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International sourcing during Covid-19: how did Chilean firms fare?[1]

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[1] This contribution was prepared for the conference. The views expressed are those of the authors and do not necessarily reflect the views of the European Central Bank, the Bank of Spain, the BIS, the IFC or the other central banks and institutions represented at the event.

International Sourcing during COVID-19: How did Chilean firms fare? *

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Abstract

COVID-19 has proven to be a unique and complex shock for firms. In this paper we analyze the performance of individual Chilean firms during this episode drawing on administrative datasets. In particular we empirically characterize the international trade adjustment at the firm and product level. Importer firms, specially in the manufacturing sector, have adjusted their import flow through three margins along 2020/21. In 2020 imports declined as some firms either stopped their import activity, or they imported less product varieties (product and country of origin) or by reducing the intensity of imported varieties. In this period importers faced a short-lived increase in imported input costs. In 2021 imports rebound strongly. While exporter firms (excluding mining) kept their export activity as well as their selling price stable. We also explore if foreign factors such as the incidence of COVID-19 and containment measures in partner countries had an impact on Chilean trade during 2020. We find that these foreign factors had an impact on intermediate rather than consumption goods imports.

JEL Codes: D22, F10.

Keywords: COVID-19, lockdowns, firm-level trade, international sourcing, Chilean firms.

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1 Introduction

Since the start of the pandemic international trade has faced several challenges with different degrees of intensity during 2020 and 2021. The closure of production plants or ports from main global suppliers, with different degrees of intensity throughout this period; higher transport costs; longer delivery times; difficulties in finding key intermediate inputs led to some firms not being able to keep up with production targets. In a relatively short time span, firms have faced dramatic declines in demand, and from the production side, have faced labor shortages, the need to re-organize their tasks to keep up with health restrictions, and have dealt with supply disruptions in their input materials. In addition the shortage of finished/consumer goods lead to price pressures. Along 2021 production problems were coupled with a swift demand recovery–a product of relatively high rates of vaccination and its fairly good performance against variants.

By analyzing monthly and highly detailed firm-level micro trade data, we disentangle the channels through which the crisis initially affected aggregate international trade outcomes in Chile. From a policy point of view, it is interesting to analyze which trade margins were driving trade developments. As aggregate developments can hinder different margins through which firms are adjusting. This can be either by the number of trading firms, the number of traded products, the number of trade transactions or associated shipments (the so-called extensive margin), or by a collapse in the trading values of certain trading firms, products and transactions (that is, the intensive margin). By looking into this dissection we can anticipate the smoothness of reaching pre-crisis levels during the recovery for firms, as broken links might be more difficult to recover than a temporary decline in trade volumes and can lead to more severe scarring effects.

An additional open issue is whether and to what extent firms will pass-through the observed increases in input material costs or in transport freights to final prices. We also exploit firm-level variation in the usage of inputs. Firms have heterogeneous production functions, and their sourcing decisions expose them unevenly to foreign shocks. The simple idea is that firms/sectors that are more dependent on imported inputs, should also be more affected by supply chain disruptions stemming from the initial COVID-19 crisis.

We make use of three different firm-level administrative datasets. The first source is the form "F29" that contains firm-level monthly information used for tax purposes on sales revenues, expenditures, material purchases, etc. The second source we use is “Customs data" with information on imports and exports at a very narrowly defined products (at HS-8digit level), country of origin or destination, values, and quantities.[1]Finally, the third

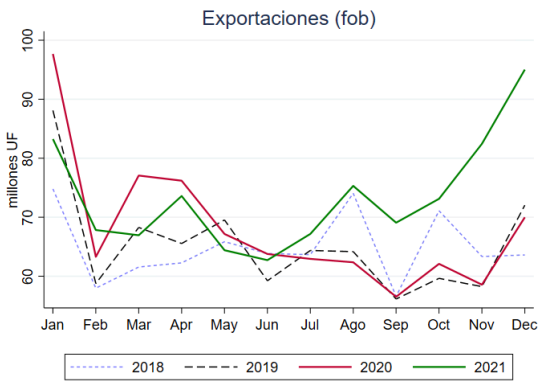
[1]Form “F29" also provides information on purchases and sales abroad but without such detailed information. To cross-check the two sources we have kept the information from both sources and they show a high correspondence and correlation.

source is the Matched Employer-Employee dataset, where we obtain information on the number of employees in each firm, that will allow to estimate the firm labor productivity.

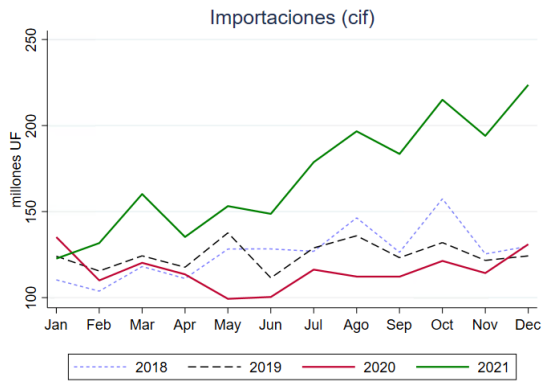
Among firms that trade abroad, the pandemic impacted differently to exporters and importers. In Figure 1 we show how trade flows have evolved from 2018 to 2021. In value terms, exports-excluding Mining- in 2020 and 2021 have performed relatively similarly to previous years. Notwithstanding, imports show a noticeably different pattern, showing a sharp decline in 2020 followed by a strong recovery in 2021[2]. While domestic factors might explain this sharp recovery, in the context of supply shortages it is of interest to exploit the granular data to understand the drivers and macroeconomic implications of this recovery.

Figure 1: Aggregate Trade

(a) Exports



(b) Imports



Notes: We plot traded volumes in each year in Panel (a) exports and in Panel (b) imports. While exports exhibit a similar pattern along 2020 and 2021, import behavior is radically different. There was a significant drop in Q2 2020. And there was a sharp recovery by the end of the year and along 2021. This information is based on the Customs dataset after applying the cleaning procedure detailed in Section 2. We exclude firms in the Mining and Public Administration sectors. Transactions in USD have been converted to CLP and deflated using a CPI inflation indexed unit of account called *Unidades de Fomento* calculated and published by the Central Bank of Chile (see https://si3.bcentral.cl/estadisticas/Principal1/metodologias/EC/IND_DIA/ficha_tecnica_UF_EN.pdf).
Sources: Chilean Customs and own calculations.

This work relates different strands of the literature. First, this paper is related to (the prolific) empirical literature on the impact of COVID-19 on international trade, the exposure to other countries like China and the consequences of supply disruptions: from a sectoral perspective (Cerdeiro & Komaromi (2022), Meier & Pinto (2020)), from a product-level perspective (Jaravel & Mejean (2021)) and with a focus on granular data on French firms (Brussevich, M. and Papageorgiou, C. and Wibaux, P. (2022) and Bricongne, J.C., Carluccio, J. , Fotagnè, L., Gaulier G. and Stumpner, S (2023)). Second, this paper is also related to the firm-level literature that explores firm-dynamics during

[2]For more details on trade developments see https://si3.bcentral.cl/estadisticas/Principal1/enlaces/Informes/AnuariosBDP/anuario_BDP_2021.html

COVID-19. In de Lucio et al. (2022), by combining Spanish firm-level monthly trade data with country-level COVID-19 containment measures over February-July 2020, they show that strict containment measures in a partner country increased the probability of a firm ceasing to trade with it. Negative effects were concentrated between March and May 2020, and the detrimental effect of containment on exports was larger for goods consumed outside the household; for wholesalers and retailers; and for manufacturers not participating in global value chains. A common finding is that the pandemic has negatively affected international trade flows, although the details of the results vary significantly across papers.

Our paper is also connected to the literature that focuses on the impact of cost shocks on prices. The pass-through of costs, such as tariffs changes, has been analyzed by Cavallo et al. (2021). They find that the degree of pass-through is higher at the border than at the retail level. Ganapati et al. (2020), Duprez & Magerman (2018) and Amiti et al. (2014) document how firms change their prices in response to cost shocks and other price changes and their relationship with buyers and suppliers in a production network. This paper is also linked to other articles that exploit Chilean granular data for the study of various topics such as the role of production networks in the propagation of foreign shocks (Huneeus (2018)), the estimation of the pass-through of exchange rate movements to domestic prices (Giuliano & Luttini (2020)), and the characterization of the adjustment of firms during the pandemic through different margins (Albagli et al. (2022)).

The contributions and distinctions between our work and the existing empirical studies are that (i) we use both COVID-19 cases and lockdown policies. In contrast, most existing papers focus either on one or the other. While COVID-19 cases are an intuitive proxy for the impact of the pandemic, it is well known that lockdowns are implemented as a reaction to the pandemic, often precisely when the number of cases is high or is expected to rise soon. Other studies such as König & Winkler (2021) work with deaths and lockdown measures. (ii) We focus on the sample of Chilean firms participating in international trade in goods, and (iii) with recent data (until 2021).

We compare the performance along 2017-2020, and 2021. The data reveals the following: at the beginning of the pandemic, exports were less affected than imports. However, since the end of 2020, imports showed dynamics that exceeded the performance shown at least during the study period. This recovery in imports has been broad based in terms of the type of goods: intermediate goods, consumption, capital, etc., perhaps influenced by the liquidity provided in Chile by the support programs created to face the pandemic. At the aggregate level, the intensive margin was reduced for both imports and exports during the onset of the pandemic. Within imports, firms in the distribution sector, which comprises wholesale firms, recovered their intensive margin faster than manufacturing

firms. It is also worth highlighting the increase displayed by distribution firms in their new products margin. This increase has been sharp and has been present across all good categories of goods.

The rest of the paper is organized as follows. In Section 2 we describe with more detail the data, the cleaning process and the variable definitions used for the analysis. In Section 3 we report the main stylized facts about trading firms. In particular, we characterize the behavior of trading firms according to the extensive and intensive margins of trade adjustment and according to their size and the economic sector in which they operated. In Section 4 we proxy the impact on costs that firms have faced by using unit values. In Section 5 we explain the empirical strategy to explore to what extent health conditions in partner countries have influenced trade developments and in Section 6 we present the results. Finally, in Section 7 we conclude.

2 Datasets

This section introduces the data, cleaning, and merging process used in the analysis. We make use of 2 different administrative datasets: (1) the Standard tax form F29 (*Declaración Mensual y Pago Simultáneo de Impuestos*) from "Servicios de Impuestos Internos" (SII) and (2) Customs declarations and which are described below. The datasets are merged by each firm's identifier and we compare them with official statistics to check that they are representative. Our monthly panel dataset compiles information on Chilean firms from 2017 to 2021 which allows us to compare the performance of the firms before and during the COVID-19 pandemic.

1. **VAT form - F29**.– The first source of information employed is the Firm Production Dataset with firm-level information used for tax purposes on total sales revenue, expenditures on intermediate goods, and investment in machinery and equipment. Chilean firms must submit their form F29 by law, therefore the dataset covers the universe of formal firms in Chile and has been available since the mid 2000s. The source is the F29 form collected by the Chilean tax authority (*Servicio de Impuestos Internos*, SII). The F29 form is presented on a monthly basis. The information contained there is of a tax nature coming from the self-declarations of contributors submitted to the SII, therefore the truthfulness of aforementioned data is not the responsibility of the SII.

2. **Customs data**.– The dataset provides information at the firm level on a monthly basis on the universe of international transactions, both exports and imports, at highly dis-aggregated levels in terms of country -as of its destination/origin- and in terms of products -at international HS8 nomenclature system-. The dataset pro-

vides information regarding the value of the transaction in USD (which is converted into CLP) and the quantity. We aggregate the data up from HS8 to HS6 (the 6-digit level). In the rest of the paper we use the terms "product" and "good" to refer to an HS6 category. We make use of Broad Economic Categories (BEC) classification which is a goods classification of foreign trade statistics. The classification correlates the goods to macroeconomic categories (capital goods, intermediates goods, and consumer goods). We are interested in the classification of goods as intermediate goods, industrial supplies, or capital good parts.[3]

We also make use of the **Employer-Employee Dataset** that contains firm-month level information on all formal labor contracts in Chile with detailed information on the contract (wage, start and end dates, etc.) and the ID of employees and firms. We use this dataset to keep in the sample those firms that active productive units and we exclude self-employment. The dataset has been available since 2005 and the source is the Superintendencia de Pensiones that is the Chilean pension regulator [4].

2.1 Merging and Cleaning Methodology

We merge the aforementioned data sets using unique tax IDs of firms that are common across sources. To secure the privacy of workers and firms, we observed anonymized micro datasets.

With the aim of removing outliers and remaining errors that are common in large-scale microdata sets, we apply a cleaning procedure based on previous work with similar datasets such as Kalemli-Ozcan et al. (2015) and Almunia et al. (2018) for the balance-sheet dataset and Bergounhon et al. (2018) for the Customs dataset. To clean the data, we proceed in two steps. In the first step, we remove firm observations that report employment, sales, imports or exports as either negative or above the maximum reported values by the firm with the most employees nationwide.

In the second step, we merge monthly information with annual observations in order to discard observations that imply extreme labor productivity by firms. So we replace turnover with a missing value for those firms with less than 50 employees and whose turnover/employees ratio is above the 99.5th percentile in the sample (i.e., small firms with unusually high labor productivity). Analogously, we replace employment with a missing value for those firms with more than 50 employees and whose turnover/employees ratio is below the 0.5th percentile in the sample (i.e. large firms that appear to have unusually low productivity). The rationale for these two criteria is that small firms with

[3]To convert HS to Broad Economic Categories (BEC) we use the concordance from World Integrated Trade Solution (WITS). WITS offers information about various product nomenclatures and help with mapping between various product nomenclatures.

[4]For more details on datasources and analysis on Chilean labor market see Albagli et al. (2023)

huge productivity ratios are suspicious of having undetected and misreported output units; also, large firms with excessively low productivity ratios are candidates for having misreported employment figures. In all of these cases, we replace the corresponding variable with a missing value, but the remaining firm variables are kept in the database.

2.2 Representativeness of the Dataset

After all the cleaning steps, we keep track of the representativeness of the microdata compared to the official data, allowing us to guarantee consistency in the conclusions obtained from the microdata. The benchmark data are the official statistics from the Central Bank of Chile (Balance of Payments) and Instituto Nacional de Estadísticas (Employment). The firm level data can replicate the growth rates of output, employment, wage bill and trade flows (see Appendix A). The merge with Customs data covers between 80% and 90% of imports and exports in the official data.

2.3 Variable Transformations

- **Exchange rates**.– Customs data are reported in USD, independently of the currency in which the transactions were made. We convert all the flows into CLP so as to compare them with the data from other sources used. As shown by Giuliano & Luttini (2019) on average, 90% of international transactions, by value, are denominated in USD and therefore the use of imported inputs and import intensities are affected by exchange rate movements. In regression analysis we control for exchange rates movements.
- **Deflators**.– All monetary variables have been deflated and are expressed in constant terms. To deflate the variables, we have used the *Unidades de Fomento (UF)*, whic is a unit of account indexed to inflation.[5]
- **Sectors**.– In the database, we have the International Standard Industrial Classification of all Economic Activities (ISIC) code for each firm. Through parity with the Economic Activity Code defined by EAC (CAE in Spanish) we obtain the economic sector which each firm belongs to. We focus the analysis on the productive sector of the economy without Mining. Thus, we exclude firms whose main sector of activity is related to Mining as well as Public Administration, as the number of firms within each category does not comply with the requirement of statistical secrecy as well as their specific characteristics of these activities that can bias the analysis.

[5]The *Unidades de Fomento (UF)* is a unit of account used in Chile that exchanges with the Chilean Peso which is constantly adjusted for Consumer Price Index developments so that the value of the Unidad de Fomento.

- **Firm size**.– Chilean firms are classified by size bins according to their annual firm turnover in real terms. They are considered a micro firm if turnover is below $<$ 2,400 UF, a small firm if turnover lies between 2,400 and 25,000 UF. They are categorized as medium sized firms when turnover lies between 25,000 and 100,000 UF. Finally they are considered large firms when turnover is above $>$ 100.000 UF. This classification is made according to what is currently established in the Statute of the Ministry of Economy of Chile (Law No. 20.416).

2.4 Sample Definitions

We work with several samples throughout the paper. First, we label the sample of firms after applying the basic cleaning steps as the *full sample*. Then we make use of the subset of firms that report sales each and every month which we label it *permanent sample*. This sub-sample avoids the issue of results driven by composition changes, although it may imply losing information.

In addition we break down the sample into *exporting* firms and *importers*. We also focus on the firms in sectors that account for the bulk of international trade firms in the *manufacturing* sector and those in the *distribution* sector. We use this distinction given the heterogeneous nature of the purpose of trading, mainly on the import side. While *manufacturing* firms import intermediate goods to be included in its processing activity, firms in the *distribution* sector import consumption goods or intermediates at the wholesale level.

Finally, the time sample used in each section varies according to the question. To characterize firms trade developments we use the data along 2017-2021 in sections 3 and 4. In section 5 we restrict the sample to 2019-2021 to capture the impact on trade growth during the period were COVID-19 started. All COVID-related variables are available only for the year 2020; for years before 2020, they are set to zero.

3 Stylized facts

In this section we will provide some stylized facts about Chilean firms. We document some facts about firms' international trade behavior in the data.

3.1 Data at a Glance

In Tables 1 and 2 we report the main characteristics of the firms used in the analysis. We use the *full sample* and the *permanent sample*, the latter of which only considers those firms that are reporting sales each and every month.[6]

- **Firm Heterogeneity**.– There is substantial heterogeneity between firms that import compared to those that are non-importers. In Table 1, we compare several statistics that are standard in the literature.[7] This heterogeneity is reflected in terms of size, as sales and number of employees are, on average, 33 and 8 times higher, respectively. Importers are more capital intensive and more likely to export; when they do, they do so in larger volumes. Importing firms register higher labor productivity, as measured by sales per worker. This ratio is, on average, around three times higher. Another aspect of heterogeneity is the number of products by destination/origin that exists depending on the sectors (see Table 2). It is worth highlighting the number of firms in "Wholesale and Retail Trade". In general, the stylized facts remain unchanged if we consider the permanent firms' sub-sample.
- **Imports and Exports**.– The bulk of the imported and exported volume is concentrated in the largest firms (see Figure E.9). The negative impact of the pandemic was not absorbed homogeneously. Small and medium-sized companies were in the hardest hit segment, both of which were in the proportion of firms that experienced a drop in international trade. This conclusion is obtained by comparing the reduction in the number of firms during the start of the pandemic (Figure E.10) and the volume of imports and exports (Figure E.11).
- **Export and Import shares**.– On average, an exporting firm exports 50% of its output. Moreover, the propensity of firms to purchase inputs outside the firms boundaries, that is, the propensity to import, can account for 50% of total materials. Notwithstanding, it is possible that some firms use imported inputs not bought directly abroad but sourced through locally based distributors.

3.2 A Focus on Trade Dynamics

The pandemic has had a significantly negative impact on international trade. From a policy perspective, an interesting issue is on which are the within-firm margins of trade that are driving aggregate developments. In 2020 there was a decline in the number of traded products, and the number of associated trade transactions or shipments and to a lesser extent in the number of firms trading (the extensive margin). The decline in trade values for given trading firms, products, and transactions (the intensive margin)

[6] This provides a sample that is free of composition effects, and excludes the entry and exit of firms.
[7] See Amiti & Konings (2007), Bernard et al. (2009), Halpern et al. (2015) and Kee & Tang (2016).

Table 1: Summary Statistics (2018)

	Full sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	16.45	150.15	13.67	126.40	83.68	435.34
Sales (thousands)	1.88	174.99	1.16	169.40	33.75	883.30
Capital per worker (thousands)	0.28	0.73	0.27	0.72	0.40	0.91
Sales per worker (thousands)	0.18	0.30	0.17	0.28	0.40	0.50
Export (thousands)	0.14	11.69	0.05	3.26	3.64	69.67
Export share in output	0.51	0.40	0.60	0.38	0.29	0.34
Imports (thousands)	0.19	18.46	0.00	0.00	7.15	112.96
Import share in materials	0.50	0.31	.	.	0.49	0.30
	Permanent sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	18.09	160.97	14.87	134.79	87.04	446.97
Sales (thousands)	2.65	214.03	1.61	207.96	36.93	932.56
Capital per worker (thousands)	0.29	0.75	0.28	0.73	0.40	0.91
Sales per worker (thousands)	0.19	0.31	0.18	0.29	0.40	0.50
Export (thousands)	0.20	14.28	0.07	3.98	4.02	73.45
Export share in output	0.48	0.39	0.57	0.38	0.28	0.34
Imports (thousands)	0.28	22.54	0.00	0.00	7.74	119.00
Import share in materials	0.49	0.30	.	.	0.49	0.30

Note: Summary statistics based on dataset after the cleaning procedure detailed in Section 2.*Non-Importers* is computed for firm-years in which the firm does not import. *Importers* is computed for firm-years in which the firm does import. Employment is the average number of employees per month. Firms in the Mining and Public Administration sectors have been excluded. Monetary values are in Unidades de Fomento (UF). Table 1 disaggregated by firm size can be found in Appendix B.
Sources: Merged SII, Superintendencia de Pensiones and Customs data.

contributed more intensively to the trade fall in 2020. We have analyzed high-frequency and highly detailed firm-level micro trade data to disentangle the channels through which the crisis initially affected aggregate trade outcomes in Chile. Based on our firm-level sample in Figure 2, we plot the aggregate dynamics in imports, panel (a), and exports, panel (b), from 2018 to 2021. We can observe a differentiated pattern. Exports fared relatively well during the pandemic, while imports showed a sharp decline during 2020, followed by a sharp recovery in 2021, possibly related to fiscal packages.

In light of this, we focus on import dynamics in Figure 3, and we break the sample into

Table 2: Number of Products and Origin/Destination by Sector (2018)

	Importer firms					
	Number of Products			Countries of Origin		
sectors	Mean	Median	Max	Mean	Median	Max
Agro (n=11,069)	3.5	1.0	142	1.8	1.0	26
Manu (n=46,533)	6.6	2.0	427	2.6	1.0	42
Const (n=9,726)	3.3	1.0	107	1.5	1.0	23
Wholesale/retail(n=140,235)	5.7	2.0	387	1.9	1.0	34
Transp (n=12,128)	2.3	1.0	79	1.4	1.0	23
Finan Act (n=2,969)	2.0	1.0	51	1.3	1.0	13
Hous Act (n=1,014)	1.6	1.0	23	1.1	1.0	9
Busi Act (n=20,601)	2.1	1.0	186	1.3	1.0	30
Pers Serv (n=20,788)	1.4	1.0	80	1.1	1.0	12
Total (n=265,063)	4.9	2.0	427	1.8	1.0	42
	Exporter firms					
	Number of Products			Countries of Destinations		
sectors	Mean	Median	Max	Mean	Median	Max
Agro (n=5,990)	2.0	1.0	26	4.4	2.0	50
Manu (n=10,948)	3.2	2.0	125	3.2	2.0	72
Const (n=505)	3.2	1.0	70	1.3	1.0	7
Wholesale/retail (n=15,025)	2.8	1.0	154	2.4	1.0	86
Transp (n=1,864)	2.1	1.0	96	2.7	1.0	77
Finan Act (n=286)	1.0	1.0	5	2.8	1.0	13
Hous Act (n=48)	1.0	1.0	2	1.3	1.0	4
Busi Act (n=986)	2.3	1.0	85	2.0	1.0	18
Pers Serv (n=51)	1.2	1.0	5	1.3	1.0	2
Total	2.7	1.0	154	3.0	1.0	86

Note: Based on the dataset obtained by using the cleaning procedure detailed in Section 2. We exclude the following sectors: Mining and Public Administration.
Source: Merged SII and Customs database.

imports by *Manufacturing firms* and imports from *Wholesale and Retail Trade*. We do so since we observe a heterogeneous behavior among manufacturing firms acting as direct importers of intermediate goods compared to firms that act as distributors. These firms purchase both finished goods for consumption and intermediate goods sold to domestic

firms to be embedded in their production process.[8] Recent literature is pointing to the differentiated impact of input trade or trade in final goods (see (Comin & Johnson 2020)).

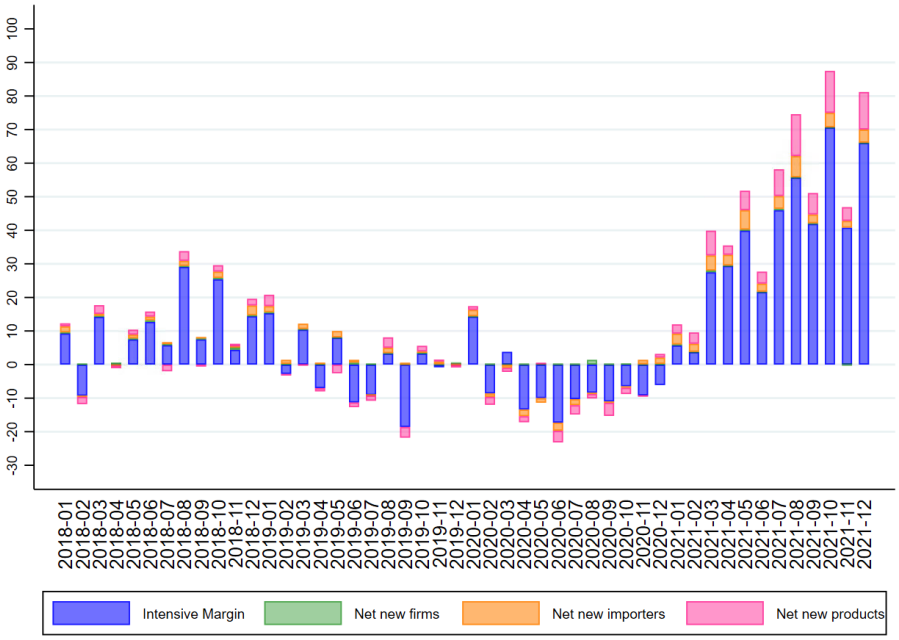
We decompose growth in imports into a within-firm intensive component (blue) and three different net extensive margins: net new firms[9], net new importers, and net new products. We can observe that import dynamics are mainly driven by the intensive margin. Notwithstanding, the extensive margins have played an important role since the start of the lockdown period and along the recovery initiated at the beginning of 2021, led mainly by distributing firms (wholesalers and retailers). The large magnitude of the extensive margin calls for an explicit analysis of the decision to enter/leave additional import markets, i.e., whether it reflects recovering pre-pandemic trading links or new links.

[8] In Figure E.7 we show that the main type of imported goods according to BEC are intermediates goods. A further breakdown shows that a limited fraction of firms act as direct importers and that firms have access to imported inputs through distributors. Indirect importers could be flagged using the information from the "Factura Electrónica" in the same vein as indirect exporters as in Marcel & Vivanco (2021).

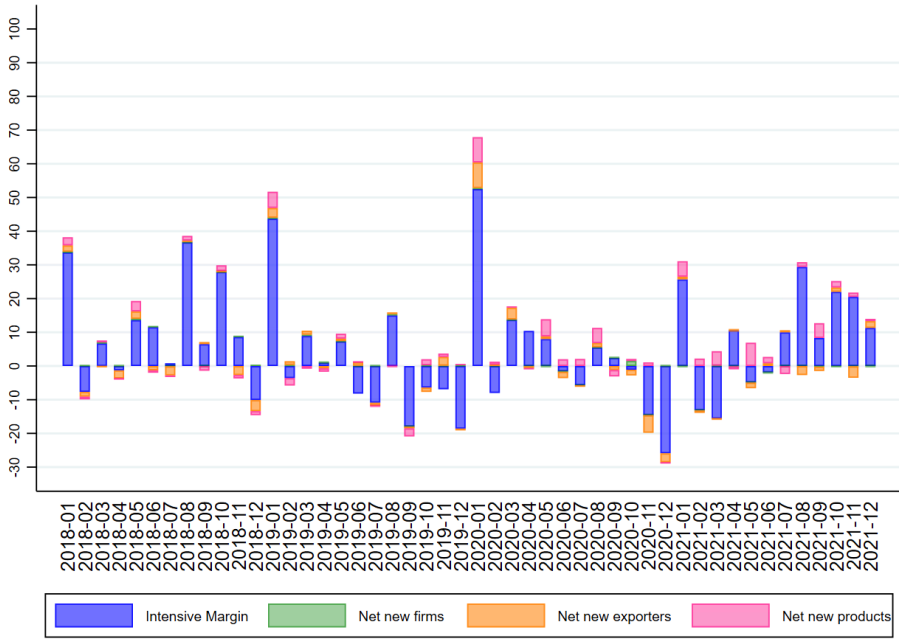
[9] Note that given the monthly frequency of the data it is difficult to capture the new entrant margin as it is not common for a recently founded firm to start import activities the same month it starts its activities, this margin is better captured in annual data.

Figure 2: Import and Export Dynamics: Trade Margins

(a) Imports by firms



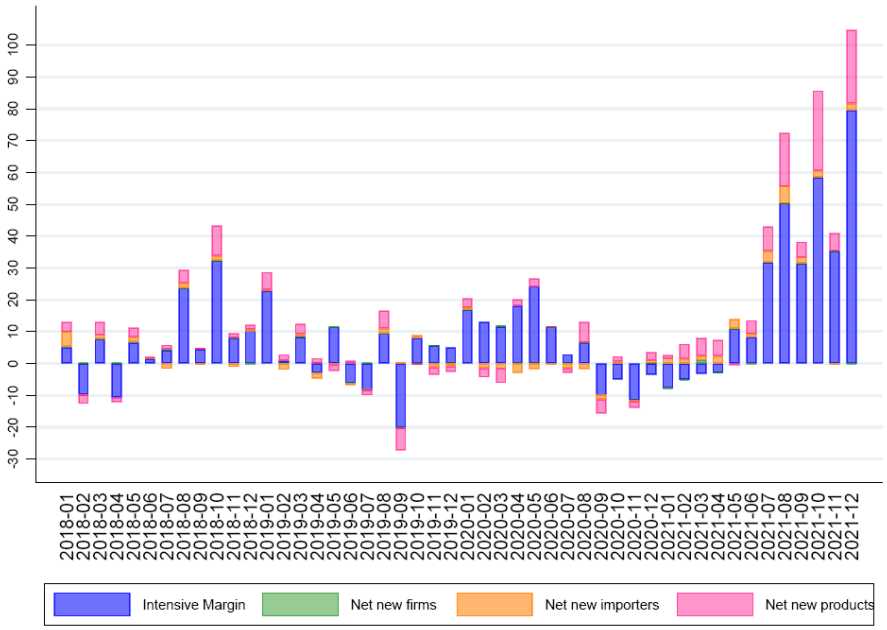
(b) Exports firms



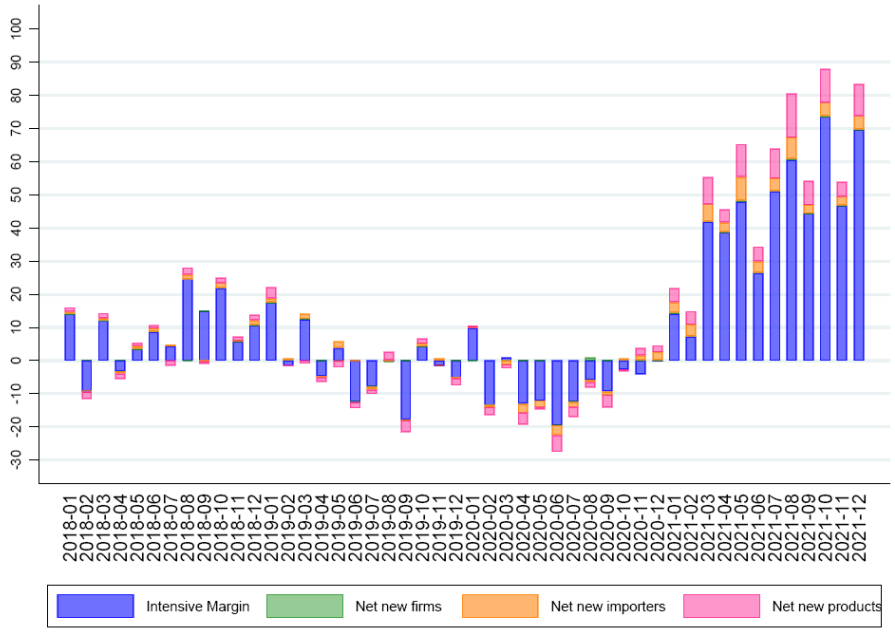
Notes: Decomposition of exports and imports growth rates. The contributions measure in pp increase attributable to different margins. The intensive margin measures (net) growth in exports/imports of products that a firm also imported in the previous period (the previous year, and at the beginning of the sample period analyzed). "New firms" are firms that did not exist and start to trade. "New importers" are firms that did exist in the previous period but did not import. And finally, "New product" are newly imported products. Based on merged dataset after the cleaning procedure detailed in Section 2.
Source: Chile's National Custom Data and own calculations.

Figure 3: Import Dynamics by Sector: Trade Margins

(a) Imports by Manufacturing firms



(b) Imports by Distribution/Wholesale and Retail firms



Notes: Decomposition imports growth rates. The contributions, either positive or negative, measured in pp are attributable to different mechanisms. The intensive margin measures (net) growth in imports of products that the firm also imported during the previous period (the previous year, and at the beginning of the sample period analyzed). "New firms" are firms that did not exist and had not started to trade. "New importer" are firms that did exist in the previous period but did not import. And finally, "New product" are newly imported products. Based on the dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: Mining and Public Administration. In *Unidades de Fomento*. In Appendix C we breakdown the sample according the size of firms.
Source: Chile's National Custom Data and own calculations.

The firm's extensive margin—measured by net new importers (in orange)—registered reductions in both manufacturing and distribution firms throughout 2020. This indicates that based on net value, more firms stopped their importing activities completely. The product's extensive margin consistently shrank more in distribution firms than in manufacturing firms. However, at the end of 2020, the recovery of imports was stronger in wholesalers and retailing firms, possibly driven by domestic demand and the greater liquidity available to households due to aid given during the pandemic.

Figure 3 illustrates the within-firm changes in the mix of imported varieties and supplier countries, regardless of whether other importers drop those same varieties, play a significant role in trade adjustment.

3.3 A Focus on Varieties

In Table 2, we report the main stylized facts for Chilean firms in terms of traded varieties in 2018. That year firms imported from up to 42 countries and exported to 86 destinations. However, on average, firms that engage in trading activities imported from 1.8 and exported to 3 countries. This hints that there is substantial heterogeneity in the number of international links. Given the observed contribution of the extensive margin on products in Figure 3, especially in small and medium firms (SMEs) (see Figure C.4), we exploit the information on imported products at the firm level.

We estimate the following specification at the firm level:

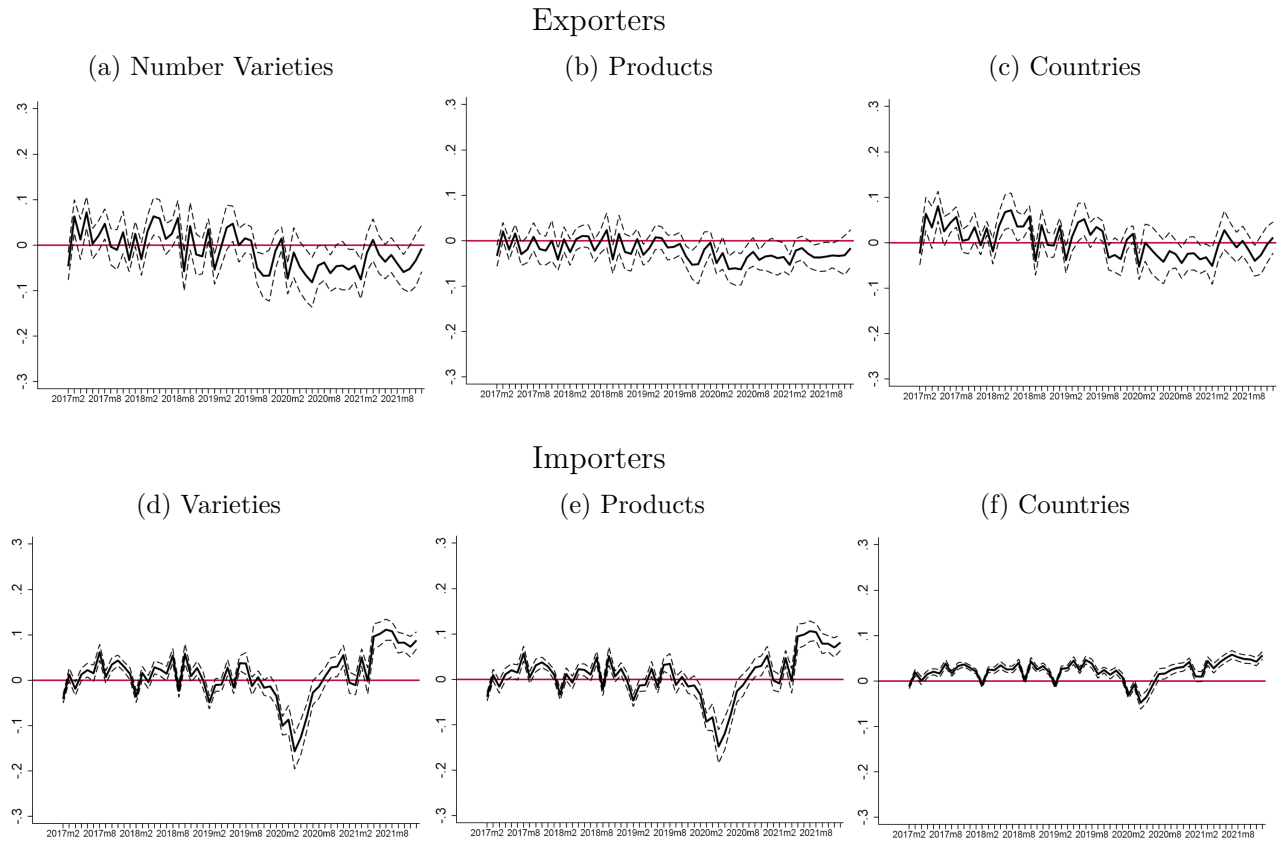
$$lnx_{it} = \nu_i + \beta_t + \gamma_X X_{it} + \epsilon_{it}, \tag{1}$$

where x_{it} is the number of varieties, the number of products or number of countries, ν_i firm fixed-effects and $\gamma_X X_{it}$ captures the control variables. We drop the time dummy for January 2017 and use it as the benchmark average value. The coefficients β_t are the monthly dummies in a regression where the dependent variable is either the (log) number of export or import varieties by each firm. A positive and rising β_t implies that varieties are increasing over time, while a negative β_t implies that they are decreasing.

In Figure 4 we plot the monthly time dummies at the firm-level of the average (ln)number of varieties. We consider variety as the combination of a product and a country of origin. The evolution of the monthly-time dummies suggests that firms, on average, imported fewer import varieties at the start of the pandemic but recovered quickly to pre-crisis levels. When looking at the behavior of exporting firms we can observe that, on average, firms reduced the number of varieties, but to a lesser extent, and this was mainly driven by the number of destination countries. As for the sample mean, the number of import varieties declined by 0.15 log points in March 2020 compared to

early 2017.

Figure 4: Number of Exported/Imported Varieties



Notes: Graphs plot the monthly time dummy coefficients by estimating the following equation: $lnx_{it} = \nu_i + \beta_t + \gamma_X X_{it} + \epsilon_{it}$, where x_{it} is the number of varieties, the number of products or number of countries, ν_i firm fixed-effects and $\gamma_X X_{it}$ captures the control. The coefficient β_t represents the monthly dummies in a regression of the number of varieties exported or imported. **Exports:** a small decline in the average number of products exported, mainly driven by the number of destinations. **Imports:** a sharp decline in the number of products. The dashed lines indicate 95% confidence intervals.
Sources: Merged SII and Customs and own calculations.

We also find substantial heterogeneity when considering the size of firms (see Figure D.5), as large firms show the largest declines in varieties for a longer time period, while SMEs showed rapid recovery. This difference may be due to the fact that the SMEs were the firms that mostly accessed the support policies deployed by the Chilean authorities to mitigate the economic impacts of the COVID-19 crisis. Two of these policies were directly aimed at firms: the FOGAPE-COVID program of state guarantees for loans to firms, and the Employment Protection Law (LPE in Spanish) that allowed firms to temporarily suspend relations with their workers. Since its inception (May 2020), a large proportion of firms massively accessed the FOGAPE-COVID credit program. Most were SMEs, with the Commerce (Wholesale/Retail) and Manufacturing industry sectors leading access. The evidence also shows that firms that accessed the FOGAPE program at the beginning of the COVID-19 pandemic experienced a faster recovery in their sales

than those that did not access it. It was the same for firms that had at least one worker under the LPE (see Monetary Policy Report December 2021, Central Bank of Chile).

Graphs in Figure 4 also serve to explore the idea of whether and to what extent the reduction of import varieties does not need to imply an impact on production costs under the scenario where there is a similar reduction in final good varieties. It can be the case that a multiproduct firm reduces its number of output varieties. By looking at the number of exported varieties we do not observe a decline in the same proportion as the decline in imported input varieties.[10]

4 Unit Values

Now we turn to analyze the behavior of import prices during this period. Import prices can be used to proxy import costs and to analyze whether firms faced cost-push shocks and whether they were paid or instead had to find alternative supply sources. In the first step we compute the unit values for each transaction as follows:

$$\mathrm{p}_{ijkt}^{(mx)} \approx \mathrm{uv}_{ijkt}^{(mx)} = \frac{\mathrm{value}_{ijkt}}{\mathrm{quantity}_{ijkt}},$$

where $p_{ijkt}^{(mx)}$ stands for the export (import) price of product k to (from) destination (origin) j at time t for each firm i.

For each firm i we compute each firm's marginal cost using the unit values:

$$mc_{it} = \sum_{j \in J_{f,t}} \sum_{k \in K_{f,t}} \omega_{ijkt} uv_{ijkt}, \tag{2}$$

from all source countries weighted by respective expenditure shares as in Amiti et al. (2014). Where uv_{ijkt} is the price in USD (unit value) of firm i imports of intermediate good k from country j at time t, the weights ω_{ijkt} accounts for the average share between period t and t-1 of import values in the firm's total variable costs, and $K_{f,t}$ and $J_{f,t}$ denote the set of all imported goods and import source countries for the firm at a given time. Note that this measure of the marginal cost is still a proxy since it does not reflect the costs of domestic inputs and firm productivity.

Similarly to the exercise done to the number of imported/exported varieties, we explore how the average unit values faced by firms evolved. In Figure 5 we plot the time dummies from firm level regressions.[11] It can be observed that there was a sharp increase in the average cost of imports at the start of the lockdowns by mid March 2020, followed

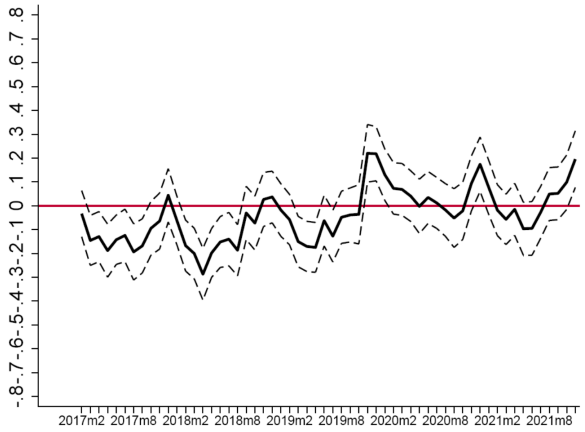
[10] These evidence has been highlighted by Gopinath & Neiman (2014) for the Argentinian case in 2002 devaluation.

[11] We apply fixed effects, and errors are clustered at the industry level.

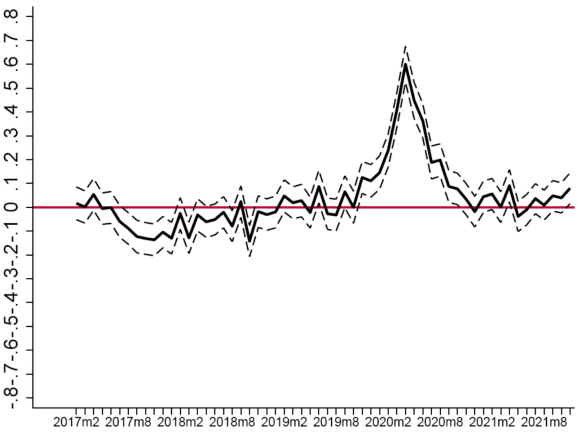
Figure 5: Impact on (average) Unit Values

Full Sample - in CLP

(a) Exports

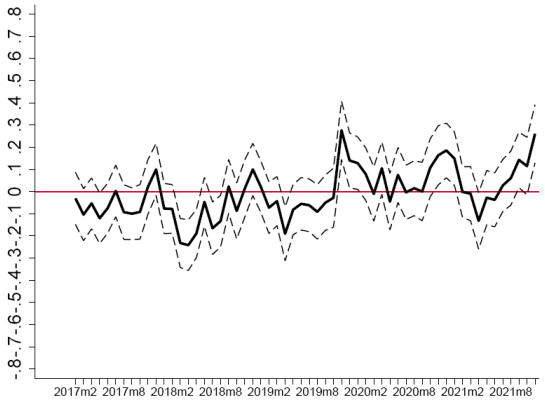


(b) Imports

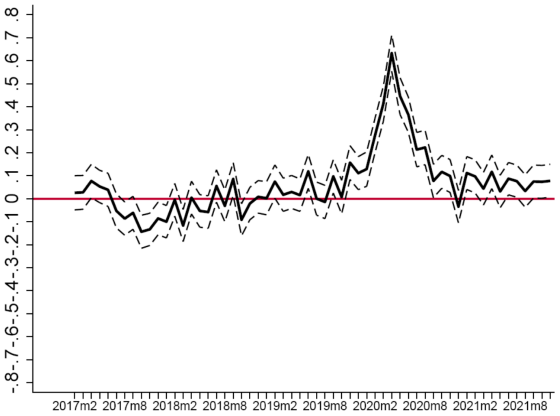


Permanent Sample - in CLP

(c) Exports

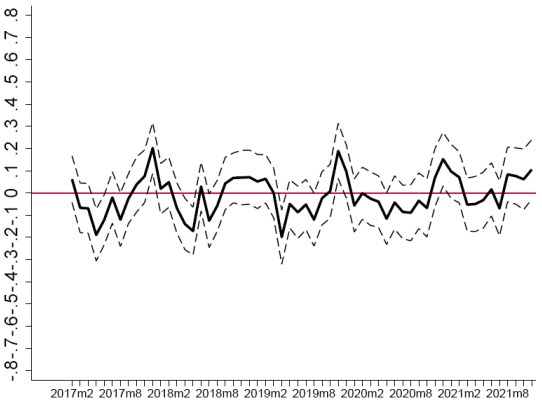


(d) Imports

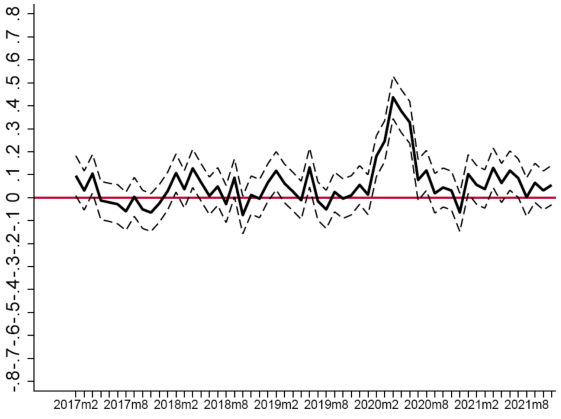


Permanent Sample - in USD

(e) Exports



(f) Imports



Notes: Shows the impact on unit values of exports and imports. It can be observed that before the COVID-19 crisis, the β_t coefficients are consistently close to zero and statistically indistinguishable from zero. At the start of the crisis, the average unit values of imports faced by firms increased substantially.

by a return to pre-pandemic levels. The Chilean peso (CLP) depreciated against the USD throughout this period, which would increase the price of imported inputs. To address this potential problem, we run the regressions with unit values expressed in CLP and in USD and keep the permanent sample so as to avoid compositional effects. Regarding the behavior export unit value, a different pattern is observed, as it remains stable over time.

5 Empirical analysis

After providing stylized facts with this rich administrative data we want to explore the role of some possible explanatory variables. In the previous section we made use of firm level regressions, in this section we turn to analyze the firm-product level.

Firstly we explore whether the health situation or stringency measures taken by partner countries has affected import and export developments. As shown in Figure 6 the evolution of the health situation and measures taken by each government has been quite heterogeneous over time. An important distinction between our paper and the existing empirical literature is that we use both COVID-19 incidence and policy indicators while most existing papers focus on one or the other. While COVID-19 incidence measures are an intuitive proxy for the impact of the pandemic, it is well known that lock-downs (of various degrees of stringency) are implemented as a reaction to the pandemic, often exactly when the number of cases/deaths is high or is expected to rise soon. As a result, studying either variable in isolation can lead to misleading results, for example with large negative effects associated to Covid-19 cases/deaths due to the omission of lock-down measures and vice-versa. Our estimation framework is similar to Liu et al. (2022), with measures of a country's own COVID incidence, own lockdown restrictions, and the same variables for the country's main trading partners. We also take full advantage of the highly-detailed data and its monthly frequency, therefore we can exploit additional information on the importer firms characteristics.

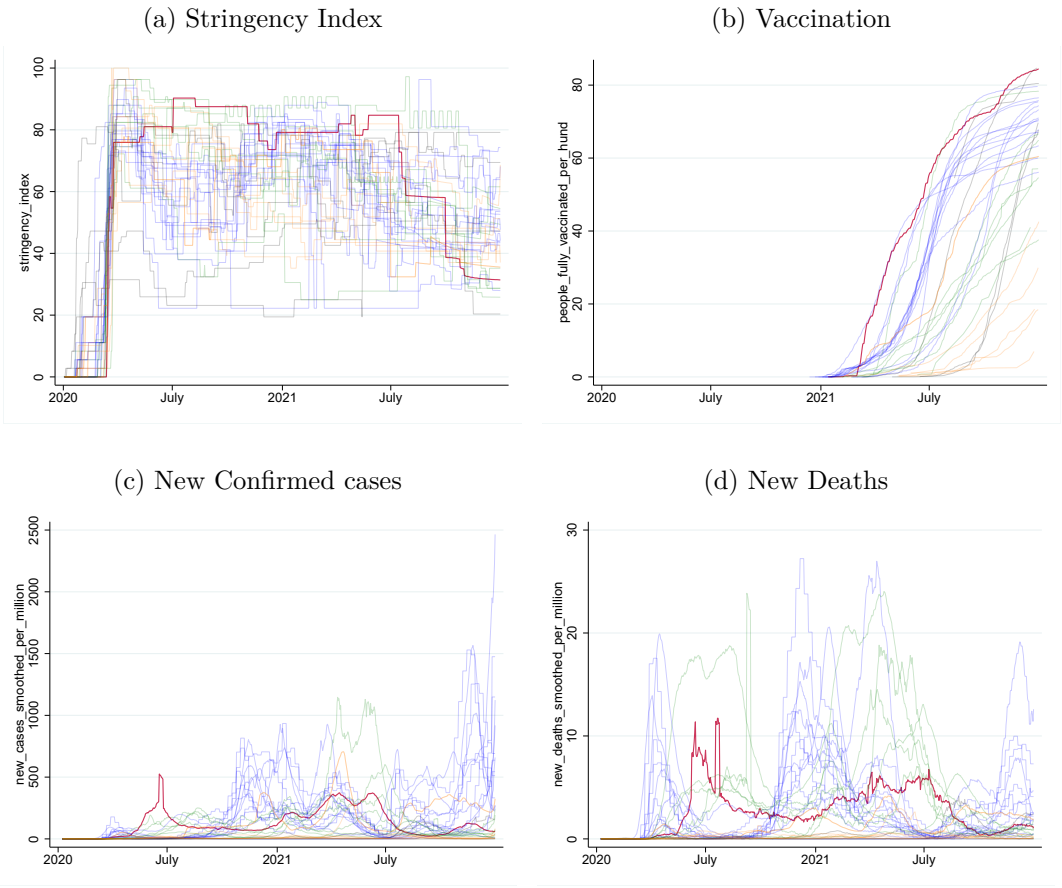
5.1 Firm-product regressions.

For each firm we run the following specification:

$$\begin{aligned} \Delta \mathrm{X}_{ijkt} \quad = \quad & \\ & \beta_1 \mathrm{Stringency}_{jt} + \beta_2 \mathrm{COVIDC}_{jt} + \\ & \beta_3 \mathrm{Stringency}_{\mathrm{chl},t} + \beta_4 \mathrm{COVIDC}_{\mathrm{chl},t} + \\ & \alpha_{jk} + \sigma_i + m_t a_t + \varepsilon_{ijkt}, \end{aligned} \tag{3}$$

where the dependent variable, $\Delta \mathrm{X}_{ijkt+h}$ is the h (if 1 monthly, if 12 yearly) variation of

Figure 6: Stringency index and health situation 2020/21



Notes: In panel (a) the stringency index, in panel (b) the share of population fully vaccinated. In panel (c) new confirmed cases per million (smoothed) and in panel (d) the number of new deaths per million (smoothed). Chilean figures are shown in red versus all other countries in the sample, in blue developed countries, in green Latin American economies and in orange Asian economies.
Source: Oxford COVID tracker and Our World in Data (OWID)
https://ourworldindata.org/covid-deaths.

X, which can be: (i) imports values or (ii) exports export values by firm i, of product k from/to country j. In sum, we consider the h month import/export growth in month t of each exporter i for each destination-product pair j, k.

The dependent variable growth rates are computed as a mid-point so as to keep symmetric growth rates to lie in the closed interval $[-2, 2]$ so as to avoid extreme statistical outliers when some outcome drops close to zero.[12] The mid-point growth is computed as follows:

[12]This metric allows to account for the extensive margins, compared to the common growth calculation. In addition the individual growth rates adds up to the aggregate growth rate. For more details on the advantages of using this metric see Bricongne, J.C., Carluccio, J. , Fotagnè, L., Gaulier G. and Stumpner, S (2023)

$$\Delta \mathrm{X}_{ijkt} = \frac{x_{ijkt} - x_{ijkt-h}}{1/2(x_{ijkt} + x_{ijkt-h})}, \tag{4}$$

where t is a monthly time index, $h = 1$ for monthly growth rates, and $h = 12$ for yearly (12-month) growth rates. Mid-point growths allows to take into account entry and exit at the product-country-level that is frequent in this type of datasets.

We explore the effects of stringency measures set in trading partners j on firms import activity. We use the index constructed by Hale et al. (2021). This $Stringency_{jt}$ measure, which lies between 0 and 1, is based on a subset of sub-indexes which ranges from stay at home requirements, school closures to restrictions on international travelling.[13]

Given that policy measures may not provide a complete picture of the underlying health situation we also control for the health situation in terms of cases by taking into account "the number of new cases per million" ($COVIDC_{jt}$) and as an alternative to "new deaths per thousand" ($COVIDD_{jt}$).[14]

We also control for the local health conditions $Stringency_{\mathrm{chl},t}$ and $COVIDC_{\mathrm{chl},t}$ to capture the fact that they can affect imports through channels that are not related to the containment measures of trading partners. These can encompass lockdowns imposed locally that, for example, can disrupt the ability of domestic ports to receive imports or voluntary isolation or depressed consumer confidence which can affect demand.

Fixed effects and controls.– To control for other contemporaneous shocks and characteristics, we rely on a large set of fixed effects.

- We consider a set of fixed effects at the country-product-month level (α_{jk}), which represents any factor that affects imports from a particular country-product pair in the same way over the months of a year. These effects capture differences in imports due to specific characteristics of the exporting/importing country, such as its size, and due to specific characteristics of the product, such as those that make it more or less appealing. They also capture similar effects at the country-product level—for example, factors that cause a country to have a particular large or small demand for imports of a specific product. Furthermore, they are allowed to vary over time.
- firm-product (σ_i) we compare the imports behavior of a firm importing the same product in the same month with a trading partner that has increased its stringency measures compared to a country of origin not taking any additional measures.

[13] Raw data can be retrieved from the Oxford COVID tracker https://www.bsg.ox.ac.uk/research/research-projects/COVID-19-government-response-tracker.

[14] These two indicators along 2020 where highly correlated, but since the introduction of the vaccines in 2021 the proportion of deaths to cases has declined. When using ($COVIDD_{jt}$) results are similar in terms of sign and significance.

- firm-country different products coming from the same country.
- In turn, m_t refers to time (year-month) fixed effects, which capture worldwide and Chilean-specific macro and health factors, as well as seasonal elements.

With this wide set of fixed effects, the variation that our coefficients capture comes only from within-country or within country-product pairs over time.

To sum up, the sources of variation that we exploit are the following:

- The evolution over time of lockdown policies and health conditions as imposed by trading partners.
- The heterogeneity in trade exposures by each firm prior to the crisis.

6 Results

In Table 3 we report the results from our baseline specification in Equation 3. We assess the impact on the year-on-year log difference of imports at the six-digit (HS6) product level from each partner country on a monthly basis. Column (1) reports the baseline results with the estimates of the effect on the health situation and the lockdown measures taken in Chile. This provides information on the correlation between import growth and domestic conditions. This also provides information on the extent to which import developments are domestically demand driven. In column (2) we explore the role of the health situation and restrictions imposed by the local authorities on each trading partner country. This may proxy international sourcing disruptions. All the coefficients are negative and statistically significant, meaning that they have a negative effect on import growth from a country of origin that is facing an increase in the number of cases and is imposing restrictions. In column (3) we include both domestic and partner country controls. The impact on import growth remains negative and significant. In all three of these specifications, we include a control for the exchange rate of the CLP against the USD as a year on year change to capture the role of exchange rate developments. Although statistically significant, quantitatively it has a limited impact.

As anticipated in Section 5 we make use of several controls and fixed effects. In column (4) we control for firm (α_i) and year (α_t) fixed effects, in column (5) we add for product (α_k) fixed effects , in column (6) for product effects (α_j) and in column (7) for country-product fixed effect (α_{jk}). The coefficients associated with the variables of interest show some changes.[15]

[15]Given that our dataset is at the firm-product level we also control for the firm's ID. This will allow us to compare firms importing the same product from countries which are differentiated by the degree and the health measures taken by the trading partner. For this regression we will make use of a sub-sample where we just keep firms import from at least two countries of origin.

Table 4 explores the impact of COVID-19 containment measures on exports. Domestic containment measures had a significant effect on exports, but containment measures in the partner country or the number of cases did not have a significant impact on exports.

Table 3: Baseline Regression
Lockdown spillovers effect on import growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Δ Import_ijkt	Δ Import_ijkt	Δ Import_ijkt	Δ Import_ijkt	Δ Import_ijkt	Δ Import_ijkt	Δ Import_ijkt
$COVIDC_{chl}$	-0.522***		-0.450***	-0.385***	-0.370***	-0.375***	-0.373***
	(0.033)		(0.042)	(0.042)	(0.044)	(0.043)	(0.055)
$Stringency_{chl}$	-0.316***		-0.403***	-0.151***	-0.170***	-0.143***	-0.148***
	(0.014)		(0.023)	(0.031)	(0.033)	(0.032)	(0.056)
$COVIDC_j$		-0.048**	-0.192***	-0.134***	-0.135***	-0.125***	-0.127*
		(0.022)	(0.023)	(0.026)	(0.030)	(0.029)	(0.064)
$Stringency_j$		-0.176***	0.194***	0.057*	0.060	0.034	0.036
		(0.018)	(0.025)	(0.034)	(0.038)	(0.037)	(0.081)
$log(tc\_d12)$	-0.007***	0.000	-0.005***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	647,320	443,213	435,054	430,773	423,979	430,771	430,461
R-squared	0.002	0.000	0.002	0.041	0.086	0.041	0.050
number of firms	21718	15646	15525	11244	10990	11244	11226
number of products	4023	3841	3837	3794	3375	3794	3501
Firm FE				✓	✓	✓	✓
Year FE				✓	✓	✓	✓
Country FE						✓	✓
Product FE					✓		✓

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: The dependent variable is the mid-point year-over-year growth between an import from firm i of product k from country j in month t of 2020 compared to the corresponding import value in the same month of 2019, divided by the average sum and multiplied by 100. *Stringency* accounts for the lockdown index in Chile and in the partner country j, this index is re-scaled to be between 0 and 1. $COVIDC$ is the confirmed cases per thousand people in the population in each month. $COVIDC_{chl}$ controls for the health situation in Chile and $COVIDC_j$ for the situation in partner country j. Various set of country (α_j), HS6 product (α_k), or country*HS6 (α_{jk}) fixed effects are included. Robust standard errors, in parentheses, are clustered at the HS6 product level in the first three regressions (at country-HS6 level in the last regression).

Table 4: Baseline Regression
Lockdown spillovers effect on export growth

	(1)	(2)
VARIABLES	Δ Export_ijkt	Δ Export_ijkt
$COVIDC_{chl}$	-0.121	
	(0.144)	
$Stringency_{chl}$	0.027	
	(0.067)	
$COVIDC_j$		-0.098
		(0.146)
$Stringency_j$		0.079
		(0.072)
$log(tc\_d12)$	0.016***	0.016***
	(0.002)	(0.002)
Observations	106,035	101,254
R-squared	0.039	0.040
number of firms	2557	2518
number of products	1839	1807
Firm FE	✓	✓
Year FE	✓	✓
Product FE	✓	✓

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: The dependent variable is the mid-point year-over-year growth between an export from firm i of product k from country i in month t of 2020 compared to the corresponding export value in the same month of 2019, divided by the average sum and multiplied by 100. *Stringency* accounts for the lockdown index in Chile and in the partner country j, this index is re-scaled to be between 0 and 1. $COVIDC$ is the confirmed cases per thousand people in the population in each month. $COVIDC_{chl}$ controls for the health situation in Chile and $COVIDC_j$ for the situation in partner country j. Various set of country (α_j), HS6 product (α_k), or country*HS6 (α_{jk}) fixed effects are included. Robust standard errors, in parentheses, are clustered at the HS6 product level in the first three regressions (at country-HS6 level in the last regression).

We explore whether goods respond differently based on their type. We split the sample by type of good according to the Broad Economic Categories (BEC) classification (see Table 5). Foreign indicators keep their sign and significance. Notwithstanding the role of domestic indicators show some variation, with intermediate inputs being more affected by the health situation and imports of consumption goods more related to restrictions imposed by the authorities.

At the firm level, we check whether firms in the manufacturing sector, which are more reliant on intermediate goods, behave differently from firms in the wholesale and retail trading sector which import both final consumer and intermediate goods (see Table 6). We can observe that the impact of contagion cases is much stronger than the stringency measures on Manufacturing firms, possibly as the restrictions were targeted to activities that involve higher social interactions.[16]

Throughout 2020, consumer patterns changed, lockdowns favored the consumption of indoor goods rather than outdoor related goods. To explore whether there are differences we use the classification proposed by de Lucio et al. (2022) and it can be observed that imports of indoor related goods sharply increased while outdoor ones sharply declined (see Figure E.12). When breaking the sample into these two types of goods in the regression we observe that domestic indicators, specially stringency measures, had a higher impact on indoor goods (see Table 7).

Finally, we explore the role of firm size in Table 8. As expected, the number of observations are concentrated within large firms, as shown previously in the stylized facts large firms are more likely to trade. Small firms are less affected by health conditions. Medium sized firms are affected by domestic health conditions and trading partner stringency conditions. Finally, large firms maintained the negative sign and significance in all the indicators.

[16] Another avenue to explore is the ability by firms to substitute inputs for production it will much depend on its degree of specificity. To explore this the classification proposed by Rauch (1999) can by used in line with other works that have explored the role of input specificity such as Barrot & Sauvagnat (2016) and Boehm & Oberfield (2020).

Table 5: Product heterogeneity
Broad Economic Categories (BEC)

VARIABLES	(1) Consumption Δ Import_ijkt	(2) Capital Δ Import_ijkt	(3) Intermediates Δ Import_ijkt
$COVIDC_{chl}$	-0.500***	-0.193**	-0.392***
	(0.132)	(0.092)	(0.056)
$Stringency_{chl}$	-0.344**	-0.198***	-0.094
	(0.132)	(0.054)	(0.066)
$COVIDC_j$	0.007	-0.100*	-0.168**
	(0.101)	(0.057)	(0.082)
$Stringency_j$	0.043	0.179*	-0.002
	(0.158)	(0.107)	(0.086)
$log(tc\_d12)$	-0.002	0.005**	0.008***
	(0.003)	(0.002)	(0.001)
Observations	78,225	89,721	259,675
R-squared	0.095	0.051	0.054
number of firms	4371	3207	7981
number of products	766	504	2207
Country FE	✓	✓	✓
Product FE	✓	✓	✓
Year FE	✓	✓	✓
Firm FE	✓	✓	✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: This table presents the estimates from panel regressions of firm's import growth relative to the same month in the previous year using a set of variables accounting for the health situation due to COVID-19. The sample is broken down according to the type of good imported following the Broad Economic Categories (BEC): [1] consumption , [2] capital and [3] intermediates.

Table 6: Firm level heterogeneity: Manufacturing vs. Distributors

	(1)	(2)
	Manuf	Distributors
VARIABLES	Δ Import_ijkt	Δ Import_ijkt
$COVIDC_{chl}$	-0.281**	-0.430***
	(0.122)	(0.070)
$Stringency_{chl}$	-0.035	-0.186***
	(0.075)	(0.066)
$COVIDC\_j$	-0.094	-0.140*
	(0.089)	(0.077)
$Stringency\_j$	-0.046	0.037
	(0.106)	(0.088)
$log(tc\_d12)$	0.011***	0.004***
	(0.002)	(0.001)
Observations	82,804	313,428
R-squared	0.062	0.050
number of firms	1908	6962
number of products	2193	3103
Country FE	✓	✓
Product FE	✓	✓
Year FE	✓	✓
Firm FE	✓	✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table presents the estimates of firms in the manufacturing sector and firms in the distribution sector.

7 Conclusions

In this paper we have analyzed how Chilean firms have performed during COVID-19, with a focus on their international trade links. By using firm-level customs data on exports and imports from Chile to and from each trading partner, we carry out the analysis at the firm-product-country level. We found that exports were resilient in 2020, maintaining similar dynamics to that of previous years. However, imports showed a different pattern, with a clear drop at the beginning of 2020 due to this crisis, followed by a strong recovery in 2021. The granularity of the data allows to dissect the margins through which firms have adjusted their purchases and sales abroad. In a first step we explored the different behavior by firms in terms of the intensive and extensive margins of international trade, with the aim of capturing the sources of adjustment during this episode. We find that firms primarily adjusted through the intensive margin, i.e. reducing the intensity of their purchases from the same variety (defined as the product-partner country), and through the extensive margin, either dropping/adding varieties or by stopping/starting the international trade activity. We observe a differentiated pattern from manufacturing firms and firms in the distribution sector and by firm size, where the small and medium firms (SMEs) relied more heavily on the extensive margins to adjust their trade volumes. When we exploit the information on imported products at the firm level and consider the

Table 7: Product level heterogeneity: Consumption
Indoor vs. Outdoor

VARIABLES	Indoor Δ Import_ijkt	Outdoor Δ Import_ijkt
$COVIDC_{chl}$	-0.468***	-0.702***
	(0.144)	(0.129)
$Stringency_{chl}$	-0.559**	-0.255**
	(0.219)	(0.110)
$COVIDC_j$	0.157	-0.041
	(0.232)	(0.109)
$Stringency_j$	0.086	-0.016
	(0.257)	(0.151)
$log(tc\_d12)$	-0.006	-0.002
	(0.005)	(0.003)
Observations	28,816	58,434
R-squared	0.105	0.089
number of firms	1628	2887
number of products	305	567
Country FE	✓	✓
Product FE	✓	✓
Year FE	✓	✓
Firm FE	✓	✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Sample is breakdown into [1] Indoor and [2] Outdoor consumption goods.

size of firms, we also find heterogeneity: SMEs registered a rapid recovery in varieties. A possible explanation is that SMEs were the ones that had an important participation in at least two of the policies aimed at firms to respond to the COVID-19 crisis (the FOGAPE-COVID credit program and the Employment Protection Law - LPE in Spanish). Notwithstanding, the share of total imports by this type of firm is relatively small (see Figure E.9 in Appendix E.).

Then, by means of regression analysis we exploit time dummies to explore the average behavior of firms in terms of the number of exported and imported varieties and the average costs paid on imported goods. While exports (excluding the Mining sector) were relatively stable, imports registered a more dynamic pattern, a sharp decline in the number of varieties, together with a high average import cost at the beginning of the pandemic but very short lived over time.

In a second step, we explore the role of the health situation and measures taken by partner countries (namely the lockdowns) and explore different sources of heterogeneity such as the type of imported product, the type of firm in terms of size or operating sector. We find, that domestic measures as well as foreign factors have played an important role. The measures taken by trading partners have not been a major source of supply disruptions but we also find some evidence that a higher degree of lockdown by a country's

Table 8: Size heterogeneity: Large vs. SMEs

	(1)	(2)	(3)
	Small	Medium	Large
VARIABLES	Δ Import_ijkt	Δ Import_ijkt	Δ Import_ijkt
$COVIDC_{chl}$	-0.047	-0.403**	-0.402***
	(0.158)	(0.161)	(0.067)
$Stringency_{chl}$	-0.214*	-0.001	-0.173***
	(0.123)	(0.097)	(0.062)
$COVIDC_j$	-0.023	-0.001	-0.151*
	(0.074)	(0.122)	(0.077)
$Stringency_j$	0.080	-0.126	0.064
	(0.117)	(0.112)	(0.086)
$log(tc\_d12)$	-0.004	0.004	0.006***
	(0.003)	(0.003)	(0.001)
Observations	39,940	49,198	340,656
R-squared	0.189	0.108	0.035
number of firms	4873	2551	3662
number of products	1611	1814	3170
Country FE	✓	✓	✓
Product FE	✓	✓	✓
Year FE	✓	✓	✓
Firm FE	✓	✓	✓

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Sample is breakdown by firm size into [1] small, [2] medium and [3] large.

trading partner is also associated with lower import growth, that is to say imports from countries with higher stringency measures imply a reduction of imports. The development of vaccines during 2021 does not seem to be playing a major role for the moment.

In spite of the good process of vaccines, the recovery is posing some challenges and it has been far from a smooth recovery to the "new" normality. Firms are still facing some disruptions, such as the ongoing closures on certain ports, new outbreaks, an uneven pace in global vaccination, the appearance of new variants which are leading to heightened uncertainty. The evidence provided in this article shows the heterogeneous reaction by firms and how shocks propagate using international supplier-customer links. Looking ahead, this type of analysis can extended to evaluate other type of shocks such as climate related events and could also explore the adjustment in the labor market.

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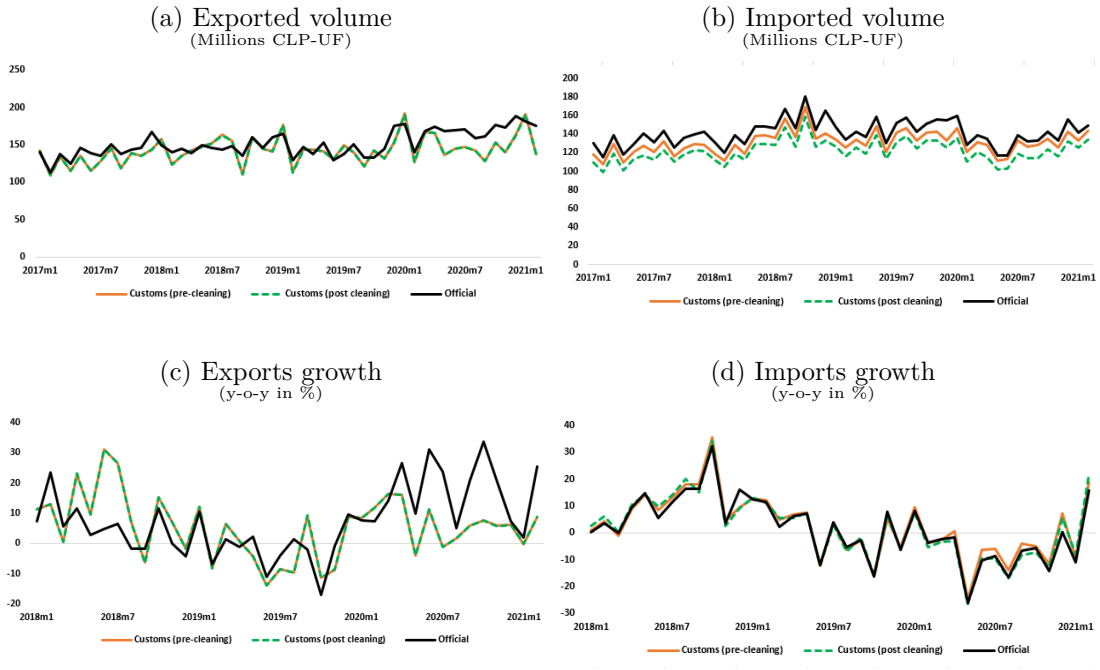
Appendix

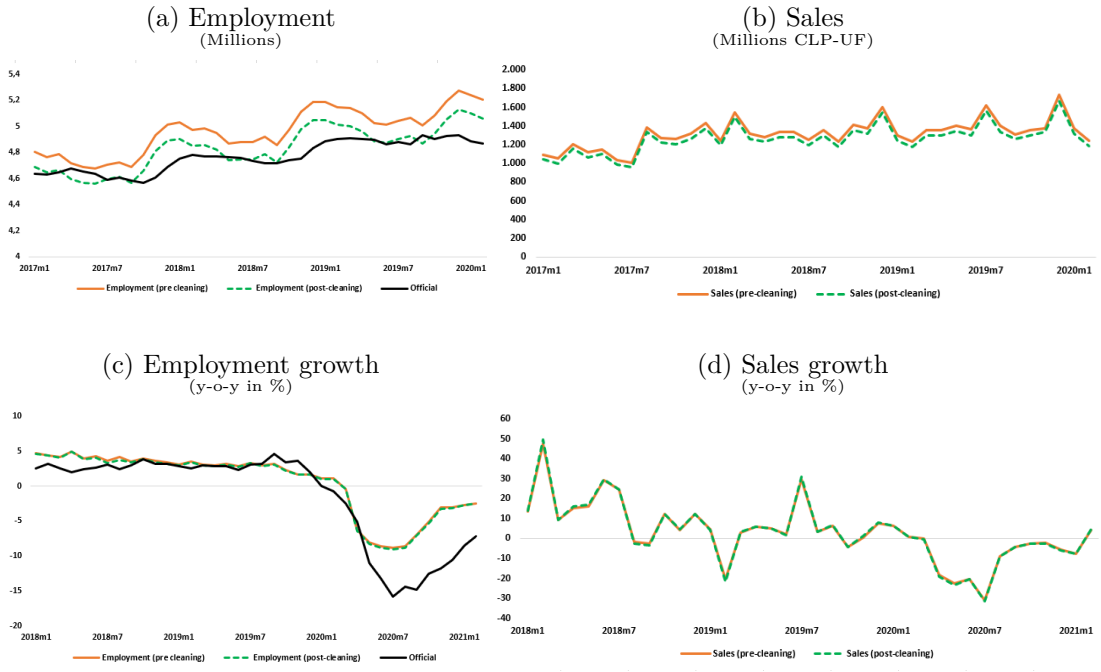
A Data coverage

Figure A.1: Trade Coverage and Dynamics
(before and after cleaning)



Notes: Panels (a) and (b) show the aggregate developments of exports and imports, in million of CLP in constant terms by Chilean firms, before and after the basic cleaning, compared with the official data sources. In panels (c) and (d) we compare year-on-year growth rates of the aggregate official source and aggregates obtained with granular data.
Sources: Chile's National Customs Data.

Figure A.2: Employment and Sales
(before and after cleaning)



Notes: Panels (a) and (b) shows the aggregate evolution of employment (in million) and sales (in million of CLP in constant terms) by Chilean firms, before and after the basic cleaning, compared with the official data sources. In panels (c) and (d) we compare year on year growth rates of the aggregate official source and aggregates obtained with granular data.
Sources: Instituto Nacional de Estadísticas (INE) de Chile and Servicio de Impuestos Internos (SII).

B Summary statistics by firm size

Table B.1: Summary Statistics - 2018
Large firms

	Full sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	199.79	669.23	195.89	663.56	236.90	752.73
Sales (thousands)	77.59	1294.74	57.37	1504.68	125.56	1755.06
Capital per worker (thousands)	0.44	1.04	0.36	1.00	0.57	1.16
Sales per worker (thousands)	0.48	0.61	0.42	0.59	0.56	0.62
Export (thousands)	6.72	85.95	3.02	25.96	14.01	137.94
Export share in output	0.37	0.38	0.55	0.40	0.25	0.32
Imports (thousands)	9.55	136.69	0.00	0.00	25.69	223.38
Import share in materials	0.40	0.30	.	.	0.41	0.30
	Permanent sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	200.57	671.03	196.75	665.43	237.51	754.29
Sales (thousands)	78.24	1303.07	58.01	1516.71	125.88	1760.37
Capital per worker (thousands)	0.43	1.04	0.36	0.99	0.56	1.15
Sales per worker (thousands)	0.48	0.61	0.42	0.59	0.56	0.61
Export (thousands)	6.77	86.48	3.02	26.07	14.08	138.35
Export share in output	0.37	0.38	0.54	0.40	0.25	0.32
Imports (thousands)	9.60	137.52	0.00	0.00	25.63	223.99
Import share in materials	0.40	0.30	.	.	0.41	0.30

Note: We keep only large firms, with an annual turnover above > 100.000 UF.Based on dataset after the cleaning procedure detailed in Section 2. Mining and Public Administration sectors have been excluded. Monetary values are deflated using Unidades de Fomento (UF).
Source: Merged SII and Customs data.

Table B.2: Summary Statistics - 2018
Small and medium-sized enterprises

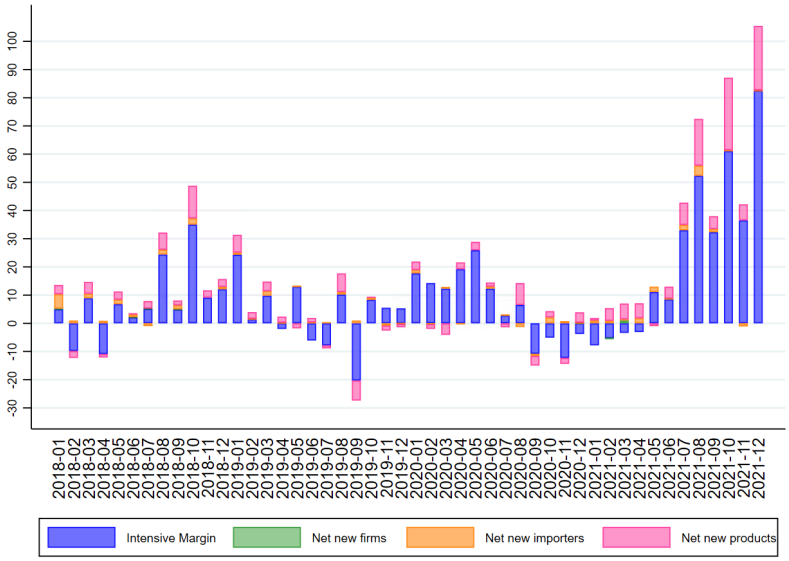
	Full sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	8.10	39.92	7.94	39.39	14.20	55.36
Sales (thousands)	0.48	14.42	0.45	14.31	2.76	18.28
Capital per worker (thousands)	0.27	0.70	0.27	0.70	0.29	0.69
Sales per worker (thousands)	0.17	0.27	0.16	0.26	0.33	0.42
Export (thousands)	0.01	1.55	0.01	1.43	0.14	4.77
Export share in output	0.58	0.39	0.61	0.38	0.36	0.36
Imports (thousands)	0.02	1.22	0.00	0.00	0.89	8.51
Import share in materials	0.54	0.30	.	.	0.53	0.30
	Permanent sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	8.15	29.44	8.00	28.93	13.11	42.78
Sales (thousands)	0.58	16.60	0.54	16.71	2.40	8.52
Capital per worker (thousands)	0.27	0.71	0.27	0.71	0.29	0.69
Sales per worker (thousands)	0.17	0.27	0.17	0.27	0.33	0.42
Export (thousands)	0.02	1.73	0.02	1.74	0.12	1.97
Export share in output	0.55	0.39	0.58	0.38	0.35	0.35
Imports (thousands)	0.02	0.53	0.00	0.00	0.79	3.11
Import share in materials	0.52	0.30	.	.	0.52	0.29

Note: We keep only large firms, with an annual turnover below < 100.000 UF. Based on dataset after the cleaning procedure detailed in **Section 2**. Mining and Public Administration sectors have been excluded. Monetary values are deflated using *Unidades de Fomento* (UF).
Source: Merged SII and Customs data.

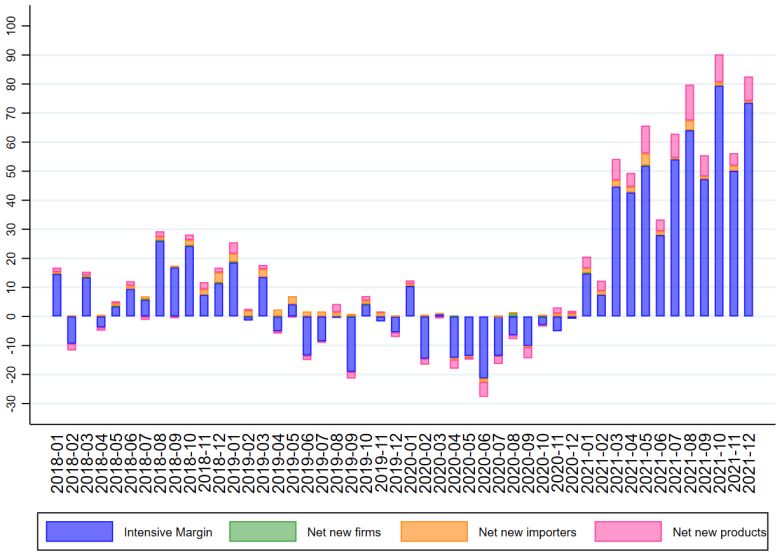
C Import Dynamics by Firm Size

Figure C.3: Import Dynamics - Large firms

(a) Imports by Manufacturing firms



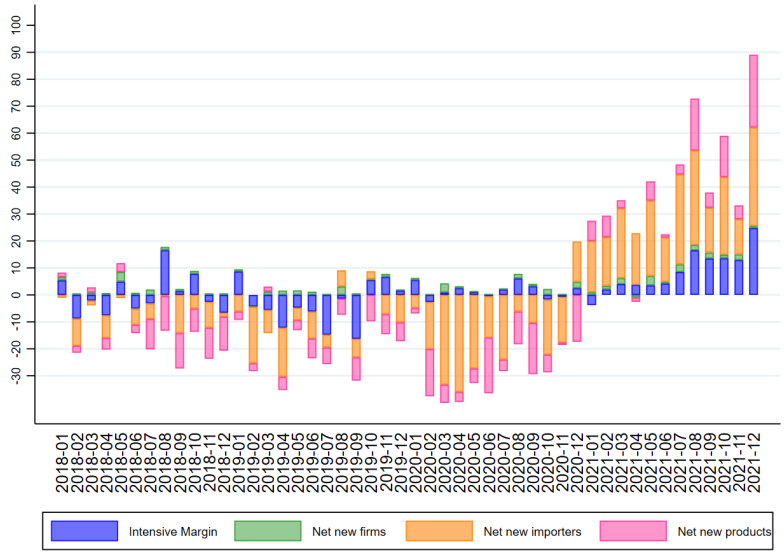
(b) Imports by Distribution/Retail firms



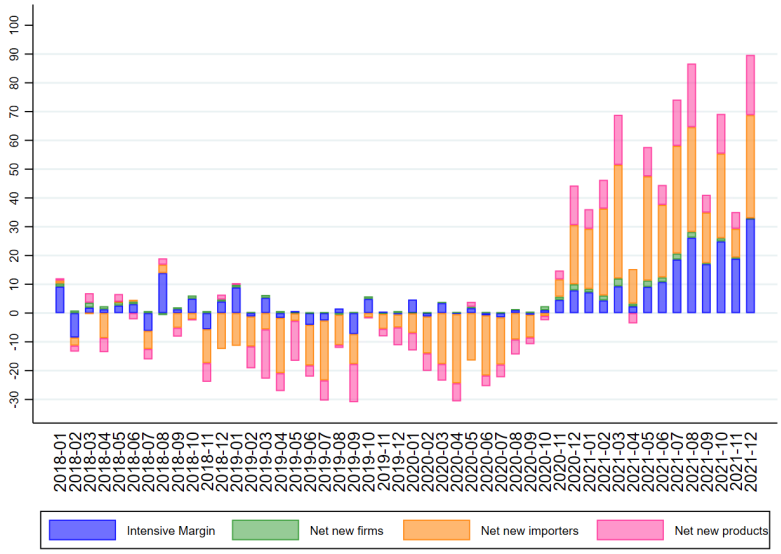
Notes: Decomposition imports growth rates. The contributions measure in pp increase attributable to different mechanisms. The intensive margin measures (net) growth in imports of products that the firm also imported in the previous period (the previous year, and at the beginning of the sample period analyzed). "New firms" are firms that did not exist and start to trade. "New importer" are firms that did exist in the previous period but did not import. And finally, "New product" are newly imported products. Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: Mining and Public Administration. Monetary values are deflated using *Unidades de Fomento*. The within-firm extensive margin or sub-extensive margin play a smaller role in trade dynamics.
Sources: Chile's National Customs Data.

Figure C.4: Import Dynamics - Small and medium-sized enterprises

(a) Imports by Manufacturing firms



(b) Imports by Distribution/Retail firms



Notes: Decomposition imports growth rates. The contributions measure in pp increase attributable to different mechanisms. The intensive margin measures (net) growth in imports of products that the firm also imported in the previous period (the previous year, and at the beginning of the sample period analyzed). "New firms" are firms that did not exist and start to trade. "New importer" are firms that did exist in the previous period but did not import. And finally, "New product" are newly imported products. Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: mining and public administration. Monetary values are deflated using *Unidades de Fomento*. The most prevalent margin of external adjustment in smallest firms is the extensive margin.
Sources: Chile's National Custom Data.

D Number of exported/imported varieties by Firm Size

Figure D.5: (Average) number of imported varieties - Large firms vs. small firms

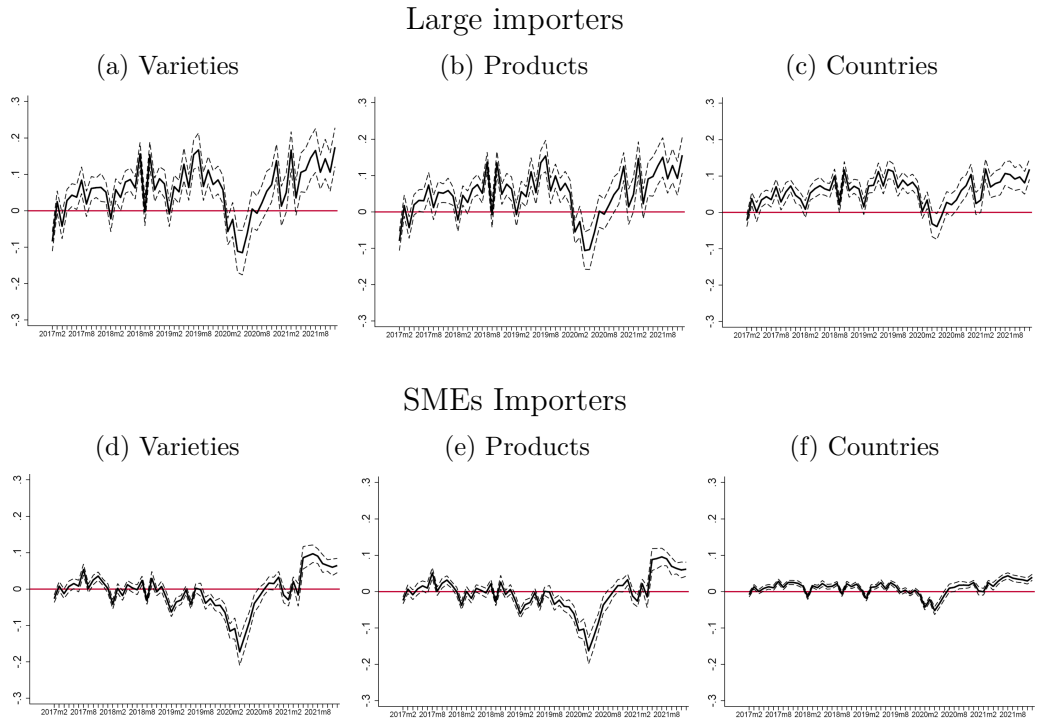
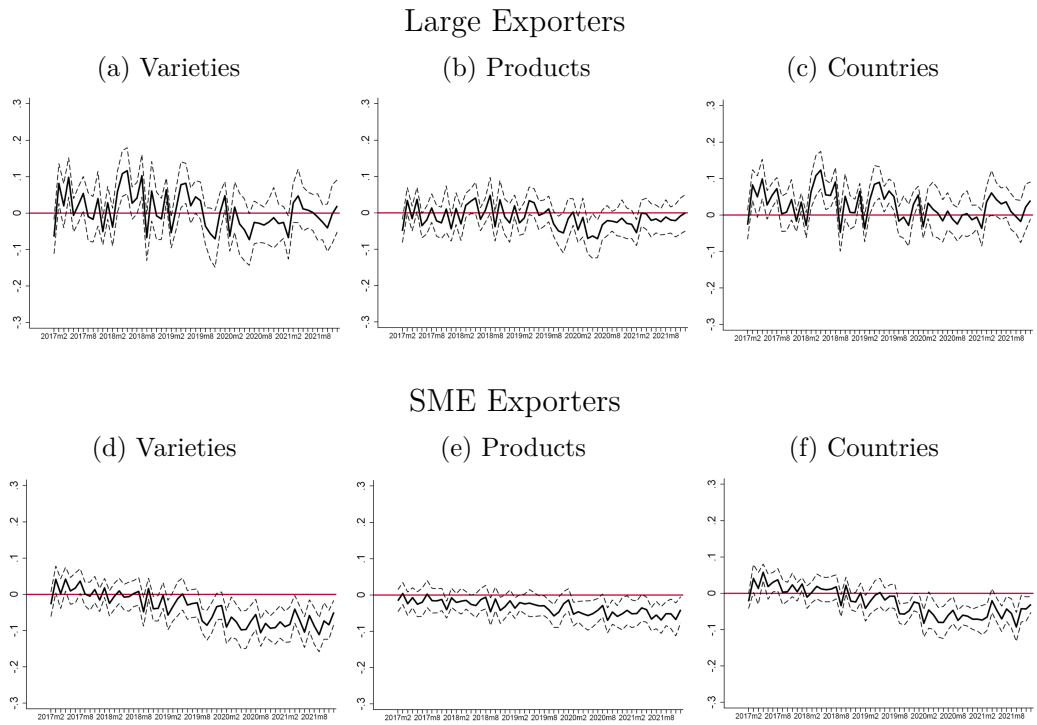


Figure D.6: (Average) number of exported varieties - Large firms vs. small firms



E Additional tables and graphs

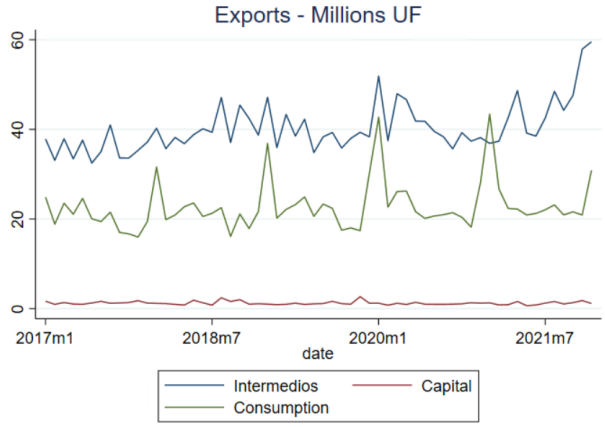
Table E.3: Summary statistics - regression

	Obs	Mean	S.d.	min	max
Δ Import_pkt	714.544	0.16	1.94	-2.00	2.00
CovidC_j	1.865.522	0.15	0.16	0.00	1.44
Stringency_j	1.909.422	0.59	0.19	0.00	1.00
CovidC_chl	2.859.161	0.14	0.11	0.00	0.35
Stringency_chl	2.859.161	0.71	0.19	0.00	0.85
Standardized values of (tc)	4.463.070	3.92	10.37	-18.70	24.58
Observations	4.463.070				

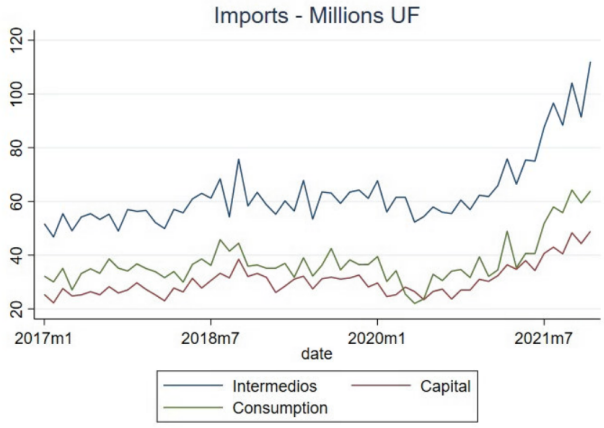
Note: Summary statistics of the variables used in the regressions of Table 3. Confirmed cases are the number of new cases (smoothed) per thousand. The number of observations corresponds to the number of transactions.

Figure E.7: Exports and Imports by Type BEC - Total

(a) Exports



(b) Imports

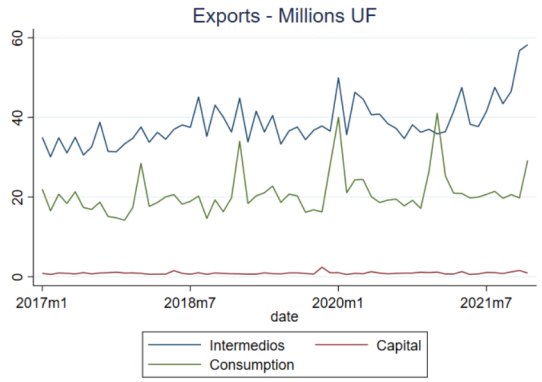


Notes: Trade flows classified according to Broad Economic Categories (BEC). Imports in Panel (b) show that import trade consists primarily of intermediate inputs. Based on dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: Mining and Public Administration.
Sources: Chilean Customs.

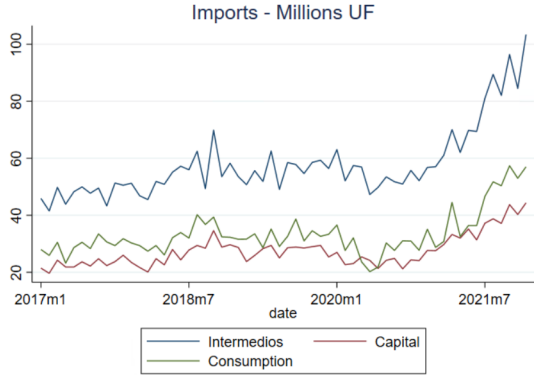
Figure E.8: Exports and Imports by Type BEC and Firm Size

Large firms

(a) Exports

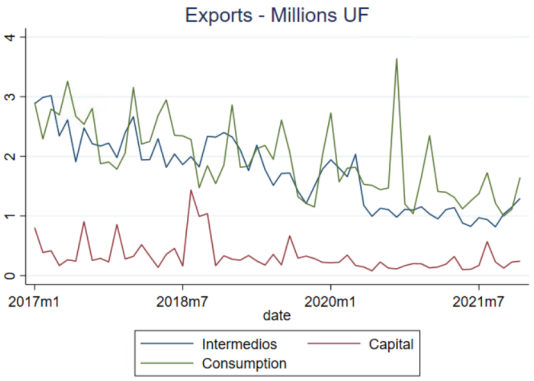


(b) Imports

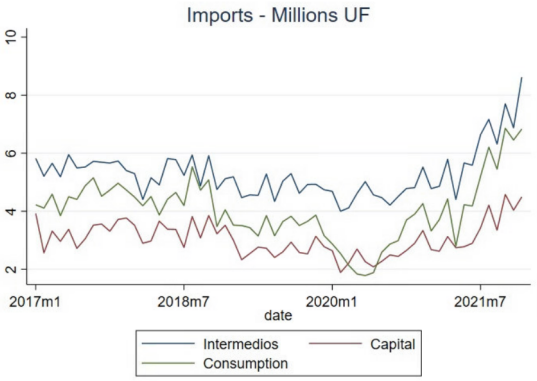


Small and medium-sized enterprises

(c) Exports



(d) Imports

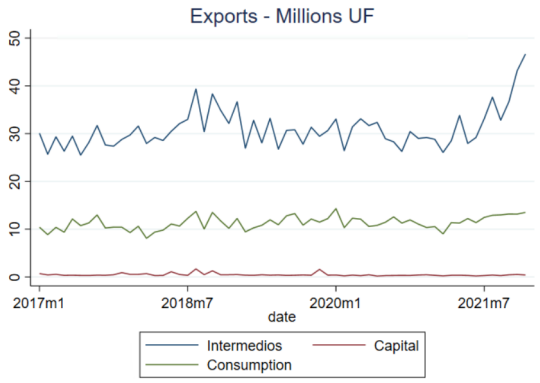


Notes: Based on dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: Mining and Public Administration. Based on Broad Economic Categories (BEC). Imports in Panel (b) show that import trade consists primarily of intermediate inputs as shown the higher share of imports. *Sources:* Chilean Customs.

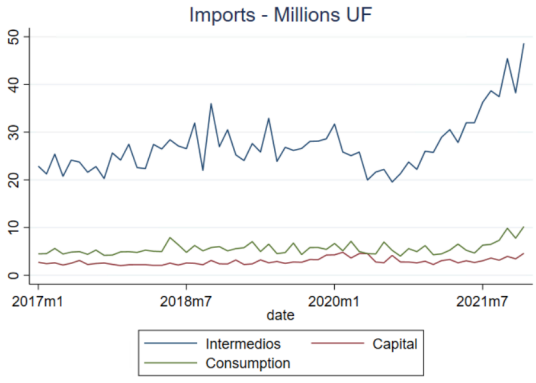
Figure E.9: Exports and Imports by Type BEC and Sector

Manufacturing firms

(a) Exports

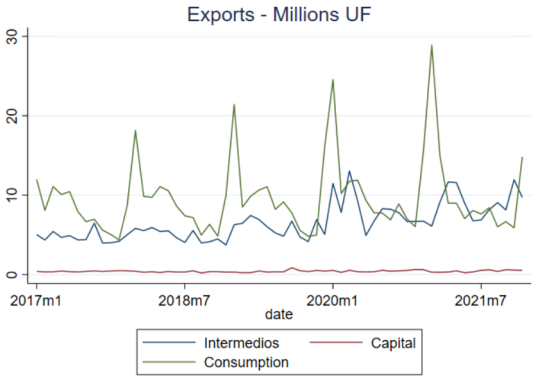


(b) Imports

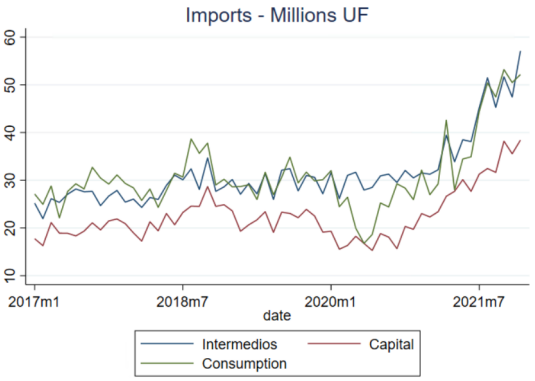


Distribution/retail firms

(c) Exports



(d) Imports



Notes: Based on dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: mining and public administration. Based on Broad Economic Categories (BEC). Imports in Panel (b) show that import trade consists primarily of intermediate inputs as shown the higher share of imports. *Sources:* Chilean Customs.

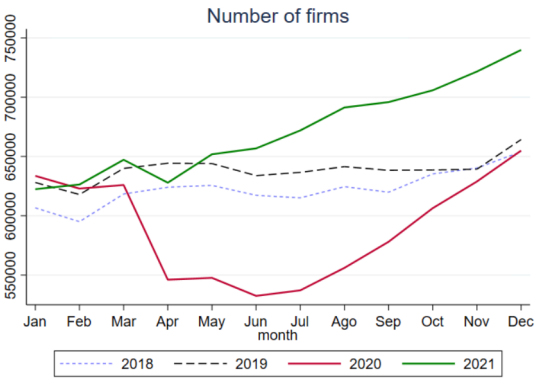
Figure E.10: Number of Firms

(a) Only exporters

(b) Only importers

(c) Two-way traders

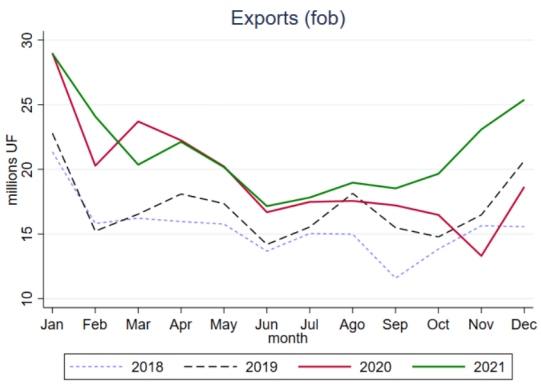
(d) Do not Export - Import



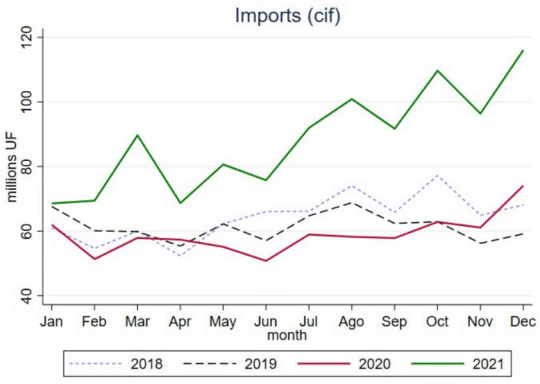
Notes: Panel (a) reports the number of firms that only report exporting activity. In Panel (b) the number of firms that only import and in Panel (c) firms that declare to participate on both types of activity. In Panel (d) the number of firms that neither export nor import. Based on dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: Mining and Public Administration.
Sources: Chilean Customs.

Figure E.11: Exported/imported Volumes by type of firm

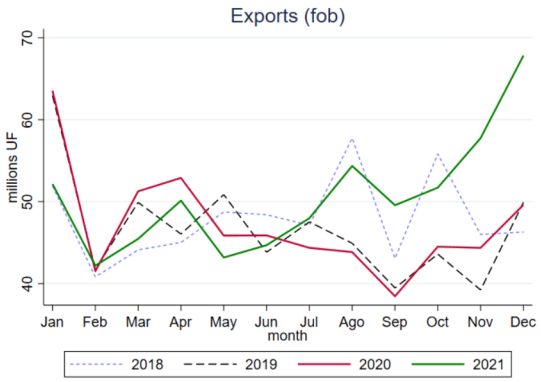
(a) Only exporters



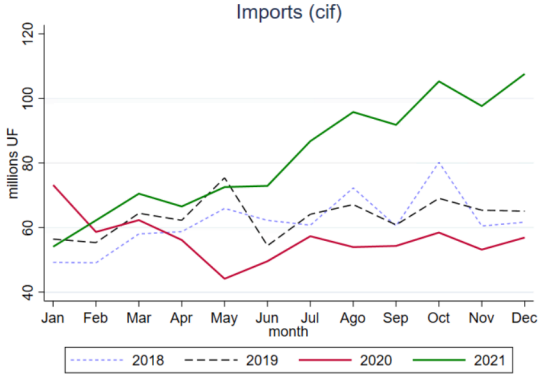
(b) Only importers



(c) Two-way traders



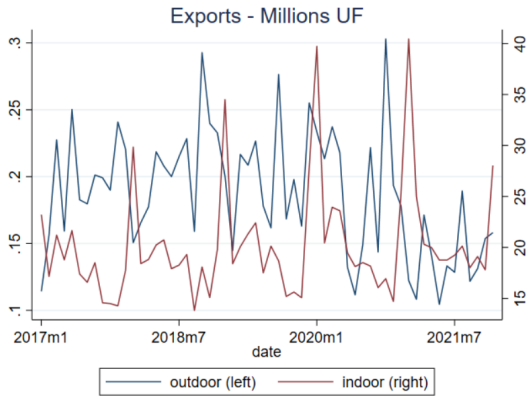
(d) Two-way traders



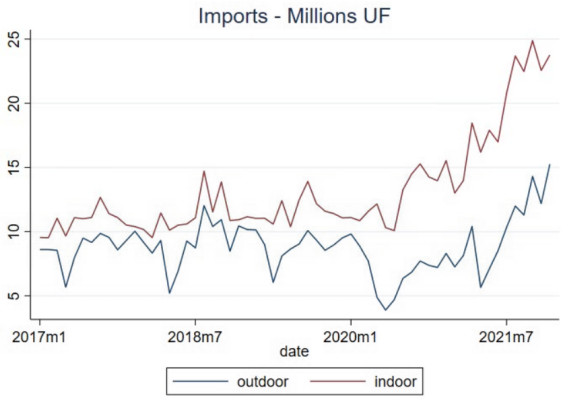
Notes: Panel (a) plots the exported volume by only exporter firms. Panel (b) only importers. In Panels (c) and (d) the volumes traded by firms that are both exporters and importers. Based on dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: Mining and Public Administration. *Sources:* Chilean Customs.

Figure E.12: Consumer goods by Type (Outdoor - Indoor)

(a) Exports



(b) Imports



Notes: Consumption goods according to BEC have been further categorized as indoor or outdoor based on de Lucio et al. (2022). Outdoor goods are those that are consumed outside the household. Dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: Mining and Public Administration.
Sources: Chilean Customs and the list of HS 6-digit consumption goods with the outdoor identification can be downloaded from https://paginaspersonales.deusto.es/aminondo/Research.htm.

International sourcing during Covid-19: How did Chilean firms fare?

Jennifer Peña[§] and Elvira Prades[*]

Central Bank of Chile Banco de España

External Statistics After the Pandemic: Addressing Novel Analytical Challenges
Irving Fisher Committee on Central Bank Statistics — BIS-ECB-BdE

Madrid, 12 February 2024

[§] The views and conclusions presented do not necessarily reflect the position of the Central Bank of Chile or its Board members.
[*] The views and conclusions presented do not necessarily reflect the position of the Bank of Spain or the Eurosystem.

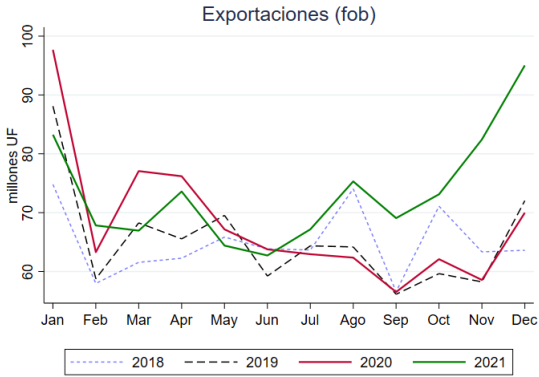
Motivation

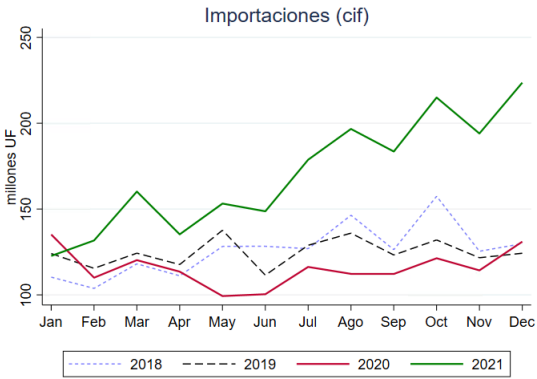
- Covid-19 unprecedent shock: demand/supply.
- How have Chilean firms swiftly pivoted and transformed their activities to navigate the challenges posed by the COVID-19 pandemic? Through which margins?
  - **Domestic margins** → Data on firm turnover, employment, domestic supplier/clients Albagli, Fernández, Guerra-Salas and Huneuus (2023).
  -  This paper:
    - We empirically characterize the mechanics of trade adjustment during the Covid crisis and its aftermath.
    - **International links** → In this paper we explore the links with foreign suppliers/clients. Exports and import dynamics *intensive margin* and *extensive margin*.
    - Why do we care on international supply churning? Input varieties have an impact on productivity and costs for production for a firm.
    - Regression based approach, "let (micro) data speak".

The Dataset

- Massive effort by the CBCh to build in a repository anonymous administrative data for Policy&Research.
- We make use of a combination of two sources of data (at the firm-level):
  - **VAT form - F29 SII:** Data on sales/turnover, material, wagebill, number of employees, sector, ...
  - **Customs - DIN and DUS formulaires:** Detailed Transaction based Trade Data from Customs. Information on firm-level transactions at HS-8 digit and country of origin/destination of the trading partners, this allows to obtain more details on the relationships with foreign suppliers/clients. Info on Volumes and Quantities, we can recover Unit Values.
- **Time span:** 2017m1-2021m12 (up dated regularly: 2023m9).
- Sectors excluded: Mining, EGW and Public Administration.
- Basic cleaning ▸ CLEANING STEPS to guarantee consistency and keep high coverage

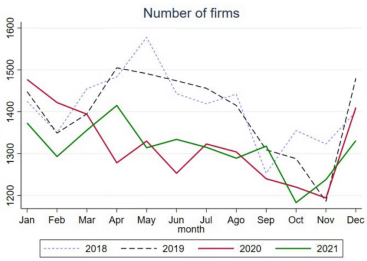
International Trade Developments





Few firms are engaged in international trade

(a) Only Exporter



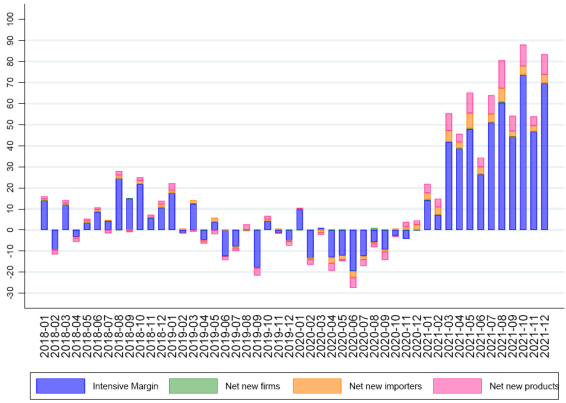
(b) Only Importer

(c) Two-way trader

Import dynamics and margins of adjustment

(a) Import growth dynamics: product margin

Distribution firms: wholesale/retail

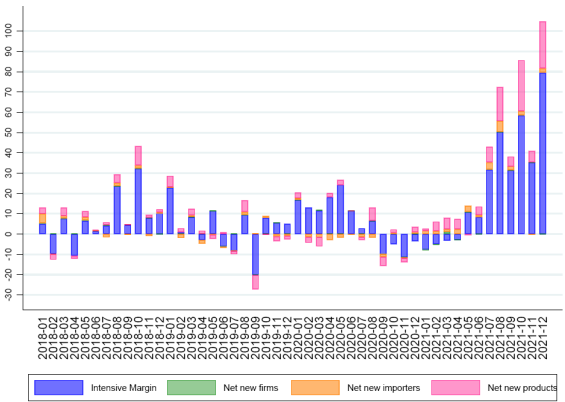


- Sharp recovery in imports by firms operating in the distribution sector.
- Those firms that were already importers in $t - 12$, increased their product portfolio.
- The net contribution of firms entering import activities is small.
- ▸ by BEC

Import dynamics

(b) Import growth dynamics: product margin

Manufacturing firms

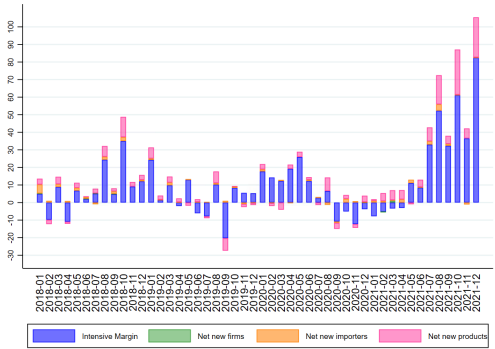


- Dynamics mainly driven by the intensive margin.
- Negative net entry in new products and firms exiting their import status. This has implications for the recovery. Concerns as regards international production network broken links, how easy will be to re-establish them (Huneuus (2019)) and possibly with new prices.
- by BEC

Import dynamics: by firm size

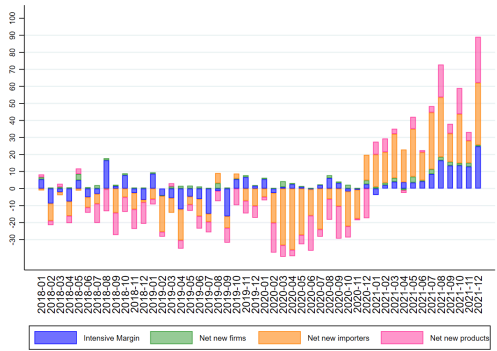
(b) Import growth dynamics: product margin

Manufacturing: Large firms



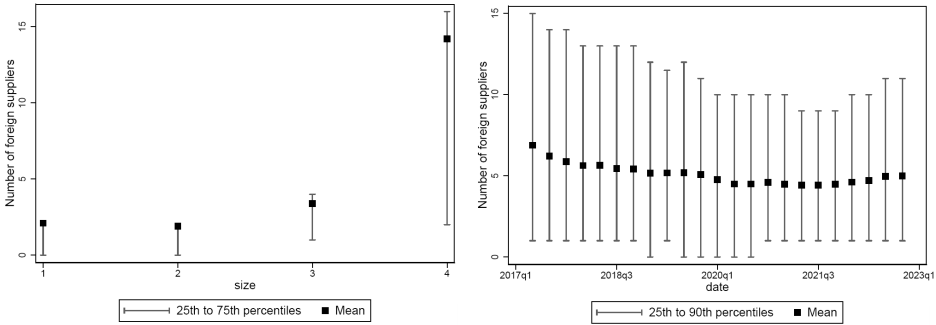
(b) Import growth dynamics: product margin

Manufacturing: Small-Medium sized firms



Number of suppliers

Figure: Number of suppliers by importer firms - Manufacturing



Sources: Merged SII and Customs and own calculations.

Empirical analysis: Firm level

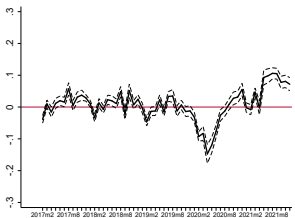
$$lnx_{it} = \nu_i + \beta_t + \gamma_X X_{it} + \epsilon_{it} \tag{1}$$

- **Dependent variables x_{it}:** (log) number of products/countries and varieties, (log) growth in exported/imported volumes, quantities, or unit values by a firm i, at time t.
- **Dummies:** time dummies.
- **Fixed effects:** (firm) (industry) (firm#time).
- **Standard errors cluster:** industry level.

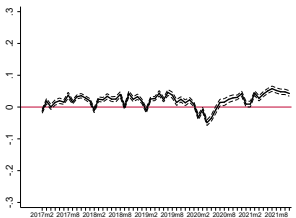
Import dynamics: Firm-level

- Time dummies (with firm fixed effects) show a sharp drop in the average number of products imported relative to early 2017.

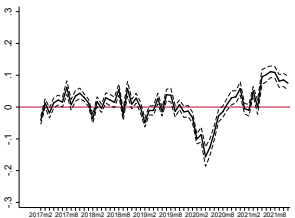
(a) Number of Products



(c) Number of Countries



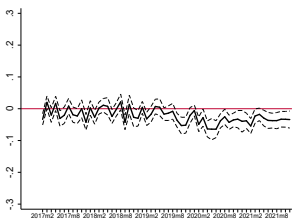
(b) Number of Varieties



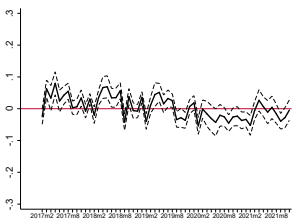
Export dynamics: Firm-level

- Time dummies show that Chilean firms slightly reduced the average (ln) number of exported products, the number of destination countries and varieties (product#destination) since the start of the covid outbreak.

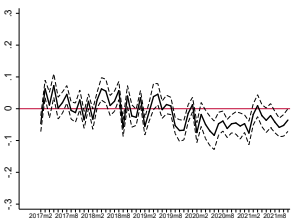
(a) Number of Products



(c) Number of Countries

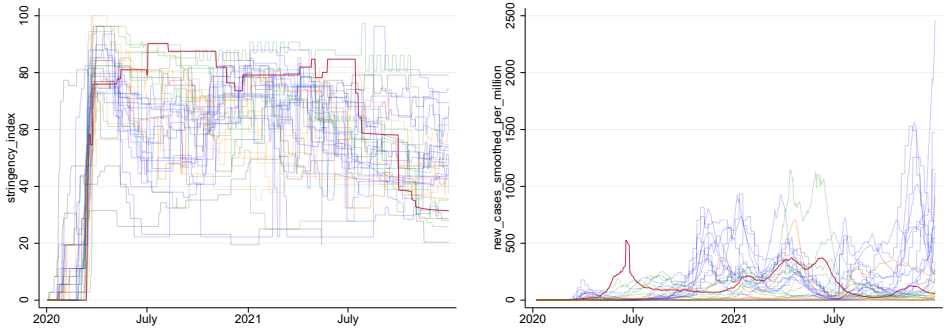


(b) Number of Varieties



The role of trading partners...

Figure: Stringency index and health situation 2020/21



Source: Oxford COVID tracker and Our World in Data (OWID)
`https://ourworldindata.org/covid-deaths`.

Empirical analysis: Firm-Product-Country level

$$\begin{aligned} \Delta \mathsf{X}_{ijkt+h} &= \beta_1 \mathsf{Stringency}_{jt} + \beta_2 \mathsf{COVIDC}_{jt} + \\ &\quad \beta_3 \mathsf{Stringency}_{\mathsf{chl},t} + \beta_4 \mathsf{COVIDC}_{\mathsf{chl},t} + \\ &\quad \alpha_{jk} + \sigma_i + m_t a_t + \varepsilon_{ijkt}, \end{aligned} \tag{2}$$

- **Dependent variable:** $\Delta \mathsf{X}_{ijkt+h}$ is the h (if 1 monthly, if 12 yearly) variation of X, which can be: (i) imports values or (ii) export values by firm i, of product k from/to country j.
- **Variable of interest:** Health situation/containment measures in/taken by trading partners ▸ Oxford
- Similar approach to Cerdeiro and Komaromi (2020) → daily, country, product and to Meier and Pinto (2021) analyze the exposure to China.

Import growth

VARIABLES	(1) Δ Import$_{ijkt}$	(2) Δ Import$_{ijkt}$	(3) Δ Import$_{ijkt}$	(4) Δ Import$_{ijkt}$	(5) Δ Import$_{ijkt}$	(6) Δ Import$_{ijkt}$
$COVIDC_{chl}$	-0.522***		-0.450***	-0.385***	-0.370***	-0.375***
	(0.033)		(0.042)	(0.042)	(0.044)	(0.043)
$Stringency_{chl}$	-0.316***		-0.403***	-0.151***	-0.170***	-0.143***
	(0.014)		(0.023)	(0.031)	(0.033)	(0.032)
$COVIDC_j$		-0.048**	-0.192***	-0.134***	-0.135***	-0.125***
		(0.022)	(0.023)	(0.026)	(0.030)	(0.029)
$Stringency_j$		-0.176***	0.194***	0.057*	0.060	0.034
		(0.018)	(0.025)	(0.034)	(0.038)	(0.037)
$log(tc\_d12)$	-0.007***	0.000	-0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Observations	647,320	443,213	435,054	430,773	423,979	430,771
R-squared	0.002	0.000	0.002	0.041	0.086	0.041
number of firms	21718	15646	15525	11244	10990	11244
number of products	4023	3841	3837	3794	3375	3794
Firm FE				✓	✓	✓
Year FE				✓	✓	✓
Country FE						✓
Product FE					✓	

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Export growth

VARIABLES	(1) Δ Export$_{pkt}$	(2) Δ Export$_{pkt}$	(3) Δ Export$_{pkt}$	(4) Δ Export$_{pkt}$	(5) Δ Export$_{pkt}$	(6) Δ Export$_{pkt}$
$COVIDC_{chl}$	-0.121		-0.085	-0.041*	-0.085	-0.053*
	(0.144)		(0.148)	(0.034)	(0.148)	(0.034)
$Stringency_{chl}$	0.027		0.019	0.021	0.019	0.015
	(0.067)		(0.069)	(0.071)	(0.069)	(0.072)
$COVIDC_j$		-0.098	-0.060	-0.059	-0.055	-0.059
		(0.146)	(0.148)	(0.151)	(0.157)	(0.151)
$Stringency_j$		0.079	0.015	0.074	0.012	0.074
		(0.072)	(0.070)	(0.074)	(0.069)	(0.074)
$log(tc\_d12)$	0.016***	0.016***	0.017***	0.017***	0.017***	0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	106,035	101,254	106,035	101,254	106,035	101,254
R-squared	0.039	0.040	0.038	0.039	0.038	0.039
number of firms	2557	2518	2557	2518	2557	2518
number of products	1839	1807	1839	1807	1839	1807
Firm FE				✓	✓	✓
Year FE				✓	✓	✓
Country FE						✓
Product FE					✓	

Imports by Broad Economic Category

VARIABLES	(1) Consumption Δ Import$_{ijkt}$	(2) Capital Δ Import$_{ijkt}$	(3) Intermediates Δ Import$_{ijkt}$
$COVIDC_{chl}$	-0.511***	-0.190**	-0.403***
	(0.111)	(0.097)	(0.053)
$Stringency_{chl}$	-0.340**	-0.186***	-0.106***
	(0.091)	(0.058)	(0.039)
$COVIDC_{j}$	-0.014	-0.089*	-0.179***
	(0.058)	(0.061)	(0.033)
$Stringency_{j}$	0.046	0.162**	0.027
	(0.098)	(0.068)	(0.042)
$log(tc\_d12)$	-0.002	0.005**	0.007***
	(0.003)	(0.002)	(0.001)
Observations	78,225	89,721	259,675
R-squared	0.095	0.051	0.054
number of firms	4371	3207	7981
number of products	766	504	2207
Country FE			
Product FE	✓	✓	✓
Year FE	✓	✓	✓
Firm FE	✓	✓	✓

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

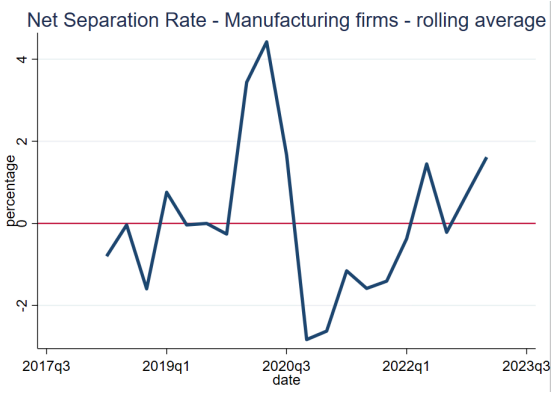
Note: Based on dataset after basic cleaning. EGW, Mining and Public Administration sectors have been excluded. Monetary values are in Unidades de Fomento (UF).

International Supply Chains

- On separation rates, entry rates and net separation rates.

$$X_{it} = \alpha + \beta_{2020} \times I_{2020} + \beta_{2021} \times I_{2021} + \beta_{2022-23} \times I_{2022-23} + FE_i + \varepsilon_{it} \quad (3)$$

Net separation rates



International Supply Chains

Table: Difference-in-differences estimates for key outcomes

	Separation Rate	Entry Rate	Net sep.	Distance (in Km)	HHI (mean)
$1(t = 2020)$	0.015***	0.008	0.010***	120.7***	0.003
	(0.004)	(0.004)	(0.007)	(25.896)	(0.001)
$1(t = 2021)$	-0.005	-0.007*	0.002	23.7	-0.002
	(0.004)	(0.004)	(0.006)	(25.776)	(0.001)
$1(t = 2022\text{-}23)$	0.020***	-0.004	0.030***	39.3	0.002
	(0.004)	(0.004)	(0.006)	(27.296)	(0.001)
Constant	0.566***	0.572***	-0.007***	1,875.5***	0.922***
	(0.002)	(0.002)	(0.002)	(11.485)	(0.001)
Observations	25,020	25,020	25,020	25,020	25,020
R-squared	0.198	0.204	0.050	0.708	0.487
number of firms	2132	2132	2132	2132	2132
Firm FE	yes	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Firm-level characteristics (I)

$$\begin{aligned} X_{it} = \alpha + \gamma_{2020}[1(t = 2020)] + \gamma_{2021}[1(t = 2021)] + \gamma_{2022\text{-}23}[1(t = 2021)] + \\ \beta_{2020}[1(t = 2020) \times (Z_i)] + \\ \beta_{2021}[1(t = 2021) \times (Z_i)] + \\ \beta_{2022\text{-}23}[1(t = 2022\text{-}23) \times (Z_i)] + \\ FE_i + \varepsilon_{ikt} \end{aligned} \quad (4)$$

- Distance
- Input concentration, at the product level or at overall suppliers
- Number of suppliers
- Specificity of imported inputs (Rauch99)

Firm-level characteristics (II)

Table: The role of distance

VARIABLES	(1) sep_rate	(2) entry_rate	(3) sep_rate_net
2020	0.024***	0.003	0.024***
	(0.004)	(0.004)	(0.007)
2021	-0.005	-0.009**	0.005
	(0.004)	(0.004)	(0.006)
2022-23	0.025***	-0.003	0.032***
	(0.004)	(0.004)	(0.006)
1(t=2020) $\times$(Distance$_j$)	-0.063***	0.037***	-0.130***
	(0.013)	(0.013)	(0.029)
1(t=2021) $\times$(Distance$_j$)	-0.012	0.018	-0.042
	(0.012)	(0.012)	(0.026)
1(t=2022-23) $\times$(Distance$_j$)	-0.034***	0.001	-0.034
	(0.013)	(0.012)	(0.029)
Constant	0.568***	0.571***	-0.005*
	(0.002)	(0.002)	(0.003)
Observations	25,020	25,020	21,335
R-squared	0.199	0.205	0.051
number of firms	2132	2132	1917
Firm FE	✓	✓	✓

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Firm-level characteristics (III)

VARIABLES	(1) sep_rate	(2) entry_rate	(3) sep_rate_net
Distance			
1(t=2020) $\times$(Distance$_j$)	-0.063***	0.037***	-0.130***
	(0.013)	(0.013)	(0.029)
1(t=2021) $\times$(Distance$_j$)	-0.012	0.018	-0.042
	(0.012)	(0.012)	(0.026)
1(t=2022-23) $\times$(Distance$_j$)	-0.034***	0.001	-0.034
	(0.013)	(0.012)	(0.029)
Concentration product level			
1(t=2020) $\times$(HHI$_{jk}$)	-0.033***	0.020*	-0.052**
	(0.012)	(0.012)	(0.025)
1(t=2021) $\times$(HHI$_{jk}$)	0.006	-0.006	0.025
	(0.011)	(0.011)	(0.020)
1(t=2022-23) $\times$(HHI$_{jk}$)	-0.012	0.000	0.003
	(0.012)	(0.011)	(0.024)
Concentration firm level			
1(t=2020) $\times$(HHI$_j$)	-0.044***	0.018*	-0.076***
	(0.011)	(0.010)	(0.020)
1(t=2021) $\times$(HHI$_j$)	-0.015	0.015	-0.043**
	(0.010)	(0.010)	(0.018)
1(t=2022-23) $\times$(HHI$_j$)	-0.044***	0.003	-0.046**
	(0.011)	(0.010)	(0.020)

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Main takeaways

- In this work we offer a detailed account on the international sourcing behaviour of Chilean firms using very dis-aggregated level data. We cover Covid-19 period and the aftermath $\rightarrow$ evidence of heterogeneous behavior among firms.
- We explore the role of partner countries as well as firm characteristics to follow-up the importing activity.
- Up to know, we have analyzed the behavior of **direct international links**...
- ... but we are missing the indirect exporting/importing, the role of wholesalers, and exploit the information on B2B transactions ("FE") (see Marcel and Vivanco (2021) and Albagli, Fernández, Guerra-Salas y Huneuus (2023)).
- **Further work:** A focus on the implications on of supply disruptions on firm-level imported input costs and to firm productivity.

Thanks!

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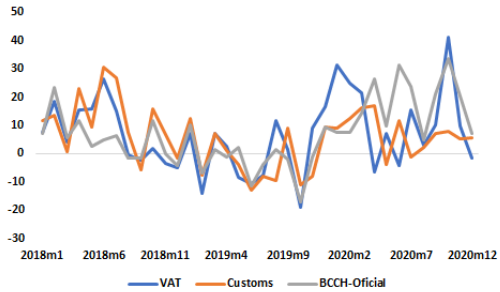
Cleaning steps DATASET

- We take away firms with negative values in sales or wage bill.
- We take away firms with just one employee .
- We take away firms with highly volatile capital stock growth or value added. Winsorized at the 90th percentile.
- We take away firms with implausible sales to labor and sales to capital.
- Compute lpr and trim the distribution 1th and 99th percentile.
- We exclude sectors: mining, utilities: Electricity, Gas and Water and Public Administration.

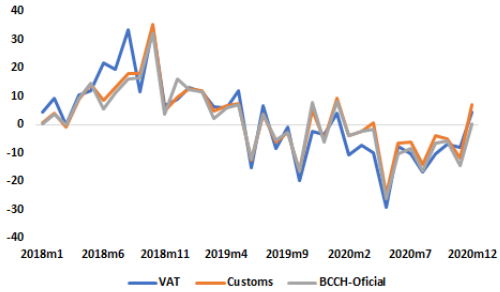
Coverage

DATASET

(a) Exports (year-on-year growth)



(b) Imports (year-on-year growth)



Summary statistics

Table: Summary Statistics

	Full sample					
	Full Sample		**non-Importers**		**Importers**	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	16.45	150.15	13.67	126.40	83.68	435.34
Sales (thousands)	1.88	174.99	1.16	169.40	33.75	883.30
Capital per worker (thousands)	0.28	0.73	0.27	0.72	0.40	0.91
Sales per worker (thousands)	0.18	0.30	0.17	0.28	0.40	0.50
Export (thousands)	0.14	11.69	0.05	3.26	3.64	69.67
Export share in output	0.51	0.40	0.60	0.38	0.29	0.34
Imports (thousands)	0.19	18.46	0.00	0.00	7.15	112.96
Import share in materials	0.50	0.31	.	.	0.49	0.30

Note: Based on dataset after basic cleaning. EGW, Mining and Public Administration sectors have been excluded. Monetary values are in Unidades de Fomento (UF).

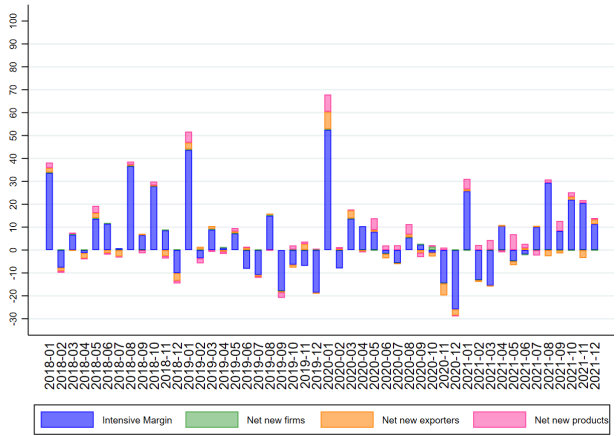
Imported varieties

	Importer firms					
	Number of Products			Countries of Origin		
sectors	Mean	Median	Max	Mean	Median	Max
Agriculture (n=11,069)	3.5	1.0	142	1.8	1.0	26
Manufacturing (n=46,533)	6.6	2.0	427	2.6	1.0	42
Construction (n=9,726)	3.3	1.0	107	1.5	1.0	23
Wholesale/retail(n=140,235)	5.7	2.0	387	1.9	1.0	34
Transportation (n=12,128)	2.3	1.0	79	1.4	1.0	23
Financial Activities (n=2,969)	2.0	1.0	51	1.3	1.0	13
Housing Activities (n=1,014)	1.6	1.0	23	1.1	1.0	9
Business Services Activities (n=20,601)	2.1	1.0	186	1.3	1.0	30
Personal Services (n=20,788)	1.4	1.0	80	1.1	1.0	12
Total (n=265,063)	4.9	2.0	427	1.8	1.0	42

Note: Based on dataset after basic cleaning. EGW, Mining and Public Administration sectors have been excluded. Monetary values are in Unidades de Fomento (UF).

Export dynamics and margins of adjustment

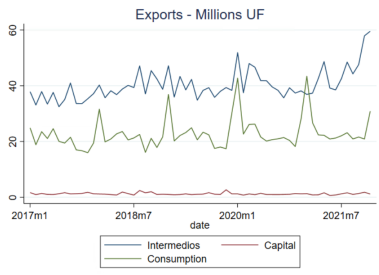
(a) Exports growth dynamics: product margin



- Aggregate dynamics, decomposed into:
  1. intensive margin
  2. net extensive margins:
     (a) new products
     (b) new exporter.
- Exports fared relatively well.
- Dynamics mainly driven by the intensive margin.
- Net entry in new products/new destinations.
- Firms stopping their exporting activity.

By type of good: Broad Economic Categories (BEC) DATASET

(a) Exports



(a) Imports