European Commission took several measures to facilitate procurement of essential supplies, including through a (voluntary) coordinated joint procurement mechanism (Beuter, 2020; European Commission, 2020). Some governments directly contracted with large producers, bypassing standard competitive procedures stipulated in public procurement regulations (Hoekman et al. 2020). While warranted, there are risks associated with diverging from standard PP practices, including higher cost procurement, greater vulnerability to fraud, and diminished accountability and less transparency in contracting (Atkinson et al. 2020).

Trade can play a pivotal role in emergencies to ensure that much needed medical supplies get to where they are needed (Gereffi, 2020; OECD, 2020b). Instead, what was observed during the COVID-19 outbreak – amidst shortages of medical supplies – was some governments imposing export control measures and requisitioning domestic supplies of essential goods. Such reactions may exacerbate rather than facilitate provision of vital equipment to healthcare workers by increasing prices, market volatility and distorting investment decisions (Fiorini et

al. 2020). The associated disruption to crisis health planning in trading partners makes net importers of medical products particularly vulnerable (Baldwin and Evenett, 2020).

The basic premise underlying the analysis that follows is that attributes of public procurement regulation may influence incentives to use trade policy and decisions to requisition existing stocks and prohibit exports in crises. The idea is that specific attributes of procurement regimes may facilitate or constrain the ability of agencies to rapidly procure needed supplies of medical products in an emergency. PP practices that are designed to control corruption, ensure accountability through due process, transparency, nondiscrimination, and competitive bidding may constrain the ability to respond rapidly. Conversely, PP regimes that are efficient in the sense of allocating contracts more rapidly may be more conducive to addressing an emergency and attenuate incentives to resort to trade restrictions. We do not have strong priors on whether the relationship will be positive or negative but treat this as an empirical question.

Several dimensions of PP policy may be salient in influencing the likelihood that trade policy is used. For example, "buy national" prescriptions reflecting industrial development objectives may be accompanied by restrictive import policies to support domestic production. In circumstances where domestic production capacity is too small to satisfy a crisis-induced increase in demand, a policy bias towards domestic sourcing may be associated with a temporary reduction of removal of import restrictions. The higher the initial import barriers the greater the scope for liberalization. In short, differences in the attributes of PP regimes may be associated with differences in trade policy responses to a global pandemic.

In our analysis of PP regimes we are limited by the availability of indicators that characterize salient attributes of PP regimes.[8] One relevant feature of procurement systems on which comparable information is reported on a cross-country basis is the time taken to complete procurement processes. The World Bank Doing Business Contracting with the Government indicator measures the time of awarding a specific public contract to a domestically-owned medium-sized limited liability company based on the indicator's assumptions. Countries where PP takes more time may be at a disadvantage in procuring supplies even if standard processes are not applied in a crisis. For example, insofar as a nation's PP "type" is common knowledge and suppliers prefer to sell products in short supply to buyers that can credibly offer rapid contracting and processing of payments. Another attribute of prevailing PP regimes is membership of the WTO GPA and PTAs that encompass government procurement. We expect that members of such PP-liberalizing trade agreements will make less use of trade restrictions in a crisis than other countries. To the best of our knowledge these are issues that have not been investigated in the extant literature on procurement and trade, which has focused on home bias in the allocation of public contracts and associated impacts on costs and productivity.[9]

3. Trade policy measures during COVID-19

The source of trade policy data used in the analysis is a European University Institute (EUI), Global Trade Alert (GTA) and World Bank project that tracks changes in trade policies for medical products starting on January 1, 2020. The exercise classifies measures as restrictive or liberalizing and differentiates between type of instrument (tariff, quota, licensing requirement,

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[8] For example, cross-country data on the extent to which jurisdictions include "buy national" provisions or PP processes include preferences for specific types of domestic bidders, such as SMEs, are not available. See e.g., Hoekman and Tas (2020).

[9] See e.g., Shingal (2015), Kutlina-Dimitrova and Lakatos (2016), Hoekman and Sanfilippo (2020).

ban, etc.). A unique feature of the project is that it includes information on the date of announcement, implementation, and removal (if applicable) of each reported measure.[10]

As of mid-July 2020, the data set documented 414 trade policy measures taken by over 100 distinct jurisdictions. The measures include 209 measures liberalizing imports of protective equipment, medical supplies and medicines implemented in 106 jurisdictions and 191 export controls imposed by 91 countries for the same set of products. The most common liberalizing measures were reduction in import tariffs, while export bans were the most common restrictive measure across countries. Data on trade policy measures are available for 133 countries.

We focus on the first seven months of 2020 because this is the period in which most trade policy measures were imposed. Our research question is whether attributes of prevailing PP regimes are associated with the imposition of trade measures. While the supply of essential goods was largely fixed in the initial period of the crisis, over time, as supply responds to increased demand, this will attenuate the perceived need for exports controls and import liberalization, confounding inferences regarding the possible relationship between PP regulation and use of trade policy in the initial period of a public emergency which is what we are interested in. The GTA data set shows that some governments began to roll back trade measures starting in June 2020, a pattern that strengthened in the summer and fall of 2020 (see Evenett et al. 2020).[11]

A weekly evolution of trade restrictive measures on imports and exports of medical products according to the date of implementation of the measures, shows that the number of restrictive measures on medical products increased exponentially as of the end of March (Figure 1). This coincides with the beginning of the COVID-19 pandemic and the growing demand for medical products worldwide. There were a limited number of liberalizing measures implemented for medical products during the first two months of the year. However, the trend changed drastically as of the end of March, when this number started growing rapidly: the number of such measures more than doubled over a month from 77 measures at the end of March to 174 measures at the end of April. This trend is noteworthy as the period of the spike coincides with the "acknowledged" outbreak of the COVID-19 pandemic and the growing demand for protective equipment and medical products worldwide.

Close to half of all measures were implemented in March 2020. Starting in May there is a gradual decline in the imposition of measures. Based on countries and measures where a removal date is explicitly mentioned in the database, restrictive measures were implemented for a shorter duration (58 days) on average than liberalizing measures (71 days). Within these distributions, the duration of restrictive measures for medical products ranges from as brief as 2 days in the case of an export ban imposed by Slovenia to 137 days for an export ban imposed by Azerbaijan (Figure 2). Similarly, for liberalizing measures the duration ranges from as brief as 11 days in the case of import tariff liberalization by the Dominican Republic to 104 days for import tariff liberalization by the Republic of South Korea.

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[10] Evenett et al. (2020) provide an overview of the pattern of trade policy activism that emerges from the data. The data can be accessed at: https://www.globaltradealert.org/reports/54. The methodology used to collect and validate the data, as well as a listing of the Harmonized System (HS) codes for the products covered by the exercise can be found at: https://globalgovernanceprogramme.eui.eu/wp-content/uploads/2020/05/Methodologynote050420.pdf.

[11] The empirical analysis accounts for roll-back of measures during the period as we can distinguish between measures that were implemented and subsequently removed and those that remained in force as of July 2020.

Figure 1: Trade measures for medical products (weekly, January-July 2020)

Export restrictions   *Import liberalization*
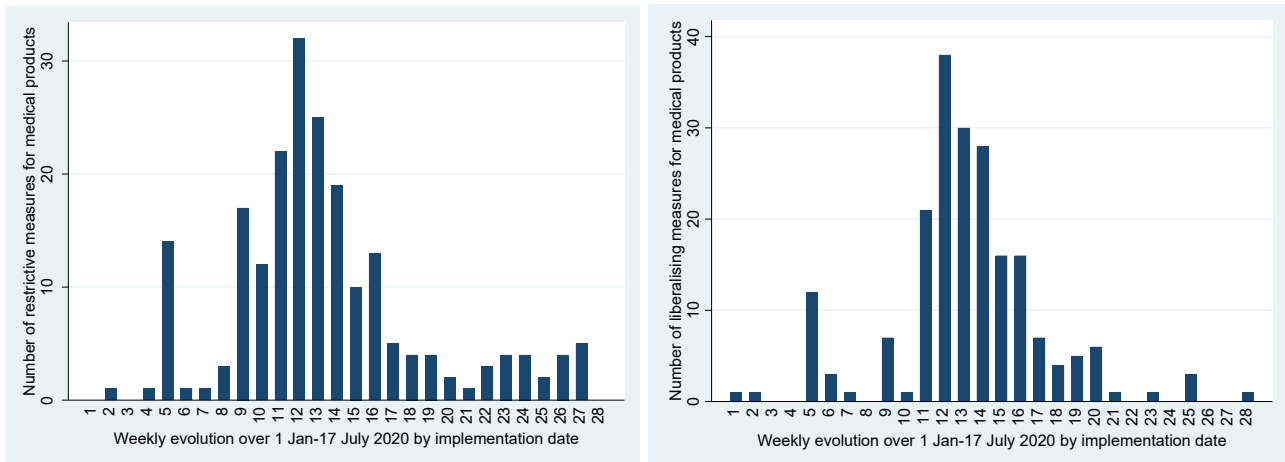
Source: COVID-19 Trade Policy database, own calculations.
Note: The data at the end of each week do not consider the measures that were removed (with a removal date in that week).

Figure 2. Duration of trade measures for medical products by implementation date
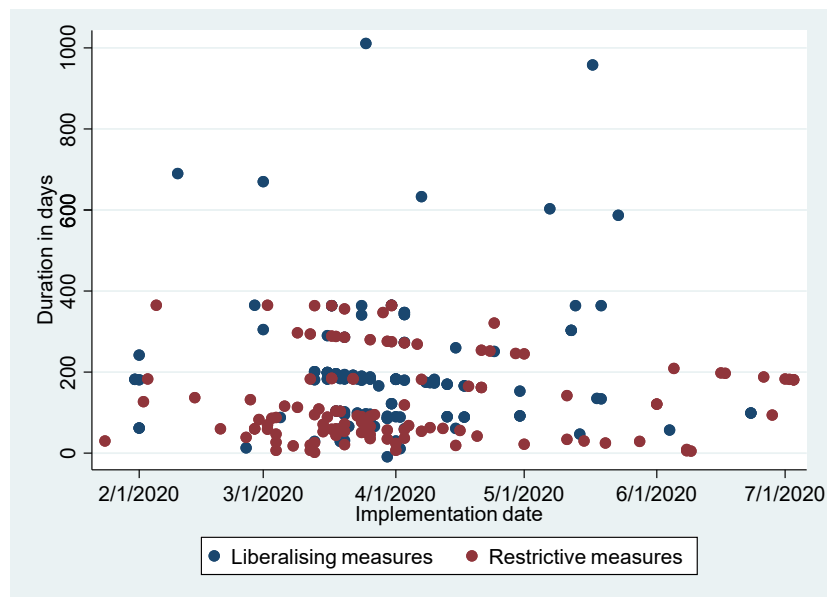
Source: COVID-19 Trade Policy database, own calculations.

High and upper middle-income countries, according to the World Bank income classification, enacted more trade policy measures targeting the medical sector than other countries (Evenett et al. 2020). As already mentioned, many of the trade restrictive and liberalizing measures that were adopted to increase the availability of personal protective equipment and medical supplies at the beginning of the COVID-19 pandemic outbreak, were subsequently removed. We consider this dynamic in the empirical analysis.

4. Empirical methodology

We assess the relationship between different attributes of public procurement regulation and trade policy measures imposed by countries on imports and exports separately by estimating the following equations:[12]

$$Num^{M,T}_j = \alpha + \emptyset_k Proc_{kj} + \Sigma\beta_z z_{zj} + \varepsilon_j \qquad (1)$$
$$Num^{X,T}_j = \alpha + \emptyset_k Proc_{kj} + \Sigma\beta_z z_{zj} + \varepsilon_j \qquad (2)$$

where $Num^{M,T}_j$ is the number of import ("M") policy measures imposed by type ("T" = liberalizing, restrictive) in implementing jurisdiction j; $Num^{X,T}_j$ is the number of export ("X") policy measures imposed by type ("T" = liberalizing, restrictive) in implementing jurisdiction j; $Proc_{kj}$ is the vector of public procurement variables for country j; z_{zj} is a vector of country- and country-sector specific control variables; α is the constant term and ε_j is the error term. Equations (1) and (2) are estimated separately for liberalizing and restrictive measures imposed on medical products and personal protective equipment.

The procurement vector comprises variables reflecting the timeliness ($Total\_time_j$), administrative procedures ($Total\_steps_j$), efforts to lower transactions costs ($Eproc_j$) and commitments to open government procurement regimes to foreign competition. The first two variables denote the pre-crisis total time and number of steps to complete procurement processes in each country or jurisdiction. Use of e-procurement is measured as the frequency of the use of an e-procurement platform in total procurement by a procuring entity, based on the range categorization reported in the World Bank Doing Business Contracting with the Government indicator: less than 25%, 25%-50%, 50%-75% and more than 75%. Greater reliance on e-procurement may have a positive or negative association with resort to trade measures. It may facilitate a rapid response by making it easier for small and medium-sized enterprises (SMEs) – which account for a large share of the total number of firms in any economy – to sell essential supplies to the authorities (SMEs that do not already participate in PP may be able to retool relatively quickly if it is clear there is demand for their output). But this may also go the other way if the fixed costs associated with registration, certification and approval of new firms to bid to provide medical supplies are significant and take time to complete.

Openness of procurement regimes is proxied by a binary variable indicating GPA membership (GPA_j) and by the number of deep procurement agreements (DPAs) signed by each country with trading partners (Num_DPA_j). Membership of the GPA and the number of DPAs signed by a country implies more open PP regimes, which may be associated with a lower likelihood of imposing trade-restrictive measures. Conversely, transparency, due process and nondiscrimination commitments made in these agreements may impede rapid responses in procurement and induce governments to resort to export controls in the initial phase of the crisis.

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[12] We organize the data as a cross-section instead of a panel because the dependent variable is available by country on a weekly basis but all explanatory variables, except those on the incidence of COVID-19, are only available for each country annually in the year 2018 or before. The annual variation in our variables of interest will thus not explain the weekly or monthly variation in the count of trade policy measures imposed during the pandemic. This said, we account for the time dimension of the trade policy measures by computing the duration of the measures (where a removal date is reported in the GTA data set) and replacing the dependent count variables in equations (1) and (2) with their respective duration. Results are reported in Table 4.

The control vector includes country size, the log of population (POP_j); a measure of geographic distance to global markets, the log of market penetration (MP_j), computed as a distance (d_{ij}) weighted measure of other countries' GDP (GDP_i), i.e. $MP_j = \Sigma_i(GDP_i/d_{ij})$; and a measure of government effectiveness (GE_j). Both equations also include (i) the share of imports of medical goods in country j's total imports (Msh_j); (ii) country j's standardized revealed comparative advantage index (RCA_j) for medical goods;[13] and (iii) the (log of) simple average applied tariff rate [$ln(1+Tar_j)$] in country j on medical goods.

Large, populous countries are likely to have market power, which in turn may induce governments to use trade policy to affect their terms of trade. Government effectiveness is directly correlated with per capita income. A more effective government is more likely to adapt procurement processes to source needed medical supplies, thereby reducing the incentive to change trade policy. The import share, RCA and import tariff variables proxy for political economy forces that shape pre-crisis trade policy and can be expected to influence the duration of crisis trade measures.[14] Higher import dependence is suggestive of a pro-liberalization domestic political economy. Conversely, high levels of import restrictions suggest a country has industrial development goals. Such countries may relax import barriers temporarily to improve access to essential commodities but are more likely to reimpose import barriers more rapidly to support local production, reflecting prevailing industrial policy objectives. An RCA > 1 for exports of medical products implies supply-side capacity that may induce governments to remove export controls more rapidly if a decision is taken to temporarily restrict exports in response to the pandemic spike in demand.

We also control for the number of COVID-19 cases ($Covid\_cases_j$) and the number of related deaths ($Covid\_deaths_j$) as of 22 July 2020. We do this because the number of cases and deaths may affect the likelihood of removing (retaining) trade policy instruments, with greater case numbers potentially associated with more export restrictions, keeping them on longer and/or deeper liberalization of imports of essential supplies. We do not use number of cases/deaths for the early months of the pandemic because in most countries case numbers and deaths were low in the initial period – February-March – when most of trade measures were put in place by those countries that decided to do so.

The dependent variable in all equations is characterized by over-dispersion, which biases log linear OLS estimation. Given the scale-dependence of the negative binomial pseudo-maximum likelihood estimator, we estimate the equations using the Poisson- pseudo-maximum likelihood estimator (PPML) (Santos Silva and Tenreyro, 2006). Given that our interest is in trade policy measures imposed in response to COVID-19 in the first half of 2020 and all the explanatory variables pertain to 2017-2018 (see Section 5 below), endogeneity emanating from reverse causality is unlikely to be a concern in estimating equations (1) and (2). There could however be omitted variable biases, especially given that we cannot include any fixed effects. We therefore refrain from drawing any inferences about causality in the presentation of our results.

5. Data sources and descriptive statistics

The procurement variables used as explanatory variables in the empirical analysis are sourced from the World Bank Doing Business Contracting with the Government indicator and pertain

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[13] The RCA is defined as the ratio of country j exports of product i to its total exports of all products divided by the same ratio for the world. If the $RCA_{ji} > 1$ a country is said to have a revealed comparative advantage in i.

[14] Leibovici and Santacreu (2020) analyze the potential role of net importer and net exporter status as a potential driver of trade policy activism in a pandemic.

to the year 2019. Data are available for all 133 jurisdictions reported to have used trade measures in the first half of 2020 in the GTA trade policy data set (Appendix Table 1).[15]

PP processes in richer countries tend to require both a smaller number of steps and less time for completion on average (Figure 3, bottom panels). The total number of steps range from a low of 12 (Singapore) to a high of 21 (Honduras, Hungary, the Islamic Republic of Iran, the Lao People's Democratic Republic, Myanmar and Oman). The total time taken to complete a procurement process ranges from 270 (Korea) to 2062 (the República Bolivariana de Venezuela) days. The sample mean is 18 steps and 717 days, respectively. Richer countries also tend to use e-procurement more on average (Figure 3, top right panel). The share of e-procurement in total procurement ranges from less than 25% for most African countries to more than 75% for EU and ASEAN Member States.

GPA_j is constructed using information on membership of the WTO's Agreement on Government Procurement as of July 2020; and Num_DPA_j is constructed using data from Shingal and Ereshchenko (2020), which cover all PTAs in effect until March 2017.[16] On average richer countries tend to be members of more DPAs (Figure 3, top left panel). The number of non-zero DPAs ranges from 1 for West Asian countries to 26 for the EU. There are 32 WTO GPA members in the sample, mostly comprising high-income countries. E

The control variables are sourced as follows: population and GDP data are from the World Bank World Development Indicators; market penetration (MP_j) is computed using bilateral distance data from CEPII (Head et al. 2010); and government effectiveness (GE_j) is sourced from the Worldwide Governance Indicators (Kaufmann et al. 2011). Trade data to construct the import share and RCA variables are from UN Comtrade. Import tariffs are from UNCTAD TRAINS/WITS. Data on COVID-19 cases are from the WHO (https://covid19.who.int/table). Appendix Table 2 reports summary statistics for all variables used in the analysis. Apart from COVID-19 cases and deaths that pertain to the third week of July 2020, all control variables are the average for the years 2017 and 2018.

6. Results

Table 1 reports the results from PPML estimation of equations (1) and (2) separately for liberalizing and restrictive measures imposed on medical goods, with standard errors clustered by country in each case. Results reported in Table 2 replicate the analysis in Table 1 but distinguish between measures that were imposed and subsequently removed within the sample period and those that remained in effect as of mid-July 2020. Table 3 reports the results from the PPML estimation of equations (1) and (2) applied to specific types of trade measures, i.e., restriction or liberalization of exports or imports, respectively. Finally, based on the dates of implementation and removal, Table 4 reports the results from estimating equations (1) and (2) using as dependent variable the duration of the respective measure and not the total number of measures.

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[15] Jurisdictions imposing measures include the Eurasian Economic Union, the EU, and the South African Customs Union (SACU). Measures imposed by these blocs are allocated to their member states for the purpose of analysis.

[16] Shingal and Ereshchenko (2020) measure the "depth" of procurement provisions in PTAs on the basis of seven broad attributes: non-discrimination; coverage in terms of goods, services (including construction) and type of procuring entity (central, sub-central government and utilities); procedural disciplines; ex-ante and ex-post transparency, dispute settlement; and new issues (e-procurement, sustainable procurement, SME participation, adoption of safety standards, and cooperation on matters of public procurement).

Figure 3: Scatterplots of procurement variables against per capita income
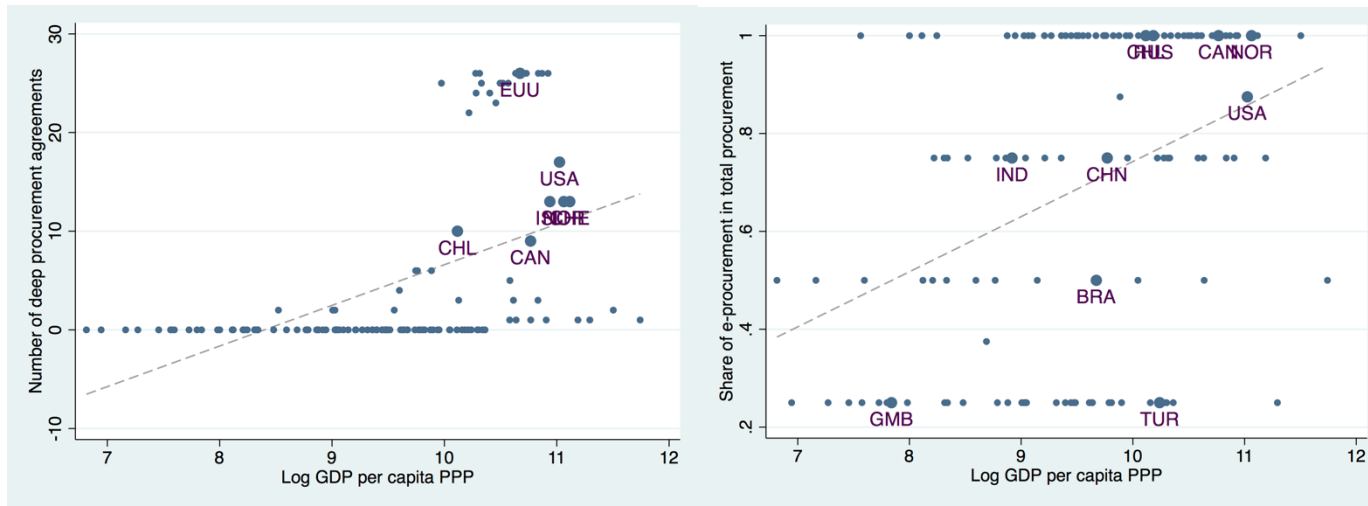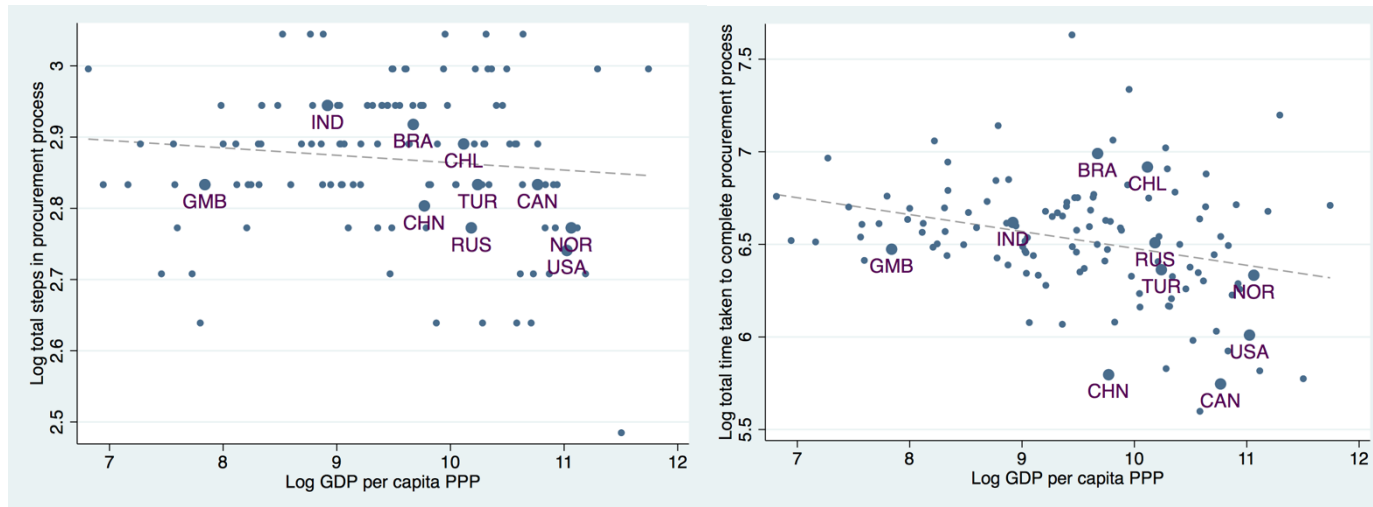
The average number of pre-crisis steps required to complete procurement processes is found to be positively correlated with the number of trade liberalizing measures, on both the import and export side. This result reflects measures that were still in force at the end of the sample period (see Table 2, columns 1 and 3). In contrast, this variable is positively correlated with the duration of import restrictive measures (Table 4, column 2). There is also a relatively strong correlation between the total time taken for procurement and the number of trade restrictions, on both the import and export side. This result reflects measures that were still in force at the end of the sample period (see Table 2, columns 2 and 4). On the import side this result is driven by import tariff levels, while on the export side it reflects licensing requirements (Table 3, column 4 and 6). In contrast, the duration of import restrictions is found to be inversely related to pre-crisis time to complete procurement processes (Table 4, column 2). Thus, both attributes of pre-crisis PP regimes are strongly correlated with trade policy activism during the initial months of the pandemic, which supports the contention that jurisdictions with PP systems characterized by more steps or stages and processes that take longer on average to complete made greater use of trade policy to increase domestic availability of protective equipment and medical supplies.

This is not the case for e-procurement. Greater use of e-procurement is only weakly associated with the number of export restrictions (Table 1), although the association is stronger for use of export bans (Table 3). In contrast, e-procurement is found to be inversely related to import restrictions that were imposed but subsequently removed (Table 2, column 6) as well as the duration of such measures (Table 4, column 2).[17]

Turning to our international procurement policy variables, membership of the GPA is positively associated with the number of liberalizing measures for imports of medical products as well as removal of export restrictions (Table 1). The former result is also found when attention is restricted to measures that are still in force at the end of the sample period (Table 2). These findings provide some support for a presumption that members of the GPA are more inclined (committed) to maintaining open markets. At the more disaggregated trade instrument level we find a weakly positive association between GPA membership and the use of export bans, a finding that attains strong statistical significance when focusing on the duration of export restrictions: GPA membership is positively correlated with maintaining export controls during the whole period under analysis if a member decides to use this instrument (Table 4).

The greater the number of DPAs a jurisdiction has signed, the smaller is the number of import restrictive measures imposed on medical products – the coefficient on Num_DPA_j is negative and statistically significant at conventional levels. This result seems to be driven by measures that were still in effect at the end of our sample period (see Table 2, columns 1-2). The analysis focusing on disaggregated measures reveals this is driven mainly by import tariffs (Table 3, columns 1 and 4). These results suggest that countries with more DPAs are more open, liberalizing imports and less prone to (re-)impose import barriers.

Among the control variables, country size is positively correlated, significant at the 1% level, with the number of export restrictions on medical products (Table 1). The same result is obtained for the measure of distance to markets – greater distance from markets is associated

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[17] The relatively small number of instances in which jurisdictions are observed to (re-)impose import barriers during the sample period leads to a fully saturated model when we analyze this specific type of trade measures. The results in Table 2, column (6) and Table 4, column (2) for (re-)imposition of import restrictions therefore need to be interpreted with caution.

with greater use of export restrictions. These findings seem to be driven by measures that were still in effect at the end of the sample period (i.e. that were not removed within the seven-month period under consideration) (Table 2). Indeed, conditional on measures not having been removed during the period there is some suggestion that larger countries may also pursue import liberalization, i.e., to operate on both margins, presumably with the aim to expand domestic availability of medical products. This finding is consistent with terms-of-trade models of trade policy.

Table 1: Number of export and import measures targeting medical products

Variables	(1) lib_m	(2) res_m	(3) lib_x	(4) res_x
$\text{Ln}(Total\_steps_j)$	2.20**	6.28**	2.89**	1.35
	(1.08)	(3.02)	(1.47)	(1.22)
$\text{Ln}(Total\_time_j)$	0.39	1.34	-0.60	1.72**
	(0.31)	(0.91)	(0.76)	(0.71)
$Eproc_j$	0.03	-0.84*	0.47	0.30*
	(0.11)	(0.46)	(0.34)	(0.18)
$\text{Ln}(Num\_DPA_j)$	-0.31**	-1.97***		-0.04
	(0.15)	(0.63)		(0.16)
GPA_j	0.72**	0.56	2.68***	0.67*
	(0.33)	(0.79)	(0.85)	(0.38)
$\text{Ln}(POP_j)$	0.09	0.16	0.08	0.40***
	(0.07)	(0.17)	(0.17)	(0.13)
$\text{Ln}(MP_j)$	-0.08	0.38	-0.24**	0.23**
	(0.07)	(0.27)	(0.11)	(0.12)
GE_j	0.34*	2.06**	-0.62	0.75**
	(0.18)	(0.87)	(0.38)	(0.35)
Msh_j	1.76	3.91	7.32	-4.03
	(3.34)	(11.62)	(10.88)	(5.97)
RCA_j	0.18	1.50***	1.72**	-0.07
	(0.23)	(0.56)	(0.82)	(0.53)
$\text{Ln}(1+Tar_j)$	0.44**	0.23	0.44	-0.46
	(0.22)	(0.48)	(0.46)	(0.32)
$\text{Ln}(Covid\_cases_j)$	0.05	0.37*	-0.49	-0.09
	(0.10)	(0.21)	(0.32)	(0.17)
$\text{Ln}(Covid\_deaths_j)$	0.12	0.06	0.32	0.06
	(0.10)	(0.23)	(0.29)	(0.14)
Constant	-10.15**	-32.18***	-6.67	-16.60***
	(3.98)	(7.22)	(9.12)	(6.25)
Observations	108	108	108	108
R-squared	0.54	0.84	0.65	0.45

Note: Robust standard errors, clustered by country, in parentheses. Levels of significance: *10%, **5%, ***1%.
Legend: lib=liberalizing; m=import policy; res=restrictive; x=export policy; GE: government effectiveness; DPA: deep procurement agreement; GPA: WTO Government Procurement Agreement; RCA: revealed comparative advantage; POP: population; MP: measure of geographic distance to global markets.

Table 2: Number of trade measures by status of implementation

Variables	Measures still in effect as of mid-July 2020				Measures no longer in effect as of mid-July 2020			
	(1) lib_m	(2) res_m	(3) lib_x	(4) res_x	(5) lib_m	(6) res_m	(7) lib_x	(8) res_x
$Ln(Total\_steps_j)$	3.86***	3.72	20.61***	2.75*	-0.12	274.81***	2.06	-1.52
	(1.31)	(4.45)	(6.56)	(1.60)	(3.11)	(3.72)	(2.33)	(1.88)
$Ln(Total\_time_j)$	0.31	1.71*	-13.33***	2.04***	1.57	-47.89***	0.73	1.10
	(0.32)	(1.04)	(3.24)	(0.79)	(2.05)	(1.37)	(1.56)	(0.75)
$Eproc_j$	-0.06	-1.02**	-0.18	0.31	0.19	-0.61***	1.06***	0.08
	(0.10)	(0.49)	(0.25)	(0.23)	(0.26)	(0.10)	(0.30)	(0.17)
$Ln(Num\_DPA_j)$	-0.51***	-2.50***	4.35***	-0.06	-0.16			0.11
	(0.15)	(0.71)	(1.35)	(0.20)	(0.25)			(0.21)
GPA_j	1.14***	1.16		0.71	0.09			0.75*
	(0.32)	(1.10)		(0.53)	(0.63)			(0.44)
$Ln(POP_j)$	0.13*	0.22	0.26	0.40**	-0.19	-0.20	-0.29	0.16
	(0.07)	(0.24)	(0.19)	(0.16)	(0.16)	(0.16)	(0.25)	(0.15)
$Ln(MP_j)$	-0.13*	0.25	-0.11	0.31**	0.21	11.23***	-0.21	0.16
	(0.07)	(0.33)	(0.39)	(0.13)	(0.24)	(0.18)	(0.27)	(0.11)
GE_j	0.35**	3.20***	-3.03***	1.08***	0.63	8.37***	-0.31	0.21
	(0.16)	(0.52)	(0.97)	(0.38)	(0.54)	(0.67)	(0.83)	(0.43)
Msh_j	4.72	-5.45			-0.77	-299.18***		
	(3.37)	(13.71)			(10.44)	(8.57)		
RCA_j			-0.75	-0.26			1.01*	-0.28
			(0.87)	(0.63)			(0.61)	(0.44)
$Ln(1+Tar_j)$	0.31	0.03	2.25**	-0.22	1.10**	29.81***	-1.61**	-0.42
	(0.21)	(0.41)	(0.93)	(0.29)	(0.52)	(0.54)	(0.67)	(0.40)
$Ln(Covid\_cases_j)$	-0.03	0.15	-0.34	0.01	0.10	8.20***	-1.48***	0.08
	(0.12)	(0.23)	(0.24)	(0.17)	(0.31)	(0.29)	(0.46)	(0.26)
$Ln(Covid\_deaths_j)$	0.20	0.47	-0.52	0.01	0.04	-7.06***	1.20***	-0.15
	(0.13)	(0.32)	(0.35)	(0.15)	(0.26)	(0.23)	(0.34)	(0.20)
Constant	-13.92***	-26.98***	20.79*	-24.84***	-14.54	-642.77***	-5.16	-3.85
	(4.09)	(9.28)	(11.41)	(7.86)	(9.93)	(8.66)	(13.02)	(6.68)
Observations	97	97	75	97	50	33	43	50
R-squared	0.66	0.86	0.35	0.45	0.30	1.00	0.63	0.48

Note: Robust standard errors, clustered by country, included in parentheses. Levels of significance: *10%, **5%, ***1%.

Table 3: Types of trade measures used (number)

Variables	(1) m_lib_t	(2) m_lib_tx	(3) m_lib_oth	(4) m_res_t	(5) x_res_b	(6) x_res_lic	(7) x_res_oth
$Ln(Total\_steps_j)$	-0.02	0.24	1.49*	2.36***	1.63**	2.38**	-0.39
	(0.43)	(0.62)	(0.81)	(0.86)	(0.79)	(0.99)	(0.91)
$Ln(Total\_time_j)$	1.23	3.38**	2.29	7.86***	-1.45	5.37***	-0.48
	(1.35)	(1.62)	(3.40)	(2.66)	(1.57)	(1.66)	(2.19)
$Eproc_j$	0.03	0.01	0.01	-0.30	0.39**	0.44	-0.59
	(0.15)	(0.17)	(0.22)	(0.28)	(0.17)	(0.36)	(0.38)
$Ln(Num\_DPA_j)$	-0.42**	0.17	-0.50	-1.69***	-0.04	-0.11	0.67**
	(0.18)	(0.26)	(0.34)	(0.42)	(0.19)	(0.25)	(0.32)
GPA_j	0.72*	0.86	0.36	0.30	0.66*	0.89	0.95
	(0.41)	(0.54)	(0.63)	(0.72)	(0.35)	(0.69)	(0.99)
$Ln(POP_j)$	0.05	0.00	0.18	0.41*	0.29*	0.55***	0.33
	(0.10)	(0.12)	(0.18)	(0.23)	(0.16)	(0.17)	(0.27)
$Ln(MP_j)$	-0.09	-0.08	0.07	0.38	0.26**	0.25*	-0.23*
	(0.09)	(0.08)	(0.20)	(0.24)	(0.12)	(0.15)	(0.13)
GE_j	0.25	0.03	0.65	0.84	0.33	1.29***	0.46
	(0.23)	(0.28)	(0.48)	(0.68)	(0.40)	(0.46)	(0.64)
Msh_j	4.21	-2.14	1.33	9.77	-4.49	-3.82	4.35
	(3.90)	(5.69)	(8.99)	(11.11)	(6.88)	(10.05)	(8.17)
RCA_j	-0.05	0.35	0.73	1.42***	0.12	-0.07	0.29
	(0.28)	(0.38)	(0.51)	(0.49)	(0.56)	(0.61)	(0.89)
$Ln(1+Tar_j)$	0.37	0.86**	0.43	-1.44***	-0.27	-0.82	1.25**
	(0.30)	(0.42)	(0.39)	(0.40)	(0.34)	(0.54)	(0.63)
$Ln(Covid\_cases_j)$	0.14	-0.09	-0.03	0.37	-0.12	-0.07	0.59*
	(0.13)	(0.18)	(0.29)	(0.30)	(0.20)	(0.22)	(0.35)
$Ln(Covid\_deaths_j)$	0.12	0.21	-0.01	0.28	0.13	-0.00	-0.55**
	(0.13)	(0.16)	(0.22)	(0.27)	(0.16)	(0.19)	(0.24)
Constant	-6.14	-13.91**	-18.48*	-45.21***	-9.11	-33.88***	-2.61
	(4.84)	(6.98)	(10.91)	(7.92)	(7.49)	(10.93)	(9.31)
Observations	108	108	108	108	108	108	108
R-squared	0.51	0.29	0.17	0.91	0.28	0.56	0.29

Note: Robust standard errors, clustered by country, included in parentheses. Levels of significance: *10%, **5%, ***1%.
Legend: lib=liberalizing; m=import policy; res=restrictive; x=export policy; t=tariff; tx=tax; oth=other; b=ban; lic=licensing requirement

This "aggregate" finding across the four main categories of trade policy actions is unpacked in Table 3, which reports results for seven different types of instruments that are most frequently observed in the GTA data set. This more disaggregated focus reveals large countries focused more on import tariffs as well as export bans and export licensing requirements.[18] Distance to markets is positively associated with restrictive export measures and inversely correlated with liberalizing export measures on medical products; the former finding driven by measures still in force (see Table 2, column 4). Conversely, if the focus is on measures that were removed during the period, this variable is strongly correlated with re-imposition of import restrictions, with a coefficient estimate that is statistically significant at the 1% level (Table 2, column 6). Distance has a very similar pattern as country size does on the export side (Table 3).

Government effectiveness is positively correlated with all categories of trade policy measures, especially export licensing requirements (Table 3), except for imposition of import barriers, especially when it comes to measures still in force at the end of the sample period (Table 2). Higher initial tariffs are positively correlated with liberalization of imports (Table 1), which is expected as the higher the pre-crisis tariffs the greater the expected impact of removal of the tax on prices (or more realistically, attenuation of price rises for essential products). The result seems driven by liberalization of domestic taxation on imported medical products (Table 3). Conversely, when it comes to measures that are removed during the sample period, pre-crisis tariffs are strongly associated with re-imposition of import barriers – which may reflect a return to the initial level of protection for the products concerned (Table 2, column 6). This can also be inferred from the large positive correlation between pre-crisis tariff levels and the duration of import policy measures imposed on medical products (Table 4).

Supply-side capacity (proxied by a revealed comparative advantage in exporting medical products) is positively correlated with both import restrictive and export liberalizing measures (Table 1). Conversely, greater reliance on imports of medical products is not correlated with the number of import or export measures imposed on medical products, in either aggregate or disaggregated analysis, which is a counter-intuitive result (Table 1). However, import reliance is strongly negatively associated with re-imposition of import barriers (Table 2), consistent with higher import dependence disincentivizing imposition of import barriers.[19] This variable is also found to be negatively correlated with the duration of restrictive measures imposed (Table 4, columns 2-3).

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[18] A possible rationale for (re-)imposing import tariffs is to protect upstream industries that produce medical inputs and/or domestic producers of medical products.

[19] This will depend on government objectives and domestic political economy forces – a subject that is beyond the scope of the present analysis.

Table 4: Correlates with the duration of aggregate measures

Variables	(1) lib_m	(2) res_m	(3) res_x
Ln(Total_steps$_j$)	2.98	385.15***	-1.33
	(2.80)	(4.08)	(1.84)
Ln(Total_time$_j$)	0.50	-49.43***	-0.47
	(1.34)	(2.29)	(0.69)
Eproc$_j$	-0.33	-1.77***	-0.29
	(0.35)	(0.13)	(0.20)
Ln(Num_DPA$_j$)	0.11		-0.11
	(0.33)		(0.18)
GPA$_j$	1.27		1.37***
	(0.85)		(0.51)
Ln(POP$_j$)	0.14	3.77***	-0.20
	(0.22)	(0.20)	(0.13)
Ln(MP$_j$)	0.07	15.76***	-0.09
	(0.23)	(0.27)	(0.10)
GE$_j$	1.11**	10.06***	-0.29
	(0.50)	(0.89)	(0.36)
Msh$_j$	-11.95	-238.30***	-18.44**
	(14.68)	(10.82)	(9.18)
RCA$_j$	-2.43**	0.32	0.04
	(1.01)	(0.47)	(0.55)
Ln(1+Tar$_j$)	1.04**	38.76***	-0.13
	(0.49)	(0.69)	(0.33)
Ln(Covid_cases$_j$)	-0.11		0.42
	(0.40)		(0.27)
Ln(Covid_deaths$_j$)	0.14	-2.06***	-0.22
	(0.31)	(0.16)	(0.25)
Constant	-10.91	-955.74***	10.36**
	(7.52)	(9.43)	(4.28)
Observations	50	33	50
R-squared	0.20	1.00	0.31

Note: Robust standard errors, clustered by country, in parentheses. Levels of significance: *10%, **5%, ***1%.

7. Conclusion

Controlling for country size, government effectiveness and economic factors that may influence trade policy, we find evidence that the use trade measures targeting medical products in the first seven months of the global COVID-19 pandemic is positively correlated with pre-crisis attributes of national public procurement regimes. Jurisdictions with PP systems that are characterized by more steps or stages and processes that take longer on average to complete made greater use of trade policy to increase domestic availability of protective equipment and medical supplies. At the same time, we find that GPA membership and participation in DPAs is associated with maintaining more open markets for medical products. Jurisdictions that have signed agreements that require nondiscrimination between foreign and domestic firms do more to reduce import barriers and are slower to reimpose import restrictions.

While striking and novel, our results are no more than suggestive. They call for more in-depth analysis that includes information on what was done by different jurisdictions to procure medical products and protective equipment on an emergency basis, and the global supply response by businesses producing the relevant products. The main conclusion we draw from our analysis is that future research assessing policy responses to the COVID-19 pandemic should consider both the efficacy and efficiency of public procurement processes and the recourse made to trade policy in efforts by governments to address the sharp rise in domestic demand for personal protective equipment and medical supplies.

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Appendix Table 1: Jurisdictions included in the sample

Albania, Algeria, Angola, Anguilla, Antigua & Barbuda, Argentina, Armenia, Australia, Azerbaijan, Bahamas, Bahrain, Bangladesh, Belarus, Belgium, Belize, Bermuda, Bhutan, Bolivia, Botswana, Brazil, Brunei, Darussalam, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Costa Rica, Cyprus, Czech Republic, Côte d'Ivoire, Democratic Republic of Congo, Dominican Republic, Ecuador, Arab Republic of Egypt, El Salvador, Estonia, Eurasian Economic Union, European Union, Fiji, France, The Gambia, Georgia, Germany, Greece, Guatemala, Guinea, Guyana, Honduras, Hungary, Iceland, India, Indonesia, Islamic Republic of Iran, Israel, Italy, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Libya, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Moldova, Montserrat, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Caledonia, New Zealand, Niger, Nigeria, North Macedonia, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Qatar, Republic of Korea, Sudan, Romania, Russian Federation, Samoa, Saudi Arabia, Senegal, Serbia, Seychelles, Singapore, Slovak Republic, Slovenia, South Africa, Southern African Customs Union, Sri Lanka, St. Kitts and Nevis, St. Vincent and the Grenadines, Suriname, Switzerland, Syrian Arab Republic, Taiwan, China, Tajikistan, Thailand, Togo, Turkey, Turks & Caicos Islands, Uganda, Ukraine, United Kingdom, United States, Uruguay, Uzbekistan, República Bolivariana de Venezuela, Vietnam, Zambia, and Zimbabwe.

Appendix Table 2: Summary statistics

Variable name	Variable description	Obs	Mean	Std. Dev.	Min	Max
Dependent variable						
lib_m	Count of import liberalizing measures on medical products	133	1.91	2.68	0	22
res_m	Count of import restrictive measures on medical products	133	0.24	1.12	0	10
lib_x	Count of export liberalizing measures on medical products	133	0.16	0.37	0	1
res_x	Count of export restrictive measures on medical products	133	1.49	2.98	0	30
Control variables						
pop	Population (mln)	128	57	179	0.04	1390
ge	Government effectiveness	127	0.06	0.88	-1.81	2.23
mp	Market penetration (USD mln)	130	168	481	0	5200
Msh	Share of medical imports in total imports	129	0.06	0.03	0.01	0.17
RCA	Standard RCA for medical products	129	-0.47	0.44	-0.99	0.58
Tar	Simple average applied tariff rate on medical products	119	5.93	4.57	0	27.59
COVID_cases	Cumulative count of COVID-19 cases	130	107070	400949.8	3	3805524
COVID_deaths	Cumulative count of deaths due to COVID-19	130	4294	15539.5	0	140437
Procurement variables						
tot_steps	Total steps required to complete procurement process	122	17.72	1.76	12	21
tot_time	Total time to complete procurement process (# of days)	122	716.61	245.10	270	2062
eproc	Share of e-procurement in total procurement	124	0.69	0.32	0.25	1
gpa	Membership of WTO's GPA	133	0.24	0.43	0	1
num_dpa	Number of deep procurement agreements	133	4.36	8.71	0	26