

# The Chile-Republic of Korea Free Trade Agreement: a synthetic control assessment<sup>1</sup>

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## Abstract

In 2003, Chile and the Republic of Korea signed the first trans-Pacific free trade agreement (FTA). The two countries' objectives differed. Chile sought to increase, diversify, and add value to its exports, while the Republic of Korea had the political economy-driven goal of initiating preferential liberalization negotiations, and Chile was seen as an ideal candidate for exploring this path. This paper focuses on the Chilean objectives behind the signing of the Chile-Republic of Korea FTA and therefore considers its effects on Chilean exports. Synthetic control methods are used to assess the impact of the Agreement on exports, in terms of value and number of products. As an extension, the impact of the Agreement on the intensive and extensive margins of Chilean exports to the Republic of Korea is analysed. While the Agreement is found to have had a positive impact on Chilean exports, this effect is non-significant for newly exported products.

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## Keywords

Economic relations, foreign trade, free trade, economic agreements, exports, value, evaluation, statistical methodology, trade policy, Chile, Republic of Korea

## JEL classification

F13, F14, F53

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## I. Introduction

The signing of the Chile-Republic of Korea Free Trade Agreement (hereinafter CRKFTA) in 2003 was a milestone in international economic relations, becoming the first trans-Pacific agreement to enter into force, in April 2004. Negotiations on the Agreement began in the late 1990s, in the aftermath of the Asian financial crisis, and for both countries it marked the starting point of a new phase in their engagement with the international economy. For Chile, it was the first agreement with a country on Asia's Pacific Rim, and for the Republic of Korea it was the beginning of a shift towards preferential trade agreements. Despite being a preferential agreement beyond the scope of the World Trade Organization (WTO), CRKFTA was negotiated within an environment that favoured multilateral negotiations. The Doha Round was launched in 2001, and a number of topics of particular concern to developing economies were supposed to be addressed as part of it. In 2018, fifteen years on from the signing of the Agreement, the international political and economic context had changed. Now, not only have the multilateral negotiations reached an impasse, but debates about the effects of globalization and protectionism have begun in a number of economies. The effects of these kinds of agreement need to be evaluated in this new context, particularly where countries have relied on them for international integration and economic development.

Chile is amongst those economies that have most actively relied on integration into international markets as a pathway to economic growth and development. This strategy has been heavily based on the signing of preferential trade agreements. Chile has built an extensive network of preferential agreements covering 65 economies, 67% of the world's population and 88% of global gross domestic product (GDP) (SUBREI, 2022). This active negotiating agenda has spawned an extensive literature covering the political economy principles behind the strategy (Bull, 2008; Gamboa, 2013; Herreros, 2010; Jara, 2005; Sáez, 2002). There is also a growing literature dealing with the effects of free trade agreements (FTAs) on the country (Jean, Mulder and Ramos, 2014; Kuno, Urata and Yokota, 2017; López and Muñoz, 2008; Reyes, 2005; Schiff, 2002), but there is as yet little evidence regarding the bilateral economic relationship between Chile and the Republic of Korea and the effects of CRKFTA on Chilean exports (López, Cáceres and Muñoz, 2022; Rehner, Baeza and Barton, 2015; Schuschny, Durán and De Miguel, 2008). Most literature dealing with the bilateral relationship focuses on the political process leading to the establishment of the FTA (Chung, 2003; Park and Koo, 2007; Sohn, 2001) or on sectoral assessments, with agriculture, a sensitive sector for the Korean economy, being of particular interest (Ahn and Im, 2016; Kim and Choi, 2007; Moon, Seok and Kim, 2018). There is thus a gap in the literature where the assessment of this agreement is concerned, and this has resulted in a policymaking deficit, as most official reports rely wholly on descriptive statistics dealing with export volumes, leading products or the number of products traded (DIRECON, 2005, 2006, 2007 and 2011).

The purpose of this paper is to examine the impact of CRKFTA on Chilean exports, in respect both of value and of the number of products. Specifically, a synthetic control method is used to compare the trajectories of these variables before and after the FTA. The reduction of trade barriers (particularly tariffs) is expected to lead, first, to an increase in export volumes for existing products and, second, to the establishment of new trading relationships (measured by the incorporation of new products into the export basket). A positive impact is found for both variables. As an extension, and following López, Cáceres and Muñoz (2022), this paper also looks into the impact of CRKFTA on the intensive and extensive margins of trade. Here, it is found that while there has been a positive impact on the intensive margin, the results for the extensive margin are inconclusive.

The paper is structured as follows. After this introduction, the section II reviews the negotiating process and main features of CRKFTA and some stylized facts connected with the bilateral trade relationship. Section III presents the methodological framework, with an analysis of the synthetic control method that particularly emphasizes its use in trade policy analysis. Section IV contains the data and

analytical results for Chile's total exports to the Republic of Korea and the number of products composing its export basket. As an extension of these results, section V provides a disaggregated analysis of the intensive and extensive margins of trade. Lastly, section VI discusses the estimation results and offers some concluding remarks.

## II. The Chile-Republic of Korea Free Trade Agreement

Following the return to democracy in the early 1990s, and as a complement to extensive unilateral trade liberalization, Chile embarked on a broad agenda of preferential trade negotiations to open up markets (López and Muñoz, 2015; Van Klaveren, 2011). As part of this agenda, the Asia-Pacific region was a natural partner, and Chile sought entry to the recently formed Asia-Pacific Cooperation Forum (APEC), which it obtained in 1994, just when the Bogor Goals were set (Jara, 2005). Chile then sought to strengthen its regional and bilateral ties with the region, as it had already embarked on a quest for preferential trade agreements as part of its market opening reforms (Herreros, 2010; Schuschny, Durán and De Miguel, 2008; Wilhelmy, 2010). With the benefit of these reforms and its geographical location on the Pacific Ocean, the country expected to be a platform for trade between the two regions. This objective was in doubt, however (Artaza, 2007), as there was a need for new instruments and alliances to take full advantage of existing and potential relationships. In this context, an FTA with the Republic of Korea would provide not only preferential access to an important market, but a model for access to other economies in the region (Jara, 2005).

At the same time, the Republic of Korea was undertaking a complete overhaul of its economic approach in the aftermath of the Asian financial crisis of 1997–1998. Observing the rise of preferential trade agreements and the erosion of multilateral preferences worldwide, the Republic of Korea departed from its long-standing support for the WTO negotiations and initiated its own preferential process with Chile (Cheong, 2003; Kim, 2003; Ministry of Foreign Affairs, 2002; Park and Koo, 2007; Sohn, 2001).

In this context, Chile and the Republic of Korea announced during the meeting of APEC leaders held in Auckland, New Zealand in 1999 that they intended to negotiate a bilateral FTA. After six negotiating rounds, the Agreement was signed on 15 February 2003. Following both parliaments' approval, CRKFTA entered into force on 1 April 2004 (OAS, 2019), becoming the first FTA between a Latin American and an Asian economy (López, Cáceres and Muñoz, 2022).

For the Chilean government authorities, the Agreement meant international recognition for its trade policy orientation and an opportunity to increase and diversify its exports (DIRECON, 2002). The objective was to take advantage of Chile's position as the first country to gain preferential access to one of Asia's main economies, allowing it to increase its exports, particularly of new and more sophisticated products. In the case of the Republic of Korea, considerations of economic, political and diplomatic leverage were what motivated it to pursue the Agreement. The potential costs of trade with Chile for the Republic of Korea's uncompetitive sectors such as agriculture (which remained protected) were minimal, and its accumulated experience in such negotiations made Chile an ideal candidate for the Republic of Korea's first FTA (Park and Koo, 2007; Sohn, 2001).

CRKFTA was based on the WTO agreements, taking into consideration the ongoing Doha Development Agenda (DDA). However, it followed texts previously negotiated by Chile (with Mexico and Canada) and went beyond the scope of the DDA, with WTO+ and WTO-X provisions. The text incorporated the chapters usually negotiated at the time in preferential agreements, including regulations for trade in goods and services, investment, intellectual property, and government procurement (DIRECON, 2002). As mentioned above, the main difference between the two economies was their

approach towards agricultural trade liberalization. While this sector had become one of Chile's most important export clusters, for the Republic of Korea it was sensitive and protected. In the final agreement, some agricultural products were treated as "exceptions to liberalization", and a "seasonal tariff system" was imposed on Chilean wines for the first 10 years (ICTSD, 2004). Thus, merchandise trade liberalization was scheduled into different periods of tariff reduction, with special time frames for sensitive products (agriculture) and a system of quotas, including a DDA category subject to revision after the conclusion of the multilateral negotiations (see table 1).

**Table 1**  
Chile-Republic of Korea Free Trade Agreement tariff reduction schedule

Category	Republic of Korea		Chile	
	No. of items	Share (Percentages)	No. of items	Share (Percentages)
Immediate	9 470	87.20	2 422	41.4
Most favoured nation 0%	750	6.70	-	-
5 years	701	6.30	2 018	34.5
7 years	35	0.30	14	0.2
9 years	1	0.01	-	-
10 years	262	2.30	1 194	20.4
10 years seasonal basis	1	0.01	-	-
13 years (5 years exempt)	-	-	152	2.6
16 years	12	0.11	-	-
Quotas	24	0.20	-	-
Doha Development Agenda	373	3.30	-	-
Exceptions	21	0.20	54	0.9

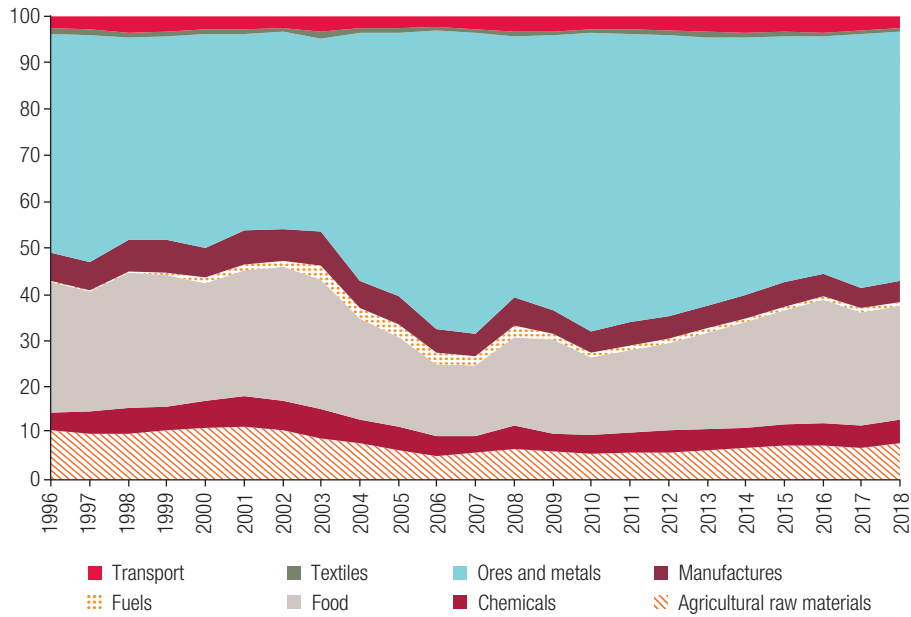
**Source:** General Directorate of International Economic Relations (DIRECON), "Tratado de Libre Comercio (TLC) entre Chile y Corea", Santiago, 2002 [online] [http://www.sice.oas.org/tpd/chl\\_kor/studies/antecedentes\\_s.pdf](http://www.sice.oas.org/tpd/chl_kor/studies/antecedentes_s.pdf).

## 1. Trade flows between Chile and the Republic of Korea: some stylized facts

Although Chile has based its economic development model on engagement with international markets, it is recognized that diversifying and adding value to the country's export basket remain a challenge. Chile's economic structure is based on the exploitation of natural resources, and it has not been able to move up value chains, i.e., export more technology-intensive products. As seen in figure 1, since the 1990s, when the strategy of signing bilateral and preferential trade agreements was applied, the composition of the Chilean basket of exports to the world has been dominated by mineral products. When considered by technological composition, exports mostly comprise commodities or resource-based manufactures (see figure 2).

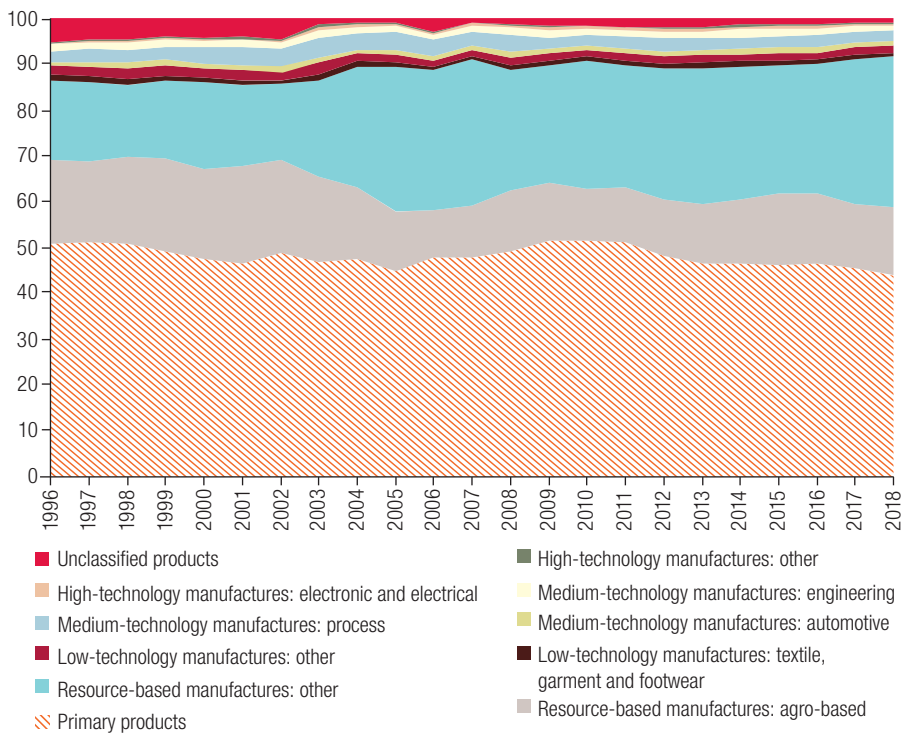
It was in this context that the authorities decided that signing FTAs was the route to the development of new economic sectors. FTAs were expected to help diversify and increase the value added of the country's industries by opening up new overseas markets, including the Republic of Korea. The first indication of the impact of CRKFTA on trade flows is provided by a descriptive analysis of trends following its entry into force in 2004. As seen in figure 3, exports grew at an exponential rate until the turmoil of the financial crisis in 2009, since when they have behaved erratically, which is consistent with the slow recovery of the global economy. Nevertheless, Chile's exports in 2017 were four times as high as before CRKFTA, a fact that is highlighted in most government reports (DIRECON, 2011).

**Figure 1**  
Exports from Chile to the world by sectoral composition, 1996–2018  
(Percentages)



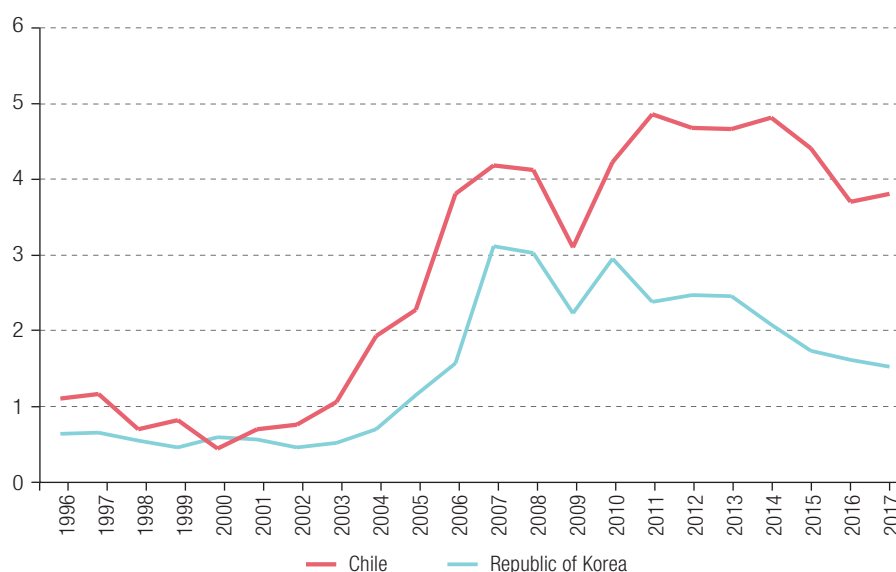
**Source:** Prepared by the authors, on the basis of information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

**Figure 2**  
Exports from Chile to the world by technological composition (Lall classification), 1996–2018  
(Percentages)



**Source:** Prepared by the authors, on the basis of information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

**Figure 3**  
Total exports from the Republic of Korea to Chile and from Chile  
to the Republic of Korea, 1996–2017  
(Billions of dollars)



**Source:** Prepared by the authors, on the basis of information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

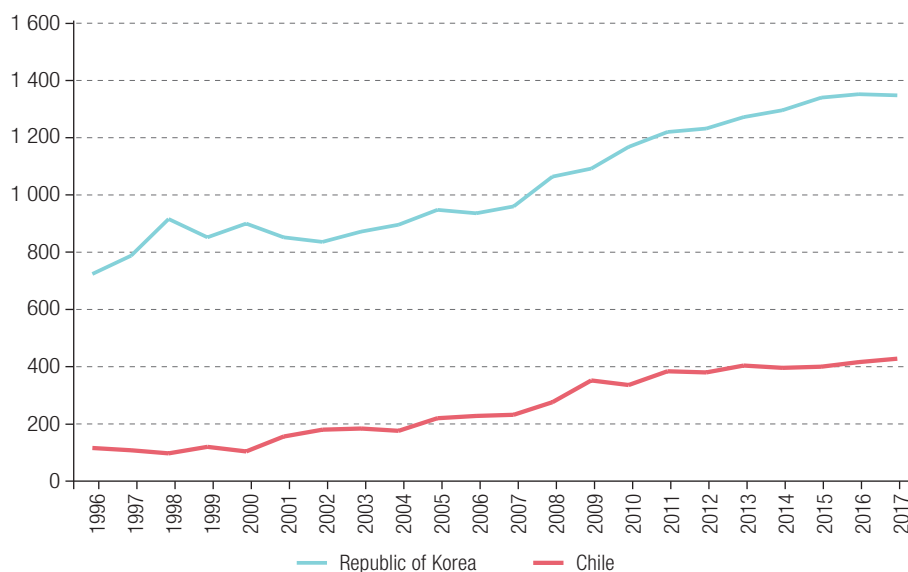
As shown in figure 4, the number of products exported (at the six-digit level of the Harmonized Commodity Description and Coding System) also grew for both countries after CRKFTA (López, Cáceres and Muñoz, 2022). For Chile, it grew from 117 in 1996 to 428 in 2017, while for the Republic of Korea it increased from 723 to 1,349 in the same period. Yoon (2015) shows that for the Republic of Korea, the number of firms trading with Chile multiplied around threefold, with over 200 companies entering the Chilean market each year.

In 2015, as part of the work of the ninth CRKFTA Free Trade Commission, the intention to modernize CRKFTA was announced (DIRECON, 2015). This was based on the positive overall numbers following the application of the Agreement, the rise of new trade topics and the slowing of multilateral negotiations at WTO. The negotiations to modernize the Agreement were launched in 2018, with the first round taking place in Seoul (November 2018) and the second in Santiago (July 2019), covering trade facilitation, gender, environment, anti-corruption, intellectual property and labour issues, amongst others (SUBREI, 2019). The negotiations are currently stalled, but both countries have acknowledged the need to continue to update the Agreement provisions and proclaimed their intention of doing so, considering the needs of the current trade environment.

Even though an examination of CRKFTA reveals positive results overall, since the volume of exports and the number of products have grown, this growth is mostly explained by traditional products. The Chilean export basket has not undergone significant modifications since the Agreement entered into force, but remains dominated by copper and mineral products. As shown in table 2, the top export products were almost the same in 2017, 14 years on from implementation of the FTA, as they were in 2003, before it entered into force. It may be argued that there was a large decrease in the refined copper category, which dropped from 45% to 26% of the total in the period. However, most of this relative decrease was explained by the rise of other mineral products, such as copper ores, lithium, molybdenum and zinc, so that the share of commodities and minerals remained substantial within the overall basket. The growth among the top export products of the residual component (“other exports”),

whose share rose from 11% to nearly 22% in the period examined, may also be pointed to. This growth was accounted for by the incorporation of new products, particularly agricultural and food products. Nevertheless, the volumes exported, while significant for the companies and sectors concerned, are still relatively minor in the overall composition of the Chilean basket and thus do not represent any substantive change in the export mix, diversification or increase in the value added of Chilean exports to the Korean market.

**Figure 4**  
Products exported from the Republic of Korea to Chile and from Chile  
to the Republic of Korea, 1996–2017  
(Numbers)



**Source:** Prepared by the authors, on the basis of Information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

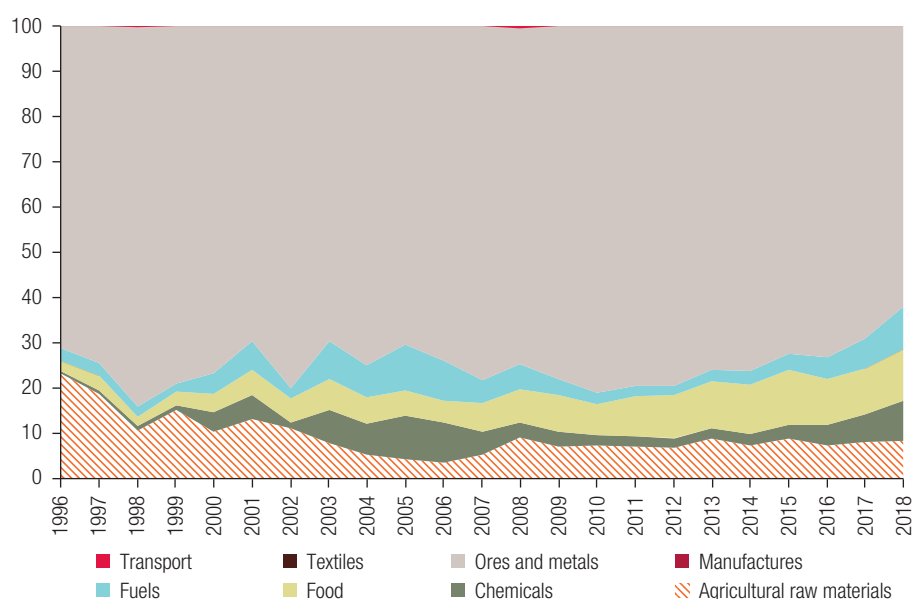
**Table 2**  
Main products exported from Chile to the Republic of Korea  
(Thousands of dollars and percentages)

Product	2003		Product	2017	
	Amount (Dollars)	Share (Percentages)		Amount (Dollars)	Share (Percentages)
Copper, refined	494 870.59	45.51	Copper, refined	1 008 769.93	26.52
Copper ores	144 107.33	20.72	Copper ores	932 028.39	24.50
Alcohols	100 617.90	7.84	Lithium	218 211.47	5.74
Chemical wood pulp, soda or sulphate, other than dissolving grades, semi-bleached or bleached, coniferous	68 310.43	4.24	Chemical wood pulp, soda or sulphate, other than dissolving grades, semi-bleached or bleached, non-coniferous	202 060.43	5.31
Meat	45 107.73	2.85	Copper, unrefined	189 194.03	4.97
Copper, refined, unwrought	42 932.77	2.76	Zinc	125 255.62	3.29
Chemical wood pulp, soda or sulphate, other than dissolving grades, semi-bleached or bleached, non-coniferous	36 956.12	1.89	Lumber, coniferous (softwood) thickness less than 6 mm	112 899.14	2.97
Wood pulp (unbleached)	36 091.90	1.60	Molybdenum	101 924.67	2.68
Iron ores	31 000.40	1.45	Meat	99 761.31	2.62
Other exports	29 319.62	11.14	Other exports	813 634.28	21.39

**Source:** Prepared by the authors, on the basis of Information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

What is seen, then, is a fairly unchanging mix of exports from Chile to the Republic of Korea, dominated by natural resources with low value added. As shown in figure 5, the prevalence of mineral products has remained relatively stable over the last few years, as they have continued to account for over 60% of total exports to the Korean market. Probably the most interesting shift in the composition of exports has been that from raw agricultural products to food products, which could imply the development of a processing industry in this sector to supply Korean demand. When the composition of the export basket by technological content is examined (see figure 6), it can be seen that although commodity exports have dropped, Chile has not been able to move up the export value chain beyond resource-based manufactures. Despite there being an FTA in force, the mix of Chilean exports to the Republic of Korea does not differ from the overall export basket.

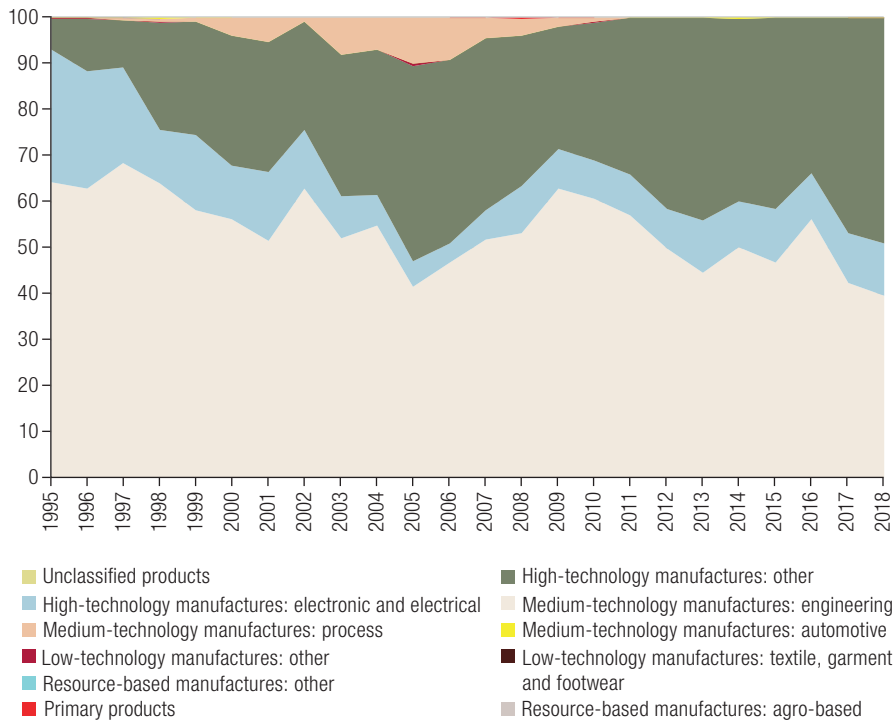
**Figure 5**  
Exports from Chile to the Republic of Korea by sectoral composition, 1996–2018  
(Percentages)



**Source:** Prepared by the authors, on the basis of information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

Research is needed for sound policymaking. In a context where the traditional understanding of trade liberalization is being challenged and the focus is on renegotiation of trade agreements, there is a need for assessments that can contribute to the discussions. After 15 years, CRKFTA should have had an appreciable effect on Chilean exports, i.e., it should have increased both the volume and the number of products traded. From that premise, this article derives its main working hypothesis, which is that CRKFTA has had a positive impact on Chilean exports to the Republic of Korea as measured by both the value and the number of products exported because of the removal of trade barriers under the Agreement.

**Figure 6**  
Exports from Chile to the Republic of Korea by technological composition  
(Lall classification), 1995–2018  
(Percentages)



**Source:** Prepared by the authors, on the basis of United Nations Conference on Trade and Development (UNCTAD).

### III. Methods and data

A synthetic control method (SCM) was implemented to test the impact of CRKFTA on Chilean exports. First described by Abadie and Gardeazabal (2003), this method proposes the creation of a synthetic control constructed as a weighted combination of potential control countries to approximate the most relevant characteristics of the country affected by an intervention (in this case the FTA) (Billmeier and Nannicini, 2013). The essence of the model is to take pre-treatment treated outcomes as benchmarks to choose units that will predict treated counterfactuals (Xu, 2017). Hence, a synthetic unit is created to estimate the trajectory of the dependent variable if the treatment had not taken place. This synthetic unit is constructed by contrasting the case study's pre-treatment data with a selection of a similar untreated population (depending on the unit of analysis this could range, for example, from countries to cities or neighbourhoods).

While this methodology has been widely used in the assessment of social policy outcomes (Eren and Ozbeklik, 2016; Kreif and others, 2016; Peri and Yassenov, 2015), SCM is quite new as a methodological approach for assessing trade policy reforms. Billmeier and Nannicini (2013) investigated the impact of economic liberalization on real per capita GDP in a worldwide sample of countries, comparing the post-liberalization GDP trajectory of treated economies with the trajectory of a combination of similar but untreated economies. Other studies have focused on the impact of specific agreements on trade flows (Aytuğ and others, 2017; Hannan, 2017). One of the areas that had gained most attention in the literature is the impact of trade agreements on social conditions such as health and mortality (Baggio and Chong, 2020; Barlow, 2018; Barlow and others, 2017; Olper, Curzi and Swinnen, 2018).

Following the literature (Abadie and Gardeazabal, 2003; Billmeier and Nannicini, 2013), a panel of  $I_c + 1$  countries in  $T$  periods will be considered, where country  $i$  signs an FTA at time  $t_0 < t$ , while the rest of the sample does not. The effect of the treatment (FTA) on country  $i$  at time  $t$  is expressed as follows:

$$\tau_{it} = Y_{it}(1) - Y_{it}(0) = Y_{it} - Y_{it}(0) \quad (1)$$

where  $Y_{it}(1)$ ,  $Y_{it}(0)$ , stand for the potential outcomes with and without treatment, respectively. The absence of counterfactual  $Y_{it}(0)$  in the treatment effect complicates the estimates, so the interest of this paper relies on the estimation of the vector of dynamic effects  $(\tau_{i,T_0+1}, \dots, \tau_{i,T})$ . To deal with this situation, Abadie, Diamond and Hainmueller (2010) propose the following model:

$$Y_{jt}(0) = \delta_t + X_j \theta_t + \lambda_t \mu_j + \varepsilon_{jt} \quad (2)$$

where  $\delta_t$  is an unknown common term with constant factor loadings across units;  $X_j$  is a vector of relevant observed covariates (not affected by the intervention) and  $\theta_t$  the related vector of parameters;  $\mu_j$  is a specific country unobservable, with  $\lambda_t$  representing the unknown common factor; and, lastly,  $\varepsilon_{jt}$  are transitory shocks with zero mean.  $W = (w_1, \dots, w_{IC})'$  can be defined as a generic  $(IC \times 1)$  vector of weights such that  $w_j \geq 0$  and  $\sum w_j = 1$ , where every value of  $W$  represents a possible counterfactual for a country  $i$ , and  $\bar{Y}_j^k = \sum_{s=1}^{T_0} k_s Y_{js}$  represents a linear combination of pre-treatment outcomes, such that  $W^*$ :

$$W^* = \sum_{j=1}^{I_c} w_j^* \bar{Y}_j^k = \bar{Y}_i^k \quad \text{and} \quad \sum_{j=1}^{I_c} w_j^* X_j = X_i \quad (3)$$

Then

$$\hat{\tau}_{it} = Y_{it} - \sum_{j=1}^{I_c} w_j^* Y_{jt} \quad (4)$$

is an unbiased estimator of the average treatment effect,  $\tau_{it}$ . With the estimations formulated, the next section reviews data collection and the results of the regressions.

## IV. Data and discussion of the results

We tested the hypothesis by constructing synthetic countries to mimic the trade relationship between Chile and the Republic of Korea. For Chilean exports to the Republic of Korea, the focus was placed on Latin American economies<sup>3</sup> with a view to obtaining a pool of potential economies that were “similar” to the treated economy. To arrange the sample, we used United Nations (2019) data for trade flows, analysing them at the six-digit level of the Harmonized Commodity Description and Coding System. Discrepancies were noted in countries' reported exports to the Republic of Korea, so mirror statistics were used to confirm their actual exports. For consistency, data reported by the Republic of Korea on imports from Latin American economies were considered. Data from the World Bank's World Development Indicators<sup>4</sup> were used to construct control variables. With this information, SCM estimations were conducted for two outcome variables: total exports and the number of products. Tables 3 and 4 show the covariate and outcome means for each variable.

<sup>3</sup> Argentina, the Bolivarian Republic of Venezuela, Brazil, Costa Rica, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, the Plurinational State of Bolivia and Uruguay. Colombia and Peru were omitted because they signed FTAs with the Republic of Korea during the period.

<sup>4</sup> See World Bank, World Development Indicators [online database] <https://databank.worldbank.org/source/world-development-indicators>.

**Table 3**  
Mean values of covariates and outcome variables for exports by value, 1996–2018

Covariate	Chile	Synthetic control unit <sup>a</sup>
Exports by value (Thousands of dollars)	899 485.9	856 013.7
Gross domestic product (GDP) (Logarithm)	9.138665	8.928961
Per capita GDP (Logarithm)	25.67762	26.68654
Trade as a share of GDP (Percentages)	58.944	56.44168
Exports as a share of GDP (Percentages)	29.84957	26.23024
Bilateral distance (Kilometres)	18 345	16 520.49
Root mean squared prediction error		164 710.7

**Source:** Prepared by the authors.

<sup>a</sup> Composed of Argentina (0.701) and Panama (0.299).

**Table 4**  
Mean values of covariates and outcome variables for the number of products, 1996–2018

Covariate	Chile	Synthetic control unit <sup>a</sup>
Exports by value (Thousands of dollars)	899 485.9	116 996.6
Number of products	132.75	127.5738
Population	1.52e+07	1.74e+07
Trade as share of gross domestic product (GDP) (Percentages)	58.944	73.43621
GDP	1.42e+11	1.50e+11
Per capita GDP (Dollars)	9 321.878	7 612.003
Root mean squared prediction error		23.27647

**Source:** Prepared by the authors.

<sup>a</sup> Composed of Mexico (0.15), Panama (0.334) and Uruguay (0.516).

As shown in figures 7 and 8, CRKFTA seems to have had a significant effect on Chilean exports to the Republic of Korea in terms of both the value and number of products. For the period before the signing of the FTA (treatment), common trajectories can be observed between Chile and “synthetic Chile”. Since 2004, the year in which the Agreement entered into force, Chilean exports have grown at a greater rate. The effect is constrained in the period 2008–2009 because of the financial crisis. It is interesting to note that the impact on exports during the crisis (in terms of value) was greater for Chile than for the synthetic control unit. Although both saw a decrease, the effect was much more significant for Chile, revealing this economy’s exposure to international trade.

Hence, it can be concluded that CRKFTA has had a positive and significant effect on Chilean exports, in terms of both the value and the number of products. Although the number of products traded with the Republic of Korea can be seen to have increased as result of the Agreement, this analysis only covers aggregate numbers and provides no insight as to which products explain trade growth. For this, an extension of the model is proposed. Following López, Cáceres and Muñoz (2022), the next section will look at the extensive and intensive margins of trade, to see whether the increase in exports by value is due to the appearance of new products or growth in existing ones. This will test whether the objective of diversifying the Chilean export basket has been accomplished.

**Figure 7**  
Chile and synthetic control unit: total exports by value, 1996–2018  
(Billions of dollars)



**Source:** Prepared by the authors.

**Note:** The covariates are trade by value, gross domestic product (GDP), per capita GDP, trade as a share of GDP, exports as a share of GDP and bilateral distance. The synthetic control unit is composed of Argentina (0.701) and Panama (0.299).

**Figure 8**  
Chile and synthetic control unit: exported products, 1996–2018  
(Numbers)



**Source:** Prepared by the authors.

**Note:** The covariates are total exports, population, trade as a share of gross domestic product (GDP), GDP and per capita GDP. The synthetic control unit is composed of Mexico (0.15), Panama (0.334) and Uruguay (0.516).

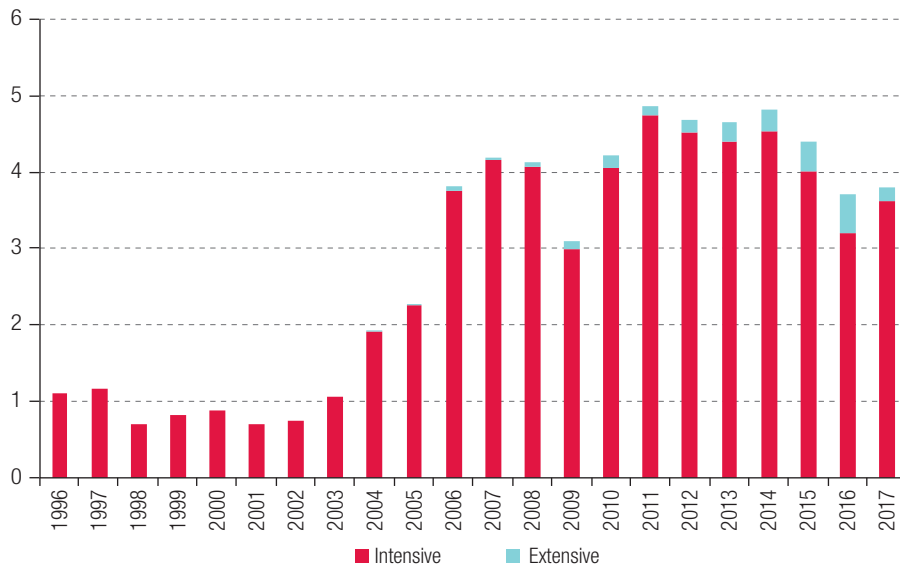
## V. Extension: extensive and intensive margins

The results set out above show a positive effect of CRKFTA on Chilean exports to the Republic of Korea. To correctly attribute the origin of this impact, however, it is necessary to extend the analysis to trade

flows at the product level since, as pointed out in the descriptive analysis of exports above, it is possible that this growth may have been largely confined to products already traded between the two economies. In other words, this effect may not be evenly distributed amongst products, as those with pre-established trading networks could be benefiting more from the Agreement. From this we derive a second hypothesis, which is that owing to the different factors affecting trade relations, CRKFTA has had a stronger effect on goods that were already being exported (intensive margin of trade) than on new products (extensive margin of trade).

To test this hypothesis, exports were divided into two groups: those already being exported before the Agreement was signed and the rest. Figure 9 presents export values differentiated between these two categories. It should be remembered that most growth may be explained by products that were already being exported to the trading partner, so that although new products have been incorporated into the export basket, their weight in the bilateral trade is minimal.

**Figure 9**  
Exports from Chile to the Republic of Korea: disaggregation into intensive and extensive margins, 1996–2017  
(Billions of dollars)



**Source:** Prepared by the authors, on the basis of information from the United Nations Commodity Trade Statistics Database (COMTRADE) [online] <https://comtrade.un.org/>.

Although removing trade barriers may boost bilateral trade, the effect may differ between different goods. A way to understand this difference is to study the intensive and extensive margins of trade, analysing the impact of CRKFTA on each. As argued by Chaney (2008), trade barriers impact two different margins, the intensive margin, defined by how much the volume of each existing exporter's exports changes, and the extensive margin, defined by how much new entrants export. To differentiate the two margins, Besedeš and Prusa's (2011) methodology is followed. Bilateral trade is defined in equation (5):

$$V_t = \sum N_{k,t} v_{k,t} \quad (5)$$

where  $V_t$  is the value of exports in year  $t$ ,  $N_{k,t}$  is the number of export relationships and  $v_{k,t}$  is the average value per relationship. The number of relationships will change over time, with some products sustaining their participation in bilateral trade (survival-stayers) so that there is a deepening relationship, some products dropping out (failure) and some newcomers appearing (entry). The authors formulate this as

stated in equation (6), where  $h_{z,t+1}^i$  denotes the hazard rate of a relationship in industry  $z$  (the probability in sector  $z$  of a product leaving or entering the relationship).

$$V_{t+1} - V_t = \sum_{z \in Z} \left\{ \sum [(1 - h_{z,t+1}^i) n_{z,t}^i] [v_{z,t+1}^i - v_{z,t}^i] - \sum_{i=1}^I [(h_{z,t+1}^i n_{z,t}^i) v_{z,t}^i] + \epsilon_{z,t+1} v_{z,t+1}^0 h_{z,t+1} \right\} \quad (6)$$

Summing up, and as stated in equation (7), trade flows may be explained by an intensive and an extensive margin, covering existing ( $n_{z,t}^i v_{z,t}^i$ ) and new ( $\hat{n}_{z,t}^i \hat{v}_{z,t}^i$ ) trade flows between two economies.

$$V_t = \sum \{ [n_{z,t}^i v_{z,t}^i] + [\hat{n}_{z,t}^i \hat{v}_{z,t}^i] \} \quad (7)$$

## 1. Discussion

In the light of the differences between the two margins, SCM is used to analyse the impact of CRKFTA on these dimensions. We first consider the intensive margin of trade, meaning the impact that the Agreement has had on products already being exported to the Republic of Korea at the time the FTA was signed. Table 5 presents the covariate and outcome means for each variable. In this case, Brazil and Ecuador form the synthetic control country.

**Table 5**

Mean values of covariates and outcome variables for the intensive margin of trade, 1996–2018

Covariate	Chile	Synthetic control unit <sup>a</sup>
Total exports ( <i>Thousands of dollars</i> )	899 485.9	805 139.3
Number of products	132.75	316.4165
Population	1.52e+07	1.12e+08
Root mean squared prediction error		178 060.6

**Source:** Prepared by the authors.

<sup>a</sup> Composed of Brazil (0.621) and Ecuador (0.379).

As seen in figure 10 below, the impact of CRKFTA on the intensive margin of trade is significant and repeats the patterns shown for the total value of exports. Thus, since the Agreement came into force in 2004, these exports have grown at a higher rate than would have been expected without the treatment. The 2008 financial crisis had a profound impact on these flows, equivalent to that presented in figure 5. This is not surprising, as the descriptive analysis of Chilean exports showed that most of their value was accounted for by the type of products dealt with in that chart.

Lastly, the results for the extensive margin, i.e., the impact of the Agreement on new products entering the export basket, were analysed. As shown earlier, there has been substantial growth in the number of products exported, and the results indicate a positive impact of the FTA on these numbers. Nevertheless, trade volumes for these new products do not appear to be significant in the overall basket. Constructing a synthetic control country is a way of measuring whether there has been an impact for these new products. Table 6 shows the covariate and outcome means for each variable, in this case using a combination of Argentina, Mexico, Panama and Uruguay.

**Figure 10**  
Chile and synthetic control unit: intensive margin of trade, 1996–2018  
(Billions of dollars)



**Source:** Prepared by the authors.

**Note:** The covariates are total exports, the number of products and population. The synthetic control unit is composed of Brazil (0.621) and Ecuador (0.379).

**Table 6**  
Mean values of covariates and outcome variables for the extensive margin of trade, 1996–2018

Covariate	Chile	Synthetic control unit <sup>a</sup>
Total exports (Thousands of dollars)	899 485.9	109 549.3
Number of products	132.75	116.3074
Population	1.52e+07	1.68e+07
Extensive margin (Thousands of dollars)	6 901.113	6 528.818
Bilateral distance (Kilometres)	18 345	17 388.83
Gross domestic product (GDP)	1.42e+11	1.43e+11
Per capita GDP (Dollars)	9 321.878	7 862.958
Root mean squared prediction error		8 289.736

**Source:** Prepared by the authors.

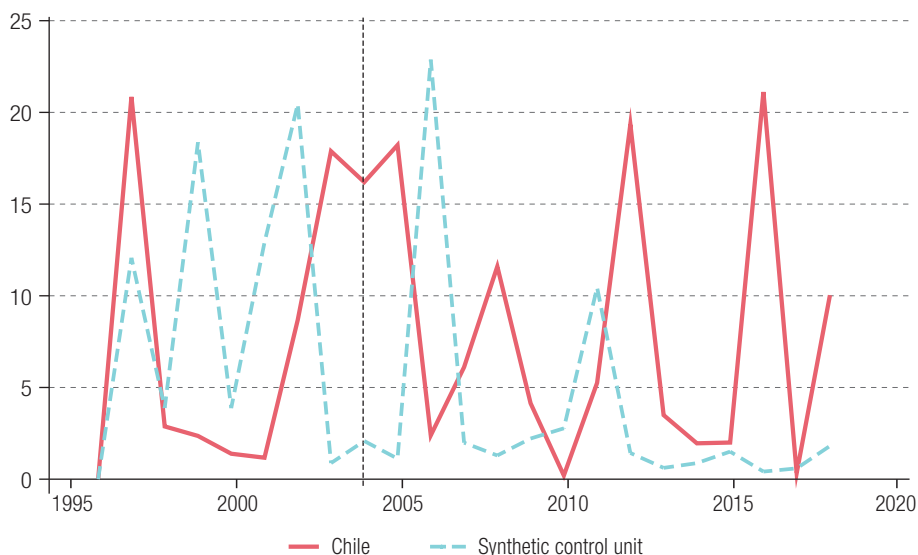
<sup>a</sup> Composed of Argentina (0.076), Mexico (0.116), Panama (0.245) and Uruguay (0.564).

Figure 11 shows the results for this case, in which, as presented, there is no correlation between the Agreement and the extensive margin value. From these results, it is not possible to conclude that the Agreement has had a positive impact on the value of these exports. Although it has allowed new products to enter the market, this has not guaranteed success or sustained growth for them.

Here, the scope of an FTA must be emphasized. While instruments of this kind provide preferential access to third markets and legal certainty (Mitchell and Voon, 2008), they do not produce trade. FTAs facilitate these relationships, but for full advantage to be taken of their preferences, other complementary policies such as industrial or trade promotion policies are needed. This is particularly true for new products, as entering a foreign market requires not only preferential access, but also business networks, logistics, marketing and other factors beyond the scope of an FTA. These instruments need to be seen

in this perspective, and complementary policies and actions are always required if their objectives of diversifying and adding value to the export basket are to be fully accomplished.

**Figure 11**  
Chile and synthetic control unit: extensive margin of trade, 1996–2018  
(Thousands of dollars)



**Source:** Prepared by the authors.

**Note:** The covariates are total exports, the number of products, population, bilateral distance, gross domestic product (GDP) and per capita GDP. The synthetic control unit is composed of Argentina (0.076), Mexico (0.116), Panama (0.245) and Uruguay (0.564).

## VI. Concluding remarks

The objective of this paper was to assess the effect of the FTA between Chile and the Republic of Korea on Chilean exports using an alternative methodology to those traditionally employed to assess trade policy, namely the synthetic control method. By generating a control variable, this method serves to estimate the effect of a treatment (signing the FTA) on trade flows. The relevance of this type of evaluation lies in both its academic and its public policy contributions. First, it provides new evidence and methods for the study of international economic relations, specifically here the bilateral relationship between Chile and the Republic of Korea, a field of study that has not attracted a great deal of attention in the specialized literature. Second, through this academic contribution, it generates inputs for the development of better public policies by identifying the effects of agreements, which is particularly relevant at a time when trade policy is being re-examined.

From the results obtained, it can be concluded that the agreement between Chile and the Republic of Korea has had a positive effect on Chilean exports to the Asian country, confirming the first hypothesis. A “synthetic country”, composed of other Latin American economies that have not signed agreements with the Republic of Korea, was created to generate a control variable unaffected by the FTA. This synthetic country was contrasted with the actual values to isolate the effect attributable to the trade agreement. The total value and number of products exported by this “synthetic country” proved to be significantly less than the actual figures, reinforcing the thesis that the Agreement has had a positive impact on trade flows. However, when the analysis was extended to trade margins, the results

showed that the effect was largely confined to products already being exported to the Republic of Korea prior to the trade agreement (intensive margin), while for new products the relationship was inconclusive, which bears out the second hypothesis. Therefore, the objective of diversifying and adding value to the Chilean export basket has not been fully accomplished. This is consistent with the latest estimates made by López, Cáceres and Muñoz (2022) using a different methodology, the conclusion from which is that although there have been positive effects on exports, these effects are more significant for products already in the export basket than for new products.

The positive effect of the FTA on Chilean exports is easily explained by the benefits deriving from the tariff preferences contained in the Agreement and by the legal certainty that it provides. Accordingly, the Agreement has allowed trade relations between the two countries to develop more than would have been expected without it. This is illustrated by the lower rate of growth in total exports and the number of products estimated for the synthetic country. However, the inconclusive results for the evolution of the new products added to the export basket (extensive margin of trade) point to the need for further analysis of the Agreement and its impact on different goods.

FTAs are instruments that facilitate the development of trade relations, as indicated above, mainly by providing tariff preferences and legal certainty, but these are not sufficient conditions for the creation of trade. Other factors are critical if a sustained trade relationship is to be achieved, such as the establishment of business networks, an understanding of the destination market and its consumers, effective marketing campaigns to achieve the penetration of new products, and a diversified export supply.

Taking these factors into consideration, it may be concluded that the products already present in the bilateral relationship (identified as the intensive margin) may already have achieved most of these conditions, so that they have been able to benefit fully from the FTA preferences. In the case of new products, the Agreement grants preferential access, which explains the increase in their number, but this is not a sufficient condition, as it does not ensure growth in terms of value (amounts traded) and market development, with the result that the FTA has not had a statistically significant impact on their volume. The limitations of quantitative research must be acknowledged, however, since it only looks at overall numbers and not at the specific actions taken by companies and the public authorities in relation to the market. Hence, further research is needed to fully understand the impact of CRKFTA, including qualitative methodologies that can complement and yield further analysis of these results.

The findings give rise to a number of recommendations, in relation to both the literature and the formulation and implementation of public policies. First, with respect to the literature, the consistency of the results obtained with other methodologies used for the ex post analysis of trade reforms (such as gravity models) makes it necessary to point out that the synthetic control method can be a useful tool for such assessments, opening up opportunities to analyse the impact of trade agreements not only on trade flows, but also on other economic and social variables, and thereby obtain a better understanding of their effects. Then, the results show that the Agreement has had a positive impact overall on Chilean exports to the Republic of Korea, but that these remain concentrated in certain products, so that the desired trade diversification has not been achieved. This line of research needs to be strengthened with empirical sectoral studies to analyse the specific trajectory of different products. It is important to complement this kind of quantitative methodology with other methods in order to fully understand the factors explaining trade flows.

All the foregoing is relevant because of the contribution that these studies can make to the correct formulation and implementation of public policies. As noted, an explicit objective of Chile in negotiating this agreement was to diversify and add value to its export basket, an aim that has not been fulfilled. The results highlight the need to implement policies that can supplement FTAs. FTAs only create the conditions for the promotion of a country's trade: how trade develops will depend actively on other

factors that are beyond the competence of trade policy. Thus, Chile should treat FTAs as instruments for export development, not a sufficient condition, and look to the formulation of industrial and business promotion policies and to the entrepreneurial spirit of its companies to meet the objective of diversifying and adding value to its export basket.

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