MACROECONOMIC POLICY RESPONSES TO COVID-19

INTERNATIONAL SOURCING DURING COVID-19: HOW DID CHILEAN FIRMS FARE?

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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 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 this paper we analyze the performance of individual Chilean firms during this episode, drawing on administrative datasets. In particular we focus on the sample of firms participating in international trade in goods and we document several empirical findings. Importer firms, specially in the manufacturing sector, have adjusted their import flow through several margins, the intensive and the extensive margins, either by stopping the import activity or by importing less product varieties. Importers faced a short-lived increase in imported input costs. While exporter firms seem to have been less affected. An additional source of heterogeneity is the size of firms. At the start of the pandemic, both large and SMEs firms largely reduced the number of product varieties. Notwithstanding, SMEs showed a fastest recovery, which may be related to the fact were the firms that mostly accessed the support policies deployed by the Chilean authorities to mitigate the economic impacts of the Covid-19. We also explore if foreign factors such as the Covid-19 related health situation in partner countries, by considering the number of cases and stringency measures, had an impact on Chilean imports during 2020/21.

JEL Codes: .

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

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1 Introduction

Since the start of the pandemic international trade has faced several challenges with different degrees of intensity along 2020 and 2021. The closure of production plants or ports from main global suppliers, with different degrees of intensity along this period; higher transport costs; longer delivery times; the difficulties finding key intermediate inputs led to some firms not being able to keep up with production targets to couple with a swift demand recovery–a product of relatively high vaccination and its fairly good performance against variants. In addition the shortage of finished/consumer goods could lead to price pressures.

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

An additional open issue is whether and to which extent firms will transfer the observed increases in input material costs 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 formulaire "F29" with firm-level monthly information used for tax purposes on sales revenues, expenditures, material purchases, etc. The second source is the Matched Employer-Employee dataset, where we obtain information on the number of employees in each firm. And finally, the third source we use is "Customs data" with information on imports and exports at a very disaggregated level in terms of products (HS-8digit), country of origin or destination, values, and quantities.[1]

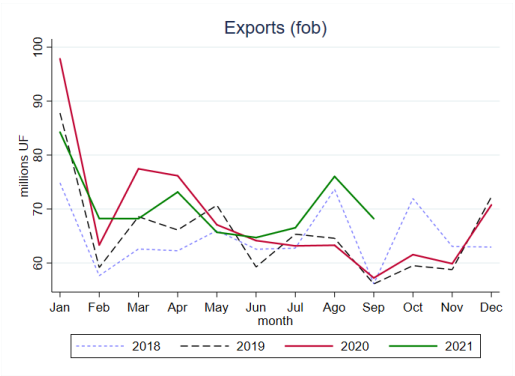
In Figure 1 we show how trade flows have evolved from 2018 to 2021. In value terms, exports in 2020 and 2021 have performed relatively similar to previous years.

[1]Formulaire "29" 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.

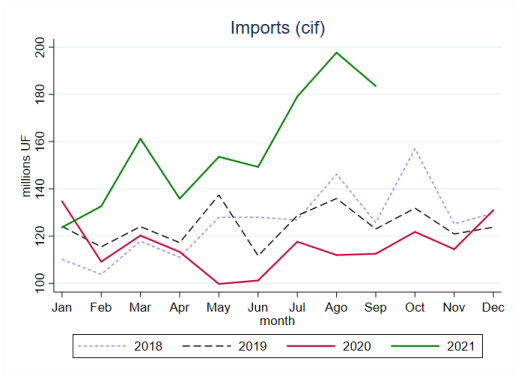
Notwithstanding, imports show a noticeable different pattern, showing a sharp decline in 2020 followed by a strong recovery in 2021. While domestic factors might explain this sharp recovery, in the context of supply shortages is of utmost interest to exploit the granular data to understand the drivers 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 behaviour is radically different. There was a significant drop in Q2 2020. And a sharp recovery by the end of the year and along 2021. 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 in 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 with (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 sectorial perspective (Cerdeiro & Komaromi (2022), Meier & Pinto (2020)) and from a product-level perspective (Jaravel & Mejean (2021)). Second, this paper is also related to firm-level literature to explore firm dynamics during 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 also connects with the literature that focuses on the impact of cost shocks on prices. The pass-through of costs such as tariffs have been analyzed by Cavallo et al. (2021) and they find 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. In addition, this paper is also linked to other works analyzing the Chilean economy exploiting rich and granular data such as the role of production networks as in Huneuus (2018), the estimates of exchange rate pass-through Giuliano & Luttini (2020) and the margins of adjustment during the pandemic by 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. Others studies work with deaths and lockdown measures like König & Winkler (2021). (ii) We focus on the sample of Chilean firms participating in international trade in goods, and (iii) with recent data (until September 2021).

We compare the performance of 2019, 2020, and the first nine months of 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 within the support programs 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 by distribution firms of the new products margin, which again, all categories have registered sharp in increases consumer, intermediate and capital goods.

The rest of the paper is organized as follows. In Section 2 we describe with more detail the data and the variable definitions used for the analysis. In Section 3 we report the main results on the stylized facts of trader firms, that is the extensive and intensive margins and behavior of firms according to size and economic sector where they operate. 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 3 different administrative datasets: (1) the F29 formulaire (*Declaración Mensual y Pago Simultáneo de Impuestos*) from "Servicios de Impuestos Internos" (SII), (2) Employer-Employee Dataset, and (3) Customs declarations and which are described below. The datasets are merged by each firm's id and we compare with official statistics to check for their representativeness. Our monthly panel dataset compile information on Chilean firms from 2017 to September 2021 which allows us to compare the performance of the firms before and during the COVID-19 pandemic.

1. **VAT formulaire - F29**.–The first source of information employed is the Firm Production Dataset with firm-level information used for tax purposes on sales revenues, expenditures in intermediate goods, and investment in machinery and equipment. Chilean firms must submit by law their F29 then the dataset covers the universe of formal firms in Chile and is available since the mid 2000s. The source is the form F29 collected by the Chilean tax authority (Servicio de Impuestos Internos, SII). The form F29 is presented on a monthly basis. The information contained here 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 responsability of the SII.

2. **Employer-Employee Dataset**.–The second source of information employed is the Matched Employer-Employee Dataset with 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. The dataset is avalable since 2005 and the source is the Chilean Administrator of Unemployment Insurance (Superintendencia de Pensiones).

3. **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 very dis-aggregated level in terms of country -as of its destination/origin- and in term of product -at HS8-. The dataset provides information as regards the value of the transaction in USD (which is converted into CLP) and the quantity. We aggregate the data up to the 6-digit level. As working at the six-digit classification can be noisy, we aggregate the data to the four-digit level (HS4). In the rest of the paper we use the terms "product" and "good" to refer to a HS4 category. We make use of Broad Economic Categories (BEC) classification as we are interested in the classification of goods as intermediate goods, industrial supplies, or capital good parts.[2]

[2]To convert HS to Broad Economic Categories (BEC) we use the concordance from WITS. https:

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 to remove 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 a second step, we merge monthly information to the annual observations in order to discard observations that implies 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 99.5 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 huge productivity ratios are suspicious of having undetected misreported output units; also, large firms with excessively low productivity ratios are candidates for having misreported employment figures. In all those 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 with 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 of the official data.

//wits.worldbank.org/es/product_concordance.html

2.3 Variable transformations

- **Exchange rates**.– Customs data are reported in USD, independently of the currency in which the transaction made. We convert all the flows into CLP so as to compare 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 by 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)*, a unit of account indexed to inflation.[3]
- **Sectors**.– In the database, we have the International Standard Industrial Classification of all Economic Activities (ISIC) code of each firm. Through parity with the Economic Activity Code defined by EAC (CAE in Spanish) we obtain the economic sector to which each firm belongs. 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 and the public sector (public administration).
- **Firm size**.– Based on annual firm turnover in real terms, firms are classified by size. Micro firm $<$ 2,400 UF, small firms: 2,400-25,000 UF, Medium firms: 25,000-100,000 UF. And large firms $>$ 100.000 UF. This classification is made according to what is currently established in the SME Statute of the Ministry of Economy of Chile (Law No. 20.416).[4] We consider 2017 as the base year. A weakness of this consideration is that when considering disaggregations by size, we do not consider new firms. However the volume of the large ones that are present in the sample is maintained.

2.4 Sample Definitions

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

[3]Another option would have been to convert the nominal data to real with price indices according to the category of products. However, for simplicity, we use the UF, which is a unit of account used in Chile and readjustable according to the variation of the Consumer Price Index (CPI).

[4]SME or small and medium enterprise (PYME in Spanish).

In addition we breakdown the sample into *exporter* 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 firms 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.

3 Stylized facts

In this section we will provide some stylized facts of 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* where we consider only those firms that are reporting sales each and every month.

- **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.[5] 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 bigger volumes. Importer firms register higher labor productivity, measured as sales per worker. This ratio is, on average ,around 3 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' subsample.
- **Import 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 enterprises were in the hardest hit segment, both in the proportion of firms that experienced a drop in international trade. This 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).

[5] See Amiti & Konings (2007), Bernard et al. (2009), Halpern et al. (2015) and Kee & Tang (2016).

- **Export and Import shares**.– On average, an exporter firm exports 50% of its output. Moreover, the propensity of firms to purchase inputs outside the firm boundaries, that is, the propensity to import, can account for 50% of total materials and around 70% of sales. Notwithstanding, it is possible that some firms use imported inputs not bought directly abroad but sourced through locally based distributors. To capture the differentiated dependency on imports for each firm, an option that we did not explore but would be an improvement is to compute the import share over total materials as in Blaum (2018), and then decompose into the within, between component and the covariance to check to what extent firms increased their import share within or whether firms that grew in size are the ones with higher import shares.

Table 1: Summary Statistics
(2018)

	Full sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	16.50	150.45	13.74	126.72	83.05	436.65
Sales (thousands)	1.87	174.86	1.16	169.29	33.26	879.62
Capital per worker (thousands)	0.28	0.77	0.27	0.76	0.40	0.94
Sales per worker (thousands)	0.18	0.30	0.17	0.28	0.40	0.50
Export (thousands)	0.13	11.65	0.05	3.28	3.56	69.06
Export share in output	0.51	0.40	0.60	0.38	0.29	0.34
Imports (thousands)	0.19	18.45	0.00	0.00	7.08	112.48
Import share in sales	0.76	1.65	.	.	0.75	1.63
Import share in materials	0.50	0.31	.	.	0.50	0.30
	Permanent sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	16.90	153.17	14.05	129.07	83.74	438.58
Sales (thousands)	2.48	203.87	1.52	197.97	35.28	906.40
Capital per worker (thousands)	0.28	0.77	0.28	0.76	0.40	0.94
Sales per worker (thousands)	0.18	0.30	0.17	0.28	0.40	0.50
Export (thousands)	0.18	13.58	0.07	3.83	3.78	71.16
Export share in output	0.49	0.40	0.58	0.38	0.28	0.34
Imports (thousands)	0.26	21.51	0.00	0.00	7.50	115.90
Import share in sales	0.71	1.53	.	.	0.71	1.52
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. Firms in 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. *Source:* Merged SII and Customs data.

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=11,110)	3.5	1.0	142	1.8	1.0	26
Manu (n=46,819)	6.6	2.0	427	2.6	1.0	42
Const (n=9,807)	3.3	1.0	107	1.5	1.0	23
Wholesale/retail (n=142,852)	5.7	2.0	387	1.8	1.0	34
Transp (n=12,121)	2.3	1.0	79	1.4	1.0	23
Finan Act (n=2,943)	2.0	1.0	51	1.3	1.0	13
Hous Act (n=1,020)	1.6	1.0	23	1.1	1.0	9
Busi Act (n=20,567)	2.1	1.0	186	1.3	1.0	30
Pers Serv (n=20,601)	1.4	1.0	80	1.1	1.0	12
Total	4.8	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 dataset after the cleaning procedure detailed in Section 2. We exclude the sectors: mining and public administration. *Source:* Merged SII and Customs database.

3.2 A focus on trade dynamics

The pandemic has had a significant negative impact on international trade. From a policy point of view, questions arise about which margins of trade are driving aggregate developments. In 2020 there was a plunge in the number of trading firms, the number of traded products, and the number of associated trade transactions or shipments (extensive margin) and a collapse of trade values for given trading firms, products, and transactions (intensive margin). 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 the first nine months of 2021. We can observe a very 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 the fiscal packages.

In light of this, we focus on import dynamics in Figure 3, and we break the sample into imports by *Manufacturing firms* and imports from *Wholesale and Retail Trade*. We do so as we observe an heterogeneous behavior of 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 embed in their production process.[6] Recent literature is pointing to the differentiated impact of input trade or trade in final goods (see (Comin & Johnson 2020)).

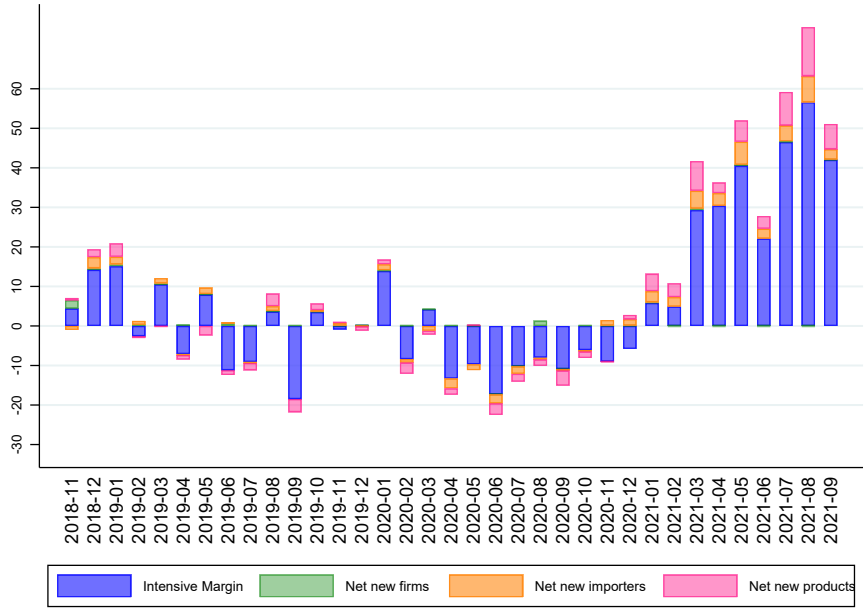
We decompose growth in imports into a within-firm intensive component (blue) and three different net extensive margins: net new firms[7], net new importers, and net new products. We can observe that import dynamics are mainly driven by the intensive margin. Notwithstanding, the extensive margins have played an important role since the start of the lockdown period and along the recovery initiated at the beginning of 2021, led mainly by distributor firms (wholesalers and retailers). The large magnitude of the extensive margin calls for an explicit analysis of the decision to enter/quit additional import markets, i.e., whether it reflects recovering the pre-pandemic trading links or new links.

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

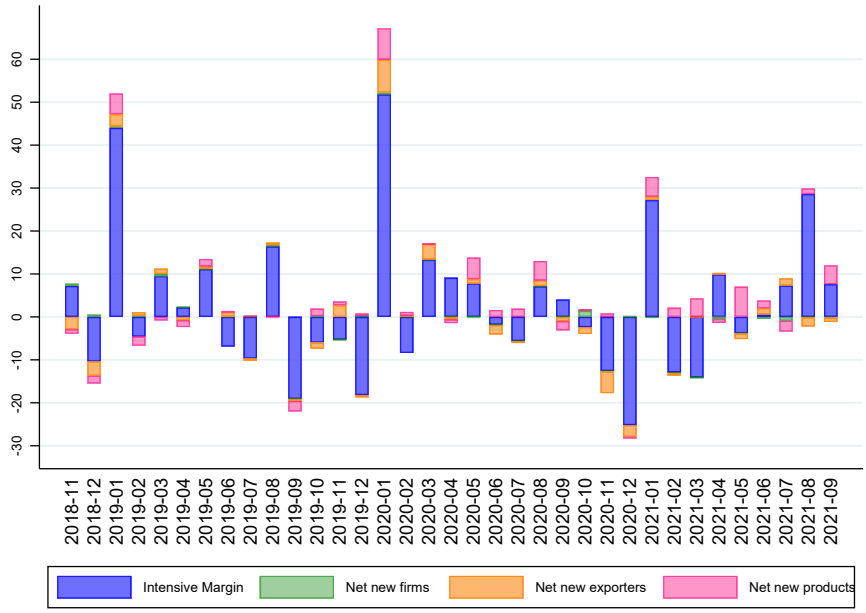
[7] Note that given the monthly frequency of the data it is difficult to capture the new entrant margin as it is not common for a recent born firm to start import activities the same month it starts its activities, this margin is better captured in annual data.

Figure 2: Import and Export Dynamics

(a) Imports by firms



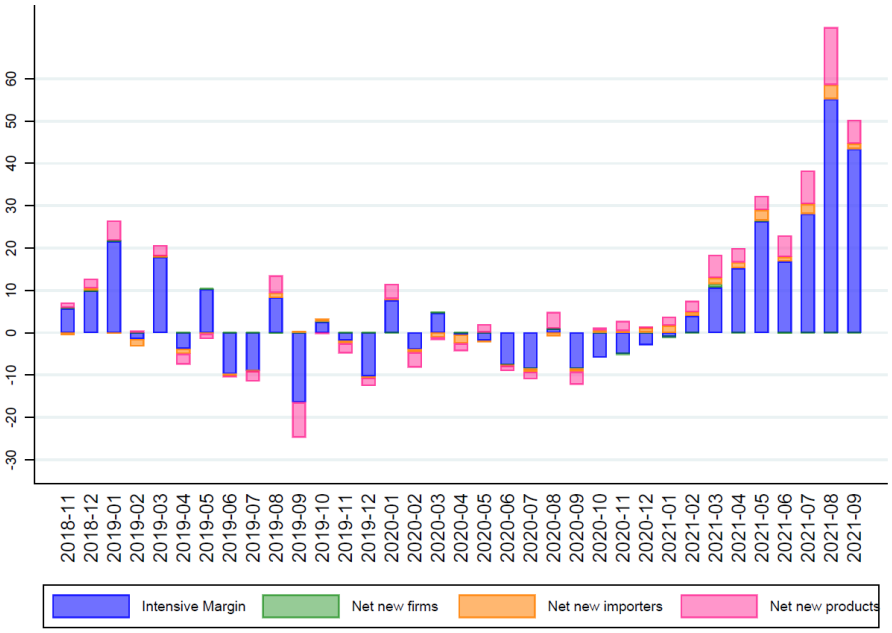
(b) Exports firms



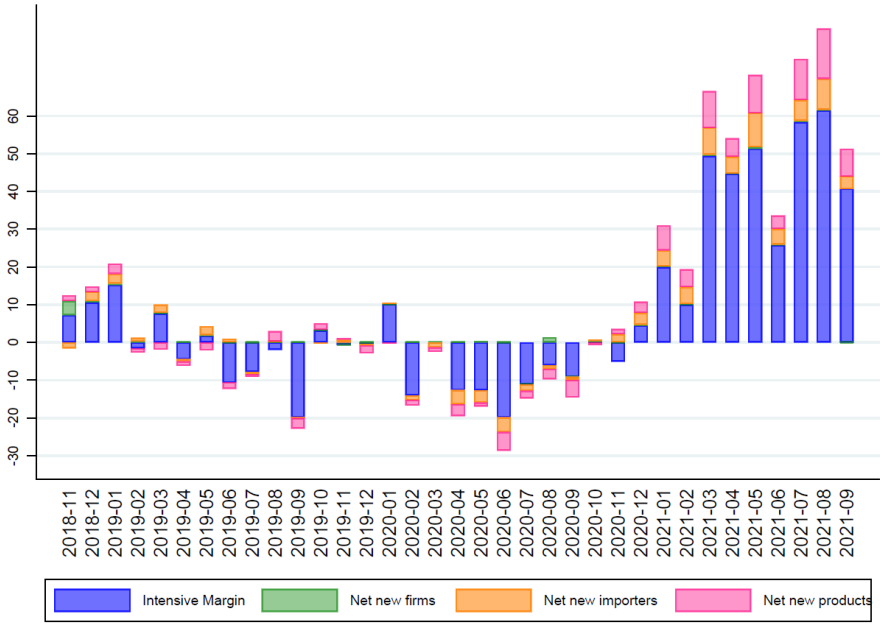
Notes: Decomposition of exports and imports growth rates. The contributions measure in pp increase attributable to different margins. The intensive margin measures (net) growth in exports/imports of products that a firm also imported in the previous period (the previous year, and at the beginning of 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.

Figure 3: Import Dynamics

(a) Imports by Manufacturing firms



(b) Imports by Distribution/Wholesale and 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. In *Unidades de Fomento*. In Appendix C we breakdown the sample according the size of firms. *Source:* Chile's National Custom Data.

The firm's extensive margin—measured by net new importers (in orange)—registered reductions in both manufacturing and distribution firms along 2020. Indicating that on net value, more firms stopped their importing activities completely. While 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 the wholesalers and retailers firms, possibly driven by domestic demand and greater liquidity available to households due to aid made 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 up to 42 countries and exported to 86 destinations. However, on average, firms that engage in trading activities import from 1.8 and export to 3 countries. Which 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 SME firms (see Figure C.4), we exploit the information on imported products at the firm level.

We estimate the following specification at the firm level:

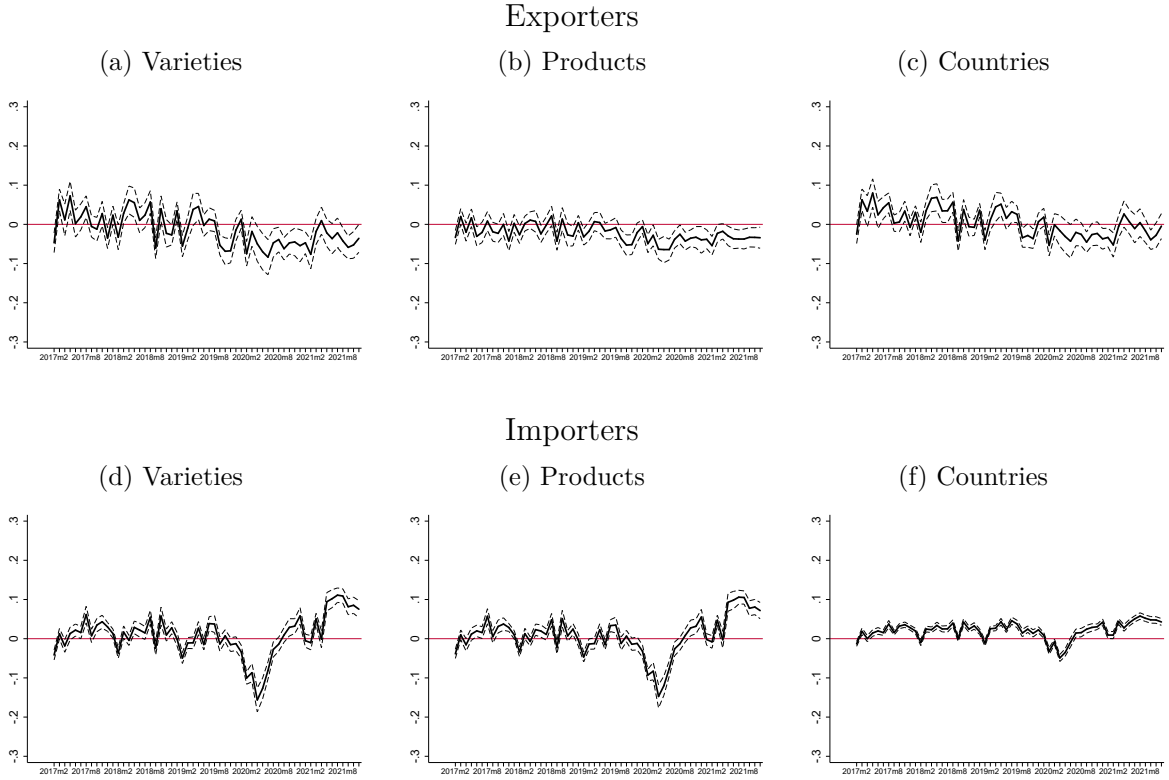
$$lnx_{it} = \nu_i + \beta_t + \gamma_X X_{it} + \epsilon_{it} \tag{1}$$

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 were the dependent variable is either the (log) number of export/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 are decreasing. The dashed lines indicate 95% confidence intervals.

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 exporter firms we can observe that, on average, firms reduced the number of varieties, but to a lesser extent, and mainly driven by the number of destination countries. At the sample mean, the number

of import varieties declined by 0.15 log points in March 2021 compared to early 2017.

Figure 4: Number of Exported/Imported Varieties



Notes: Graphs plot the monthly time dummies coefficients from 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 are the monthly dummies in a regression of number of varieties exported or imported. **Exports:** small decline in the average number of products exported, mainly driven by the number of destinations. **Imports:** sharp decline in the number of products. 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 SME, 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 COVID-19 obtained a faster recovery in their sales than those that did not access, 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 to what extent the reduction of import varieties does not need to imply an impact 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 than the decline in imported input varieties.[8]

4 Unit Values

Now we turn to analyze the behaviour 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 they had to find alternative supply sources. In a first step we compute the unit values for each transaction as follows:

$$\mathrm{p}_{i,j,k,t}^{(m,x)} \approx \mathrm{uv}_{i,j,k,t}^{(m,x)} = \frac{\mathrm{value}_{i,j,k,t}}{\mathrm{quantity}_{i,j,k,t}}$$

where $p^x(^m)$ stands for the export (import) price of product k to (from) destination (origin) j at time t.

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

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

from all source countries weighted by respective expenditure shares as in Amiti et al. (2014). Where $uv_{i,j,k,t}$ is the price in USD (unit value) of firm i imports of intermediate good k from country j at time t, the weights $\omega_{i,j,k,t}$ 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 made on 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.[9] It can be observed a sharp increase in the average cost of imports at the start of the lockdowns at by mid March 2020, followed suit with a return to pre-pandemic levels. The Chilean peso (CLP) along this period

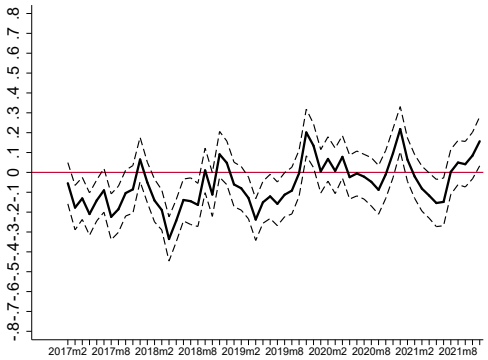
[8] These evidence has been highlighted by Gopinath & Neiman (2014) for the Argentinian case in 2002 devaluation.

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

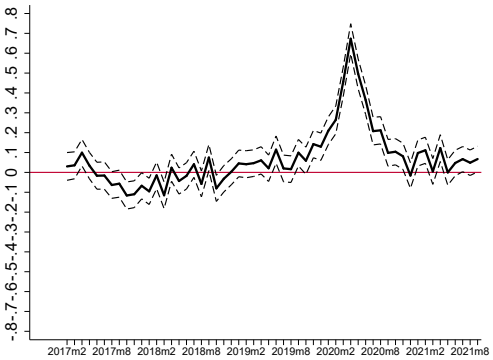
Figure 5: Impact on (average) Unit Values

Full Sample - in CLP

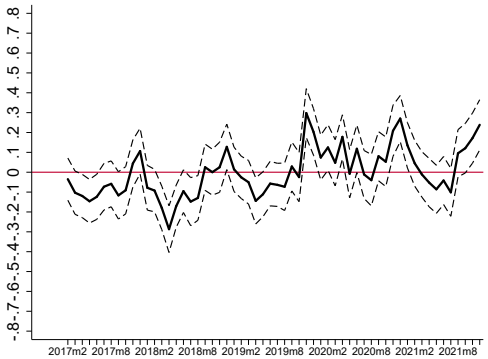
(a) Exports



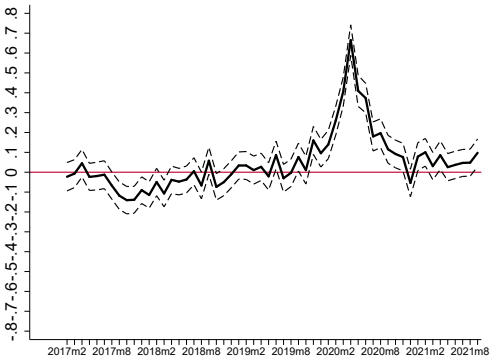
(b) Imports



Permanent Sample - in CLP

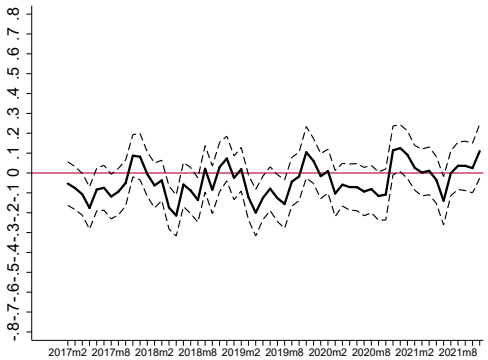


(c) Exports

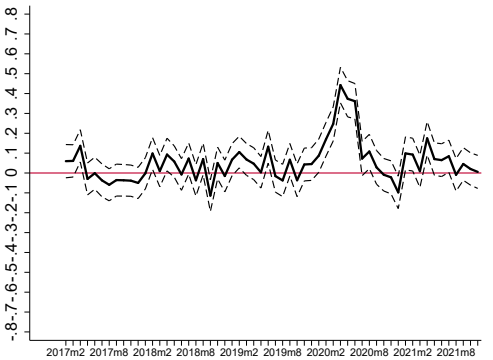


(d) Imports

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.

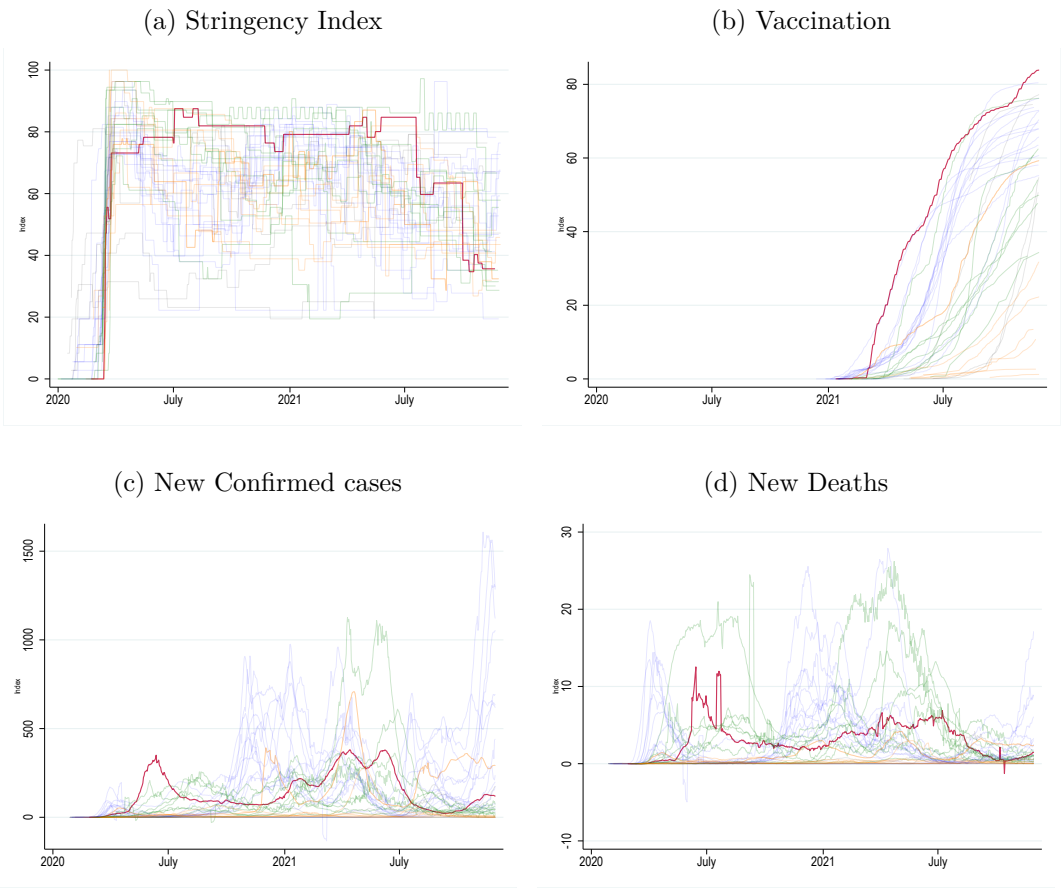
depreciated against the USD, this would increase the price of imported inputs, to address the potential problem we run the regressions with unit values expressed in CLP and in USD and keeping the permanent sample as to avoid compositional effects. As regards, the behavior export unit value a different pattern is observed, remaining 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 exploit the firm-product level.

Firstly we explore whether the health situation or stringency measures taken by partner countries has affected exports, imports growth or prices. As shown in Figure 6 the evolution of the health situation and measures taken by each government has been quite heterogeneous over time.

Figure 6: Stringency index and health situation



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. *Sources:* Oxford Covid tracker and Our World in Data (OWID).

5.1 Firm-product regressions.

For each firm we run the following specification:

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

Where the dependent variable, $\Delta \mathrm{X}_{ijkt+h}$ is the h (if 1 monthly, if 12 yearly) variation of X, which can be: (i) imports volumes, (ii) exports or (iii) unit values by firm i, of product k from/to country j. We 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.

The dependent variable growth rates are computed as follows:

$$\frac{x_t - x_{t-h}}{1/2(x_t + x_{t-h})} \tag{4}$$

where t is a monthly time index, $h = 1$ for monthly growth rates, and $h = 12$ for yearly (12-month) growth rates.

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 that ranges from stay at home requirements, school closures to restrictions in international travelling.[10] [11]

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 on "the number of new cases per million" ($CovidC_{jt}$) and as an alternative to "new deaths per thousand" ($CovidD_{jt}$).[12]

By the end of 2020 the vaccine was approved and since early 2021 several countries started with their vaccination campaigns. It can be expected that partner country's with successful vaccination rates are less prone to suffer new outbreaks and should help to improve imports. To test whether this we use the people fully vaccinated per hundred of population ($CovidV_{j,t}$).[13]

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

[11] We are aware of other indicators to capture the health situation in partner countries but we assume that measures are correlated.

[12] 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.

[13] Raw data can be retrieved from https://ourworldindata.org/covid-deaths.

We also control for local health conditions $Stringency_{\text{chl},t}$, $CovidC_{\text{chl},t}$ and $CovidV_{\text{chl},t}$ 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 of receiving imports or voluntary isolation or depressed consumer confidence that can affect the 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 represent 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 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 make a country have a particular large or small demand for imports of a specific product. Furthermore, they are allowed to vary by year.
- firm-product we compare the behaviour of imports of a firm importing the same product and in the same month with a trading partner that has increased its stringency measures compared to an origin not taking any additional measure.
- 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 of lockdown policies and health conditions that has evolved over time 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 4-digit product level from each partner countries on a monthly basis. Column (1) reports the baseline results with the estimates of the effect of health situation and the lockdown measures taken in Chile. This provides information on the correlation between import growth and domestic conditions. And to what extent import developments are domestically demand driven.

In column (2) we explore the role of the health situation and restrictions imposed by the local authorities of 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 an origin that is facing an increase in the number of cases and and imposing restrictions.[14] In column (3) we include both domestic and partner country controls. The impact on import growth remains negative and significant. In all these three specifications, we include a control for 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.

Table 3: Baseline Regression
Lockdown spillovers effect on import growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Δ Import_pkt	Δ Import_pkt	Δ Import_pkt	Δ Import_pkt	Δ Import_pkt	Δ Import_pkt	Δ Import_pkt
CovidC_chl	-0.531***		-0.455***	-0.389***	-0.375***	-0.379***	-0.376***
	(0.032)		(0.041)	(0.041)	(0.041)	(0.040)	(0.052)
Stringency_chl	-0.313***		-0.404***	-0.160***	-0.178***	-0.153***	-0.158***
	(0.014)		(0.022)	(0.028)	(0.031)	(0.029)	(0.054)
CovidC_j		-0.047**	-0.191***	-0.129***	-0.129***	-0.119***	-0.120*
		(0.021)	(0.023)	(0.024)	(0.027)	(0.027)	(0.066)
Stringency_j		-0.172***	0.195***	0.062*	0.066*	0.041	0.044
		(0.017)	(0.025)	(0.029)	(0.036)	(0.034)	(0.081)
log_tc_d12	-0.007***	-0.000	-0.005***	0.005***	0.004***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	650,691	445,424	437,241	433,012	426,209	433,010	432,706
R-squared	0.002	0.000	0.002	0.041	0.086	0.041	0.050
number of firms	21760	15599	15482	11253	10998	11253	11235
number of products	4019	3835	3832	3788	3376	3788	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 year-over-year (yoy) log difference between an import from firm i of product k from country i in month t of 2020 compared to the corresponding import value in the same month of 2019, multiplied by 100, i.e., $\Delta\text{import}_{ijkt} = 100 * [log(\text{import2020})_{pkt} - log(\text{import2019})_{ijkt}]$. *Stringency* is the lockdown index, rescaled to be between 0 and 1. *CovidC* is the confirmed cases per thousand people in the population in each month. We control for the health situation in Chile. 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).$(1 - exp(0.46))$.

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 to the variables of interest

[14]One pending issue to explore is whether there is trade diversion as in Liu & Shi (2021). It can be the case that the firm might be reducing imports from that country but might find a supplier of a certain product located in another country in a better pandemic related health situation. This effect could be captured by means of a measure that takes into account the health situation or policies taken by competitor countries. It can be thought as a third-market effect measure. We leave this aside for the moment.

show some changes.[15]

We explore whether the type of imported good responds differently. We split the sample by type of good according to the Broad Economic Categories (BEC) classification (see Table 4). Foreign indicators keep their sign and significance. Notwithstanding the role of domestic indicators show some variation, being intermediates inputs 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, behaved differently from firms in the wholesale and retail trading sector that import both final consumer and intermediate goods (see Table 5). We can observe that the impact of contagion cases is much stronger than the stringency measures on Manufacturing firms, possibly as the restrictions where targeted to activities that involve higher social interactions.[16]

Along 2020 consumer patterns changed, lockdowns favoured 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 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 the stringency measures, had a higher impact on indoor goods (see Table 6).

Finally, we explore the role of firm size in Table 7. 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 to health conditions. Medium sized firms are affected by domestic health conditions and trading partner stringency conditions. Finally, large firms keep the negative sign and significance in all the indicators.

[15] Given that our dataset is at the firm-product level we also control for the firms id. This will allow us to compare whether a firm importing the same product from countries which are differentiated by the degree and the health measures in 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.

[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 4: Product level heterogeneity
Broad Economic Categories (BEC)

VARIABLES	(1) Intermediates Δ Import_pkt	(2) Capital Δ Import_pkt	(3) Consumption Δ Import_pkt	(4) Unclassified Δ Import_pkt
CovidC_chl	-0.387***	-0.267**	-0.562***	-0.203
	(0.059)	(0.146)	(0.064)	(0.128)
Stringency_chl	-0.082	-0.297***	-0.302**	-0.210**
	(0.066)	(0.071)	(0.125)	(0.089)
CovidC_j	-0.166*	-0.200**	-0.032	0.057
	(0.089)	(0.085)	(0.108)	(0.082)
Stringency_j	0.045	0.193	0.074	-0.051
	(0.078)	(0.139)	(0.149)	(0.131)
log_tc_d12	0.008***	0.001	-0.003	0.004***
	(0.001)	(0.002)	(0.002)	(0.001)
Observations	219,597	57,942	77,971	73,399
R-squared	0.049	0.063	0.089	0.086
number of firms	6557	2692	4014	4027
number of products	1691	388	683	711
Firm FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Product FE	✓	✓	✓	✓
Year 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 on a set of variables accounting for the health situation due to Covid-19. The sample is broken according to the type of good imported following the Broad Economic Categories (BEC): [1] intermediates , [2] capital, [3] consumption and [4] and unclassified.

Table 5: Firm level heterogeneity: Manufacturing vs. Distributors

	(1)	(2)
	Manuf	Distributors
VARIABLES	Δ Import_pkt	Δ Import_pkt
CovidC_chl	-0.236***	-0.479***
	(0.086)	(0.076)
Stringency_chl	-0.124**	-0.196***
	(0.053)	(0.073)
CovidC_j	-0.114	-0.135**
	(0.100)	(0.067)
Stringency_j	-0.002	0.067
	(0.084)	(0.104)
log_tc_d12	0.010***	0.001
	(0.001)	(0.001)
Observations	144,610	254,338
R-squared	0.047	0.058
number of firms	2314	6965
number of products	2667	2928
Country FE	✓	✓
Product FE	✓	✓
Year 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.

Table 6: Product level heterogeneity: Consumption
Indoor vs. Outdoor

	Indoor	Outdoor
VARIABLES	Δ Import_pkt	Δ Import_pkt
CovidC_chl	-0.418***	-0.688***
	(0.138)	(0.122)
Stringency_chl	-0.554**	-0.277**
	(0.204)	(0.110)
CovidC_j	0.249	-0.015
	(0.238)	(0.105)
Stringency_j	0.042	-0.006
	(0.263)	(0.152)
log_tc_d12	-0.007	-0.003
	(0.005)	(0.003)
Observations	29,731	57,290
R-squared	0.103	0.091
number of firms	1618	2808
number of products	304	550
Country FE	✓	✓
Product FE	✓	✓
Year 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.

Table 7: Size heterogeneity: Large vs. SME

	(1)	(2)	(3)
	Small	Medium	Large
VARIABLES	Δ Import_pkt	Δ Import_pkt	Δ Import_pkt
CovidC_chl	-0.264**	-0.388***	-0.412***
	(0.132)	(0.111)	(0.064)
Stringency_chl	-0.133	-0.016	-0.183***
	(0.090)	(0.104)	(0.068)
CovidC_j	-0.012	-0.123	-0.142*
	(0.113)	(0.076)	(0.079)
Stringency_j	0.064	-0.086	0.061
	(0.114)	(0.082)	(0.092)
log_tc_d12	-0.003	0.003	0.006***
	(0.003)	(0.003)	(0.001)
Observations	49,221	51,277	317,794
R-squared	0.154	0.093	0.032
number of firms	4650	2163	2908
number of products	1787	1835	3088
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.

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/from every trading partner, we carry the analysis at the firm-product-country level. In a first step we explored the different behaviour by firms in terms of the intensive and extensive margins in 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, were the medium and small firms 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 considering the size of firms, we also find heterogeneity: SME registered a rapid recovery in varieties. A possible explanation is

that SME 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). Bear in mind, that the share of total imports by this type of firms 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 (without mining) were relatively stable, imports registered interesting patterns, a sharp decline in the number of varieties, accompanied 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 (e.g. lockdowns) and explore different sources of heterogeneity such as the type of imported product, the type of firm or sector. We find, that domestic measures have played an important role as well as foreign factors. The measures taken by trading partners have not been a major source of supply disruptions but we also find some evidence for higher lockdown of a country's 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 vaccination development along 2021 seems to not be playing a major role for the moment.

In spite of the good process of vaccines, the recovery is posing some challenges and far from a smooth recovery to the "new" normality. Firms are still facing some hiccups, such as the ongoing closures in 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.

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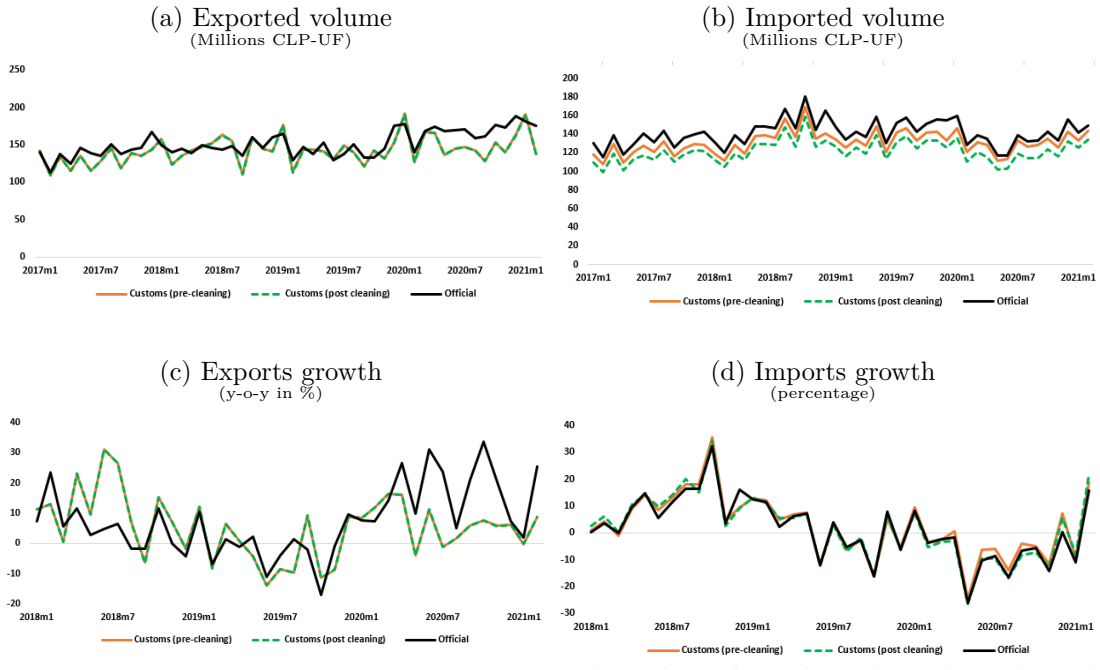
Appendix

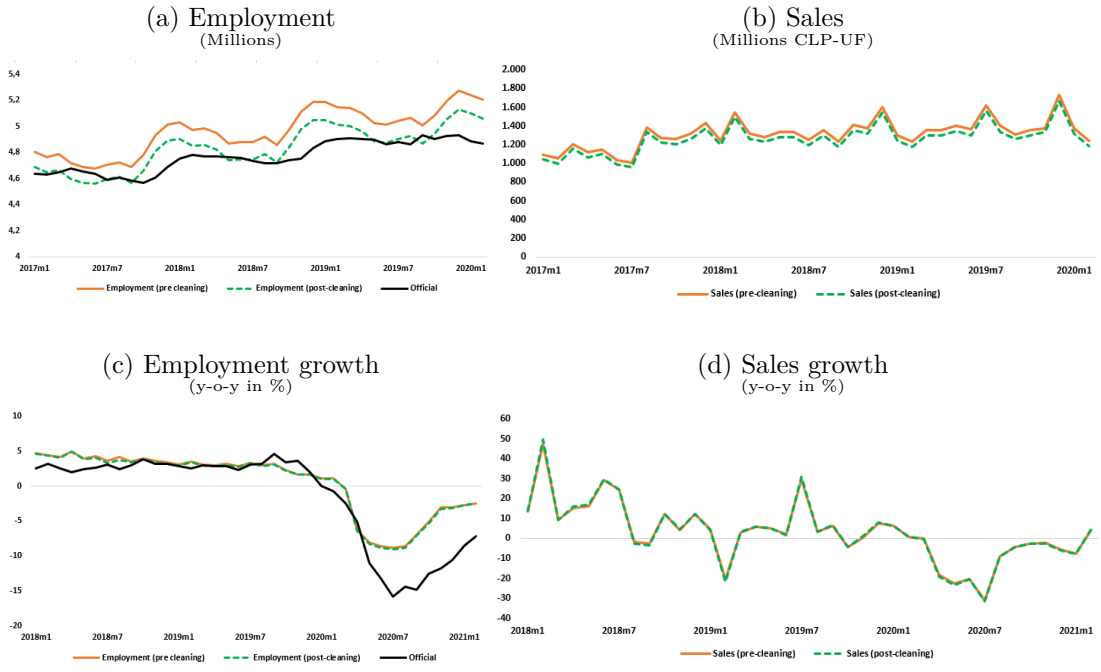
A Data coverage

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



Notes: **Panels (a)** and (**b**) shows the aggregate evolution of exports and imports in million of CLP in constant terms by Chilean firms, before 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 Custom 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 (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	230.27	713.30	226.54	709.07	268.93	798.72
Sales (thousands)	89.41	1373.69	66.90	1593.88	142.48	1861.92
Capital per worker (thousands)	0.48	1.17	0.42	1.16	0.61	1.24
Sales per worker (thousands)	0.50	0.64	0.45	0.63	0.57	0.63
Export (thousands)	7.69	91.01	3.59	27.80	15.80	145.84
Export share in output	0.38	0.38	0.56	0.39	0.26	0.33
Imports (thousands)	10.87	145.21	0.00	0.00	29.24	237.23
Import share in materials	0.38	0.30	.	.	0.38	0.30
	Permanent sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	230.48	713.64	226.85	709.57	268.93	798.72
Sales (thousands)	90.11	1381.71	67.51	1607.45	142.58	1862.59
Capital per worker (thousands)	0.48	1.16	0.42	1.16	0.61	1.24
Sales per worker (thousands)	0.50	0.64	0.45	0.63	0.57	0.63
Export (thousands)	7.77	91.55	3.64	28.02	15.81	145.90
Export share in output	0.38	0.38	0.56	0.39	0.26	0.33
Imports (thousands)	11.00	146.08	0.00	0.00	29.26	237.32
Import share in materials	0.38	0.30	.	.	0.38	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 in Unidades de Fomento (UF). *Source:* Merged SII and Customs data.

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

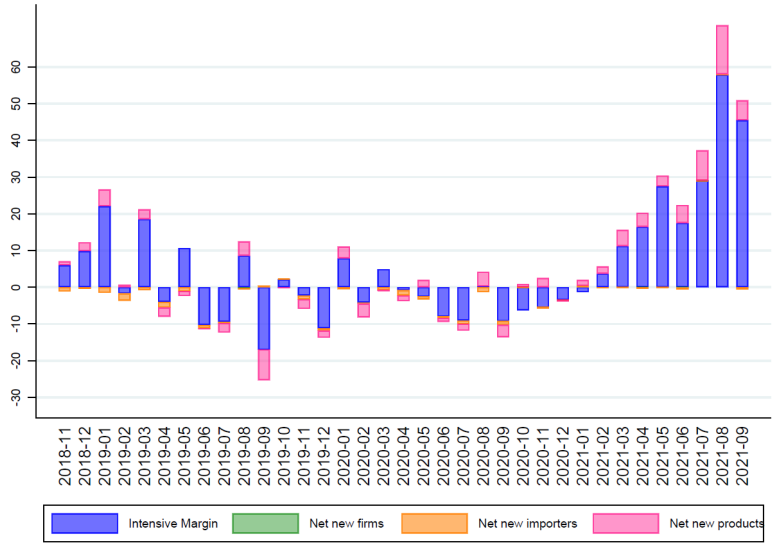
	Full sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	7.96	35.40	7.87	35.80	11.95	35.09
Sales (thousands)	0.45	13.83	0.42	13.91	2.08	6.80
Capital per worker (thousands)	0.27	0.72	0.27	0.73	0.29	0.70
Sales per worker (thousands)	0.17	0.27	0.16	0.26	0.33	0.42
Export (thousands)	0.01	0.70	0.01	0.69	0.07	0.81
Export share in output	0.57	0.39	0.60	0.38	0.34	0.35
Imports (thousands)	0.02	0.48	0.00	0.00	0.76	3.10
Import share in materials	0.54	0.30	.	.	0.53	0.29
	Permanent sample					
	Full Sample		***non-Importers***		***Importers***	
	Mean	std.dev	Mean	std.dev	Mean	std.dev
Employment	8.06	35.81	7.97	36.22	11.99	35.15
Sales (thousands)	0.55	15.72	0.52	15.85	2.18	6.98
Capital per worker (thousands)	0.27	0.72	0.27	0.73	0.29	0.70
Sales per worker (thousands)	0.17	0.27	0.16	0.26	0.33	0.42
Export (thousands)	0.01	0.79	0.01	0.79	0.07	0.84
Export share in output	0.55	0.39	0.59	0.38	0.34	0.35
Imports (thousands)	0.02	0.54	0.00	0.00	0.79	3.18
Import share in materials	0.53	0.30	.	.	0.53	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 in Unidades de Fomento (UF). *Source:* Merged SII and Customs data.

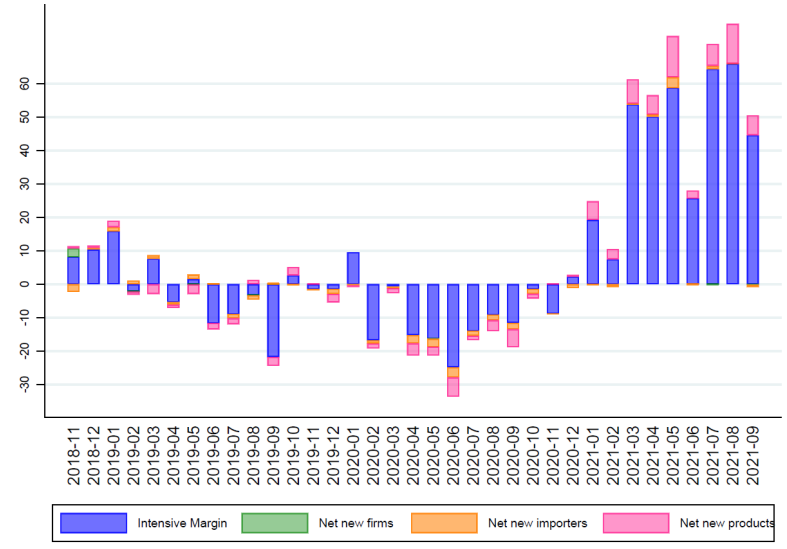
C Import Dynamics by Firm Size

Figure C.3: Import Dynamics - Large firms

(a) Imports by Manufacturing firms



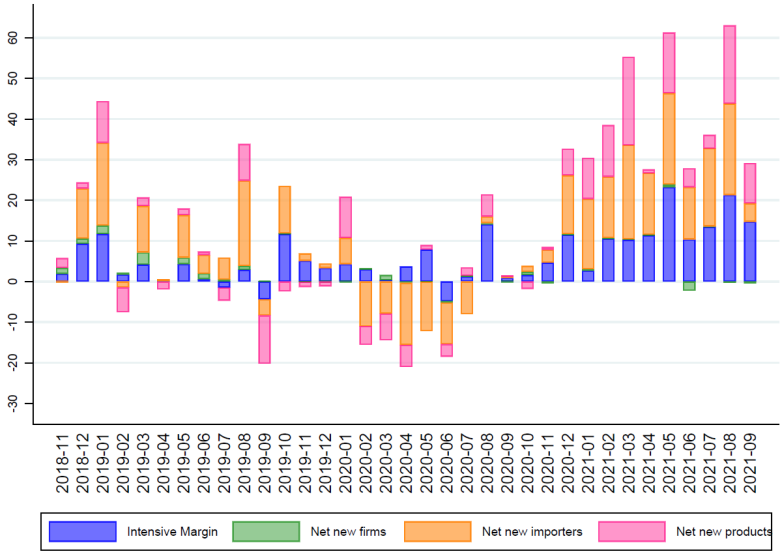
(b) Imports by Distribution/Retail firms



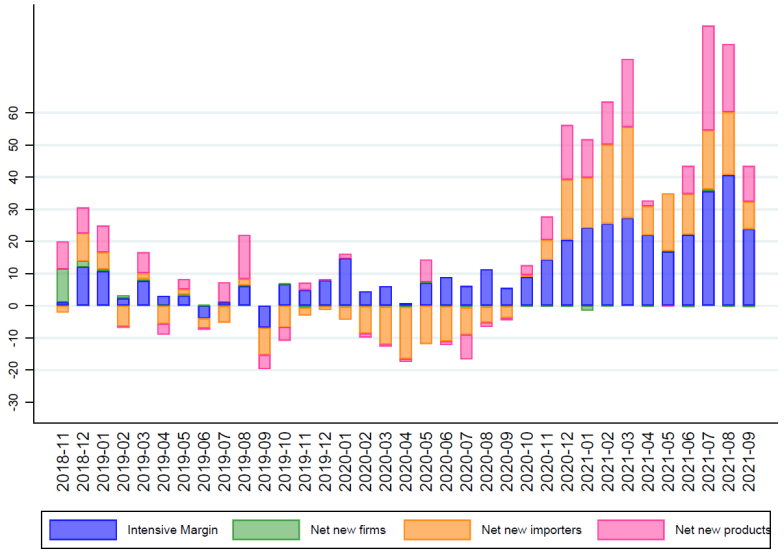
Notes: Decomposition imports growth rates. The contributions measure in pp increase attributable to different mechanisms. The intensive margin measures (net) growth in imports of products that the firm also imported in the previous period (the previous year, and at the beginning of the sample period 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. In *unidades de fomento.Sources:* Chile's National Custom 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. In *unidades de fomento*. *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

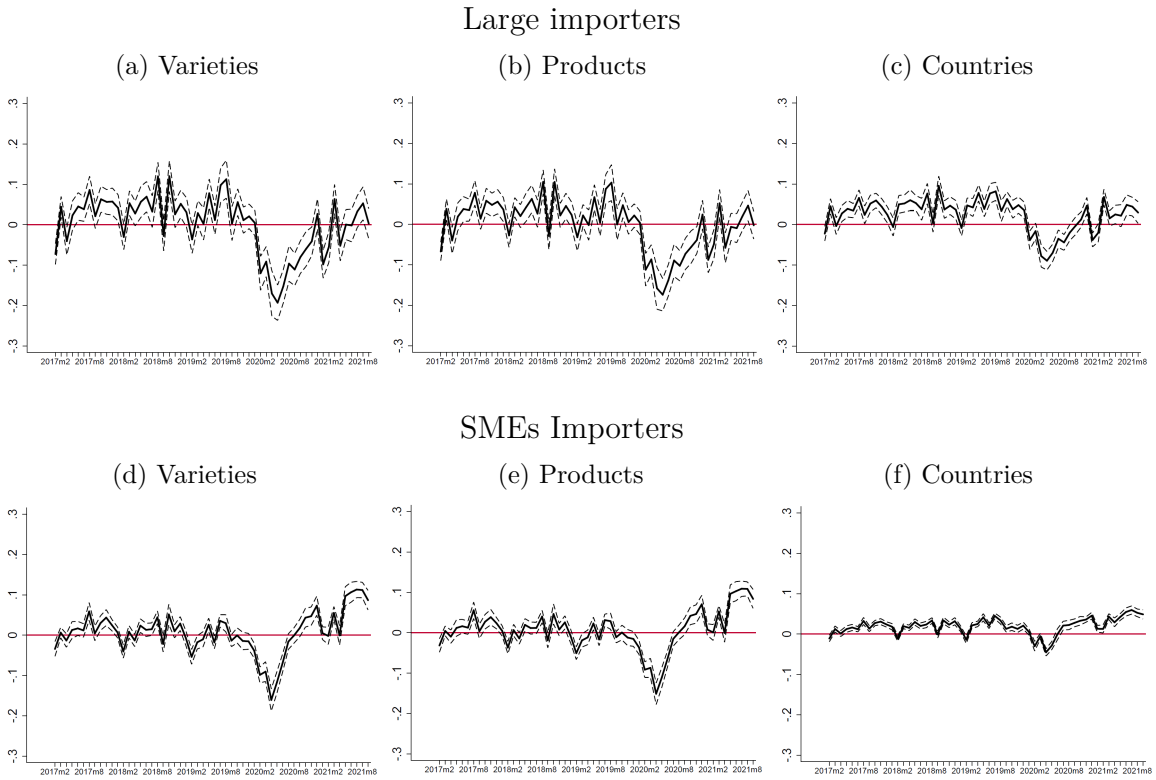
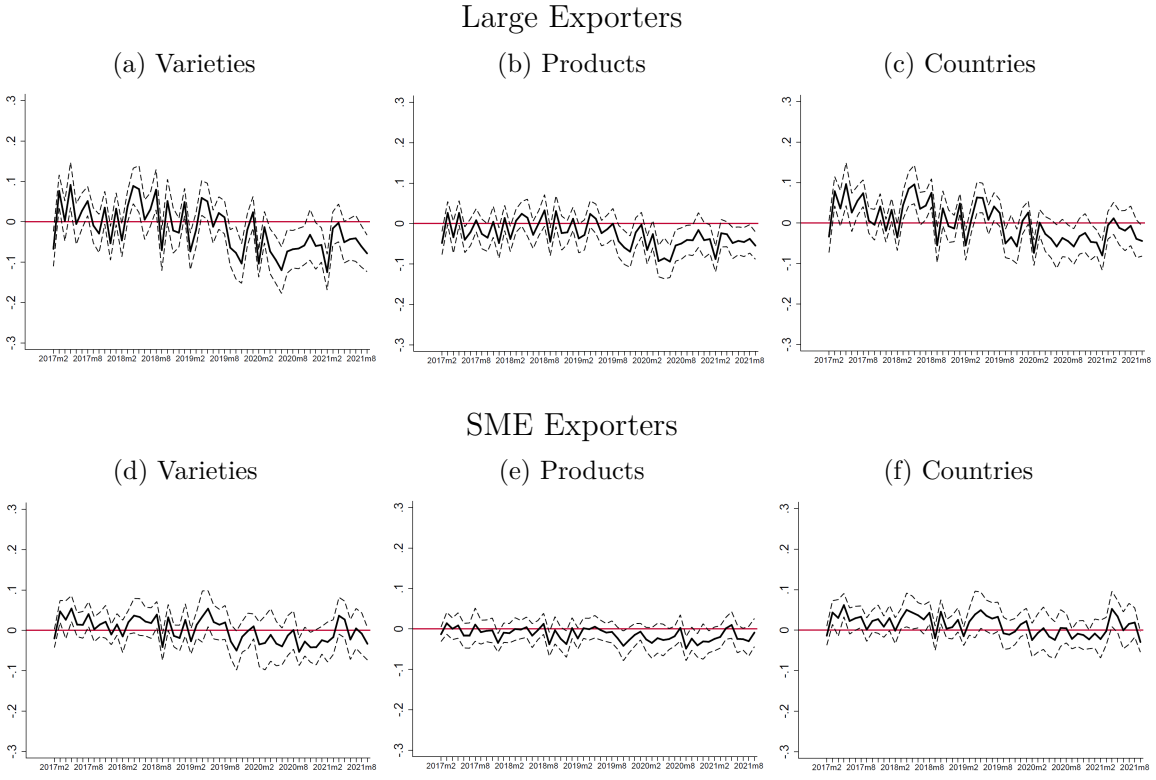


Figure D.6: (Average) number of exported varieties - Large firms vs. small firms



E Additional tables and graphs

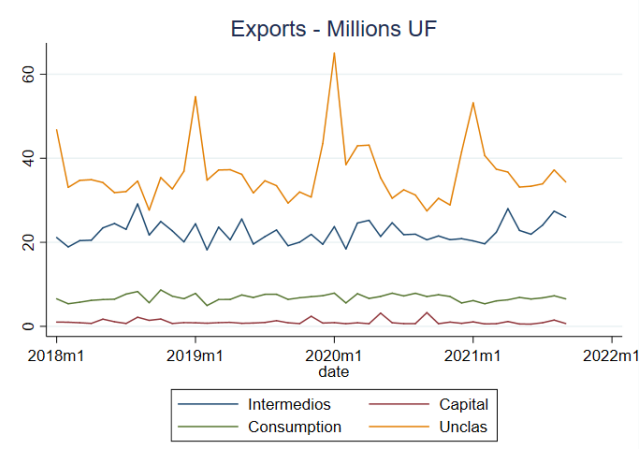
Table E.3: Summary statistics - regression

	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)	4463070	3.92	10.37	-18.70	24.58
Observations	4.463.070				

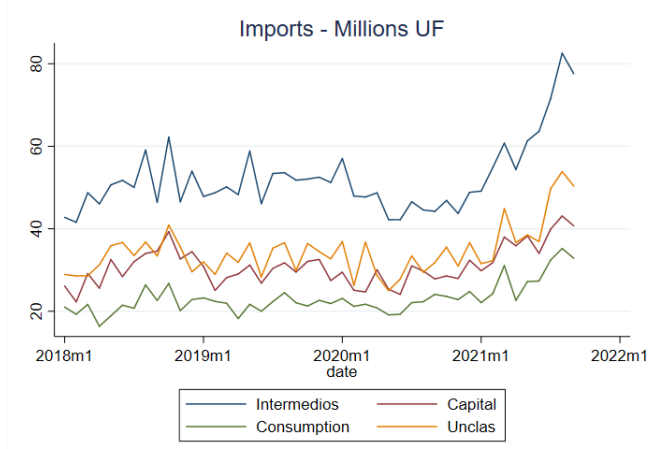
Note: Summary statistics of the variables used in the regressions of **Table 3**. Confirmed cases are the number of new cases (smoothed) per thousand. The number of observations corresponds to the number of transactions.

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

(a) Exports



(b) Imports

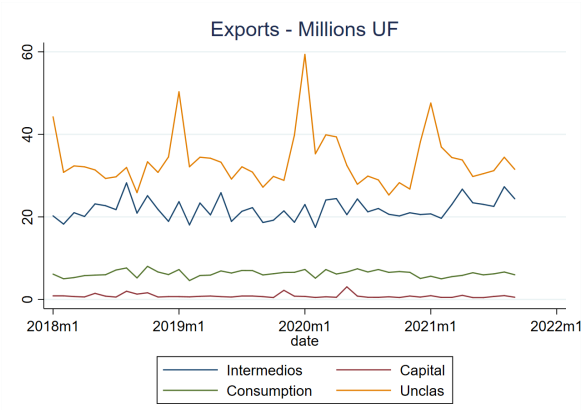


Notes: Trade flows classified according to Broad Economic Categories (BEC). Imports in **Panel (b)** show that import trade consists primarily of intermediate inputs. Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: mining and public administration. *Sources:*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

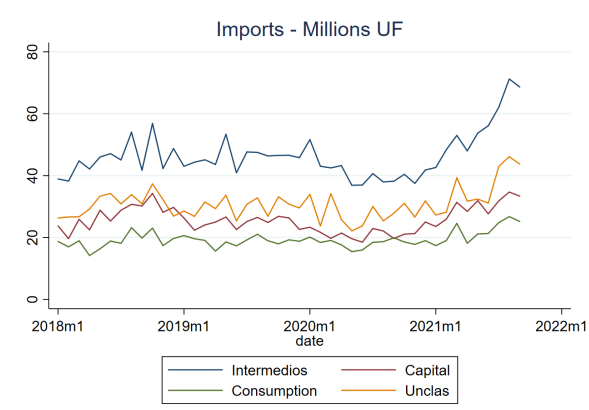
Figure E.8: Exports and Imports by Type BEC and Firm Size

Large firms

(a) Exports

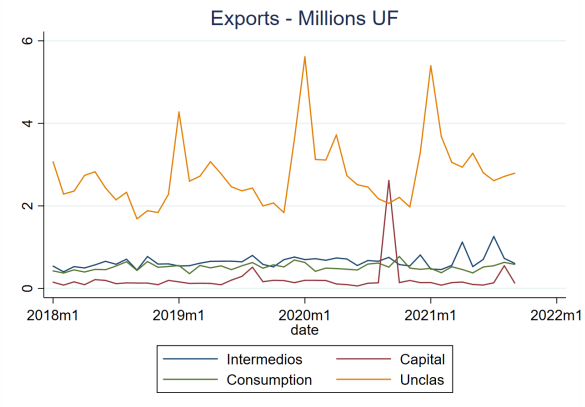


(b) Imports

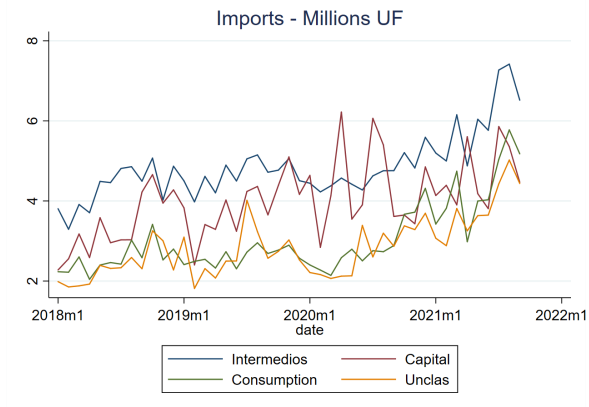


Small and medium-sized enterprises

(c) Exports



(d) Imports

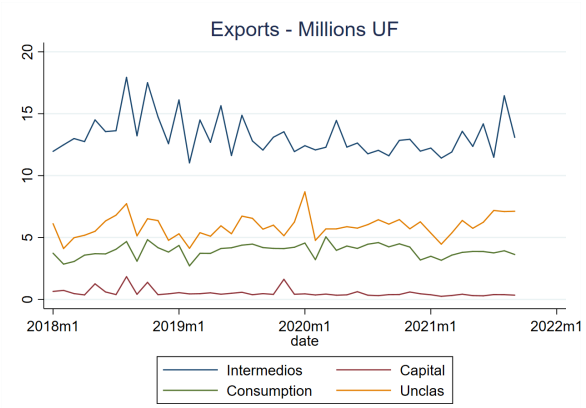


Notes: Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: mining and public administration. Based on Broad Economic Categories (BEC). Imports in **Panel (b)** show that import trade consists primarily of intermediate inputs as shown the higher share of imports.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

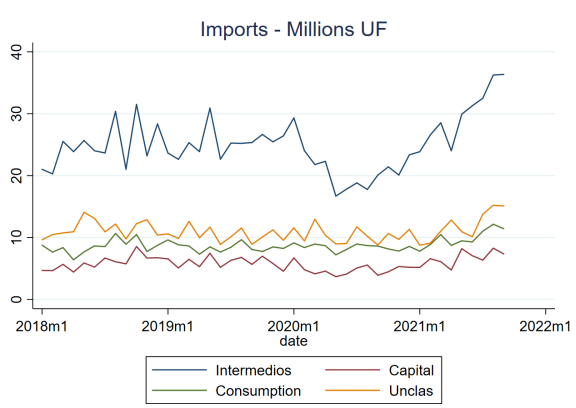
Figure E.9: Exports and Imports by Type BEC and Sector

Manufacturing firms

(a) Exports

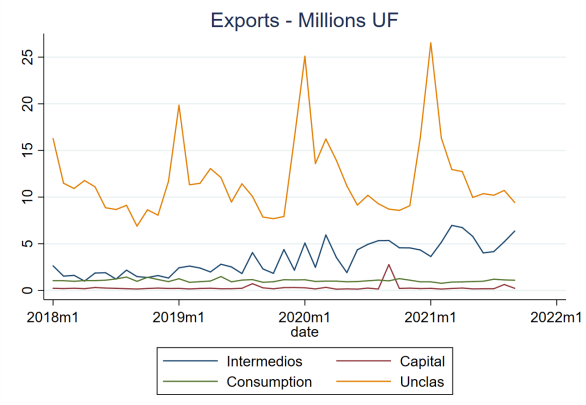


(b) Imports

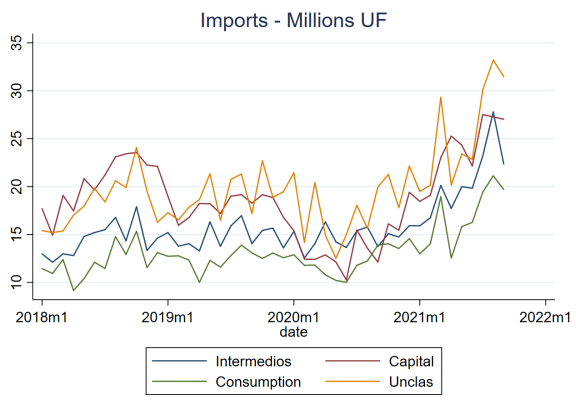


Distribution/retail firms

(c) Exports



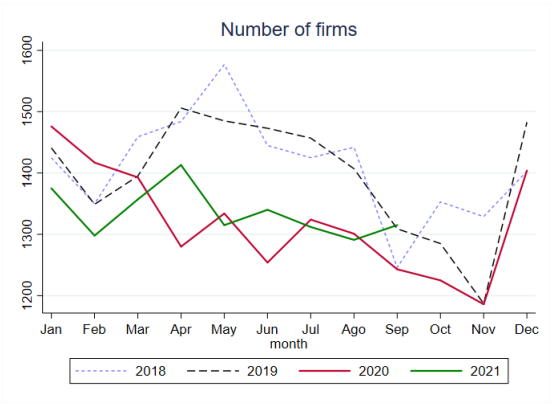
(d) Imports



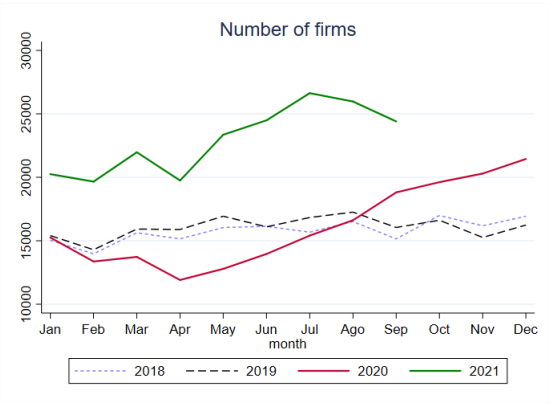
Notes: Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: mining and public administration. Based on Broad Economic Categories (BEC). Imports in **Panel (b)** show that import trade consists primarily of intermediate inputs as shown the higher share of imports.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

Figure E.10: Number of Firms

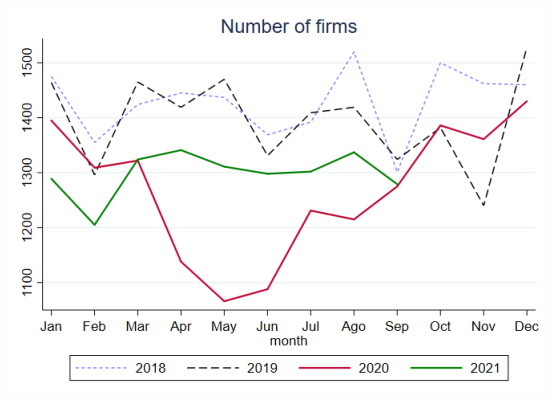
(a) Only exporters



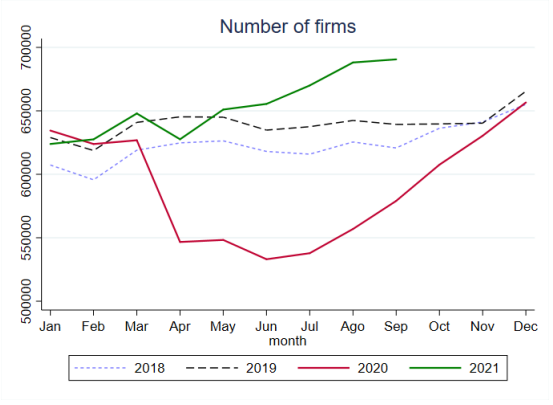
(b) Only importers



(c) Two-way traders



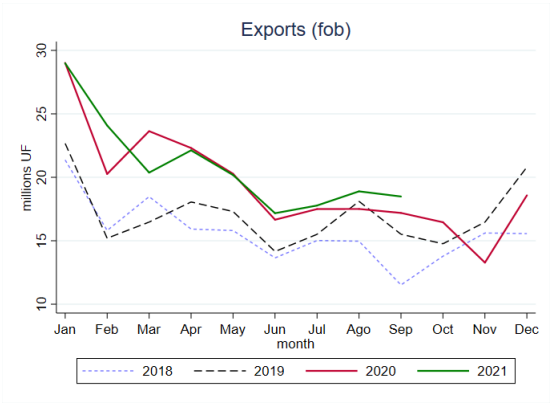
(d) Do not Export - Import



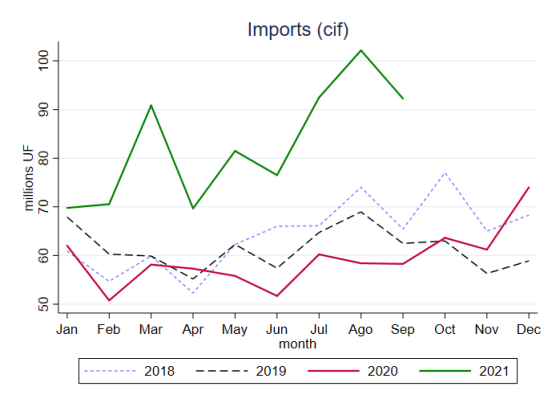
Notes: **Panel (a)** the number of firms that only report exporting activity. In **Panel (b)** firms that only import and in **Panel (c)** firms that declare both types of activity. In **Panel (d)** firms that neither export nor import. Based on dataset after the cleaning procedure detailed in **Section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

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

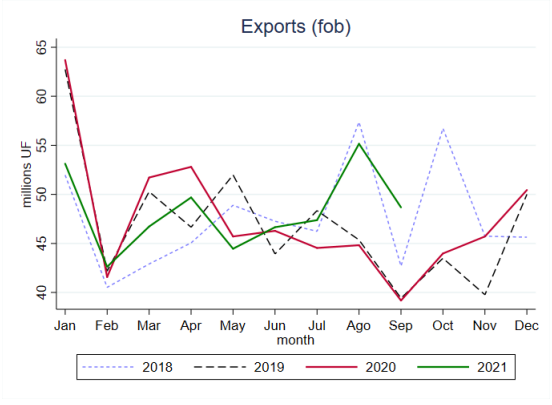
(a) Only exporters



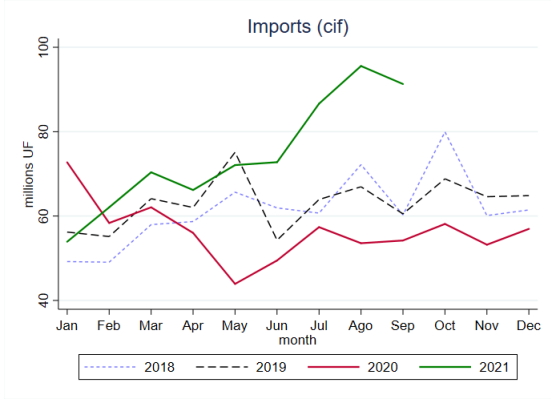
(b) Only importers



(c) Two-way traders



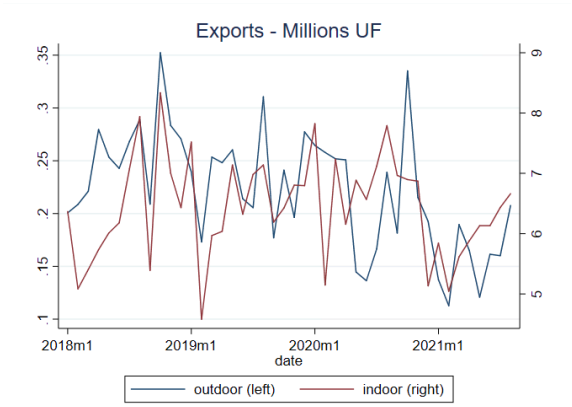
(d) Two-way traders



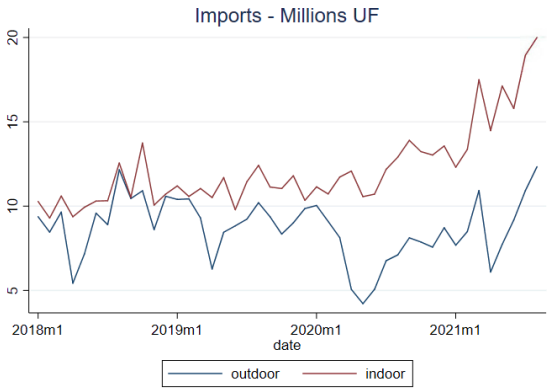
Notes: **Panel (a)** plot the exported volume by only exporter firms. **Panel (b)** only importers. In **Panels (c)** and **(d)** the volumes traded by firms that are both exporters and importers. Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: mining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

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

(a) Exports



(b) Imports



Notes: Based on the classification of de Lucio et al. (2022) imports of goods classified either as indoor or outdoor. Based on dataset after the cleaning procedure detailed in **Section 2**. We exclude the sectors: mining and public administration. *Sources:* Chilean Customs.