Dissecting Consumer Prices in Chile: From globalization to global supply chain pressures*

[VERY PRELIMINARY AND INCOMPLETE DRAFT]

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Abstract

The recent surge in inflation requires a better understanding of underlying price developments. By using very granular on import values and quantities compiled by Customs, we explore the role of trade openness and imported inflation. In particular we quantify the effect of imports of consumption-goods from low-wage countries (LWC/Asian) on inflation in Chile since 2003. This allows to decompose the impact through different channels. Firstly, we account for the role of the *substitution channel*, that is, changes in prices due to the switch from domestic goods towards imports. Then we quantify the *imported inflation* channel, derived from switching imports from different import regions and due to different inflation dynamics. Finally, we estimate the role of the *competition channel*. The sample covers an ample period from 2003 to 2022, which allows to uncover two differentiated periods, first the pre-COVID period, to account for the irruption of new trading partners where imports from Asian economies increased by 10pp. The most recent period will capture most recent developments, that encompass the recent supply disruptions caused by bottlenecks, and to evaluate the impact of a globalization reverse. Our estimates, up to, 2015 suggest that imports from Asian economies lowered CPI /cost of living by 0.3 pp per year on average.

Keywords: Inflation, Price index, International Trade, Customs, firm-level, globalization, Pandemic .
JEL-Codes: LXX.

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1 Introduction

The surge in inflation in the aftermath of the pandemic COVID-19- after years of low inflation- is leading to a heated debate to understand why inflation is so high and, more importantly, whether it will persist. Prior to the pandemic shock, economies enjoyed decades of low inflation partly driven effective monetary "Inflation Targeting" policies together with sound fiscal policies, deregulation processes and increased globalization, in particular with the emergence of Asia as an important supplier of intermediate inputs and final goods into economies, among others.

After many years of subdued inflation, mainly in tradable goods, price developments in Chile show a very different pattern since the end of 2019 (see **graph** 1). The surge in inflation is a global phenomena, and is mainly attributed to: (i) supply chain disruptions that is affecting firms costs (ii) a shift in consumer preferences (iii) aggregate stimulus and post-pandemic recovery (iv) labor supply shock and (v) the Russian invasion to Ukraine that is affecting the energy prices and other commodities.[1] While these are mainly supply side shocks that affect costs and relative prices, the extent to which impacts wage dynamics, labor market developments, price setting and other production decisions that may affect location, as there are fears it may put globalization in reverse, it will determine the aggregate impact on inflation.

With this background, this paper first briefly examines the evolution of Chilean inflation since 2003 to 2022 and focuses on the role of imported inflation by exploiting granular data from Customs (up to the first nine month of 2022), and we address the following questions: Firstly, what has been the role on prices of the emergence of Asia as a supplier of intermediate inputs and final goods into the Chilean economy? Second, how changes in international trade due to the pandemic and recent global developments is influencing recent inflation dynamics? And finally, we will explore to what extent a reversal in globalization may impact price developments.

The availability of a new and large administrative datasets will allow to explore recent inflation developments with more detailed approach. The time span covered of this dataset, allows to explore the role on prices of the emergence of Asia. This region became an important supplier of intermediate inputs and final goods to the world economy, and Chile also benefited from it. The emergence of trading partners with a lower price level may have affected the price index developments, through several channels. One channel due to the switching to suppliers with lower prices and different inflation dynamics and, as a consequence of the heightened

[1] For more details see Will Inflation Remain High? by Agarwal and Kimbal.

competition faced by firms. Notwithstanding, after decades of low inflation and increasing globalization, the COVID episode introduced global trade hiccups, a sharp increase in transportation costs, supply bottlenecks, decisions by firms to source from near-shoring, etc; and highlighted how these interruptions can negatively impact businesses, cause product shortages, and contribute to increased inflation for consumers; it even raised the trend has turned towards deglobalization. Although it is still too early to use these terms, this study contributes to the literature that has begun to study the impact of pandemic disruptions on inflation.

To explore this question we use quasi-exhaustive firm-level transactional data from the Chile's Customs with information on quantities and values of imports by product and origin-country (goods and non-services), from which we can construct detailed import price indices. The availability of granular information and for a long period of time on Customs imports allows us to evaluate, ex-post and with a medium-long term approach, what have been the different channels through which greater commercial integration and changes in the composition of trading partners with a greater weight of emerging economies, it has shifted towards final prices. Allowing to distinguish to what extent it is due to the substitution towards lower-priced products, between domestic or imported, and also by the substitution between imported products of different origins, or by the different paths of inflation of each of the two large blocks.

Throughout 1996-2018 (official data), the Chilean economy has maintained a relatively stable weight of imports (around 22% of total consumption, see panel (a) in **graph** 2). Notwithstanding, there have been changes in the country and product composition of purchases abroad. First, there is a greater weight of imports of final goods compared to imports of intermediates. And secondly, there have been changes in the composition by geographical area, where imports from Asian economies accounts for 6.4% of final demand (from 4.5%), leading to a reduction of imports originating in advanced economies. Third, this change of structure has had an impact on the evolution of prices in the economy and we estimate with administrative data, the impact of the imports from emerging economies in the evolution of consumer prices in Chile, between 2005 and 2015 imports from Asian economies lowered CPI developments by 0.3pp per year on average. But this trend has reversed and an update with the current inflation surge show it is xxpp per year. During the first period, the lower growth in prices was concentrated in certain COICOP divisions such as 3.-*Clothing and footwear* division 5.-*Furnishings, household equipment and routine household maintenance* and 7.1.-*Acquisition of vehicles*.

The rest of the paper is organized as follows. The next **Section 2** provides the literature review. In **Section 3** we explain the analytical framework we use for the

quantitative exercise. **Section 4** presents the details about the data and variable definitions used in the the analysis. **Section 5** reports the main results on the stylized facts by breaking the sample into two periods, before and during/after the start of the Pandemic. Finally, in **Section 6** we conclude.

2 Literature review

This paper merges several strands of the literature, which encompasses research that link globalization, the role of Global Value Chains (GVCs) and inflation, firm level analysis on pass-through of production and transport costs and exchange rates as well as the impact of Covid-19 on inflation.

On globalization, GVCs and inflation.–This work is included in the literature that evaluates the impact of globalization on inflation and, in particular, the effects of China's irruption in international markets. With a macro perspective Bems et al. (2018) have evaluated the role of globalization and domestic factors on inflation for a set of Latin American economies, finding that -in general- domestic factors are more relevant than global factors, but nonetheless foreign factors they have played a role. As for the impact of China's participation in global trade, the effect on employment and the impact on prices have been extensively studied for the United States (see Autor et al. (2013)). As for the impact on prices, there are multiple studies focused on different geographical areas that they find has contributed positively to being able to access products with lower prices, as well as enabling access to a greater variety of products, with clear benefits for the consumer (see Amiti et al. (2020) for the United States, Carluccio et al. (2018) for France.) as well as for firms, where access to a greater variety of products usually translates into a boost for the productivity of companies (see Halpern et al. (2015)). This work is also inspired by Feenstra (1994) where it shows that not taking into account the growing variety of products available, derived from the integration into emerging market trade, can lead to biases in the measurement of the CPI.

On supply disruptions.– Since the start of the pandemic the different measures taken to curb the spread of the virus has led to supply disruptions. In this vein and by using granular data, Lafrogne-Joussier et al. (2022) examine micro level adjustments to supply chain shocks, building on the Covid-19 pandemic as a case study. They find that firms exposed to the Chinese early lockdown experienced a 5.5% drop in domestic sales and a 5% drop in exports, in relative terms with respect to comparable non-exposed firms. The drop in foreign sales is entirely attributable to a lower volume of exports driven by a temporary withdrawal from occasional markets. The ex-ante geographic diversification of inputs does not seem

to mitigate the impact of the shock, firms with relatively high inventories have been able to absorb the supply shock better. On the other hand, Huang et al. (2012) exploit richer information on trade partner identity in the Chilean data, they then provide additional evidence that Chinese suppliers systematically vary sales prices across Chilean firms in a way consistent with the market structure in the model. In particular, upstream sellers offer lower unit prices for the same HS 6-digit product to downstream buyers that source that product from more Chinese suppliers. This result obtains in stringent specifications that account for marginal costs and quality with seller-product pair fixed effects and for downstream demand with buyer-product pair fixed effects. Celasun et al. (2022) [XXX].

Loecker et al. (2014) evaluate the role of foreign competition. In the manufacturing sector they consider both the impact of global competition through measures of import penetration and the impact of within-EU competitiveness using measures of relative labor cost. In selected manufacturing sectors they identify the strength of international competition through a firm's proximity to the border. In both instances, they consider the impact on a variety of performance dimensions to learn about the mechanisms and about firms' adjustment to these competitive pressures.

On cost pass-through.– Several studies exploring how different costs such as tariffs, exchange-rate movements, energy costs and transportation costs are passed-through to final prices.

There are numerous papers where pass-through coefficient of the exchange rate movements for the Chilean economy is evaluated. Among which it is worth mentioning García-Schmidt & García-Cicco (2020); they with a structural model, they estimate the pass-through coefficient taking into account the disturbance that underlies the movements of the exchange rates, whether a disturbance in the terms of trade or in the interest rate differential is a consequence. On the other hand, non-structural estimates as Contreras & Pinto (2016), allow to capture the heterogeneity in the pass-through coefficient at the sectoral scale or type of product. There are sectors, which due to their greater trade openness, are more exposed to fluctuations in the exchange rate and therefore register a greater transfer. Whith more granular information, with data from Customs, Giuliano & Luttini (2019) estimates the pass-through coefficient in import prices in prices at the border (*"border prices"*) and they analyze how the currency with which transactions are denominated influences the pass-through coefficient. In the case of Chile, 90% transactions are denominated in dollars, and empirically analyze the macroeconomic and monetary policy implications of carrying out commercial transactions in the predominant currency.[2]

[2]Exporting companies can set the price either in their local currency (*Producer Currency Pricing*) or in the currency of the export destination country (*Local Currency Pricing*). In the case

At firm level Albagli et al. (2022) study the role of expectations in pricing decisions. They show that firms rely on price changes observed along their supply chain to form expectations about aggregate inflation, and that these expectations have a complete pass-through to sales prices. They document that changes in prices at which firms purchase inputs inform their forecasts of the economy's inflation. This is the case even if changes in input costs do not determine the inflation outcome. These findings reject the full-information rational-expectations hypothesis and are consistent with firms' disagreement about future inflation and inattention to macroeconomic news, which they document for Chile. Their results from a firm-level Phillips' curve estimation suggest that firms' beliefs about inflation are a key determinant for their price-setting decisions.

The impact of Covid-19 on inflation.– After months of subdued inflation from May 2020 onward, prices began to pick up. The Covid-19 pandemic has disrupted global supply chains, leading to shipment delays and soaring shipping costs. The surge in inflation has also led to a vast number of works to disentangle the underlying mechanism such as changes in preferences from services towards goods, as Ferrante et al. (2022). On the other hand, Furceri et al. (2022) study the impact of shocks to global shipping costs—measured by the Baltic Dry Index (BDI)—on domestic prices for a large panel of countries during the period 1992-2021. They find that spikes in the BDI are followed by sizable and statistically significant increases in import prices, PPI, headline, and core inflation, as well as inflation expectations. The impact is similar in magnitude but more persistent than for shocks to global oil and food prices. The effects are more muted in countries where imports make up a smaller share of domestic consumption, and those with inflation targeting regimes and better anchored inflation expectations.

Another paper (theoretical) is di Giovanni et al. (2022), they study the impact of the Covid-19 pandemic on Euro Area inflation. Their exercises deliver four key results: 1) Compositional effects – the switch from services to goods consumption – are amplified through global input-output linkages, affecting both trade and inflation. 2) Inflation can be higher under sector-specific labor shortages relative to a scenario with no such supply shocks. 3) Foreign shocks and global supply chain bottlenecks played an outsized role relative to domestic aggregate demand shocks in explaining Euro Area inflation over 2020-21. 4) International trade did not respond to changes in GDP as strongly as it did during the 2008-09 crisis despite

of fixing prices in the destination currency, movements in the exchange rate will affect the margins of the exporting company, and the consumer will not see a variation in the price (assuming nominal rigidities). In the case of fixing prices in the currency of the country of origin, the consumer will assume the movements of the exchange rate. Finally, trading in a third currency such as the dollar, translate into a higher transfer coefficient. For more details see Gopinath et al. (2010) and for a recent update where the predictions are corroborated see Boz et al. (2020).

strong demand for goods. These lower trade elasticities in part reflect supply chain bottlenecks. These four results imply that policies aimed at stimulating aggregate demand would not have produced as high an inflation as the one observed in the data without the negative sectoral supply shocks.

3 Analytical framework

In order to assess to what extent trade openness has played a role in price developments we will carry out an accounting decomposition method to account for different channels. To this end we closely follow the methodology proposed by Carluccio et al. (2018).

Under this setting, consumers derive utility from consuming domestic and foreign varieties, and the (log) aggregate price index faced by consumers at time t is a composite of tradable prices p^T and non-tradable prices p^{NT}. The relevance of each price is driven by the parameter β_t, a parameter that weights the share (preference) of traded goods in total consumption.

$$p_t = \beta_t p_t^T + (1 - \beta_t) p_t^{NT} \tag{1}$$

Prices in the tradable sector p^T are a composite of foreign (F) and domestic prices (D), the weight of foreign product prices is η_t:

$$p_t^T = \eta_t (e_t p_t^{*F}) + (1 - \eta_t) p_t^D \tag{2}$$

$$p_t^T = \eta_t (p_t^F) + (1 - \eta_t) p_t^D \tag{3}$$

Foreign prices can be further decomposed as a composite of the share of prices from low wage countries and high wage countries, γ is the weight of imports from low wage countries.

Tradable prices are a composite of foreign and domestic prices. Where η captures the share of foreign goods.

$$p_t^F = \gamma_t p_t^{LWC} + (1-\gamma_t) p_t^{HWC}$$

By substituting and simplifying, we obtain the equation that serves to discipline the calculations on price developments through three channels:

$$\pi_t^{CPI} = \underbrace{\beta_t \frac{\delta \eta_t}{\delta t} \gamma_t (p_t^{LWC} - p_t^D)}_{\text{Substitution channel}} + \underbrace{\beta_t \eta t \left[\frac{\delta \gamma_t}{\delta t} (p_t^{LWC} - p_t^{HWC}) + \gamma_t (\pi_t^{LWC} - \pi_t^{LWC}) \right]}_{\text{Imported inflation channel}} + \underbrace{\beta_t (1-\eta_t) \pi_t^D}_{\text{Competition channel}}$$

CPI variation is due to changes in the weight of tradabales (β), in the share of imports (η) and the share of imports that originate from Asia/LWC (γ). Also price differentials between domestic and foreign prices do play a role as well as a price differential between the two regions. This decomposition allows to distinguish three channels through which import prices affect the Consumer Price Index.

The first, is the *substitution channel*, that is, the changes in prices due to the switch from domestic to imported varieties either from developed, EU and Latam to Asian/Chinese countries.

The second component quantifies the role of *imported inflation*, either through the switch of importing from one region or the other and secondly due to the differentiated inflation developments from these two different regions. Finally, the last component estimates the role of the *competition channel*.

4 Data and methodology

Data is drawn from **Customs Declaration** collected by Chile's National Customs Service. These are based on two formulaires the *Declaración de Ingreso* (DIN) for imports and the *Declaración Única de Salida* (DUS) for exports. All transactions

refer to goods (not services) and they are reported in USD (information as regards the currency denomination of the transaction is provided). For each exporter/importer (blinded) we observe the value of exports (fob) and the value of imports (cif), the product origin-destination level. The dataset accounts for around 85% of the aggregate Chilean exports and 90% of the aggregate imports.

The data covers the universe of Chilean imports, on average 800,000 transactions per year. The Chilean Customs use these data to compute official Balance of Payments (trade) statistics. We work on an annual frequency to smooth the series and avoid seasonal issues.[3] From each type of declaration we use information of each transaction (1) the shipment value, (2) the country of origin and (3) the product code. Our study focuses on the 2003-2022 period (with first nine months of 2022).[4]

In order to obtain more information the firm characteristics that is carrying out the transaction we merge this data with the information provided by the **Servicio de Impuestos Internos (SII)**. We have information as regards the size, based on turnover and the economic activity in which the importer/exporter firm operates according the NACE Rev. 2018 classification. 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. [5]

Product correspondences.– Each traded product is classified according to Harmonized System at 6 digit (HS-6). Each product is matched with the COICOP[6] classification at the division-group-class level, which is the classification used to construct the Consumer Price Inflation (CPI). We use the correspondence proposed by Cavallo et al. (2019) to assign to each HS-6 digit code a classification based on COICOP. We focus on *Consumption* goods based on the Broad Economic Categories (BEC).[7] The Customs dataset accounts for 9.383 differentiated products, of which $1,977$ are classified as consumer products. The HS6 correspondence to COICOP is 303.

[3] A robustness exercise in the pipeline is to work with lower frequency.

[4] For additional details on the cleaning process of the Customs dataset can be found in Peña & Prades (2021).

[5] As some firms have changed their reported activity we keep the most common code along the sample.

[6] COICOP stands for Classification of Individual Consumption According to Purpose.

[7] *Intermediates* and *investment goods* will also impact prices indirectly but this goes beyond the scope of this exercise. One possible avenue would be to approximate at the firm level the impact of marginal costs as in Amiti et al. (2014), merged with information on total expenditures on materials by each firm obtained from F29 formulaire, but we leave this for future research. Another interesting approach at the firm level and the impact of supply chain disruptions is Lafrogne-Joussier et al. (2022) for French firms and Albagli et al. (2022) for Chilean firms.

To compute the share of tradable goods in final consumption and the share of imported goods we make use of the most up to date **Inter-Country Input-Output (ICIO)** tables from the OECD. Where we can account for total final consumption by country in current USD and compute the different parameters that capture the degree of openness.[8]

To weight *unit values* by COICOP category in order to compute equivalent price indexes we use the information provided by the National Statistical Office at the division-group-class level.

–Basic calculation on prices–

Unit values.– Customs declarations do not provide information on paid prices which is a typical shortcoming of this datasource. Still, we proxy import and export prices through unit values as it is usually done in the related literature (see for example Amiti et al. (2014) and Fontaine et al. (2019)). As we also have information on values and the quantities as well as the country of origin/destination we can also compute expenditure shifts. In particular, the proxy of the price of a good-variety i, invoiced in currency c, shipped from country x, at time t is:

$$\mathrm{p}^{m,x}_{f,i,c,t} \approx \mathrm{uv}^{m,x}_{f,i,c,t} = \frac{\mathrm{value}_{f,i,c,t}}{\mathrm{quantity}_{f,i,c,t}}$$

For each type of transaction either an import (m) or an export (x) we compute *uv* payed/charged by each firm f, for each product i, for a country of origin/destination c at time t. Quantities are reported as weights (Kilograms or tons), units or pairs. Note that unit values are an imprecise proxy for prices because there may be more than one distinct product within an HS6 digit code.

While export prices are reported free on board (fob), import prices include cost insurance and freights (cif). To make them comparable we add VAT and distribution margins. That is, to observed export prices we add a 8% based on the mean estimate of the CIF-FOB margin.[9]

For each product at HS-6digit/8-digit we compare domestic and foreign prices. Domestic prices are proxied with the export unit value uv^{x}_{jt}, and the import price is proxied with the import unit value uv^{m}_{jt}. To make them comparable we add a

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

[9] For more details on the estimate on the margin between cif and fob see http://www.oecd.org/sdd/its/Estimating-transport-and-insurance-costs.pdf. We take the median estimate for the period under study.

fixed 20% on the import price, to account for transportation and distribution costs, as exports are free on board (fob) and import prices include cost, insurance and freights (cif).

We trim the data and remove quotes and transactions that deviate substantially from the median price set/paid by the firm for each product by more than the 99.0% percentile, in order to get rid of outliers. Notwithstanding, the observed price heterogeneity may reflect heterogeneity in markups, heterogeneity in marginal costs and vertical differentiation.

Price Indices.– To construct Price Indices at several dis-aggregated levels we weight each COICOP category with the weights provided by the National Statistical Office for the CPI.

$$P_{i,t}^{T} = \Pi_j P_{ijt}^{\omega_{ijt}}$$

Where, the Price index of tradable P^T of product i at time t is the set of prices of domestic varieties is denoted by D and the foreign varieties by F. The share of of imports in total consumption of i is $\eta_{it} = \sum_{j \in F} \omega_{ijt}$.

First, at HS 6 digits we compute the geometric weights of unit values. Then at COICOP 3 digit, we use the weights from INE. A COICOP 3 digit implies that we work at the class level of each division, that is, 03- Division of Clothing and Footwear, 031.- Group Clothing and 0312.- Class Garments. Then we aggregate the class within each group and division according to the INE weights.

This price index aims to measure the aggregate price change in the current period compared to a base period. Given that there are several formulas to compute the evolution of prices and the weights of the products and each of one with advantages and disadvantages, we evaluate different options in constructing the price indices given the nature of the customs data. One of the main characteristics is that product varieties are entering and exiting. The usage of bilateral price index methods where the price of a product variety in the current period is compared to the corresponding price in some base period is difficult in a context where the overlap of products declines and there are changes in the country of origin of the product. This problem becomes more relevant as we move away from the base period (for more details on how to construct Price indices Eurostat). Therefore, we use multilateral methods to construct the price index as they take into account all the products that are available in each period. We will base our analysis on a annual basis. We take as input the prices and quantities of each individual transactions.

$$\pi_{i,t}^{T} = \underbrace{\pi_{i,t}^{D} + \eta_{it}(\pi_{it}^{F} - \pi_{it}^{D})}_{\text{pure price effect}} + \underbrace{\frac{\delta \eta_{it}}{\delta t}(p_{it}^{F} - p_{it}^{D})}_{\text{composition effect}}$$

Where:

- $\pi_{i,t}^{T}$ Inflation in tradable goods
- $\pi_{i,t}^{D}$ Inflation of domestic goods
- $\pi_{i,t}^{F}$ Inflation of foreign goods
- Differential inflation for foreign and domestic goods, weighted by the expenditure share, weighted by η_{it}
- Changes in the expenditure share of foreign goods scaled by their price differential.

–Parameters on trade openness–

Share of tradadables.– The aggregate *share of tradables* over total consumption goods over time, β_t, is computed by using information from the ICIO tables, 45 sectors. Each ISIC Rev.4 category is categorized according its tradability.

$$\beta_t = \sum_{s \in T} \varphi_{st} \tag{4}$$

The share of tradables at each COICOP 2 digit/division category is the ratio between total imports of a given product (from Customs/ICIO) and the total consumption.

Share of imported goods.– The share of tradable goods that are imported, η_t, is computed using information from ICIO and Customs data.

$$\eta_t = \sum_{s \in F} \varphi_{st} \tag{5}$$

Share of goods imported from LWC.– Is computed from Customs data γ .

$$\gamma_t = \sum_{s \in LWC} \varphi_{st} \tag{6}$$

Country classification.– Customs data provides info on the country of origin of each transaction, these are classified in two groups $g \in$ (HWC,LWC), high wage countries (HWC) and low wage countries (LWC). For some exercises and calculations we make use of a more dis-aggregated grouping, i.e, $g \in$ (ASIA,LATAM,DEVELOPED,ROW).[10]

5 Preliminary results

In this section we first evaluate the evolution of the different openness parameters based on the latest ICIO tables that cover the 1996-2018 period. These parameters captures the relevance that import prices might have, and we obtain the following results:

The role of trade openness and origin of imports.– The trade openness of the Chilean economy, according to information obtained from input-output tables, has not registered remarkable changes throughout the analyzed period 2005-2018. Since the weight of imports on total GDP has remained stable at around 30% (22% in consumption.). However, it is observed that there have been changes in the geographical composition of the origin of imports. Below we analyze the evolution of each of the variables that measure openness:

- The weight of "tradable" goods or services in final consumption (β_t) in Chile on average stood at 54% in 2018 (**graph** 2). In line with other economies, the weight of tradable goods or services has declined in recent years to the extent that services are gaining importance.

  The average share of tradables in consumption in Chile was at 56% along the period 2005 to 2015. Notwithstanding, this ratio showed a declining trend from 57% in 2005 to 54% in 2018. This decline is explained by an increase in the share of services in the consumption basket. This is a phenomena observed developed countries.

- On the other hand, the weight of imports over total goods tradables (η) has shown a slight increase (+3 percentage points, from 36.5% to 39.5%) offsetting the drop in consumption in tradables.

- However, there has been an increase in the weight of imports from Asian countries. Imports from this geographical area are characterized by having more competitive prices. In Chile, imports originating from Asian economies

[10]Imports from Japan are under the DEVELOPED group.

have increased by 13 percentage points, from 33% in 2005 to 46% in 2015 (γ). What highlights the growing importance of Asian markets, not only from the export side, but also as this area becomes geography in an important supplier of intermediate materials and final products for the Chilean economy (see **graph** 2)

Unit values and Price Indices.– We make use of the unit values calculated for each product at the most disaggregated level possible based on Customs data as the best available approximation of prices import and export. With this information we compute the average wage differential and we elaborate the different price indices.

Import unit values are quite heterogeneous depending on their geographical area of origin, being on average higher from HWC than from LWC. This holds within narrowly defined product groups items from LWC are on average cheaper than its counterpart in HWC (see **figure** 4). Notwithstanding, this difference on average has become smaller from 2019 onward. And also at COICOP level.

As regards, export prices, which are used as a proxy to compare imported prices with domestic prices, do not show such differences (if so, this will imply price discrimination). However, this strategy to proxy domestic prices with export prices has some limitations, in particular for the Chilean economy where the number of exported varieties is not so broad as in other economies.[11] As mentioned above, certain margins to prices have been added in order to make these prices comparable. And on the other hand, exports are concentrated in certain products, for which reference prices for a range of products defined at a very fine level of disaggregation, on multiple occasions, are not available.

- **Price differentials:** We analyze the average price differentials ($p_t^M - p_t^D$) over time. With a further breakdown accounting for prices from low wage countries versus high wage ($p_t^{LWC} - p_t^{HWC}$) (see **figure** 4) and the difference between low wage and domestic prices ($p_t^{HWC} - p_t^D$) (see **figure** 5). Price differentials between the different regions has been relatively stable up to 2019, since then the price differential has narrowed. This implies that a reduction in the price gains derived form switching to cheaper varieties.

- **Inflation differentials:** Not only at the granular/product level. Also CPI developments by country groups g and product type i and compute a price index $P_{i,0}^g$

[11] Note that this exercise has been made for European economies that count with a higher degree of openness and with a wider variety of exports, see Carluccio et al. (2018).

With all this information, we evaluate each of the channels for each consumption division according to the COICOP classification, which is the one used to compile the consumer price index. In the first place, the *Substitution Channel* (captures the effect of substituting domestic for foreign goods), which is a consequence of the substitution of the consumption of domestic products towards foreign ones, has had practically no influence on each of the analyzed divisions (see **table** 1 and figures 6). The relative stability in the weight of imported products over total consumption means that the price differential between domestic and imported goods has had a very limited impact.

The imported inflation channel (see **table** 2), is the one that registers a greater impact on the evolution of prices. This channel is broken down into two components. The first component accounts for the impact on CPI developments due to the substitution or switch of goods imported from countries towards imports from countries with lower wages. And a second channel, consequence of the different evolution in the inflation registered in these two blocks. These two channels have contributed most notably and are concentrated in certain types of products such as those of the 3.-*Clothing and footwear* division, the 5.-*Home equipment division* and the 7.-*Transportation sector*, mainly by group 7.1.-*Acquisition of vehicles*. On the one hand, prices in emerging countries remain at lower levels. However, inflation in emerging countries has shown a slight upward trend, possibly reflecting higher quality, more sophisticated products, etc. The estimated impact on the Cost of Living are also shown in **figures 6**.

6 Key takeaways

[TBC]. In this paper we estimate with administrative data, the impact of imports from emerging economies in the evolution of consumer prices in Chile between 2003 and 2022. This long time-span allows us to study the period of low inflation and then the rise of inflation initiated during the pandemic. By using a sub-sample (2005 to 2015) we find that import substitution towards suppliers with a lower average price, such as the Asian markets, have contributed to lower relative prices in the tradables and, in particular, the lower growth in prices is concentrated in goods of division 3.- *Clothing and footwear*, division 5.- *Furnishing and household equipment* and group 7.1.- *Acquisition of vehicles*.

Table 1: Substitution Channel

Decomposition by coicop Division

Division COICOP		Weight CPI basket		β	$\Delta\ \eta$	γ	Price diff (p^{LWC}-p^{D})	Channel 1	Contr. CPI
[1]		[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
01.-	Food and non-alcoholic beverages	19.3	19.3	0.73	0.48	0.32	0.36	0.04	0.79
02.-	Alcoholic beverages and tobacco	4.8	2.9	1.00	0.48	0.32	0.68	0.10	0.30
03.-	Clothing and footwear	3.5	3.5	0.97	0.67	0.63	-0.36	-0.15	-0.52
04.-	Housing, water, electricity, gas and other fuels	14.8	4.4	0.18	0.02	0.27	1.39	0.00	0.01
05.-	Furnishings, household equ. and household maint.	6.5	2.8	0.85	0.02	0.27	0.62	0.00	0.01
06.-	Health	7.8	3.0	0.27	0.00	0.00	0.00	0.00	0.00
07.-	Transport	13.1	3.3	0.43	-0.32	0.46	-0.95	0.06	0.19
08.-	Information and communication	5.5	-	-	-	-	-	-	-
09.-	Recreation, sport and culture	6.6	5.0	0.53	-0.18	0.37	-0.35	0.01	0.06
10.-	Education services	6.6	-	-	-	-	-	-	-
11.-	Restaurants and accommodation services	6.4	-	-	-	-	-	-	-
12.-	Other	5.2	3.4	0.29	-0.18	0.37	-0.94	0.02	0.06
	Total contribution							0.09	0.90
	Annual average							0.01	0.08

Notes:
In column [2] the weight of each item on the CPI basket.
In column [3] the weight of the products for which we have information from Customs.
In column [4] the value of parameter β that accounts for the share of tradable goods within the division.
In column [5] $\Delta\ \eta$ captures the average annual growth of imports over tradable goods.
Column [6] captures the average share of imports from LWC.
Column [7] shows the average differential of (log) import prices vs. domestic prices.

Potential update and comments: With ICIO up to 2018 we will update the calculations of β, η and γ. We may have info on price differentials up to 2022. For 2019-2022 we can compute γ with Customs. Interesting to check how these price differentials have changed.

Source: Own calculations.

Table 2: Inflation Channel

Decomposition by coicop Division

[B] Using the hs-6-coicop correspondence by Cavallo et al. (2019)

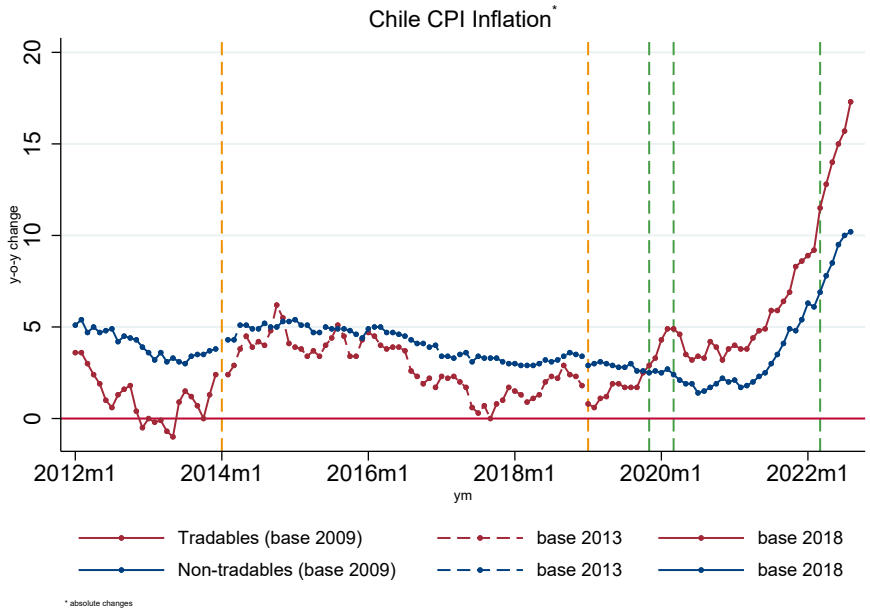
Division coicop		Weight CPI Basket		$\beta\ \eta$	Imported Infl.		Channel 2	Contr. IPC
					Substitution	Differencial		
[1]		[2]	[3]	[4]	[5]	[6]	[7]	[8]
01.-	Foods and non-alcoholic beverages	19.3	19.3	0.09	-0.84	0.01	-0.07	-1.27
02.-	Alcoholic beverages and tobacco	4.8	2.9	0.12	-0.41	0.02	-0.05	-0.13
03.-	Clothing and footwear	3.5	3.5	0.57	-1.98	0.03	-1.05	-3.67
04.-	Housing, water, electricity, gas and other fuels	14.8	4.4	0.04	-0.97	0.01	-0.03	-0.14
05.-	Household furnishings and equipment	6.5	2.8	0.17	-1.27	0.04	-0.18	-0.51
06.-	Health	7.8	3.0	0.00	0.00	0.00	0.00	0.00
07.-	Transport	13.1	3.3	0.39	-1.86	0.10	-0.67	-2.18
08.-	Information and communications	5.5	-	-	-	-	-	-
09.-	Recreation, sport and culture	6.6	5.0	0.18	-1.00	-0.01	-0.13	-0.66
10.-	Education services	6.6	-	-	-	-	-	-
11.-	Restaurants and accommodation services	6.4	-	-	-	-	-	-
12.-	Other	5.2	3.4	0.10	-0.95	0.03	-0.06	-0.20
Total contribution							-2.24	-8.76
Yearly average							-0.20	-0.80

Notes:

In Column [4] the parameter $\beta\ \eta$ measures the degree of import penetration in each COICOP division.
Column [5] inflation developments due to import substitution and
Column [6] captures inflation differential between these 2 regions.
Column [7] reports the contribution to overall price developments of Channel 2, the Inflation Channel, in each division.
Column [8] weights the contribution of each division according to CPI basket.

Figure 1: Inflation basic facts

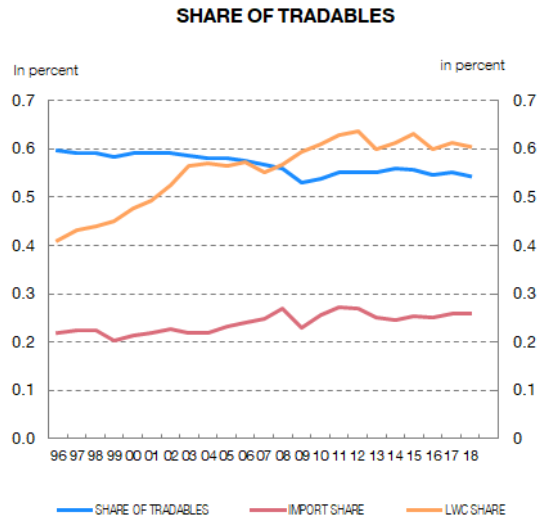
(a) CPI Inflation



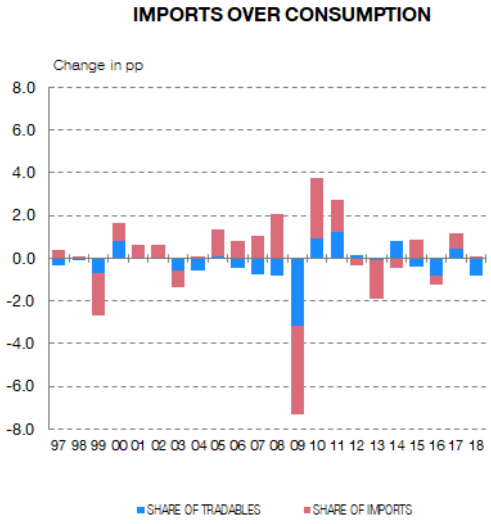
Sources: Chile National Statistical Office (INE).
Notes: This graphs illustrates the differentiated patterns in price developments between of Tradables vs. non-Tradables. While tradable goods prices increased in a more moderately compared to non-tradables up to end 2019, from then onward the pattern is reversed. Once the lockdown measures start to lift off and expansionary fiscal measures are taken, inflation spiked over 5 percent and in early 2022 with the Russian invasion to Ukraine the pace of price inflation further increased.

Figure 2: Import basic facts

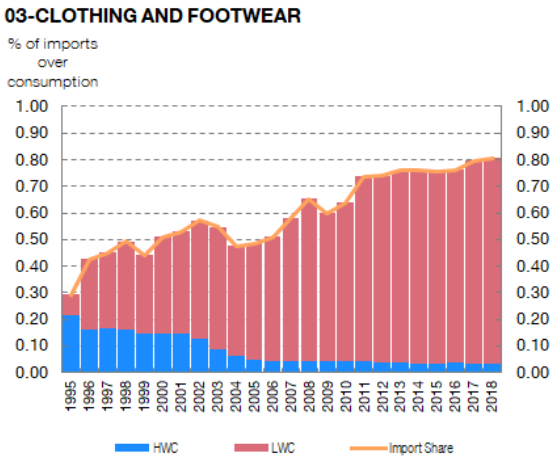
(a) Share of tradables



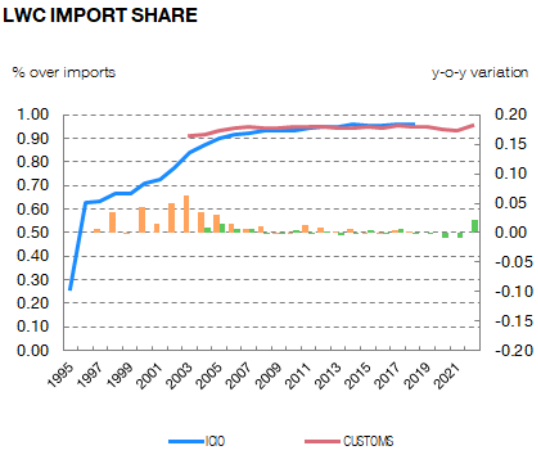
(b) Imports over consumption variation



(c) β_{03} η_{03}



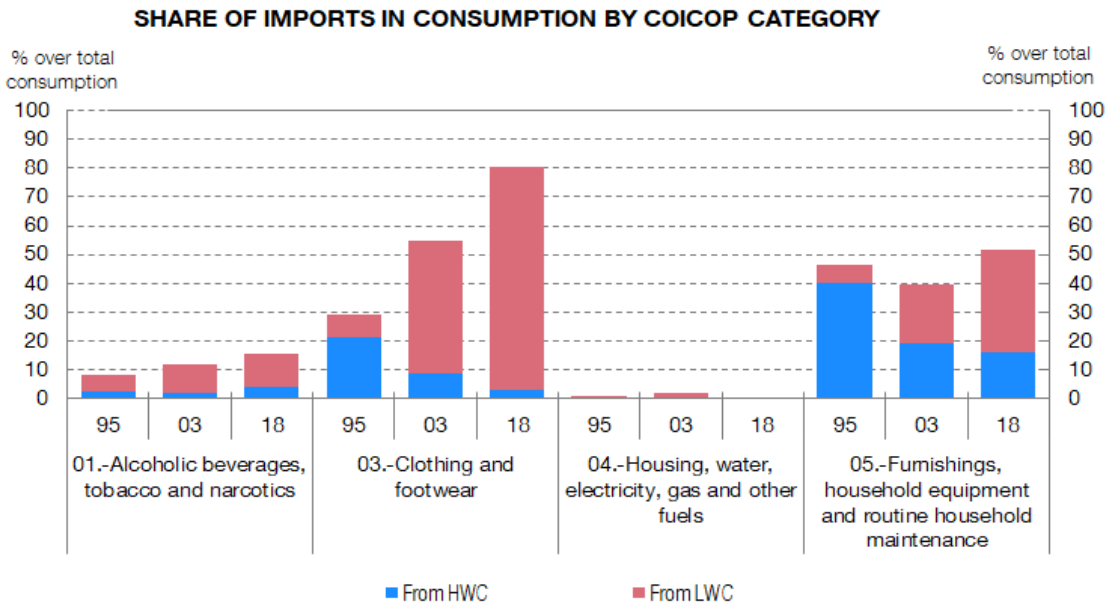
(d) γ_{03}



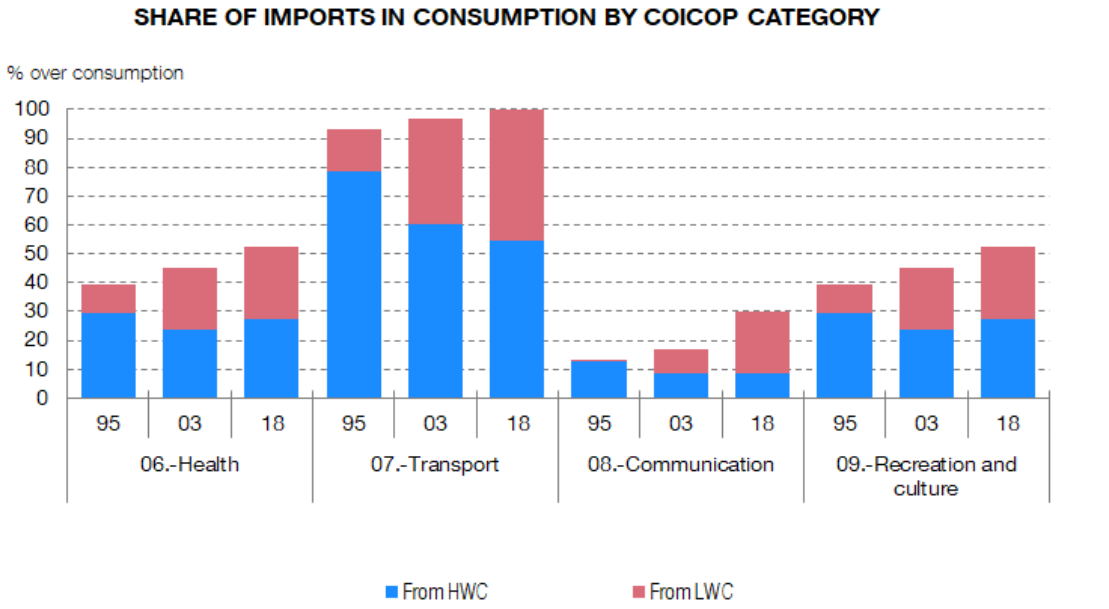
Sources: Own calculations based on ICIO 2021 release.
Notes: Panel **(a)** shows the evolution of the three measures used to capture the exposure to imports: (i) the share of tradables over total consumption (β_t) (ii) the share of imports over total consumption (η_t) and (iii) the share of imports from LWC (γ_t). Panel **(b)** shows the variation in import penetration which has been led mainly through declines in the share of the consumption of tradables and an increase in the share of imports. In 2009, the year of the Great Financial Crisis, both items showed a sharp decline.

Figure 3: Import Ratios

(a)



(b)

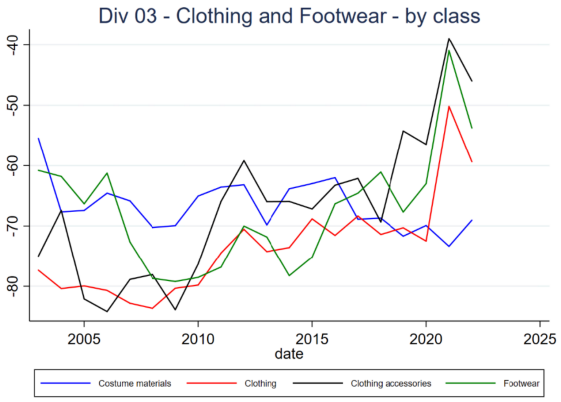


Sources: Own calculations based on ICIO 2021 Release.
Notas: **Panel (a)** and **panel (b)** report the ratio of imports for each COICOP category. This shows the different exposure of each category to external developments and the increasing weight of imports from LWC.

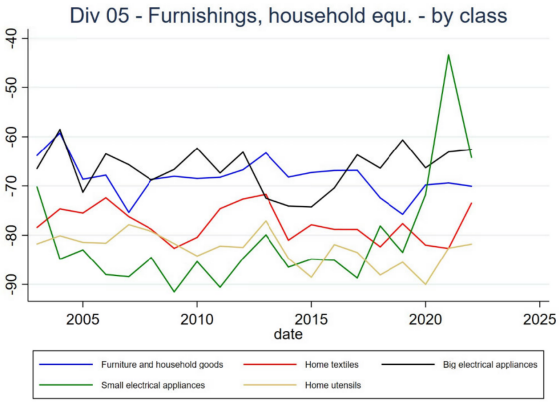
Figure 4: Import Price differentials

$(P^{LWC} - P^{HWC})$

(a) Division 03.-



(b) Division 05.-

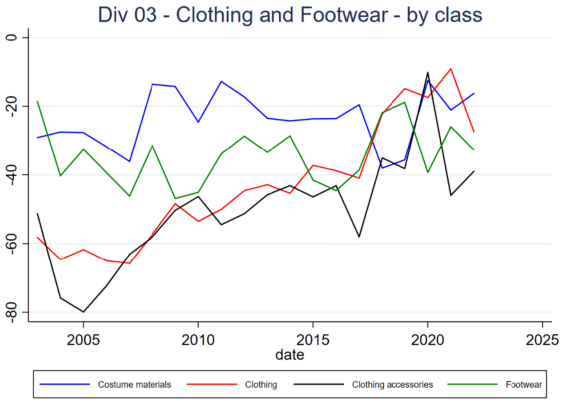


Sources: Own calculations based on Customs Data.
Notes: We plot the average price differential at the level HS6-digit of the trade product classification between unit values of imported products from and products from . The average price differential is reported at the COICOP 3 digit level (that is, the class). The price differential has been relatively stable up to 2019, where the difference showed a remarkable compression.

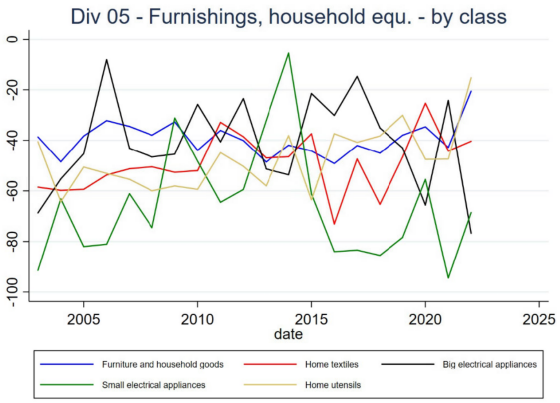
Figure 5: Price of Domestically Produced Goods Relative to Prices of Imported Goods

$(P^{LWC} - P^{D})$

(a) Division 03.-



(b) Division 05.-

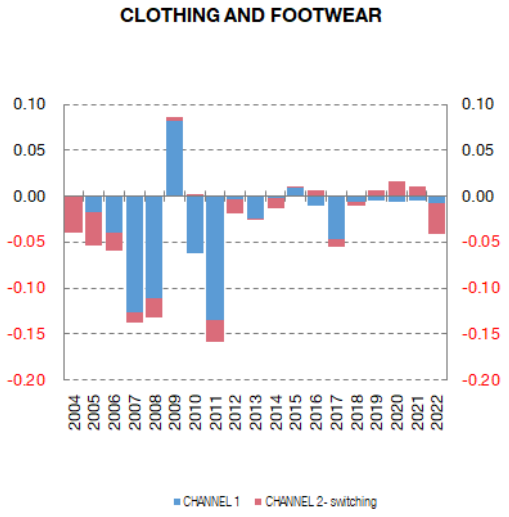


Sources: Own calculations.

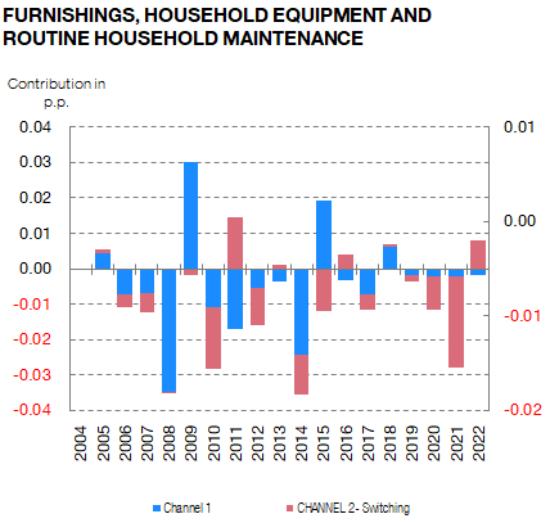
Notes: We first compute the price differential at the level 6 of the trade product classification (HS classification) between import unit values (from LWC) and export unit values (considered as equivalent to the domestic producer price). The figure reports the results at COICOP 3 digit (class).

Figure 6: Contribution to y-o-y CPI

(a) Division 03.-



(b) Division 05.-



Sources: Own calculations.
Notes: Each panel shows the contribution to annual CPI variation by each COICOP division through each of the channels.

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A Appendix

Table A.1: Data: Definition and sources

Definition		Comment
Share of imports in consumption	$\beta_{it}\eta_{it} = \frac{M_{it}}{C_{it}}$	β_{it} share of tradables in total consumption. η_{it} share of tradable goods that are imported. M_{it} imports of good i and C_{it} domestic consumption of good i at time t.
Import price indices	$P^F_{gi,0} = \prod_{c \in g} P^{\gamma_{ic,0}}_{ic,0}$	Product level prices are proxied with unit values. We compute unit values at the product(HS)-country level, at the most dis aggregated level available. Each product i from country c is weighted γ_{ic}.
Price differentials	$log(P^F_{gi,0}) - \log(\mathrm{P}^F_{gi,0})$	Differences between the price of domestically produced goods relative of imported goods.

B Analytical Framework

The analytical framework closely follows Carluccio et al. (2018) and is adapted to capture some special features in emerging markets, where exchange rate developments play a dominant role.

Preferences.- The representative consumer derives utility form consuming a bundle of goods N, among which a subset are tradable, I.

$$U(q_1, ..., q_i, ..., q_I, ..., q_N) \tag{B.1}$$

For each tradable good i, there is a number of J varieties available differentiated by country of origin, including the Chilean variety.

$$q_{it} = \Pi_{j \in J} q_{ijt}^{\omega_{ijt}} \tag{B.2}$$

With $\sum_j \omega_{ijt} = 1$.

Variations of ω_{ijt} reflect demand shifts making consumer to switch expenditures between varieties of different origins, conditional on prices, which arise from unobserved changes in *tastes* or *product quality*.

- Cobb-Douglas aggregation of a fixed number of varieties j.
- CES aggregation and varieties vary.

Prices.- The price index of traded goods is the geometric weight.

$$P_{it}^T = \Pi_j P_{ijt}^{\omega_{ijt}} \tag{B.3}$$

D is the domestic variety and F the set of foreign variety.

The share of imports in total consumption of i is $\eta_{it} = \sum_{j \in F} \omega_{ijt}$.

$$U_t = \left[\sum_{g \in G} \alpha_g \left(Q_{gt}^{\frac{\kappa-1}{\kappa}} \right) \right] \tag{B.4}$$

$$p_t^F = \gamma_t p_t^{LWC} + (1 - \gamma_t) p_t^{HWC} \tag{B.5}$$

Inflation.– Let the economy be composed by a fixed number S of sectors indexed by s, where each individual good i belongs to only one sector. Each sector includes either tradable and or non-tradable goods. Inflation in any sector s can be expressed as the weighted average of price changes of individuals goods $i \in s$:

$$\pi_{st} = \sum_{i \in s} \phi_{it} \pi_{it} \tag{B.6}$$

π_{it} the inflation of good i and ϕ_{it} the share of expenditures on good i in total consumption.

Substituting and after some algebra the arrive to the following expression for CPI inflation:

$$\pi_t^{CPI} = \underbrace{\beta_t \frac{\delta \eta_t}{\delta t} \gamma_t (p_t^{LWC} - p_t^D)}_{\text{Substitution channel}} + \underbrace{\beta_t \eta t \left[\frac{\delta \gamma_t}{\delta t} (p_t^{LWC} - p_t^{HWC}) + \gamma_t (\pi_t^{LWC} - \pi_t^{LWC}) \right]}_{\text{Imported inflation channel}} + \underbrace{\beta_t (1 - \eta_t) \pi_t^D}_{\text{Competition channel}}$$

- **Substitution channel:** how changes in the share of consumption of imported goods affect the dynamics of prices for a given price differential between domestically produced and imported goods.

- **Imported inflation channel:** quantifies the impact of variation in the import price index arising from changes in the share of LWC in total imports.

- **Competition channel:** The effect of LWC imports on domestic producer prices through increased competitive pressures.

  The competition channel transits through the pro-competitive effect of imports from LWC on domestic prices. We here estimate the impact of LWC import

penetration on product-level domestic producer price inflation. We estimate the following equation:

$$\pi^D_{i,t} = \phi \Delta S^{LWC}_{i,t} + \kappa \Delta labcost_{i,t} + \eta \Delta inputcost_{it} + \lambda_t + \nu_i + \epsilon_{i,t} \qquad \text{(B.7)}$$

Where:

- π^D_{it} is the is the log-difference of producer prices (domestic market) between year $t1$ and t for product i.
- $\phi \Delta S^{LWC}_{it}$ is the variation of the share of imports from LWC in domestic consumption of good i.
- $\kappa \Delta labcost_{i,t}$ is the annual growth rate of labour cost in sector i.
- annual change in the intermediate input cost for sector i.
- λ_t time fixed-effect
- ν_i product fixed effect

C Data, cleaning and methodology - Step by step

Customs Data. .

- We only consider the transactions made by firms present in the most recent business directory.
- We remove the varieties of HS8 products that appear once in the sample, that is, when the transaction from a product origin/destination is carried only once along the sample period. We consider that is not a representative price.
- We eliminate varieties of products that are imported/exported twice from/to a country

CPI weights. We make use the official CPI weights for each division, group, class to construct the CPI index and official data are drawn for the national statistical office.[12]

Filtering of Outliers. An observation is excluded if the price change compared with the previous month (or any earlier period) is implausible, or if the price or the quantity is unusual (too high or too low). This may point to coding errors or other mistakes in the data sets. Thresholds for identifying outliers should be set very carefully so that the number of outliers remains low. It is best to follow up any outliers detected during this phase.

[12]The methodology applied can be found in INE website.

D How to construct the price indexes

To construct the Price Indexes we use the methodology proposed by the statistical institutes by using the granular information from Customs.[13]

Notwithstanding, given the nature of the dataset, where products and countries or origin are entering and exiting, we also make use of **multilateral methods**.[14]. In particular we use the Gini–Eltetö–Köves–Szulc (GEKS) index. The GEKS index is based on a bilateral index that is used to compare any two periods belonging to the time window. The initial GEKS method is defined with Fisher price indices. Here, the GEKS method will be presented using a matched Törnqvist index (GEKS–Tq).

The aggregation at the product category level is based on variable weights. It is only at the class level that fixed weights from INE are used and the Laspeyres principle is applied.

To compute the GEKS index we use the matlab code provided by Bems & di Giovanni (2016) **pinx_fn.m**.

[]TBC] This code allows to construct several price indices: Laspeyres, Paasche, Fisher and GEKS indexes as well as volume index and revenues using data on P and Q for I products over T (19 years) periods.

[13]For more details on methodological aspects check the INE Chile website.

[14]For a review on the different options on how to construct price indexes and a discussion on the benefits and drawbacks of each one see Eurostat.