A general equilibrium, ex-post evaluation of the EU-Chile Free Trade Agreement

Sébastien Jean[1], Nanno Mulder[2] and Maria Priscila Ramos[3]

April 2012

Abstract: This paper proposes an evaluation of the economic impact of the EU-Chile Free Trade Agreement, in force since 2003, based on a computable general equilibrium (CGE) model of the Chilean economy. The method, inspired by structural decomposition methods, consists of double calibration of the model, to account for interactions between the agreement's impact and structural change in the Chilean economy. Trade flows are modelled at the detailed product level (six-digit level classification) and elasticities of substitution are sourced from econometric estimates of EU-Chile trade based on a theoretical set-up consistent with the one used here. The Agreement has triggered a small aggregate economic gain for the Chilean economy, benefiting mainly unskilled labour. Moving to a situation of unrestricted bilateral free trade would make little difference, with gains concentrated in the meat sector.

Keywords: Chile, European Union, CGE model, HS6 trade and tariffs, trade elasticities.

JEL Classification : C68, F13, F15, F17.

The authors are solely responsible for the contents of the paper. They are grateful to Alex Gohin for helpful comments and help on a previous version of the paper.

[1] INRA (UMR Economie Publique INRA-AgroParisTech) and CEPII (Paris, France).

[2] CEPAL (Santiago, Chile).

[3] UADE-DEEFI (Buenos Aires, Argentina) and CEPII (Paris, France).

1 Introduction

The evaluation of policies is recognised as important to improve their effectiveness. In many countries, several public policies are frequently evaluated, including those linked to taxes and labour markets. In the case of trade policy, however, evaluations are less common. While the trade creating impact of preferential trade agreements (PTAs) has often been questioned (see Cardamone, 2007; and Salvatici and Cipollina, 2010, for recent reviews of this literature), such analyses are very general and tell little about the impact of a given agreement, given the heterogeneity across trade agreements. Several studies focus on one single agreement, such as the CUSFTA or NAFTA (e.g., Head and Ries, 1999; Clausing, 2001; Trefler, 2004; and Romalis, 2007), using mostly econometric analysis focusing on a specific dimension of the agreement's impact, such as the structure of trade patterns across patterns and/or sectors. Such studies fall short of addressing in a consistent and complete way questions such as: what was the agreement's impact upon the structure of output, labour market or incomes? While these questions are often dealt with in ex-ante assessment, they are not subject to ex-post evaluation.

In this paper, we attempt to carry out a comprehensive, ex-post evaluation of the free-trade agreement (FTA) between the European Union (EU) and Chile, which entered into force in 2003.[4] Taking an econometric analysis of the trade impact of this agreement as a starting point (Bureau and Jean, 2012), we use a computable general equilibrium (CGE) model for this purpose.

CGE models are generally used to answer counterfactual experiments, i.e. prospective, "what if" questions, whereby the impact of a hypothetical shock is evaluated *ceteris paribus*. A different approach is proposed here, taking advantage of information available about observed changes in tastes and technologies in Chile after the implementation of the Agreement. The approach is inspired by so-called structural decomposition analyses (see for example Jean and Bontout, 2002; Abrego and Whalley, 2003; Dixon and Rimmer, 2004, 2008), involving a double calibration of the model. This method is applied here to analyse changes between 2002 and 2008.[5]

This methodology requires building two fully consistent social accounting matrices (SAMs) of the Chilean economy for 2002 and 2008. This includes sector-level data on production factors, intermediate inputs, resources and uses. In addition to national accounts data, these data were put together using the LA-KLEMS database of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) for Chile.[6]

The EU-Chile FTA is clearly important for Chile: the EU was the destination for almost 18% of Chile's exports in 2010, making it the second leading Chilean export market at that

[4] The term EU-Chile FTA is used here to refer to provisions regarding "Trade and trade-related matters" of the Association Agreement. While the whole agreement came fully into force on 1 March 2005, Articles governing the institutional framework, trade in goods and cooperation were applied on a provisional basis from February 1, 2003.

[5] Although data are available for 2009, this year would be misleading because of the strong impact of global financial crisis on the Chilean economy.

[6] We are especially grateful to ECLAC's LA-KLEMS team for making these data available. For more details on the LA-KLEMS database, see www.eclac.cl/la-klems/.

time (ranking second to China), and it supplied 14% of its imports (next to China and the US). For the EU, this agreement does not stand out by its trade weight (Chile ranked 34th among EU's trading partners in 2010, accounting for 0.6% of imports and 0.4% of exports). However, together with the FTAs with Mexico and South Africa, it pioneered the development by the EU of FTAs with distant partners. In contrast to neighbourhood agreements, the motivation for these distant FTAs is essentially economic. At a time when such agreements are spreading quickly, a thorough evaluation is useful from the EU point of view. Still, it is unlikely in this context that general equilibrium effects are very significant for the EU. This is why this paper relies on a single-country model of the Chilean economy.

A specificity of the Chilean economy is that, despite a high trade-to-GDP ratio (75% in 2008), its export basket is concentrated in few products. This is especially true when it comes to trade with the EU, as illustrated below. Inspired in Gouel et al. (2011), this paper's model provides a detailed breakdown of products of common interest for Chile-EU bilateral trade, which are singled out at the six-digit level of the Harmonized System (HS6 level).

Another challenge is the sensitivity of product-level trade flows to tariff cuts following the agreement. Corresponding elasticities are difficult to estimate, and may differ across sectors and countries. We rely here on econometric estimates carried out in a framework consistent with the one used here, dealing with the trade impact of the EU-Chile FTA at the product level (Bureau and Jean, 2012).

The EU-Chile Association Agreement includes political dialogue, cooperation and trade. The trade-related provisions include the establishment of a free-trade area in goods and services, as well as a number of important rules-related measures. Hence, this agreement goes well beyond tariff liberalisation. However, a quantitative assessment such as the one carried out here needs to rely upon meaningfully quantified elements, which are lacking for most of these dimensions. Rather than relying upon arbitrary, unverifiable assumptions about the qualitative impact of the FTA, we thus focu s on tariffs. This may be a narrow focus, but tariffs remain a decisively important dimension of such an agreement.

The paper is structured as follows. The next section describes bilateral trade and and tariff concession between Chile and the EU. The model's features and the experiment design are described in Section 3. Results of the simulation are presented in Section 4, while sensitivity analyses and alternative counterfactual scenarios are analyzed in Section 5. Finally, we give our final remarks in the last section.

2 EU-Chile bilateral trade and tariff concessions in the agreement

Putting an FTA's tariff concessions in context with initial tariffs and trade patterns is necessary to gain insights about their likely consequences. In the present case, this is useful given the complexity of the EU tariff structure and the growing number of FTAs signed by Chile with its main trading partners.

2.1 EU's imports from Chile and corresponding tariff duties

As Chilean exports to the EU are concentrated in few sectors, a general-purpose

classification would be ill-suited to illustrate the importance of EU concessions. This is because important narrowly defined sectors would be mixed with less important broadly defined sectors. A sectoral classification tailored to Chilean's export structure is used here, where copper and its derivatives, wood and its products, ores, fruits and fish are considered separately (Table 1).

TABLE 1: EU'S IMPORTS FROM CHILE AND CORRESPONDING TARIFF DUTIES, BY MAIN SECTOR, IN 2002 AND 2008

	Imports (M €)		Share in extra-EU imports (%)		Average tariff (AVE, %)	
Sector	**2002**	**2008**	**2002**	**2008**	**2002**	**2008**
Alcoholic beverages	373	498	11.64	12.16	6.0	0.0
Fruits	476	975	5.61	7.93	8.0	3.0
Fish, crustaceans & prod.	291	473	2.54	3.15	6.9	1.6
Other agric. & food prod.	200	439	0.50	0.74	8.5	12.5
Ores	432	1,380	5.37	7.55	0.0	0.0
Wood & its products	412	718	1.87	2.86	0.2	0.0
Copper & its products	1,778	4,777	41.75	40.63	0.0	0.0
Other manufactured products	692	492	0.10	0.04	0.7	0.0
All products	**4,654**	**9,753**	**0.60**	**0.76**	**2.2**	**0.9**

Note: Data refer to EU-15 imports. "Average tariff" refers to the trade-weighted average of ad-valorem equivalent tariff duties. "Share in extra-EU imports" refers to EU15 imports from Chile as a share of EU15 total (extra-EU27) imports. "Fish crustaceans and their products" includes HS chapter 03 and headings 1603-1605. "Wood & its products" includes HS sections IX and X (i.e., chapters 44 to 49), thus including pulp of wood, paper and printed material. "Copper & its products" includes chapter 74 and subheading 720270 (ferro-molybdenum). Agricultural and food products definition is limited to chapters 1 to 24. The average tariffs by sector in 2002 and in 2008 are shown in Table 3.
Source: Authors' calculations based on the EU-Chile FTA's text, on TARIC (DG Taxud) for protection data and on Comext (Eurostat) for trade data.

A key feature of Chile's exports to the EU (as for most other destinations) is the lion share of copper ores and their derivatives. This share even increased further between 2002 and 2008, mainly due to the rise in the copper price. As a matter of fact, changes in this sector's role in exports have little to do with the FTA, since they are not dutiable in the EU market.

Agricultural products are also important, especially fruits and wines, for which the EU's MFN protection is relatively high for many of these products. Although Chile was eligible to the EU's GSP in 2002,[7] the ad-valorem equivalent tariff applied by the EU to imports from Chile averaged 8.0% for fruits and 6.0% for alcoholic beverages. In 2008, the FTA had cut these levels down to 3.0% and 0%, respectively.[8] As a matter of fact, Chile's market share in the EU import market increased in these sectors. This is also the case for fish and

[7] This was the case until 2007, when Chile voluntarily withdrew from the EU's GSP.

[8] Remaining protection on fruits is mainly related to the EU's entry price system, which was not altered by the FTA.

crustaceans, with average tariff duty fell from 6.9% to 1.6%. The increase in average protection of other agricultural products is due to a composition effect,[9] since protection was reduced on each individual tariff line. In any case, the market share of Chile in EU imports of these products is smaller than that of the former sectors.

For manufactured products, the EU tariff elimination schedule includes total, front-loaded liberalization. This is a potentially large benefit for Chilean exporters. However, European protection under the MFN regime is low for these products and Chile's export potential has remained limited so far.

EU's import protection of Chile's exports shows that almost 82% entered duty free in 2008. Nevertheless, the remaining 18% still faced a positive tariff and it is in this segment where potential benefits could arise for Chile depending on its production capaticy (see Panel A from Figure 1).

2.2 Chilean imports from the EU and corresponding tariff duties

For EU exports to Chile, a specific classification is also used, where important sectors such as machinery, transport equipment (referred to as "vehicles" below) and precision instruments are singled out. While EU's exports to Chile are relatively diversified, these manufacturing sectors are especially important, as illustrated in Table 2.

TABLE 2: CHILEAN IMPORTS FROM THE EU AND CORRESPONDING TARIFF DUTIES, BY MAIN SECTOR, IN 2002 AND 2008

	Imports (M €)		Share in extra-EU imports (%)		Average tariff (AVE, %)	
	2002	2008	2002	2008	2002	2008
Agric. & food	95	238	7.4	5.5	7.0	0.9
Mineral prod.	14	58	0.5	0.3	7.0	0.3
Chemical prod.	638	1,359	25.3	18.0	7.0	0.8
Machinery	1,147	2,941	29.5	25.3	6.8	0.6
Vehicles	373	699	23.5	12.6	6.0	0.2
Precision instr.	92	216	27.1	27.2	7.0	1.2
Other	582	1,343	19.2	15.0	6.8	0.3
All products	**2,941**	**6,854**	**19.1**	**12.2**	**6.7**	**0.6**

Note: A blank means that the cell does not contain any product. See text for the definition of categories of scheduled liberalisation. Sectors are defined based on HS Section: "Agriculture & food products" (1 to 4), "Mineral products" (5), "Chemical products" (6, 7), "Machinery" (16), "Vehicles" (17),"Precision instruments" (18). The average tariffs by sector before the agreement and in 2008 are shown in Table 4.
Source: Authors' calculations based on the EU-Chile FTA's text, on Chilean customs national data.

The market share of EU's producers in Chilean imports is especially large on average, but it fell from 19% in 2002 to 12% in 2008. Noteworthy, the sectors where this market

[9] Meat products are highly protected in the EU, and they have been liberalised in the EU-Chile FTA through tariff-rate quotas (for which we use the out-of-quota tariff rate as a measure of protection). This is why the import-weighted average tariff increased.

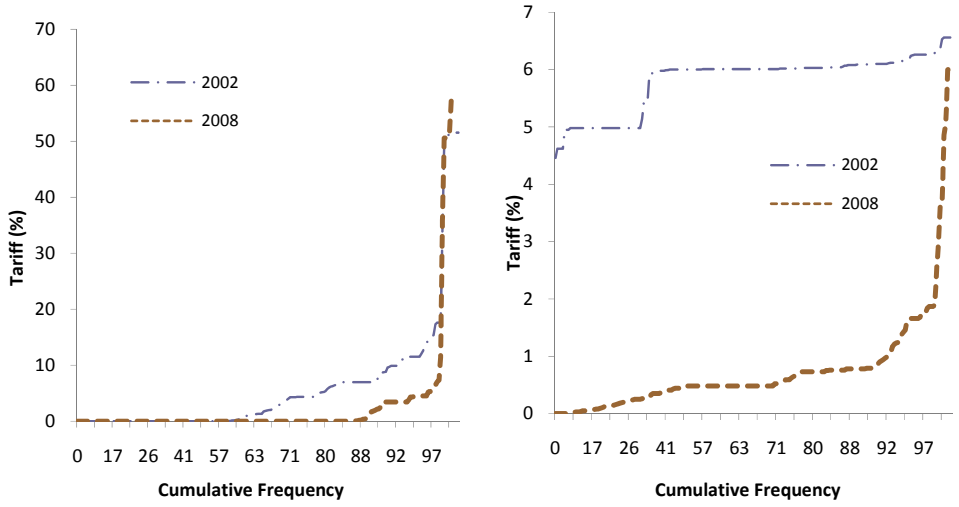
share was initially highest (machinery, precision instruments, and to a lesser extent chemical products) are also those where it fell less.

The agreement entailed a deep cut of tariff protection faced by EU's exports in the Chilean market, from 6.7% in 2002 to 0.6% in 2008 on average. This liberalisation is relatively even across sectors, in a context where MFN protection is almost homogenous: in Chile, with limited exceptions (less than 2% of tariff lines), applied MFN protection has been uniformly equal to 6% since 2003.[10] This is in stark contrast with the cross-product variability of EU's protection, mainly related to agricultural products, as illustrated in Figure 1.

It is also worth recalling that Chile has had a very active trade liberalisation policy, pushing for agreements both in the multilateral arena and the regional/bilateral arena. In October 2011, Chile had 21 trade agreements in force, with 58 partners, including South Korea, Japan, New Zealand, Singapore, China, India, Canada, Australia, the United States, EFTA and most Latin American countries.[11]

FIGURE 1: DISTRIBUTION OF BILATERAL TRADE PROTECTION IN THE EU AND CHILE

A. EU's protection over Chile exports *B. Chile's protection over EU exports*



Note: Proportion of trade flows (on the x-axis), computed with the value of Chile imports (Chile tariffs) and exports (EU tariffs) for which tariffs are inferior to the level represented on the y-axis. Source: TARIC and Chile Customs data.
Source: Authors' calculations based on the EU-Chile FTA's text, on TARIC (DG Taxud) for protection data and on Comext (Eurostat) for trade data.

Even if less than 10% of EU exports benefitted from duty free access to the Chilean market in 2008, the tariff for the rest remained low compared to the EU protection (see

[10] Between 1998 and 2003, this almost-uniform applied MFN duty rate was cut, on a unilateral basis, by one percentage point each year. 6% is the level reached on Januay 1, 2003. The exceptions are sugar, wheat and wheat flour, which are under a price band (being subject to a specific tariff), and chicken meat, for which specific measures apply. A limited number of products have zero tariffs, including planes and ships.

[11] In 2005, Chile was called by *The Economist* the "largest collection of FTAs" in the world. See Direcon's website (www.direcon.gob.cl) for an exhaustive list.

Panel B from Figure 1). The end of the FTA implementation may not necessarily lead to large potential gains for the EU.

3 Modeling issues

3.1 The model

The model built for this study is a multi-sector, multi-agent, multi-factor, single region, comparative static CGE model. Consistent with Chilean national accounts, sectors are assumed to produce multiple goods. The "small-country" assumption describes Chile as a price taker[12] on all export markets, and trade and market access are described at the detailed, HS6 level for products of interest.

Here we consider 37 sectors, which is in line with most CGE models that include between 20 and 40 sectors. This order of magnitude reflects the constraints inherent to the general equilibrium approach, both from a theoretical and empirical point of view. However, such an aggregation level considerably limits the insights gained from a CGE assessment, especially when trade is concentrated at the product level and when a specific pattern of concession schedules is of interest.

This is why the model used here describes trade flows and market access concessions at the HS6 level. Using this level of detail for the whole economy would render the model almost intractable with little gains, since the number of products of interest to bilateral trade between Chile and the EU are far less than the 5,000+ products of the HS6 classification. Minimum import levels were set as conditions for products to be singled out in the model classification, namely a minimum import level of 20 M USD for Chilean imports from the EU, or 10 M USD for EU imports from Chile.[13] Products not singled out based on this criterion are bundled by sectors of the input-output matrix. The resulting classification includes 199 products. No input-output matrix is available at this level, nor do we have any reliable data about domestic consumption. The model thus combines a sectoral breakdown in 37 sectors, for which production, input-output relationships and consumption are fully modeled, and a further breakdown of 199 HS6-level products (including the rest of each sector, once each of the HS6-level products singled out is taken into account), for which only trade and market access are fully modelled (similar to Gouel et al., 2011).

An important additional benefit from this modeling approach is that it relies on functional forms consistent with the ones used in the econometric analysis: CES functions across HS6 products, within each sector. The elasticities of substitution across providers at the product level used in the model are those estimated in Bureau and Jean (2012). The estimated elasticities by large sector, averaged across the three base estimation techniques, are thus used to parameterize the model. Such an integrated, consistent approach has no

[12] This assumption may be questionable in the case of copper, but this product is not covered by the tariff provisions of the Agreement, as most of its products and co-products are not dutiable in the EU. Thus, the corresponding sector is not at the centre of the assessment presented here.

[13] Since EU imports from Chile are less diversified than flows in the opposite direction, a lower threshold is retained in the former case, so that the number of products of interest is comparable in both directions.

precedent at this level of detail, to the best of our knowledge. Of course, trade and tariff data are also drawn from the dataset built for the statistical and econometric analysis, once they are made compatible with the national accounts data.

For service sectors, the data available do not allow sector-level trade flows to be described accurately by partner. In addition, obstacles to trade in service sectors cannot be meaningfully represented in a simple, quantifiable manner, suitable for modeling purposes. The model thus relies on national accounts data; trade flows in services are not broken down by partner and trade barriers are not explicitly represented in the model.

This detailed modeling involves describing each sector, as defined in the input-output table, as a bundle of HS6 products. On the demand side, the subutility function associated with each sector is modeled as a constant-elasticity of substitution (CES) function. On the supply side, a constant-elasticity of transformation (CET) function describes the determinants and consequences of changes in the product mix.

Total demand of each product encompasses four different uses: final consumption by households, final demand by the government, intermediate consumption and investment. In each case, demand behavior is described by a nested function describing either utility of consumers or government, or the bundle of intermediate consumption or investments. This nesting can be illustrated focusing on consumer demand (Figure 2). Assuming sector shares in total expenditure remain constant in value, cross-sectoral nesting is represented by a Cobb-Douglas function (in intermediate consumption, however, input coefficients are assumed constant). Within each sector, the elasticity of substitution between demand for domestic and imported products is assumed constant, as represented by a CES function. Within each sector, import demand is composed of various HS6-level products, among which the elasticity of substitution is also assumed constant, hence another CES function. Finally, for each of these HS6-level products, the elasticity of substitution between varieties provided by different suppliers is assumed to be constant.

Foreign demand for Chilean exports by sector is assumed to face constant own-price elasticity. The composition of this demand across HS6-level products, and subsequently across regions, is then described in a way similar to domestic demand, with elasticities parameterized based on our estimated elasticities of substitution among EU imports from various origins.

Consumers are assumed to have a fixed average propensity to save.

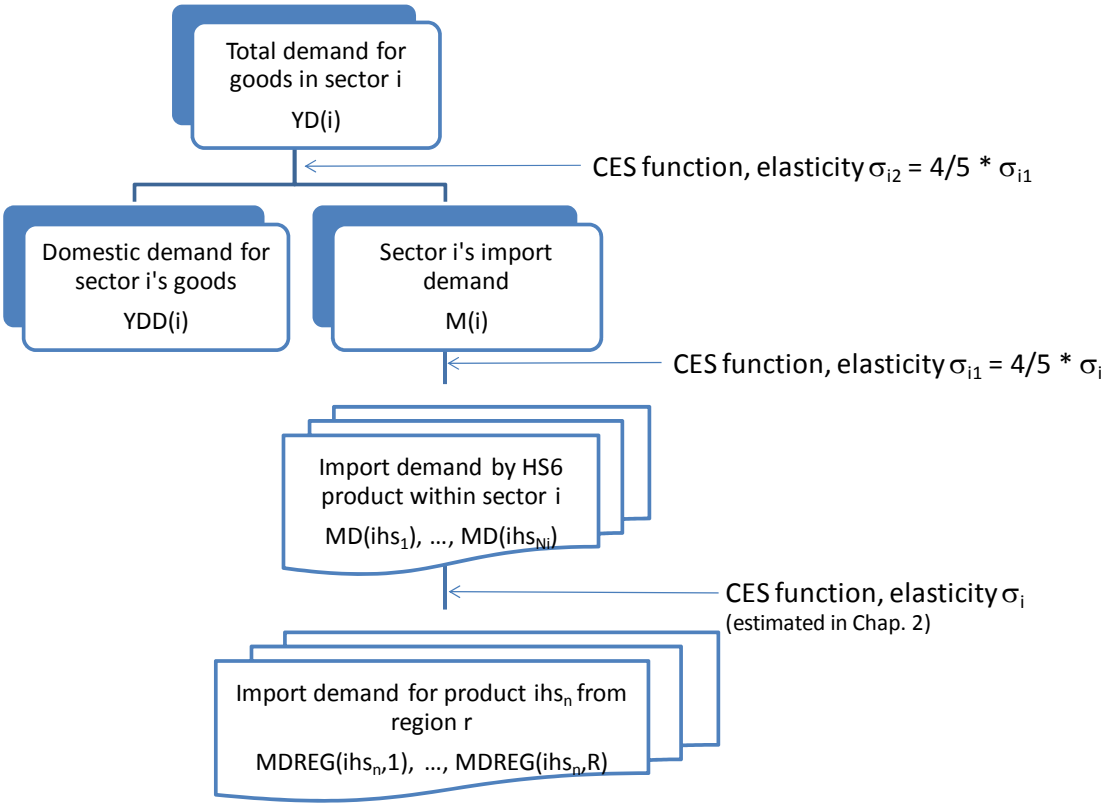
Production techniques involve a mix of intermediate inputs and value added activities, with fixed proportions. Value added is a CES function of five production factors, namely capital, independent labor, and three skill levels of salaried labor (high, medium, low). All production factors are generic: they can be used in any sector, at the same unit price. All sectors are assumed to be perfectly competitive, with constant returns to scale.

Consistent with the national accounts, each sector is assumed to produce multiple goods. In other words, even though the number of activities is the same as the number of goods (37), the correspondence is only partial, in the sense that each activity corresponds to a good that is its main, but not exclusive, output. The classification is described in the model Appendix.

Each sector produces goods for both domestic and foreign consumption, with a

constant elasticity of transformation between these two types of output.

FIGURE 2: CONSUMER DEMAND TREE IN THE CGE MODEL



Source: Authors' elaboration.
Note: The number of HS6 products within each sector (N_i) varies across sectors. The number of regions, R, is assumed equal to four in the model: EU27, United States, Latin America, rest of the world. Symbols refer to model's variables and parameters. See Appendix for details. The ratio 4/5 applied to elasticities by sector reflects the fact that substitutability is lower at a more aggregate level. It is consistent with the results found by Imbs and Méjean (2009).

Production, consumption and investment taxes are explicitly represented in the model, together with import duties (in Chile and in foreign markets). Transfers between governments and households are also modeled, as well as transfers to and from the rest of the world.

Production factors, in fixed supply, are assumed to be fully employed. Each good market also clears, with producers being price takers, and profits equal to zero.

Both a short- and a long-run macroeconomic closure are considered. Investment equals the sum of domestic savings and of the current account deficit. In the base case simulation, the current account balance is assumed to remain unchanged, meaning that investment is savings-driven. The current account balance constraint is met by endogenous adjustment of the real exchange rate. Assuming otherwise is possible, and would allow the impact of the agreement on the current account to be assessed, assuming the real exchange

rate remains constant. In the medium to long run, however, assuming the real exchange rate adjusts is more consistent. The fixed-real exchange rate assumption is thus used as an alternative closure, representing short-term behaviors. It will be used as part of the sensitivity analysis.

A technical description is available in the model Appendix.

3.2 Simulation approach: Combining structural decomposition analysis and counterfactual experiments

CGE models are normally used to answer counterfactual experiments, i.e. "what if" questions. For a given benchmark, the impact of a given shock is evaluated, *ceteris paribus*. On this sense. several ex-ante impact evaluations of the Chilean FTA with the EU have been done, often comparing its impact with that of the Chile-United States FTA. These agreements compete with each other and the asymmetry between partners' initial conditions characterizes both of them. Using a small general equilibrium dynamic model, Chumacero et al. (2004) seek to evaluate long-term steady-state and the dynamic paths of Chile FTAs with the EU and the US. They focuses on the dynamic effects of the FTAs in terms of improvements in total afctor productivity and country risk, thus their meaningful results are in this sense and not on direct tariff cut impact. With a greater static CGE model, Harrison et al. (2003) also compares different integration strategies for Chile (Mercosur, EU, NAFTA, Rest of South America), where the additive regionalism appears as the better choice for welfare in this small country in a context of multilateral trade negotiations.

A recent paper by O'Ryan et al. (2010) uses a dynamic CGE model of the EU-Chile trade agreement broadening the analysis to socioeconomic and environmental impacts. They find that Chilean allocation gains are small due to the initially low tariff level. Nevertheless, an interesting result is that unskilled workers benefit most from the agreement. On the environmental side, trade creation due to the agreement pressures on specific resources from the primary and mining sectors (i.e. water and land), while no significant increase in CO2 emissions is observed.

Since the EU-Chile FTA is already in force—even though the phase-in period is still on-going, the present study is special. In this context, counterfactual simulations would not draw the best conclusions based on existing information, since they would overlook observed changes in tastes, technologies and trade patterns with other partners. While some counterfactual simulations will be used to further assess policy changes (in particular the full implementation of the agreement, at the end of the phase-in period), a different approach is followed to assess the impact the Agreement has had so far on the Chilean economy.

Moreover, all previous papers use an ex-ante evaluation approach of the EU-Chile FTA, but also assume a short list of sectors where trade gains remain aggregate generating possible biases on the results. To avoid them and in order totake into account the complexity of tariff cut schedules in the FTA, we simulate it at the product level (6-digit level).

3.2.1 Methodology

The methodology applied is inspired by structural decomposition analysis methods. Jean and Bontout (2002) and Abrego and Whalley (2003) are examples of such a methodology, which is also close to some of the experiments carried out with Monash and USAGE models by Peter Dixon and his co-authors (see Dixon and Rimmer, 2004, 2008). Essentially, the objective is to use the model to give an interpretation of observed changes, instead of using it to assess the *ceteris paribus* impact of a specific policy change.

The description of the economy's equilibrium by a CGE model can be thought of as

(1) $$\mathbf{F}(\boldsymbol{\sigma}, \boldsymbol{\theta}, \mathbf{x}, \mathbf{y}) = 0$$

where each of the arguments is a vector. $\boldsymbol{\sigma}$ represents behavioral parameters, usually drawn from external sources; $\boldsymbol{\theta}$ summarises "distributional" parameters (for the most part representing tastes and technology), unknown a priori and usually calibrated; $\mathbf{x}$ are exogenous variables, usually policy variables, known or assumed to be known; and $\mathbf{y}$ are endogenous variables, known for the initial equilibrium from the model's database, but unknown otherwise, and determined as a result of the equilibrium.

The calibration procedure determines distributional parameters based on the assumption of initial equilibrium:

(2) $$\widehat{\boldsymbol{\theta}}_{\mathbf{0}} : \mathbf{F}\left(\boldsymbol{\sigma}, \widehat{\boldsymbol{\theta}}_{\mathbf{0}}, \mathbf{x}_{\mathbf{0}}, \mathbf{y}_{\mathbf{0}}\right) = 0$$

where a hat over a variable or a parameter signals it is estimated. Noteworthily, a value-quantity split needs to be assumed to do so, generally based on the assumption that initial prices equal one. Finally, mulations generally involve assessing the impact of a change in policy variables from $\mathbf{x}_{\mathbf{0}}$ to $\mathbf{x}_{\mathbf{1}}$, meaning that the final equilibrium is obtained as

(3) $$\hat{\mathbf{y}}_{\mathbf{1}} : \mathbf{F}\left(\boldsymbol{\sigma}, \widehat{\boldsymbol{\theta}}_{\mathbf{0}}, \mathbf{x}_{\mathbf{1}}, \hat{\mathbf{y}}_{\mathbf{1}}\right) = 0$$

In the present case, we can think of the year before the Agreement enforcement, 2002, as "period 0". But we can also observe economic developments in Chile until 2008.[14] Referring to 2008 as "period 1", this means that there is no need to assess endogenous variables at this point, $\mathbf{y}_{\mathbf{1}}$, since they can be observed. Instead, the observed values in period 1 of policy variables and of endogenous variables allow the new value of behavioral parameters to be determined:

(4) $$\widehat{\boldsymbol{\theta}}_{\mathbf{1}} : \mathbf{F}\left(\boldsymbol{\sigma}, \widehat{\boldsymbol{\theta}}_{\mathbf{1}}, \mathbf{x}_{\mathbf{1}}, \mathbf{y}_{\mathbf{1}}\right) = 0$$

This double calibration procedure means that the model is able to track perfectly the changes observed from period 0 to period 1. In the model's framework, they reflect changes in behavioral parameters (from $\widehat{\boldsymbol{\theta}}_{\mathbf{0}}$ to $\widehat{\boldsymbol{\theta}}_{\mathbf{1}}$) and in exogenous, policy variables (from $\mathbf{x}_{\mathbf{0}}$ to $\mathbf{x}_{\mathbf{1}}$). This methodology is a structural decomposition analysis, in the sense that it decomposes changes observed over a given period in the context of a structural model of the economy. In the present case, we are only interested in one specific source of change, namely the enforcement of the Agreement.

[14] Data for 2009 are also available. As already mentioned, however, year 2009 might be misleading because of the economic shock, which may make it poorly representative of the structural equilibrium of the economy.

3.2.2 Experiment design

The right counterfactual to the Agreement enforcement is not exactly the status quo, in terms of protection, because Chile lowered its almost flat MFN tariff duty from 7% in 2002 to 6% in 2003. We thus modify the initial equilibrium to take this change into account, by carrying out a pre-experiment simulation, whereby Chile's MFN duty rates in 2003. The equilibrium obtained as a result of this simulation is considered in the analysis that follows as the initial equilibrium.

As emphasized by Harrison et al. (2000) the contribution of each exogenous shock is not independent from the order in which they are assumed to take place. While the Agreement was enforced at the beginning of the period, it includes a still on-going phase-in period, and its effects have been felt progressively. For this reason, it is difficult to assume that the Agreement enforcement occurs first, before changes in technology, consumer preferences and world prices take place. Instead, we assume that all shocks are symmetrical in terms of timing. In this context, we assess the impact of the Agreement enforcement as the mean between two alternative simulations: one where the Agreement is assumed to be enforced first, before any other shock; the other where it is assumed to be enforced last, after all other shocks. The first simulation thus corresponds to the implementation of the shock based on the 2002 initial equilibrium (i.e., the situation obtained as a result of the pre-experiment); the second one can be viewed as the opposite of the impact of dismantling the Agreement in 2008. The estimated proportional impact of the Agreement is then computed as the average across these two simulated proportional impacts, using a Fisher index.[15]

Formally, let us split the vector of policy variable ($\mathbf{x}$) between tariff duties ($\mathbf{x^d}$) and the rest of policy variables ($\mathbf{x^r}$). The solution of the first simulation, whereby the upfront implementation of the Agreement is simulated, can be represented as:

$$\mathbf{\hat{y}_1^a}: \ \mathbf{F}\left(\boldsymbol{\sigma}, \widehat{\boldsymbol{\theta}}_\mathbf{0}, \mathbf{x_1^d}, \mathbf{x_0^r}, \mathbf{\hat{y}_1^a}\right) = 0. \tag{5}$$

Likewise, the second simulation corresponds to a front-end-loaded enforcement Agreement. Starting from the final equilibrium, the shock consists of applying pre-Agreement tariff duties, with a solution defined as:

$$\mathbf{\hat{y}_0^b}: \ \mathbf{F}\left(\boldsymbol{\sigma}, \widehat{\boldsymbol{\theta}}_\mathbf{1}, \mathbf{x_0^d}, \mathbf{x_1^r}, \mathbf{\hat{y}_0^b}\right) = 0. \tag{6}$$

For any given endogenous variable y (a scalar component of $\mathbf{y}$), the assessed proportional impact of the Agreement, $\widehat{\Delta y}$, is then computed as follows:

$$1 + \widehat{\Delta y} = \sqrt{(\hat{y}_1^a / y_0)\left(y_1 / \hat{y}_0^b\right)}. \tag{7}$$

This methodology requires a consistent, double calibration procedure, which is very demanding in terms of data. Two social accounting matrices (SAMs) of the Chilean economy must be put together. In addition, these two matrices must be consistent in terms of definition of physical units, meaning that deflators of consumption and production factor

[15] If Δ_1 is the proportional impact of the first shock (enforcement of the Agreement, from the 2002 baseline) on a given variable, and Δ_2 is the proportional of the second shock (enforcement of the Agreement, from the counterfactual 2008 situation without the Agreement), the average is thus computed as $\Delta = \sqrt{(1+\Delta_1)(1+\Delta_2)} - 1$.

services must be used. The corresponding dataset includes the input-output table of the Chilean economy for 2003 (Central Bank), national account sources, the LA-KLEMS database, Chilean custom data sources, and TARIC for the EU tariffs. Data sources and methodology are described in the data Appendix.

We complement this decomposition analysis with standard counterfactual experiments, starting from the 2008 database, which become more interesting our conclusion section. Three scenarios are considered:

- *Back to MFN*: this scenario assumes that the Agreement is phased out, meaning that the EU applies the MFN regime to Chilean exporters, while Chile applies MFN duties to EU exporters. The corresponding simulations should give an impact close to the opposite of the assessed contribution of the agreement over the 2002-2008 period, but they differ somewhat given the change in initial conditions, and the fact that the alternative regime for Chile is now the MFN, instead of the GSP in 2002;
- *Full implementation of the Agreement ("Full implementation")*: this scenario assumes the agreement is fully implemented, as planned at the end of the phase-in period;
- *Bilateral quota-free, duty-free trade ("EU-Chile QFDF")*: this scenario assumes that trade is duty-free, and quota-free between the EU and Chile.

4 Simulated impact of the agreement enforcement

This section presents the long-run assessment of the impact of the Agreement following the above-described methodology. The contribution that the Agreement enforcement may have made to changes observed in the Chilean economy between 2002 and 2008. The main features of the initial and final situations are first described, to set the background of these simulations. We then present the trade impacts, their consequences for output per sector, and the corresponding macroeconomic impacts. These changes are evaluated assuming long-run closure (the current account balance is fixed, while the real exchange rate is endogenous).

4.1 Trade impacts

Noteworthy, in this medium- to long-run assessment, the real exchange rate adjusts, given the assumption that the current account balance remains unchanged. This adjustment is tiny in the present case, implying a real depreciation of the Chilean peso by 0.06%. This can be interpreted as a sign that the ex-ante trade impacts of the Agreement are actually fairly balanced between both partners, notwithstanding what could have been anticipated based on the econometric estimates.

The impacts on Chilean exports to the EU are concentrated in agricultural and food products. The largest export gains are registered in wines (+128%), a sector accounting for approximately one tenth of Chilean exports to the EU (Table 3, column i). Processed seafood (+82%), fish and crustaceans (+69%), fruits (+59%), and canned fruits and vegetables (+41%) are the other products where substantial gains are registered. Outside agriculture and food products, textiles and leather (+37%) and wood products (+7%) are the only products with significant gains. In most cases (fish and crustaceans being an exception, due to a sanitary crisis), the share of these products indeed increased during the period (columns e and f). In

total, goods exports to the EU increased by 21% (aggregate results are reported in Table 6).

The double calibration for 2002 and 2008 of the evaluation of the agreement show robust results, as the signs of bilateral export variations are the same independent of the base year. Nevertheless, the magnitudes vary somewhat due to changes in the structure of the Chilean economy between 2002 and 2008. For example, when 2002 is used as the base year, seafood exports from Chile to the EU increase more than when 2008 is used (e.g. 69% versus 50%, respectively). In contrast, results for the fruit sector show an opposite result (78% versus 85%, respectively). These differences also show up for sectors which exports fall, for example other equipments (-21% versus 9.5%, respectively).

A significant export boost to one particular partner has contrasting effects on third markets: by spurring production, it increases export potential; by making the EU market more attractive comparatively, it may divert trade from other destinations. The former effect dominates for fruits and fish products, while the latter originates declines in exports to third markets for wines and textiles and leather products (column j). On the whole, trade diversion effects dominate slightly: Chilean exports are decreased by almost 3% toward other Latin American countries, and by 1% toward the US and the rest of the world (Table 6).

In sectors where the Agreement does not entail any substantial tariff cut in the EU because the initial level is negligible, exports to the EU generally fall slightly, as is the case for service sectors.[16] More than anything else, this reflects a decline in export capacity, due to import competition and to increased opportunity costs of production.[17] As a result, Chilean exports of these products to third markets also fall.

[16] As already mentioned, we are assuming zero tariff protection for services.

[17] The opportunity cost increases to the extent that the Agreement increases ex-ante profitability in sectors where tariff cuts are significant in the partner country.

TABLE 3: ASSESSED IMPACT OF THE AGREEMENT ENFORCEMENT ON CHILE EXPORTS, BY PRODUCT

	Initial level								Changes (%)		
	Output (% of total)		Exports, all partners (% of total)		Exports to the EU (% of total)		Tariff duties faced in the EU (%)		Exports to the EU	Exports to the ROW	Total exports
Product	2002	2008	2002	2008	2002	2008	2002	2008			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
P01 - Other ag. products	1.0	1.1	0.8	0.8	1.3	2.0	4.0	1.7	7.3	0.2	1.7
P02 - Fruits	1.2	1.5	5.0	5.4	7.4	12.3	8.0	2.8	59.0	10.0	19.5
P03 - Livestock	1.1	1.2	0.2	0.2	0.4	0.2	0.4	0.1	1.5	0.3	0.6
P04 - Forestry products	0.8	0.8	0.1	0.1	0.0	0.0	0.0	0.0	-4.8	-4.8	-4.8
P05 - Fish & crustaceans	1.4	1.4	4.7	4.1	4.7	3.7	7.2	1.7	69.3	6.2	13.4
P06 - Minerals	7.1	4.1	34.3	32.2	42.6	24.6	0.0	0.0	-0.3	-0.4	-0.4
P07 - Meat	1.2	1.2	1.0	1.2	1.0	2.2	36.6	32.9	0.9	0.2	0.5
P08 - Processed seafood	0.8	1.0	3.5	3.5	6.0	13.8	5.1	0.0	82.2	-0.9	18.4
P09 - Canned fruits & veg.	0.5	0.6	1.9	1.9	0.6	0.5	12.1	1.9	41.3	-0.4	1.0
P10 - Liquors & spirits	0.1	0.1	0.0	0.0	0.1	0.3	0.1	0.1	-4.0	-5.0	-4.5
P11 - Wines	0.7	0.7	2.6	2.4	8.4	10.1	6.0	0.0	128.5	-8.3	41.7
P12 - Other foods & beverages	5.2	4.9	1.5	1.7	1.1	1.3	2.3	0.2	6.5	0.8	1.2
P13 - Textiles & leather	1.2	1.3	1.4	1.7	1.0	3.4	1.4	0.0	37.2	-2.2	2.9
P14 - Wood & its products	1.6	1.8	5.1	4.8	1.7	4.8	0.5	0.0	6.6	-7.7	-6.7
P15 - Pulp, paper, printing	2.3	2.8	4.9	4.7	8.0	8.9	0.0	0.0	-4.8	-5.3	-5.2
P16 - Refined petroleum & coke	2.1	2.8	2.3	2.5	0.0	0.0	0.0	0.0	-0.5	-0.5	-0.5
P17 - Chemicals & products	2.8	1.8	3.9	4.1	6.2	5.2	1.7	0.0	2.4	-6.2	-4.3
P18 - Rubber & plastic	0.9	0.7	1.0	1.0	0.2	0.1	0.1	0.0	-3.2	-4.4	-4.4
P19 - Other non-metallic min.	0.8	0.9	0.2	0.2	0.1	0.1	0.3	0.0	2.3	-1.3	-1.2
P20 - Metal products	1.8	1.5	2.8	2.8	7.4	4.3	0.0	0.0	-4.1	-4.1	-4.1
P21 - Other machinery	0.5	0.5	0.8	1.0	0.9	0.4	0.0	0.0	-15.3	-15.5	-15.5
P22 - Electronic & optical eq't	0.5	0.4	0.8	1.0	0.2	0.1	0.1	0.0	-2.0	-4.3	-4.3
P23 - Transport equipment	0.4	0.3	1.0	1.1	0.1	0.6	0.1	0.0	0.9	-5.3	-5.2
P24 - Other manufactured	0.1	0.1	0.4	0.4	0.5	1.1	0.0	0.0	-4.3	-4.3	-4.3
P25 - Electricity, gas, water	3.0	2.0	0.0	0.0	0.0	0.0				-0.7	-0.7
P26 - Buildings	8.2	7.8	0.0	0.0	0.0	0.0					
P27 - Trade sales services	8.2	9.2	3.3	4.3	0.0	0.0				-0.5	-0.5
P28 - Hotels & restaurants	1.5	1.5	0.0	0.1	0.0	0.0				-0.3	-0.3
P29 - Transportation	9.9	10.6	12.7	13.1	0.0	0.0				-0.5	-0.5
P30 - Post & telecoms	3.7	3.7	0.6	0.7	0.0	0.0				-0.4	-0.4
P31 - Financial services	3.1	4.1	0.8	1.0	0.0	0.0				-0.3	-0.3
P32 - Real estate services	3.8	4.0	0.0	0.0	0.0	0.0					
P33 - Equipment rental	10.4	11.6	1.8	1.7	0.0	0.0				-0.4	-0.4
P34 - Public services	3.4	3.3	0.1	0.1	0.0	0.0				-1.2	-1.2
P35 - Education services	3.6	3.2	0.0	0.0	0.0	0.0					
P36 - Health & social work	2.8	3.4	0.0	0.0	0.0	0.0					
P37 - Other services	2.3	2.2	0.3	0.4	0.0	0.0				-0.5	-0.5

Source: Authors' simulations based on the CGE model described above.

Note: "2002" refers to the equilibrium of the economy after the pre-experiment simulation, which takes into account the lowering of Chile's MFN duty rate from 7% in 2002 to 6% in 2003. "% of total" means that each figure refers to the share in % of the product in the total for all products. Duties are measured as trade-weighted averages.

The Agreement's impacts on Chilean imports from the EU are far smaller across sectors if we compare their impact to exports'. This is the consequence of a lower sectoral heterogeneity in Chilean tariff protection (Table 4, column i). In most cases, the Agreement's enforcement meant a tariff cut from 6%, the level that would have been applied in 2002

without the Agreement, to an average level below 1%, and often close to zero by 2008 (columns g and h). The resulting impact on EU's exports to Chile seems important: +30 to +55% in agricultural and food sectors, respectively, which share in EU's exports to Chile is small, and 40 to 105% in industrial sectors. Overall, Chilean imports from the EU increase by 65%, which corresponds to an annual average growth rate of almost 9%.

The decomposition of these results between the two calibrated years (2002 and 2008) also shows greater differences in sectors where protection was eliminated. The imports of transport and other equipments suffered greater changes which are reflected in the Chilean import structure. For example, Chilean imports of ships and plane from the EU increased 66% with the agreement under the 2002 benchmark simulation, and 105% using the 2008 benchmark. In contrast, among those sectors where bilateral imports fell, the case of wood and forestry products stands out. In 2002 there were no wood imports from the EU while in the 2008 calibration there were, showing a 5% drop after the implementation of the agreement due to substitution effects..

In manufacturing sectors, where the market share of European products is often large, this implies significant trade diversion effects. The most important sector in this respect is machinery (P21), having a weight of 14% of total Chilean imports, where the Agreement is assessed to increase imports from the EU by 75%, inducing a decline in imports from third countries by more than one quarter. Consistent with this strong impact, the share of this sector in EU exports to Chile increased from 30% in 2002 to 41% in 2008. Even if they are smaller, significant negative impacts on imports from the rest of the world are also found, in particular in wood and derivatives (-19%), transport equipment (-17%), chemical products (-16%), wood pulp (-15%), rubber and plastic (-14%) and electronic products (-13%). On the whole, trade diversion effects are significant. Imports from other Latin American countries fall by 6%, those from the rest of the world by 8%. Imports from the US, with a structure closer to those from the EU, are even more strongly affected (-16%).

The magnitude of trade diversion also depends on the starting point for the evaluation of this FTA. Chilean bilateral Imports from the rest of the world fall more when 2002 is the base year to evaluate the EU-Chile FTA instead of 2008. This gap between base years is even greater for sectors where the FTA is crucial (e.g. transport and other equipments). The same conclusion holds for bilateral exports between Chile and the rest of the world.

Chile initially exhibits a surplus in its trade relations with the EU. As a result, a lower relative growth in bilateral exports may match in absolute term the growth in imports. This is not the case here, since the growth rate of total bilateral imports exceeds that of bilateral exports by a rather large amount. The stronger diversion effects on the import side than on the export side explain why this is compatible with an unchanged current account balance: the decline in the bilateral trade balance of Chile with the EU is balanced by its increase with respect to third countries.

TABLE 4: ASSESSED IMPACT OF THE AGREEMENT ENFORCEMENT ON CHILEAN IMPORTS

	Initial level								Changes (%)		
	Final cons. (% of total)		Imports, all partners (% of total)		Imports from the EU (% of total)		Tariff duties on imp. from EU (%)		Imp., EU	Imp., ROW	Total imports
Product	2002	2008	2002	2008	2002	2008	2002	2008			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
P01 - Other ag. products	1.3	1.3	2.3	2.2	0.8	0.3	6.0	0.6	42.9	-1.0	1.0
P02 - Fruits	0.8	0.3	2.1	1.8	0.0	0.0	6.0	0.0	60.9	8.2	8.2
P03 - Livestock	0.3	0.2	0.0	0.1	0.0	0.5	6.0	0.1	45.9	-3.6	5.7
P04 - Forestry products	0.3	0.1	0.0	0.1	0.0	0.1	6.0	0.1	17.6	-3.7	-0.9
P05 - Fish & crustaceans	0.2	0.4	0.0	1.3	0.0	0.7	6.0	0.2	57.0	4.7	9.1
P06 - Minerals	0.1	0.0	17.0	13.3	0.2	0.3	6.0	0.1	51.6	-0.9	-0.7
P07 - Meat	3.0	3.2	1.7	1.6	0.1	0.1	6.0	0.0	51.4	-0.4	-0.2
P08 - Processed seafood	0.2	0.2	0.3	0.3	0.0	0.1	6.0	1.1	37.8	-1.6	-1.0
P09 - Canned fruits & veg.	0.3	0.2	0.2	0.2	0.1	0.3	6.0	0.4	41.8	-3.8	1.3
P10 - Liquors & spirits	0.2	0.3	0.2	0.3	0.7	0.5	6.0	0.0	31.8	-10.5	5.8
P11 - Wines	0.3	0.6	0.1	0.6	0.1	1.9	6.0	0.5	35.7	-7.1	5.2
P12 - Other foods & beverages	10.4	10.5	2.4	3.9	1.1	2.1	6.0	1.3	36.7	-1.0	1.7
P13 - Textiles & leather	5.6	7.2	7.7	7.2	4.5	3.8	6.2	0.7	105.1	-6.6	1.0
P14 - Wood & its products	0.7	0.3	1.0	1.9	2.6	6.4	6.0	0.1	76.8	-19.3	13.7
P15 - Pulp, paper, printing	1.0	0.8	2.8	3.3	5.1	8.1	4.6	0.1	81.2	-14.7	8.3
P16 - Refined petroleum & coke	2.2	2.1	6.5	5.6	2.3	0.2	6.0	0.5	49.3	-1.0	0.9
P17 - Chemical products	3.9	2.1	10.6	10.9	16.8	10.0	6.0	0.9	86.4	-15.6	4.6
P18 - Rubber & plastic	0.6	0.3	2.9	2.9	3.2	4.8	6.0	0.5	102.8	-14.4	5.9
P19 - Other non-metallic min.	0.2	0.1	0.7	0.9	0.8	1.1	6.0	0.3	46.0	-4.8	3.5
P20 - Metal products	0.5	0.3	4.9	4.2	6.4	3.8	6.0	0.4	39.8	-8.4	1.7
P21 - Other machinery	0.5	0.5	14.0	13.8	29.7	40.6	5.5	0.5	75.4	-26.3	1.8
P22 - Electronic & optical eq't	1.9	1.8	8.9	8.8	11.0	7.8	5.7	0.7	55.9	-12.5	0.8
P23 - Transport equipment	1.7	1.8	8.8	8.4	13.0	6.0	5.2	0.4	90.7	-16.9	1.0
P24 - Other manufactured	0.7	0.6	1.7	1.3	1.3	0.4	6.0	0.7	88.8	-9.1	0.9
P25 - Electricity, gas, water	1.6	0.9	0.2	0.2	0.0	0.0				-1.0	-1.0
P26 - Buildings	10.0	9.7	0.0	0.0	0.0	0.0				-1.2	-1.2
P27 - Trade sales services	8.7	8.0	0.0	0.2	0.0	0.0				-0.7	-0.7
P28 - Hotels & restaurants	2.8	3.0	0.1	0.1	0.0	0.0				-1.4	-1.4
P29 - Transportation	8.1	7.0	0.4	1.7	0.0	0.0				-0.9	-0.9
P30 - Post & telecoms	3.6	3.2	0.1	0.2	0.0	0.0				-0.6	-0.6
P31 - Financial services	4.4	5.2	2.2	2.0	0.0	0.0				-0.4	-0.4
P32 - Real estate services	11.2	12.5	0.0	0.0	0.0	0.0					
P33 - Equipment rental	1.2	1.0	0.1	0.3	0.0	0.0				-1.0	-1.0
P34 - Public services	0.1	0.2	0.1	0.0	0.0	0.0				-2.5	-2.5
P35 - Education services	4.1	4.7	0.0	0.0	0.0	0.0				-0.7	-0.7
P36 - Health & social work	3.4	5.3	0.0	0.0	0.0	0.0				-0.6	-0.6
P37 - Other services	4.2	4.0	0.1	0.4	0.0	0.0				-0.6	-0.6

Source: Authors' simulations based on the CGE model described above.

Note: "2002" refers to the equilibrium of the economy after the pre-experiment simulation, which takes into account the lowering of Chile's MFN duty rate from 7% in 2002 to 6% in 2003. "% of total" means that each figure refers to the share in % of the product in the total for all products. Duties are measured as trade-weighted averages.

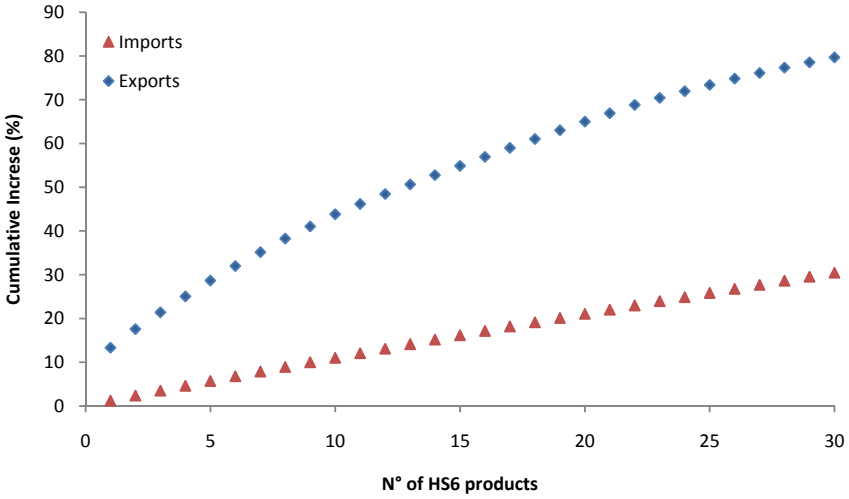
The detailed product disaggregation of the model allows the assessment of which products have been more strongly affected by the Agreement. By linking this information to changes in product shares in bilateral trade, further insights are gained about the model

simulation. However, while interpreting the differences between these figures, it should be kept in mind that while the simulations are *ceteris paribus* estimated impacts, many other factors were likely at play, in practice. In particular the rapid structural change of Chile's economy, as well as the numerous trade agreements entered into force during the period, including the one with the United States, are likely to have substantially affected Chile's foreign trade patterns.

Results at this level of detail show the differences between Chilean exports and imports structures in terms of trade composition with this agreement. Concentration in a few products remains for Chilean exports to the EU where 80% of their increase only concerns 30 HS6 products. In contrast, diversification is greater for Chilean imports under this bilateral relation where to attend 80% of bilateral imports increase we have to look at the first 100 HS6 products (Figure 3).

Still, Chile's export products that have most benefitted from the agreement indeed saw their share in exports to the EU increase between 2002 and 2008 (here again, fish products are understandably exceptions; Appendix, Table 10, Panel A). This is the case in particular for wine of fresh grapes, fresh peaches, trousers, dried prunes and molluscs.

FIGURE 3: SALIENT PRODUCTS IN TERMS OF BILATERAL TRADE IMPACT



Note: Cumulative Chilean imports and exports increase under the agreement with the EU. Top five for exports: 220429 (wine), 030378 (fish), 080930 (peach), 620462 (cotton clothes), 080920 (cherry). Top five for imports: 870421 (motors), 870322 (motors), 310210 (chemicals), 870120 (tractors), 870323 (motors).

Source: Author's simulations. See the Appendix for more details.

On the import side, the link between simulated impacts and changes in bilateral import shares is less clear, probably because tariff cuts were most often matched by those granted to US products (Appendix, Table 10, Panel B). The main impact may thus have been preventing the EU's exporters from losing ground relative to US exporters. The most affected products are parts of transport equipment (HS Chapter 87), chemicals (Chapter 31 in particular) and machinery (Chapter 84).

4.2 Impacts on output and on macroeconomic aggregates

The Agreement's impacts on output per sector result from the above-described impacts on trade, combined with the relative importance of exports and imports with respect to domestic production (Table 5). Structural changes between 2002 and 2008 in trade results are also displayed on sectoral outputs. The balance is clearly positive for agricultural and food products in general, and in particular for those products which for exports to the EU most benefited from the Agreement. Output rises 22% in fruit growing, 34% in wine making, 17% in seafood processing and 12% in extractive fishing. Indeed, these four sectors concentrate the bulk of Chile's output gains, which remain limited in other sectors.

In contrast, increased import competition is more strongly felt in industrial sectors, with negative consequences for output: -18% for other machinery products (a sector accounting for only 0.8% of Chilean output in 2002 and for 0.6% in 2008, though), -7% for timber and furniture, -6% for the chemical industry, -5% for paper and printing, -5% for transport equipment, -4% for the basic metal and plastic industries.[18] In services, output falls marginally in most sectors.

Once factor intensities are taken into account, as documented in Table 5 through factor shares (columns a to e), these impacts per sector shed light on the impact upon factors' relative rewards (Table 6). High-skilled and medium-skilled wages slightly decline (by 0.3 and 0.4%), mainly because of the contraction in several manufacturing sectors where these factors are intensively used compared to other sectors. In contrast, low-skilled workers benefit from the Agreement (+0.3%), mainly as a result of their intensive use in agricultural sectors where output expands. The rate of return to capital remains constant, while the income of own-account workers slightly increases (+0.1%). All these impacts remain small, meaning that the distributive impacts of the Agreement are limited.

At the macroeconomic level, the Agreement represents a small gain for Chile's economy as GDP increases by 0.05%. But the best measure of this economic impact is welfare, as measured through the equivalent variation of income. According to this metric, the gains for the Chilean economy amount to 0.23%. This is also a small figure, but it should be kept in mind that the impact measured here is limited to the direct consequences of tariff cuts in the Agreement. Such a shock might originate a variety of indirect effects linked to the development of new perspectives for several sectors. The new trade theories have in particular identified pro-competitive effects, and gains linked to economies of scale. As emphasized in the so-called "new new" trade theories, the reshuffling of market shares across firms, as well as the entry and exit of some of them, often originate substantial efficiency gains, which are not taken into account here. Finally, additional effects might come though impacts on technology, information or organization of industries. In this context, the direction of changes and the comparisons across industries and shocks are the most meaningful results.

[18] Output increases in electronics and optics (+13%), because firms in this sector benefit from the lesser competition of firms specialising exclusively in other machinery, the output of which includes a significant share of electronic and optic products, in addition to other machinery per se. The interaction between the two sectors is strongly felt in electronics and optics because this sector is comparatively small. On the contrary, output shrinks in liquors and spirits due to the increased competition of firms from the winemaking sector.

In addition, non-tariff aspects of the Agreement are not taken into account in these simulations, because the analysis carried out so far led us to conclude that no tangible basis is available to quantify them, so that any inclusion in the model would rest on artificial, *ad hoc* assumptions. This focus on tariff clauses limits the scope of this quantitative assessment, and this should be kept in mind when interpreting the results.

One aspect which can be directly quantified, though, is the magnitude of rents linked to filled quotas. Based on the AVE computed for the inside- and outside-quota tariff rates and on the volume of each quota, we assessed the global value of these rents in 2008 to be 21 M€ (31 M USD, or almost 0.02% of GDP). Since who may earn these rents is not clear in practice, they are not included in the model, but they may be an additional source of gains for the Chilean economy.

TABLE 5: ASSESSED IMPACT ON OUTPUT PER SECTOR IN CHILE

	Factor share in VA in 2008 (%)					Share in total output (%)		Change (%)
	Salaried lab., by skill			Indep.				
Sector	Low (a)	Med (b)	High (c)	labour (d)	Capital (e)	2002 (f)	2008 (g)	Output (h)
S01 - Other agriculture	48	9	7	13	23	1.0	1.1	0.9
S02 - Fruit growing	49	9	7	13	22	1.1	1.2	21.7
S03 - Animal husbandry	46	9	7	12	27	1.1	1.2	0.5
S04 - Forestry	51	10	7	13	19	0.8	0.8	-4.2
S05 - Extractive fishing	45	9	7	12	28	1.4	1.5	11.9
S06 - Mining	11	7	5	0	78	7.4	6.7	-0.3
S07 - Meat production	22	7	9	25	37	1.2	1.0	0.4
S08 - Seafood processing	24	8	10	28	31	0.8	0.9	16.9
S09 - Canning	23	7	9	27	34	0.5	0.5	0.8
S10 - Liquors & spirits	27	9	11	31	22	0.1	0.1	-4.6
S11 - Winemaking	18	6	7	21	48	0.6	0.7	34.0
S12 - Other agro-industrial	23	7	9	26	34	4.1	3.2	1.3
S13 - Textiles & leather	30	16	11	28	15	1.1	0.9	0.8
S14 - Timber & furniture	23	8	8	26	35	1.6	1.3	-6.9
S15 - Paper & printing	25	10	8	17	41	2.2	1.9	-5.1
S16 - Fuel industry	12	5	7	0	76	2.1	2.1	-0.2
S17 - Chemical industry	36	12	11	0	40	2.5	2.3	-5.6
S18 - Plastic industry	18	13	10	29	31	0.9	0.9	-4.0
S19 - Other non-metallic min.	20	12	7	16	45	0.9	0.8	-0.9
S20 - Basic metal industry	40	13	10	5	31	1.8	2.0	-4.0
S21 - Other machinery	30	16	14	19	22	0.8	0.6	-17.8
S22 - Electronics & optics	31	10	7	21	30	0.2	0.2	13.2
S23 - Transport equipment	14	6	4	52	24	0.4	0.3	-5.2
S24 - Other manufacturing	17	13	7	46	18	0.1	0.1	-3.2
S25 - Electricity, gas, water	17	5	4	4	70	3.0	3.5	-0.3
S26 - Construction	22	8	7	49	14	7.9	7.5	0.1
S27 - Trade	26	14	11	42	8	11.4	11.6	-0.2
S28 - Hotel & catering	10	5	4	71	10	1.5	1.6	0.1
S29 - Logistics	23	12	7	38	20	9.7	9.0	-0.3
S30 - Communications	13	5	4	35	43	4.7	5.3	0.0
S31 - Financial activities	34	17	9	17	23	3.1	3.9	0.1
S32 - Real estate	2	1	0	0	97	2.9	3.2	0.4
S33 - Leasing	37	13	9	0	41	7.7	8.5	0.1
S34 - Public administration	20	10	6	47	17	3.9	4.4	-0.9
S35 - Education	26	12	8	37	16	3.8	3.9	-0.5
S36 - Health & social	18	7	6	48	21	3.1	3.2	-0.5
S37 - Other services	32	12	9	44	3	2.4	2.3	-0.1

Source: Authors' simulations based on the CGE model described above.

Note: Output changes are measured in volume.

TABLE 6: MACROECONOMIC IMPACTS (CHANGES IN %)

	Assessed impact (%)						
	EU-Chile Trade Agreement				Alternative scenarios		
	Elasticities of substitution			Short run closure	Back to MFN	EU-Chile DFQF	Full implem-entation
	Base	Lower	Homo geneo us				
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Exports, total	1.7	1.5	1.9	2.0	-0.5	-0.4	-0.4
Good exports	2.3	2.0	2.4	2.6	-1.0	0.1	0.1
Service exports	-0.6	-0.1	0.2	-0.1	1.4	-2.2	-2.2
Exports to the EU	21.4	17.2	17.0	22.0	-13.1	20.6	20.5
Exports to Latin America	-2.6	-1.9	-1.8	-2.3	2.7	-2.3	-2.3
Exports to the US	-1.1	-0.7	0.1	-0.7	1.4	-2.5	-2.5
Exports to the rest of the world	-1.0	-0.5	0.1	-0.6	1.5	-2.3	-2.3
Imports, total	1.0	0.9	1.2	0.9	-0.3	-0.5	-0.5
Goods Imports	1.1	0.9	1.3	0.9	-0.4	-0.4	-0.4
Services Imports	-0.6	0.0	0.4	0.0	1.4	-2.3	-2.2
Imports from the EU	64.7	53.3	67.5	64.1	-44.5	6.2	6.0
Imports from Latin America	-6.4	-5.3	-7.2	-6.4	4.9	-1.5	-1.5
Imports from the US	-15.6	-13.5	-14.6	-15.7	10.2	-1.6	-1.6
Imp. from the rest of the world	-8.3	-6.9	-8.7	-8.3	6.8	-1.6	-1.6
Price of capital	0.02	0.13	0.08	0.16	0.32	-0.59	-0.59
High-skilled wage	-0.30	-0.20	-0.25	-0.28	0.19	-0.06	-0.06
Low-skilled wage	0.33	0.30	0.35	0.36	-0.52	0.42	0.41
Med-skilled wage	-0.36	-0.27	-0.32	-0.32	0.30	-0.26	-0.26
Non-salaried workers income	0.14	0.10	0.13	0.11	0.12	-0.18	-0.18
Real effective exchange rate	0.06	0.00	-0.05	0.00	-0.16	0.29	0.29
Trade balance	0.00	0.00	0.00	-11.50	0.00	0.00	0.00
GDP	0.05	0.08	0.07	0.10	0.05	-0.16	-0.16
Welfare	0.23	0.27	0.28	0.29	-0.07	-0.01	-0.01

Source: Authors' simulations based on the CGE model described above. Notes: column (a) corresponds to the impact evaluation of the EU-Chile Agreement with the elasticities of substitution estimated in Chapter 2; column (b) presents the same scenario as (a) but all elasticities of substitution at the HS level are lower by 2 points; column (c) presents the same scenario as (a) but assumes homogeneous elasticities of substitution across sectors; column (d) presents results from the same scenario in (a) but assumes a short-run closure. Alternative scenarios in columns (e), (f), (g) are simulated assuming base elasticities of substitution and the long-run closure as in the base case (a).

5 Sensitivity analysis

To complement the base case simulations presented above, a series of other simulations have been conducted. A first series is designed to check the robustness of the results, with respect to the macroeconomic closure and to the values of elasticities. Alternative scenarios are then assessed to become richer our final remarks.

Trade elasticities are key variables in robustness checks, because the trade-offs across providers and products are the most direct mechanisms through which a trade policy shock is transmitted to the economy. To investigate this sensitivity in the present case, two simulations are considered. The first one reduces the elasticities by two percentage points. Since the elasticities have been estimated at an even more detailed level than the one used to model trade flows in the model (8-digit tariff line, instead of 6-digit products in the model), it cannot be excluded that they overestimate somewhat the price sensitivity of trade flows in the model, hence this downward shifting analysis of elasticities.

Under this assumption of lower elasticities, bilateral trade flows with the EU would increase by smaller amounts than in the base case: Chile's exports to the EU would increase by 17% instead of 21%, imports by 53% instead of 65% (Table 6, column b). This remains a small difference. The aggregate impacts are very general, however with a slightly higher impact on welfare (+0.27% instead of +0.23%). At the sector level, this alternative assumption is logically reflected i n differentiated impacts across sectors (Table 7 and Table 8, columns b and i).

The second sensitivity analysis ("Homogenous elasticities") assumes away the cross-sector variance in substitution elasticities across providers obtained econometric estimates. Instead, the elasticity of substitution is assumed for all products to be equal to the average of sector-specific estimates: 14 for imports and 7.5 for exports. This is done to assess how sensitive the simulation results are to estimation errors.

Even though aggregate impacts are only marginally affected by this alternative assumption, it is noteworthy that while exports to the EU increase less than in the base case (+17% instead of +21%), imports rise slightly more (+68%, compared to +65%) (Table 6, column c). However, diversion effects on exports are also far smaller in this case. The impact on the real exchange rate, still insignificant, is reversed here, with an appreciation of the Chilean peso by 0.05%. At the sector level, the assessed impact on export is found to be significantly lower than in the base case for wine (+56%, instead of +129%), while it is on the contrary larger for fruits and vegetables, either transformed or not (Table 7, columns c and j). Although some differences are also noted in terms of impacts on imports, they remain of limited significance (Table 8, columns c and j).

In the short-run, it is highly uncertain that the real exchange rate would adjust. It is thus worthwhile to carry out a shorter-term assessment based on the assumption that the real exchange rate is exogenous, while the current account balance adjusts to the shock. However, given the very small size of the Agreement's impact on Chile's real exchange rate (a depreciation by 0.06%) this alternative closure does not substantially alter the estimated impact. This is confirmed, especially in terms of welfare (+0.29%), and the production factors' relative rewards (Table 6, column d). In this case, the trade balance deteriorates by approximately 230 M USD (11.5% of its initial value). Even the impacts on foreign trade are

hardly changed (Table 7 and Table 8, columns d and k).

On the whole, the simulation results are fairly robust to these sensitivity analyses. Larger deviations from the base case could of course be tested, but these checks already suggest that the general pattern of results is rather robust.

As a complement to assessing of the impact the Agreement enforcement, three additional scenarios have been simulated, based on the 2008 equilibrium of the economy. In the first scenario, "Back to MFN", both the EU and Chile are assumed to apply to each other the MFN duty rates. This could be thought of as a dismantling of the tariff clauses of the Agreement, given that Chile has now opted out of the EU's GSP.

Logically, the assessed impact of such a shock is close to being the opposite of the Agreement's implementation, even though a significant difference is that the initial equilibrium is now year 2008 (Table 6, column e). Chilean exports to the EU would be substantially reduced in this case (-13%), but the negative impact would be far stronger on EU exports to Chile (-45%), with the EU losing market share at the benefit of other exporters. For example, Chilean imports from the US would increase by more than 10%. The distributive effects would be more or less the opposite of those of the Agreement enforcement, with, in particular, a fall in unskilled real wages of 0.5%. This shock would originate a slight real appreciation of the Chilean peso (by 0.16%), and it would cost the Chilean economy an income decline of 0.07%, in equivalent variation. Not surprisingly, the most significant sectoral impacts are found where the Agreement was assessed to matter most, with an output decrease of 19% in winemaking, 17% in seafood processing, 16% in fruit growing, and an output increase of 13% in machinery (Table 9, column e).

Finally, since the Agreement is still in its phase-in period, the consequences of further liberalization was simulated through two additional scenarios: one assumes quota-free, duty-free trade between Chile and the EU (EU-Chile DFQF), the other one simply assumes that the Agreement is fully enforced, as will be the case at the end of the implementation period. An open question in the latter case is how products covered by a TRQ should be considered. Since most quotas were not filled in 2008 (Chilean exports of meat to the EU being the most notable exception), and since annual increases of their size are planned in most cases, quotas are assumed to not be binding in this scenario, meaning that the IQTR is applied.

In practice, the impacts of both scenarios are almost identical, not only at the aggregate level, but even at the sectoral level (Chilean exports of other agricultural products, P01, being the only exception). The bulk of the trade impact of such further liberalization scenarios is actually concentrated in the meat sectors, as the Chilean exports to the EU would increase sevenfold (Table 7, columns f and g). As this sector accounted for 2.2% of Chilean goods exports to the EU in 2008, this effect is far from trivial. As a matter of fact, while significant effects are also registered in Chilean exports of fruits and fish to the EU (+17%), the impact on the meat sector is the main reason why Chilean goods exports to the EU increase by 21% (Table 6, columns f and g). In parallel, Chilean imports from the EU grow significantly in several industrial sectors, in particular chemicals (+13%) and textiles and clothing (+10%). However, such further liberalization will not generate additional welfare gains.

TABLE 7: ASSESSED IMPACT ON CHILEAN EXPORTS IN VARIOUS SCENARIOS

	Chile Exports to the EU - Change (%)							Chile Exports to the ROW - Change (%)						
	EU-Chile Trade Agreement				Alternative Scenarios			EU-Chile Trade Agreement				Alternative Scenarios		
	Elasticities of Substitution			Short Run closure	Back to MFN	EU-Chile DFQF	Full Impl'n	Elasticities of Substitution			Short Run closure	Back to MFN	EU-Chile DFQF	Full Impl'n
	Base	Lower	Hom.					Base	Lower	Hom.				
Products	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
P01 - Other ag. products	7.3	3.4	15.7	7.4	-7.3	9.7	5.3	0.2	0.5	-0.7	0.2	-0.2	3.0	3.3
P02 - Fruits	59.0	40.2	68.7	59.9	-32.8	17.4	17.3	10.0	8.5	10.9	10.6	-5.7	-1.7	-1.7
P03 - Livestock	1.5	0.9	3.0	1.6	-1.0	23.2	23.2	0.3	0.4	0.5	0.5	-0.2	23.0	23.0
P04 - Forestry products	-4.8	-3.4	-4.2	-4.3	6.8	-4.8	-4.8	-4.8	-3.4	-4.2	-4.3	6.8	-4.8	-4.8
P05 - Fish and crustaceans	69.3	52.9	52.9	70.2	-38.0	17.2	17.3	6.2	5.4	7.8	6.8	-6.9	-2.7	-2.7
P06 - Minerals	-0.3	0.0	0.9	-0.3	1.0	-1.7	-1.7	-0.4	0.0	0.9	-0.3	1.0	-1.7	-1.7
P07 - Meat	0.9	0.6	2.4	1.0	-0.3	583.0	582.9	0.2	0.3	0.7	0.4	0.0	-12.8	-12.8
P08 - Processed seafood	82.2	62.1	64.7	83.4	-46.1	-1.5	-1.4	-0.9	-0.3	4.4	-0.2	-0.3	-1.5	-1.4
P09 - Canned fruits & veg.	41.3	15.6	114.4	41.7	-28.8	5.7	5.2	-0.4	0.1	-0.8	-0.1	0.9	-0.7	-0.7
P10 - Liquors and spirits	-4.0	-2.2	-9.3	-3.5	4.1	-2.0	-2.6	-5.0	-3.1	-9.8	-4.5	4.4	-2.7	-2.6
P11 - Wines	128.5	105.3	56.4	130.9	-52.2	-3.7	-3.7	-8.3	-6.7	0.8	-7.4	6.3	-3.8	-3.8
P12 - Other foods and beverages	6.5	3.2	14.3	6.7	-5.3	2.5	1.9	0.8	0.9	0.8	1.0	-0.6	1.4	1.5
P13 - Textiles & leather	37.2	30.1	26.5	37.5	-41.5	-1.1	-1.1	-2.2	-1.5	-1.6	-2.0	1.0	-1.1	-1.1
P14 - Wood & its products	6.6	6.6	-1.2	6.9	-9.7	-4.3	-4.3	-7.7	-6.1	-7.5	-7.5	9.4	-4.3	-4.3
P15 - Pulp, paper, printing	-4.8	-3.6	-4.8	-4.2	5.7	-2.9	-2.9	-5.3	-4.1	-5.0	-4.8	6.0	-2.9	-2.9
P16 - Refined petroleum & coke	-0.5	0.1	-0.2	0.1	0.9	-2.1	-2.1	-0.5	0.1	-0.2	0.1	0.9	-2.1	-2.1
P17 - Chemicals and products	2.4	1.7	0.6	2.6	3.5	-1.9	-1.9	-6.2	-5.2	-5.4	-6.0	3.9	-2.0	-2.0
P18 - Rubber and plastic	-3.2	-2.6	-2.9	-3.0	1.3	-1.3	-1.3	-4.4	-3.6	-3.8	-4.2	2.9	-1.3	-1.3
P19 - Other non-metallic min.	2.3	2.2	0.9	2.0	-1.9	-1.8	-1.8	-1.3	-0.7	-1.6	-1.6	1.6	-1.8	-1.8
P20 - Metal products	-4.1	-2.9	-6.6	-4.3	3.4	-2.1	-2.1	-4.1	-2.9	-6.6	-4.4	3.4	-2.1	-2.1
P21 - other equipment	-15.3	-13.6	-12.7	-16.3	10.9	-2.0	-2.0	-15.5	-13.8	-12.8	-16.5	11.2	-2.0	-2.0
P22 - Electronic & optical eqt	-2.0	-1.4	-3.4	-2.3	1.9	-2.4	-2.4	-4.3	-3.3	-5.1	-4.6	4.8	-2.4	-2.4
P23 - Transport equipment	0.9	0.6	0.1	0.7	0.5	-2.4	-2.4	-5.3	-4.3	-4.2	-5.5	3.3	-2.4	-2.4
P24 - Other manufactured	-4.3	-3.4	-4.0	-4.1	4.1	-1.7	-1.7	-4.3	-3.4	-4.0	-4.1	4.1	-1.7	-1.7

Source: Authors' simulations based on the CGE model described above.

TABLE 8: ASSESSED IMPACT ON CHILEAN IMPORTS IN VARIOUS SCENARIOS

	Chile imports from the EU - Change (%)							Chile imports from the ROW - Change (%)						
	EU-Chile Trade Agreement				Alternative Scenarios			EU-Chile Trade Agreement				Alternative Scenarios		
	Elasticities of Substitution			Short Run Closure	Back to MFN	EU-Chile DFQF	Full Impl'n	Elasticities of Substitution			Short Run Closure	Back to MFN	EU-Chile DFQF	Full Impl'n
	Base	Lower	Hom.					Base	Lower	Hom.				
Products	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
P01 - Other ag. products	42.9	29.8	108.8	43.1	-30.2	6.6	6.7	-1.0	-0.4	-2.9	-0.8	0.5	3.0	3.1
P02 - Fruits	60.9	42.6	135.7	61.6	-69.3	-1.3	-1.3	8.2	7.0	3.4	8.7	-5.1	-1.6	-1.6
P03 - Livestock	45.9	31.7	120.7	46.4	-30.3	23.0	23.0	-3.6	-2.4	-6.9	-3.3	5.4	22.4	22.4
P04 - Forestry products	17.6	12.1	43.8	18.2	-27.8	-3.0	-3.0	-3.7	-3.0	-5.4	-3.2	7.8	-3.0	-3.0
P05 - Fish and crustaceans	57.0	39.7	134.6	57.5	-36.8	0.0	0.0	4.7	4.2	1.0	5.0	-6.0	-1.7	-1.7
P06 - Minerals	51.6	36.5	123.7	51.7	-34.6	-0.3	-0.3	-0.9	-0.5	-1.2	-0.8	1.0	-1.1	-1.1
P07 - Meat	51.4	35.4	138.7	51.8	-33.7	-15.2	-15.2	-0.4	-0.1	-0.4	-0.2	0.7	-15.3	-15.3
P08 - Processed seafood	37.8	26.8	88.0	38.1	-28.6	8.8	0.3	-1.6	-0.6	-6.8	-1.4	-0.1	0.2	0.3
P09 - Canned fruits & veg.	41.8	29.1	104.7	42.0	-29.3	2.8	2.8	-3.8	-2.5	-8.8	-3.7	4.2	-0.4	-0.4
P10 - Liquors and spirits	31.8	22.6	76.3	32.0	-27.4	-0.5	-0.5	-10.5	-7.3	-21.6	-10.4	7.8	-0.8	-0.8
P11 - Wines	35.7	26.4	74.3	36.2	-28.4	2.1	2.1	-7.1	-3.9	-19.8	-6.7	4.4	-1.7	-1.7
P12 - Other foods and beverages	36.7	25.8	89.9	36.9	-27.2	9.8	2.7	-1.0	-0.3	-2.7	-0.7	0.8	0.6	0.9
P13 - Textiles & leather	105.1	86.7	108.7	105.4	-51.0	9.7	9.7	-6.6	-5.3	-6.4	-6.4	3.5	-1.4	-1.4
P14 - Wood & its products	76.8	64.4	78.8	76.4	-45.9	0.1	0.1	-19.3	-16.6	-19.7	-19.5	18.0	-2.1	-2.1
P15 - Pulp, paper, printing	81.2	67.8	83.9	81.5	-49.8	-0.2	-0.2	-14.7	-12.4	-14.7	-14.5	13.7	-1.3	-1.3
P16 - Refined petroleum & coke	49.3	34.9	114.7	49.5	-33.7	3.5	3.4	-1.0	-0.6	-2.6	-0.9	0.3	-0.5	-0.5
P17 - Chemicals and products	86.4	73.5	78.2	86.6	-49.7	12.5	12.5	-15.6	-13.4	-14.1	-15.6	10.2	-2.7	-2.7
P18 - Rubber and plastic	102.8	87.0	93.4	102.8	-53.3	6.2	6.2	-14.4	-12.2	-12.6	-14.4	10.5	-1.9	-1.9
P19 - Other non-metallic min.	46.0	32.9	107.3	45.4	-32.3	1.4	1.4	-4.8	-3.3	-8.9	-5.2	3.7	-1.3	-1.3
P20 - Metal products	39.8	28.5	90.0	39.2	-30.3	1.5	1.5	-8.4	-6.1	-15.6	-8.7	6.0	-1.2	-1.2
P21 - other equipment	75.4	65.4	60.1	73.8	-52.7	6.5	6.5	-26.3	-23.5	-21.9	-26.9	22.3	-3.5	-3.5
P22 - Electronic & optical eqt	55.9	45.4	71.5	55.1	-40.0	6.3	6.3	-12.5	-10.3	-15.2	-13.0	10.2	-2.0	-2.0
P23 - Transport equipment	90.7	77.5	78.5	89.5	-55.4	5.7	5.7	-16.9	-14.6	-15.0	-17.4	9.3	-1.6	-1.6
P24 - Other manufactured	88.8	73.6	91.4	88.5	-49.3	8.7	8.7	-9.1	-7.7	-9.2	-9.2	7.5	-1.7	-1.7

Source: Authors' simulations based on the CGE model described above.

TABLE 9: ASSESSED IMPACT ON OUTPUT PER SECTOR IN CHILE IN VARIOUS SCENARIOS (CHANGES IN %)

Sectors	EU-Chile Trade Agreement				Alternative Scenarios		
	Elasticities of Substitution			Short Run Closure	Back to MFN	EU-Chile DFQF	Full Impl'n
	Base	Lower	Hom.				
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
S01 - Other agriculture	0.9	0.7	0.8	0.9	-1.2	4.3	4.0
S02 - Fruit growing	21.7	16.2	24.8	22.5	-15.8	3.7	3.7
S03 - Animal husbandry	0.5	0.5	0.5	0.6	-0.5	23.7	23.7
S04 - Forestry	-4.2	-3.3	-4.4	-4.3	5.2	-2.1	-2.1
S05 - Extractive fishing	11.9	9.6	11.7	12.5	-10.7	-0.1	-0.1
S06 - Mining	-0.3	0.0	0.9	-0.3	0.8	-1.4	-1.4
S07 - Meat production	0.4	0.3	0.5	0.4	-0.5	33.0	33.0
S08 - Seafood processing	16.9	13.3	17.8	17.7	-16.6	-1.4	-1.4
S09 - Canning	0.8	0.4	2.2	1.1	-0.2	-0.6	-0.6
S10 - Liquors & spirits	-4.6	-3.1	-10.4	-4.5	3.3	-0.3	-0.4
S11 - Winemaking	34.0	28.5	19.1	35.6	-18.5	-3.4	-3.5
S12 - Other agro-industrial	1.3	1.1	1.2	1.4	-1.2	2.4	2.4
S13 - Textiles & leather	0.8	0.8	0.3	0.8	-4.4	0.1	0.1
S14 - Timber & furniture	-6.9	-5.5	-7.4	-6.7	7.6	-3.7	-3.7
S15 - Paper & printing	-5.1	-4.2	-5.4	-4.9	5.3	-1.5	-1.5
S16 - Fuel industry	-0.2	0.1	-0.5	0.1	0.2	-0.8	-0.8
S17 - Chemical industry	-5.6	-4.9	-5.6	-5.6	3.5	-0.8	-0.8
S18 - Plastic industry	-4.0	-3.5	-3.8	-4.1	2.1	0.0	0.0
S19 - Other non-metallic min.	-0.9	-0.6	-1.8	-1.5	0.6	-0.1	-0.1
S20 - Basic metal industry	-4.0	-3.0	-7.4	-4.5	2.8	-0.8	-0.8
S21 - Other machinery	-17.8	-16.1	-14.6	-19.2	12.6	-1.0	-1.0
S22 - Electronics & optics	13.2	13.6	7.1	14.2	-9.0	-2.9	-2.9
S23 - Transport equipment	-5.2	-4.3	-4.4	-5.4	2.8	-1.9	-1.9
S24 - Other manufacturing	-3.2	-2.5	-2.5	-2.7	3.3	-1.3	-1.3
S25 - Electricity, gas, water	-0.3	-0.2	0.0	-0.3	0.4	-0.1	-0.1
S26 - Construction	0.1	0.2	0.1	-0.5	-0.1	-0.2	-0.2
S27 - Trade	-0.2	-0.1	-0.1	-0.1	0.3	-0.3	-0.3
S28 - Hotel & catering	0.1	0.1	0.1	0.2	0.0	0.1	0.1
S29 - Logistics	-0.3	-0.1	-0.1	-0.1	0.7	-0.9	-0.9
S30 - Communications	0.0	0.0	0.0	0.0	0.1	-0.1	-0.1
S31 - Financial activities	0.1	0.1	0.1	0.0	-0.1	0.0	0.0
S32 - Real estate	0.4	0.3	0.4	0.3	-0.3	0.3	0.3
S33 - Leasing	0.1	0.1	0.1	0.1	0.1	-0.1	-0.1
S34 - Public administration	-0.9	-0.9	-1.0	-0.8	0.4	-0.2	-0.2
S35 - Education	-0.5	-0.5	-0.6	-0.5	0.2	-0.1	-0.1
S36 - Health & social	-0.5	-0.4	-0.5	-0.4	0.1	0.0	0.0
S37 - Other services	-0.1	0.0	0.0	0.0	0.1	-0.1	-0.1

Source: Authors' simulations based on the CGE model described above.

6 Conclusion

This paper uses a CGE model to evaluate ex-post the economic impact in Chile of the tariff clauses of its FTA with the EU. The impacts of the Agreement on factor prices, incomes, trade with third countries and aggregate variables, *inter alia*, are consistently take into account in this evaluation. The decomposition method, based on a double calibration of the model for 2002 and 2008, allow the interaction with the economy's structural change during this period to be accounted for. The trade impact of the agreement is studied accurately thanks to the modelling trade flows at a highly disaggregated product level, and to the use of trade elasticities estimated in consistent way, specifically for trade between the EU and Chile.

These simulations can identify the most heavily impacted sectors. It is no surprise to find among the main winners fruit growing, wine making, fisheries and fish processing on the Chilean side, and machinery, transport equipment and the chemical industries in the EU. These impacts must not only be compared to observed trends since the Agreement enforcement; they also assess, implicitly, how trade flows between the EU and Chile might have evolved without an agreement. In this case, it is likely that the enforcement of several FTAs signed by Chile, with the US among others, might have significantly influenced bilateral trade relations.

The Agreement is found to trigger a small aggregate economic gain for the Chilean economy. The assessed real income gain (+0.23% in equivalent variation of income in the base case) is small, but it should be kept in mind that the impact measured here is limited to the direct, so-to-say "mechanical" consequences of tariff cuts in the Agreement. Such a shock may also initiate a virtuous circle by allowing export sectors to gain renewed dynamism, with possible indirect effects *inter alia* on technology, competitive structure, demography of firms, information or access to markets. The so-called new and "new new" theories of trade have identified a wealth of such possible effects. And in any case, trade policy is only one element of a country's policy mix, the benefits of which are only fully felt to the extent that it is combined suitably with other policies, allowing such virtuous circles to get under way, and preventing possible undesired effects to materialize.

In this context, the direction of changes and the comparisons across industries and across shocks are the most meaningful results. In addition, non-tariff aspects of the Agreement are not taken into account in these simulations, by lack of tangible basis to quantify them, thus limiting the scope of this quantitative assessment. The general, qualitative assessment should nevertheless take them into account.

References

Abrego L. and Whalley J. (2003), 'Goods Market Responses to Trade Shocks and Trade and Wages Decompositions', The Canadian Journal of Economics / Revue canadienne d'économie 36(3), 747-757.

Bureau J.-C. and Jean S. (2012), "Assessing the impact of the EU-Chile FTA on international trade", mimeo.

Cardamone, P. (2007), 'A Survey of the Assessments of the Effectiveness of Preferential Trade Agreements using Gravity Models', *Economia Internazionale / International Economics* **60**(4), 421-473.

Chamucero R.A., R. Fuentes and K. Schmidt-Hebbel, (2004), 'Chile's Free Trade Agreements: How Big is the Deal?', Banco Central de Chile, Working Paper N° 264.

Cipollina, M. & Salvatici, L. (2010), 'Reciprocal Trade Agreements in Gravity Models: A Meta-Analysis', *Review of International Economics* **18**(1), 63-80.

Clausing, K. A. (2001), 'Trade Creation and Trade Diversion in the Canada - United States Free Trade Agreement', *The Canadian Journal of Economics / Revue canadienne d'Economique* **34**(3), 677--696.

Dixon P. B. and Rimmer M. T. (2004), 'The US Economy from 1992 to 1998: Results from a Detailed CGE Model', The Economic Record 80(s1), S13-S23.

Dixon P. B. and Rimmer M. T. (2008), 'Validating a detailed, dynamic CGE model of the U.S.: progress report'. Paper presented at the 11th Annual Conference on Global Economic Analysis, Helsinki, Finland.

Gouel, C.; Mitaritonna, C. and Ramos, M. P. (2011), 'Sensitive products in the Doha negotiations: The case of European and Japanese market access', *Economic Modelling* **28**(6), 2395-2403.

Harrison, G. W., T. F. Hertel, D. G. Tarr (2001), 'Chile's Regional Arragement and Free Trade Agreement of the Americas: The importance of Market Access', Policy Research Working Paper N° 2634, The World Bank, Development Research Group, Trade.

Head, K. & Ries, J. (1999), 'Rationalization effects of tariff reductions', *Journal of International Economics* **47**(2), 295-320.

Jean S. and Bontout O. (2002), What Drove Relative Wages in France? Structural Decomposition Analysis in a General Equilibrium Framework, 1970-1992, in Richard Upward David Greenaway and Katharine Wakelin, ed.,'Trade, Investment, Migration and Labour Market Adjustment', Palgrave Macmillan, London, pp. 115-136.

Nowak-Lehmann F., D. Herzer and S. Vollmer, (2005) 'The Free Trade Agreement between Chile and the EU: Its Potential Impact on Chile's Export Industry', Ibero-America Institute for Economic Research (IAI), Discussion Paper N° 125, November.

O'Ryan R., C.J. De Miguel, S. Miller and M.Pereira (2010), 'The Socieconomic and environmental effects of free trade agreements: a dynamic CGE analysis for Chile', Environment and Development Economics, pp 1-23.

Romalis, J. (2007), 'NAFTA's and CUSFTA's Impact on International Trade', *Review of Economics and Statistics* **89**(3), 416-435.

Trefler, D. (2004), 'The Long and Short of the Canada-U.S. Free Trade Agreement', *The American Economic Review* **94**(4), 870--895.

Appendix: Technical description of the model

A. Indexes

Index	Meaning	Values taken by the index
i (or i1)	Goods	C1*C28
His	Detailed product (HS6 level)	See below
j	Activities	A1*A28
f	Factors	K,Lhigh, Lmed, Llow,Lindep
partner (or reg or reg1)	Partner	LatAm, EU-27, US, RoW

Values taken by the index ihs of disaggregated products (numbers refer to 6-digit HS codes, "irXX" refers to the rest of sector "XX"):

20329, 20442, 20714, 21099, 30269, 30322, 30378, 30379, 30410, 30420, 30490, 30729, 30759, 40900, 60110, 70310, 71080, 80212, 80231, 80232, 80440, 80510, 80610, 80620, 80810, 80820, 80920, 80930, 80940, 81040, 81050, 81120, 81190, 81320, 81330, 100510, 120930, 120991, 121190, 121220, 130239, 150420, 160231, 160411, 160510, 160590, 200980, 210120, 210690, 220421, 220429, 220830, 230120, 230990, 260300, 261310, 261390, 262099, 271019, 271112, 280120, 280700, 281000, 282520, 282570, 283421, 283691, 284170, 285200, 290511, 300220, 300439, 300490, 300610, 310210, 310250, 310420, 310430, 320419, 330300, 330499, 380850, 382490, 390690, 401011, 401169, 440122, 440710, 441112, 441210, 441600, 450310, 470311, 470321, 470329, 481013, 481019, 481022, 481092, 481500, 490199, 510529, 620342, 620462, 710691, 710812, 720270, 720421, 722520, 730610, 730840, 730890, 740200, 740311, 740319, 740400, 740911, 840211, 840220, 840999, 841199, 841370, 841391, 841480, 841950, 842121, 842199, 842230, 842240, 842290, 842641, 842691, 842720, 842951, 842952, 842959, 843041, 843149, 843850, 844319, 844339, 844399, 847490, 848180, 848340, 848620, 850153, 850164, 850212, 850213, 850239, 850300, 850440, 852329, 853530, 853650, 853670, 853690, 853710, 853720, 853890, 854449, 870120, 870190, 870322, 870323, 870324, 870332, 870333, 870421, 870423, 870899, 890190, 901890, 950430, irC1, irC2, irC3, irC4, irC5, irC6, irC7, irC8, irC9, irC10, irC11, irC12, irC13, irC14, irC15, irC16, irC17, irC18, irC19, irC20, irC21, irC22, irC23, irC24, irC25, irC26, irC27, irC28

B. Exogenous variables and behavioural parameters

(Greek letters are written explicitly, indexes feature in parentheses)

ac(i)	Armington CES constant parameter
delta(i)	Armington CES share parameter
rhoc(i)	Armington CES substitution parameter
dences(i)	Armington CES temporary parameter
numces(i)	Armington CES temporary parameter
acex(i)	Armington CET constant parameter
deltaex(i)	Armington CET share parameter
rhocex(i)	Armington CET substitution parameter
dencesex(i)	Armington CET temporary parameter

numcesex(i)	Armington CET temporary parameter
io(i,J)	input output coefficient
gamma(i,j)	multi product parameter
a(j)	value added CES constant parameter
alpha(f,j)	value added CES share parameter
rhova(j)	value added CES substitution parameter
denva(j)	value added CES temporary parameter
betahh(i)	final consumption parameter (value share of sector i)
betagov(i)	gov final consumption parameter
betainv(i)	investment parameter, share of sector i in total investment
acd(i)	scaling parameter of the corresponding CES function
deltad(i,ihs)	distribution parameter of the corresponding CES function
rhocd(i)	substitution parameter of the corresponding CES function (defined as rho = -1+1/elasticity)
acexd(i)	scaling parameter of the corresponding CET function
deltaexd(i,ihs)	distribution parameter of the corresponding CET function
rhocexd(i)	substitution parameter of the corresponding CET function (defined as rho = 1+1/elasticity)
acdreg(ihs)	scaling parameter of the corresponding CES function
deltadreg(ihs,reg)	distribution parameter of the corresponding CES function
rhocdreg(ihs)	substitution parameter of the corresponding CES function (defined as rho = -1+1/elasticity)
acexdreg(ihs)	scaling parameter of the corresponding CET function
deltaexdreg(ihs,reg)	distribution parameter of the corresponding CET function
rhocexdreg(ihs)	substitution parameter of the corresponding CET function (defined as rho = 1+1/elasticity)
TIMPEXO(j)	production taxes (the “EXO” suffix signals that the variable is exogenous)
TTARDregEXO(ihs,reg)	tariff rate over imports from reg
TTARDCHLEXO(ihs,reg)	tariff rate by reg over imports from CHL
TTVAEXO(i)	consumption tax
TTVIEXO(i)	investment tax
XTHHEXO(F)	household factor endowments
XTGOVEXO(F)	government factor endowments
TRHHGOVEXO	transfers from household to governments
TRHHRMEXO	transfers from household to rest of the world
TRGOVRMEXO	transfers from government to rest of the world
SAVGOVEXO	government saving rate
SAVHHEXO	household saving rate
PWMDregEXO(ihs,reg)	foreign import price (exogenously fixed, since importers’ behavior not represented)
COMPWEDregEXO(ihs,reg)	(exogenous) ratio export price / domestic price (underlying assumption: mill pricing product-by-product, but the export

backet is different from the domestic use basket, hence the difference in prices, expressed here as a constant ratio)

numer numeraire

TRADEBAL_ini to define as the initial value of the trade balance

ARGMINIMPDreg(ihs) = values as estimated in Bureau and Jean (2012) for Chilean imports from the EU

ARGMINEXPDreg(ihs) = values as estimated in Bureau and Jean (2012) for EU imports from Chile

ARGMINIMPD(i) = 4/5 * ARGMINIMPDreg(ihs)

ARGMINEXPD(i) = 4/5 * ARGMINEXPDreg(ihs)

ARGMINIMP(i) = 4/5 * ARGMINIMPD(ihs)

ARGMINEXP(i) = 4/5 * ARGMINEXPD(ihs)

ELASKL(j) = 0.5 ;

C. Endogenous variables

Y(j) output index for sector j

YS(i,J) output of sector j in product i

X(j,F) factor use

IC(i,j) intermediate consumption

TIC(i) total demand for intermediate consumptions of product i

VAFC(j) volume of value added

PJ(j) output deflator for sector j

PVA(j) value added price for sector j

YD(i) demand of product i

YDD(i) Domestic demand of product i

P(i) price index

PE(i) export price

PD(i) domestic price

XC(i) total domestic consumption of product i

M(i) imports of good i

PC(i) price index of total consumption (domestic and imported) on the domestic market, net of taxes

PM(i) domestic import price

IMP(j) Production taxes receipts

RDHH Households' available income

RDGOV Government's available income

QDHH(i) household final consumption

QDGOV(i) Government final consumption

W(F) Price of factor f

HHSAVINGS Household savings

GOVSAVINGS Government savings

INV(i) Investment in sector i

TRADEBAL Trade balance

IT Total investment

TVA(i) Tax on value added

TVI(i) Taxes on investment collected over sector i
E(i) Exports of product i

TARDreg (ihs,reg) Tariff receipts
PMD(ihs) Import price
PED(ihs) Export price
MD(ihs) World imports
ED(ihs) World exports
MDreg (ihs,reg) Regional imports
EDreg (ihs,reg) Regional exports
PMDreg(ihs,reg) Regional, tax inclusive import price
EXCHG Exchange rate : p = EXCHG x p*

D. Model's equations

(8) $TIC_i = \sum_j IC_{i,j}$

(9) $IC_{i,j} = io_{i,j} * Y_j$

(10) $PVA_j * a_j = \left(\sum_f \alpha_{f,j}^{\frac{1}{1+\rho va_j}} * (W_f)^{\frac{\rho va_j}{1+\rho va_j}} \right)^{1+\frac{1}{\rho va_j}}$

(11) $X_{j,f} = VAfC_j * a_j^{-\frac{\rho va_j}{\rho va_j+1}} * \left(\alpha_{f,j} * \frac{PVA_j}{W_f} \right)^{\frac{1}{1+\rho va_j}}$

(12) $VAfC_j = Y_j$

(13) $YD_i = \sum_j (YS_{i,j})$

(14) $YS_{i,j} - \gamma_{i,j} * Y_j = 0$

(15) $Pj_j * Y_j = \sum_i p_i * YS_{i,j}$

(16) $PVA_j = Pj_j * (1 - TIMPEXO_j) - \sum_i io_{(i,j)} * PC_i$

(17) $P_i = \frac{1}{acex_i} * \left(deltaex_i^{\frac{1}{1-\rho cex_i}} * pd_i^{\frac{\rho cex_i}{\rho cex_i - 1}} + (1 - deltaex_i)^{\frac{1}{1-\rho cex_i}} * pe_i^{\frac{\rho cex_i}{\rho cex_i - 1}} \right)^{1-\frac{1}{\rho cex_i}}$

(18) $YDD_i = (YD_i * acex_i^{\frac{\rho cex_i}{1-\rho cex_i}} * \left(\frac{pd_i}{p_i * deltaex_i} \right)^{\frac{1}{\rho cex_i - 1}})$

(19) $E_i = (YD_i * acex_i^{\frac{\rho cex_i}{1-\rho cex_i}} * \left(\frac{pe_i}{p_i(1-deltaex_i)} \right)^{\frac{1}{\rho cex_i - 1}})$

(20) $M_i = \frac{XC_i}{ac_i} \left(ac_i PC_i \frac{1-\delta_i}{PM_i} \right)^{\frac{1}{1+\rho c_i}}$

(21) $PC_i = \frac{1}{ac_i} \left((1 - \delta_i)^{\frac{1}{\rho c_i + 1}} PM_i^{\frac{\rho c_i}{\rho c_i + 1}} + \delta_i^{\frac{1}{\rho c_i + 1}} PD_i^{\frac{\rho c_i}{\rho c_i + 1}} \right)^{1+\frac{1}{\rho c_i}}$

(22) $YDD_i = \frac{XC_i}{ac_i} * \left(ac_i * \delta_i * \frac{PC_i}{PD_i} \right)^{\frac{1}{\rho c_i + 1}}$

(23) $PMDreg_{ihs,reg} = EXCHG * PWMDregEXO_{ihs,reg} * numer * (1 + TTARDregEXO_{ihs,reg})$

(24) $TARDreg_{ihs,reg} = TTARDregEXO_{ihs,reg} * EXCHG * PWMDregEXO_{ihs,reg} * numer * MDreg_{ihs,reg}$

(25) $MD_{ihs} = \frac{M_i}{acd_i} * \left(acd_i * PM_i * \frac{deltad_{i,ihs}}{PMD_{ihs}} \right)^{\frac{1}{1+\rho cd_i}}, \forall ihs \in i$

(26) $PM_i M_i = \sum_{ihs \in i} PMD_{ihs} MD_{ihs}$

(27) $MDreg_{ihs,reg} = \frac{MD_{ihs}}{acdreg_{ihs}} * \left(acdreg_{ihs} * PMD_{ihs} * \frac{deltadreg_{ihs,reg}}{PMDreg_{ihs,reg}} \right)^{\frac{1}{1+\rho cdreg_{ihs}}}$

(28) $PMD_{ihs} * MD_{ihs} = \sum_{reg} PMDreg_{ihs,reg} * MDreg_{ihs,reg}$

(29) $$EDreg_{ihs,reg} = (ED_{ihs} * acexdreg_{ihs}^{\frac{\rho_{cexdreg_{ihs}}}{1-\rho_{cexdreg_{ihs}}}} * \left(\frac{COMPWEDregEXO_{ihs,reg}}{EXCHG} * \left(1 + TTARDCHLEXO_{ihs,reg}\right) * \frac{PD_i}{PED_{ihs} * deltaexdreg_{ihs,reg}}\right)^{\frac{1}{\rho_{cexdreg_{ihs}-1}}}, \forall ihs \in i$$

(30) $$PED_{ihs} * ED_{ihs} = \sum_{reg} \frac{COMPWEDregEXO_{ihs,reg}}{EXCHG} * PD_i * EDreg_{ihs,reg}, \forall ihs \in i$$

(31) $$ED_{ihs} = E_i * acexd_i^{\frac{\rho_{cexd_i}}{1-\rho_{cexd_i}}} * \left(\frac{PED_{ihs}}{PE_i * deltaexd_{(i,ihs)}}\right)^{\frac{1}{\rho_{cexd_i-1}}}, \forall ihs \in i$$

(32) $$PE_i E_i = \sum_{ihs \in i} PED_{ihs} ED_{ihs}$$

(33) $$IMP_j = PJ_j * TIMPEXO_j * Y_j$$

(34) $$TVA_i = TTVAEXO_i * PC_i * QDHH_i$$

(35) $$HHSAVINGS = SAVHHEXO * RDHH$$

(36) $$GOVSAVINGS = SAVGOVEXO * RDGOV$$

(37) $$INV_i = betainv_i * IT/[\sum_{i1} betainv_{i1} * PC_{i1} * (1 + TTVIEXO_{i1}))]$$

(38) $$TVI_i = TTVIEXO_i * PC_i * INV_i$$

(39) $$XC_i = TIC_i + QDHH_i + QDGOV_i + INV_i$$

(40) $$QDHH_i * PC_i * (1 + TTVAEXO_i) = betahh_i * (1 - SAVHHEXO) * RDHH$$

(41) $$QDGOV_i = betagov_i * (1 - SAVGOVEXO) * \frac{RDGOV}{\sum_{i1} betagov_{i1} * PC_{i1}}$$

(42) $$RDHH = \sum_f (W_f * XTHHEXO_f) - TRHHRMEXO * numer - TRHHGOVEXO * numer$$

(43) $$RDGOV = \sum_f (W_f * XTGOVEXO_f) + \sum_i (TVA_i + TVI_i) + \sum_{ihs,reg} (TARDreg_{ihs,reg}) + \sum_j (imp_j) - TRGOVRMEXO * numer + TRHHGOVEXO * numer$$

(44) $$\sum_{ihs,reg} (EXCHG * PWMDregEXO_{ihs,reg} * numer * MDreg_{ihs,reg}) + TRHHRMEXO * numer + TRGOVRMEXO * numer - \sum_{ihs,reg} (COMPWEDregEXO_{ihs,reg}/ EXCHG * PD_i * EDreg_{ihs,reg}) + TRADEBAL_{ini} = 0, \forall ihs \in i$$

(45) $$\sum_j x_{(j,f)} = XTHHEXO_f + XTGOVEXO_f$$

(46) $$PD_{C28} = numer$$

Appendix: Additional Results

TABLE 10: SALIENT PRODUCTS IN TERMS OF TRADE IMPACT

Panel A: Products with highest proportional impact on Chilean exports to the EU

			Initial Level Exports (% of total)		Change (%) Exp.EU
			2002 (a)	2008 (b)	(c)
220429	Wine of fresh grapes, incl. fortified wines, and grape must whose fermentation has been arrested by the addition of alcohol, in containers of > 2 l (excl. sparkling wine)	220429	0.8	1.2	568
030378	Frozen hake 'Merluccius spp., Urophycis spp.'	030378	0.5	0.4	182
080930	Fresh peaches, incl. nectarines	080930	0.1	0.3	163
620462	Women's or girls' trousers, bib and brace overalls, breeches and shorts of cotton (excl. knitted or crocheted, panties and swimwear)	620462	0.0	0.6	155
620342	Men's or boys' trousers, bib and brace overalls, breeches and shorts, of cotton (excl. knitted or crocheted, underpants and swimwear)	620342	0.0	1.6	154
080920	Fresh cherries	080920	0.1	0.5	142
870421	Motor vehicles for the transport of goods, with compression-ignition internal combustion piston engine 'diesel or semi-diesel' of a gross vehicle weight <= 5 tonnes (excl. dumpers for off-highway use of subheading 8704.10 and special purpose mo	870421	0.0	0.0	136
irP11	Rest of Wines	irC3_22	0.0	0.1	131
081120	Frozen raspberries, blackberries, mulberries, loganberries, black-, white- or red- currants and gooseberries, uncooked or cooked by steaming or boiling in water, whether or not sweetened	081120	0.6	0.6	119
081190	Frozen fruit and nuts, uncooked or cooked by steaming or boiling in water, whether or not sweetened (excl. strawberries, raspberries, blackberries, mulberries, loganberries, black, white or red currants and gooseberries)	081190	0.1	0.1	118
081320	Dried prunes	081320	0.4	0.7	99
160590	Molluscs and aquatic invertebrates, prepared or preserved	160590	3.7	12.3	98
220421	Wine of fresh grapes, incl. fortified wines, and grape must whose fermentation has been arrested by the addition of alcohol, in containers of <= 2 l (excl. sparkling wine)	220421	6.7	8.8	93
030490	Frozen fish meat, whether or not minced (excl. fillets)	030490	0.8	1.0	92
irP02	Rest of Fruits	irC1_2	0.2	0.2	89
081050	Fresh kiwifruit	081050	1.1	1.2	88
irP08	Rest of Seafood	irC3_12	0.9	0.5	87
870322	Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 1.000 cmÂ³ but <= 1.500 cm	870322	0.0	0.0	86
870323	Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 1.500 cmÂ³ but <= 3.000 cm	870323	0.0	0.0	85
870333	Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with compression-ignition internal combustion piston engine 'diesel or semi-diesel' of a cylinder capacity > 2.500 cmÂ³	870333	0.0	0.0	84

Panel B: Products with highest proportional impact on Chilean imports from the EU

Code	Description	Initial Level Imports (% of total) 2002 (a)	2008 (b)	Change (%) Imp. EU (c)
870421	Motor vehicles for the transport of goods, with compression-ignition internal combustion piston engine 'diesel or semi-diesel' of a gross vehicle weight <= 5 tonnes (excl. dumpers for off-highway use of subheading 8704.10 and special purpose mo	0.4	0.4	133
870322	Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 1.000 cmÂ³ but <= 1.500 cm	0.5	0.1	128
310210	Urea, whether or not in aqueous solution (excl. that in pellet or similar forms, or in packages with a gross weight of <= 10 kg)	0.0	0.4	124
870120	Road tractors for semi-trailers	0.1	0.2	122
870323	Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 1.500 cmÂ³ but <= 3.000 cm	2.4	1.5	121
282570	Molybdenum oxides and hydroxides	0.0	0.0	121
870423	Motor vehicles for the transport of goods, with compression-ignition internal combustion piston engine 'diesel or semi-diesel' of a gross vehicle weight > 20 tonnes (excl. dumpers for off-highway use of subheading 8704.10 and special purpose mo	0.5	0.4	119
870324	Motor cars and other motor vehicles principally designed for the transport of persons, incl.	0.2	0.3	117
870332	Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars, with compression-ignition internal combustion piston engine 'diesel or semi-diesel' of a cylinder capacity > 1.500 cmÂ³	0.4	0.3	116
280120	Iodine	0.0	0.0	115
842951	Self-propelled front-end shovel loaders	0.3	0.7	115
310420	Potassium chloride for use as fertilizer (excl. that in pellet or similar forms, or in packages with a gross weight of <= 10 kg)	0.0	0.0	115
290511	Methanol 'methyl alcohol'	0.0	0.0	114
842959	Self-propelled mechanical shovels, excavators and shovel loaders (excl. self-propelled mechanical shovels with a 360Â° revolving superstructure and front-end shovel loaders)	0.2	0.4	114
842691	Cranes designed for mounting on road vehicles	0.1	0.3	110
300610	Sterile surgical catgut, similar sterile suture materials, incl. sterile absorbable surgical or dental	0.6	0.3	110
950430	Games with screens, flipper and other games, operated by coins, banknotes 'paper currency',	0.0	0.1	111
281000	Oxides of boron; boric acids	0.0	0.0	108
842720	Self-propelled trucks fitted with lifting or handling equipment, not powered by an electric motor	0.3	0.4	106
842230	Machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers; machinery for capsuling bottles, jars, tubes and similar containers; machinery for aerating beverages	0.3	0.5	106

Source: Author's simulations and database described in the data Appendix.