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The Effect of Trade Liberalization on Chile's Export Diversity*

Min-Jung Kim**
Seoul National University, Korea

Chong-Sup Kim
Seoul National University, Korea

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ABSTRACT

Export diversification has been one of the major concerns for policymakers. In particular. those developing countries whose export structure is highly concentrated in a few primary products rather than diversified in a number of manufactures, must consider diversification policy essential in order to avoid economic problems such as resource abundance curse or the Dutch disease effect. Previous studies have hypothesized that trade liberalization through FTAs is one way to diversify export products; therefore, this paper empirically tests the hypothesis. The following analysis focuses on the Chilean experience since Chile has been highly praised for its successful export expansion and active involvement in trade liberalization.

The OLS panel estimation with period fixed effect shows that Chile's FTAs have increased export diversity only in terms of product numbers, and the overall export structure has become even more concentrated during the liberalization process. In this paper, we suggest that Chile's originally highly concentrated export structure is the main reason for the concentrating, rather than diversifying, effect of the FTAs. Nevertheless, we extend our analysis to find that the diversification effect of FTAs is significant in the manufacturing sector.

Key Words: export diversification, export extensive margin, free trade agreement (FTA)

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** Min-Jung Kim is a PhD candidate of Graduate School of International Studies, Seoul National University, Korea. Chong-Sup Kim is professor of Graduate School of International Studies, Seoul National University, Korea. Direct correspondence to Min-Jung Kim (Email: mjk@snu.ac.kr).

INTRODUCTION

Would trade liberalization diversify export goods? The question essentially stands against traditional trade theory whose fundamental assumption is that trade pattern is primarily determined by comparative advantage and specialization. In fact, recent studies have found an emerging magnitude of extensive margin in trade growth and an increasingly important role of export diversification for economic development and trade. The trend seems even prominent in case of developing countries. For example, Imbs (2003) and Cadot (2007) have found that the relationship between the level of export diversification and economic development is generally nonlinear, which implies a strong positive association between export diversity and development stages for developing countries.

Regarding export diversity expansion, Hummels and Klenow (2005) have concluded from its statistical analysis that large economies not only export more in quantity but they also export more diverse products at higher prices. According to the study, the extensive margin, which measures the coverage of export varieties in terms of export value, accounted for 66% of the large economies' export growth (Hummels and Klenow 2005, 712).

The role of export diversity is also found to be beneficial for economic development and growth stability. For instance, Herzer (2006) hypothesized the positive relationship between export diversification and economic growth and drew out statistically significant results from a set of time series analyses. In interpreting the results, Herzer (2006) suggested that positive economic externalities such as knowledge and technology spill-over must be major channels from export diversification to economic growth. In addition, Haddad (2010) provided another evidence for the positive effect of export diversification on economic development. Haddad (2010) tested the hypothesis that trade diversification reduces growth instability when a country has high degree of openness and the relevant analysis produced a supportive evidence for the hypothesis. According to the findings, the effect of trade openness on growth volatility was closely related to the degree of export diversification and product diversification was, in fact, helpful for shielding economies against external shocks.

If diversified export structure is so important in terms of its magnitude as well as its positive functions, how can a country diversify its export products? In other words, what determines export diversification? Trade liberalization is considered as one of the main causes for export diversification, which is supported by several theoretical and empirical studies. As elaborated later in this paper, it is generally believed that

market expansion facilitates export diversification and trade liberalization policies, such as joining the WTO or signing bilateral or regional trade agreements, actually help diversify country's export products.

On the reasoning, this paper attempts to examine the hypothesis that trade liberalization, in general, or the conclusion of FTAs, in particular, effectively diversifies export goods. The purpose of the analysis is to study Chilean experience in order to suggest a supporting or dissenting case evidence for the general hypothesis regarding the relationship between trade liberalization and export diversification. The Chilean experience is especially opted for since it serves as an appropriate test example for two reasons. First, Chile has long pursued an outward-oriented growth strategy since the mid-1970s and presented a successful case of economic development, which is commended as the "Miracle of Chile" (WTO 2009). Chile's successful trade performance in the past provides a good test sample for this study since the successful trade performance usually accompanies significant expansions in both export intensity and diversity. Second, the Chilean government has actively pursued trade liberalization policy over the past two decades. It is noted that Chile has agreed to dozens of FTAs with countries from all over the world, which will certainly provide a rich data for estimating the FTA effect.

This paper consists of five parts. It first reviews the existing literature on the relationship between trade liberalization and export diversification. Then, it undertakes OLS panel estimations on the export diversifying impact of the Chilean FTAs. It further carries out a statistical investigation into Chile's export structure and estimations for disaggregate sectors in order to elaborate on the estimation results. Last, it summaries and concludes.

LITERATURE REVIEW

Recently, the issue of export diversification draws much attention from policy-makers and the relationship between trade liberalization and export diversification has been one of the most important research questions. The first paper that introduced a theoretical framework is Melitz's (2003) 'heterogenous firm model'. The theory assumes that export goods diversify when producers decide to supply their new heterogeneous products in the international market. According to Melitz (2003), these potential suppliers are categorized as producers in the middle range who are productive enough to supply domestically but cannot overcome the sunk cost threshold for international supply. Once the threshold cost is reduced or eliminated

by trade liberalization, they can now start international trade with their new products. Their decision to enter the international market thus contributes to the overall export product diversification.

Based on the theory, a number of empirical papers test the relations between trade liberalization and export diversification. How to measure export diversification is a critical issue and empirical studies diverge in the measurement. Table 1 groups previous studies into two-by-two dimensions based on their measure of export diversification and estimation methodology.

Table 1. Impact of Trade Liberalization on Export Variety

Trade liberalization \ Export variety	Value of one or zero (One for new trades or product lines or no trade)	Specific Indicator (HHI, Gini, Feenstra Index, etc.)
Tariff Reduction	**Debare (2010):** Probit estimations on new trade	**Parteka (2008):** OLS on Theil & Gini index
Dummy Variables (RTAs, WTO)	**Pacheco (2006):** Tobit, Logit, OLS estimations on zero trades **Felbermayr (2007):** OLS, Logit, Tobit estimations on new trades **Gamberoni (2007):** Tobit, Probit estimations on new trades	**Feenstra (2007):** OLS on Feenstra index

The column divides the existing literature by different measurements of export diversification while the row distinguishes measurements of trade liberalization. First, a group of literature in the right column tries to capture export diversity with specific indicators such as HHI, Gini, Theil or Feenstra Index. HHI, Gini, Theil indexes are originally used for measuring income inequality in development studies but they are later adopted to explain trade structure. The other type of literature in the left column tries to take account zero trades and constructs a data set that is composed of either the value of one or zero – 'one' for new trade, new product lines, or sometimes reversely zero trade and 'zero' for otherwise. The former indicators in the right column require OLS estimation whereas the latter in the right column calls for some limited dependent variable models such as Logit, Probit, or Tobit estimations.

Few papers, however, used Hummels and Klenow (2005) index to capture export diversification. Therefore, this paper examines the trade liberalization impact on three different measures of export diversification: simple count of product, HHI and Hummels and Klenow index.

Though estimated in different ways, most of these empirical studies have released consistently positive results for the estimation on export diversifying effect of trade liberalization. Pacheco (2006) attempts to examine the Euro-Mediterranean FTA's export diversifying effect during the period 1990-2004, using the HS 6 digit bilateral trade matrix between 25 European countries and their 10 Mediterranean partners. By undertaking three types of estimations –that is, Tobit for overall effect, Logit for probability of switching from zero trade to some trade (extensive margin), and OLS for existing trade (intensive margin)–, the study concludes with statistically significant associations between the FTA and export variety increase. In addition, it finds the largest drop in zero-trade in the most liberalized sector. Feenstra (2007) focuses on the impact of the NAFTA on Mexico's export to the US. By using the Feenstra index, specifically devised to capture product variety in Feenstra (1994), it considers export diversity in 7 major industries for the period 1974-2001. The result of OLS regression analysis shows a positive relationship between NAFTA and Mexico's export diversity. The emergence of Mexico's strong competitor China even confirms the export diversifying effect of NAFTA. Debaere (2010) questions whether tariffs affect the extensive margin of international trade. For the purpose, it examines 3,328 products of the US bilateral trade with 177 partners and concludes that 12% of the newly traded goods are attributed to the US tariff cuts but this diversifying impact of the tariff reduction is relatively smaller for developing countries as compared to developed countries. Parteka (2008), in its attempt to identify determinants of export diversification, finds that RTAs facilitate de-concentration of export structure.

However, there are some findings that cast a doubt on the clear and positive association between trade liberalization and export diversification. Felbermayr and Kohler (2007) constructs a data set of country pairs for 104 countries and the estimation results show that effect of the WTO membership is statistically significant and positive but the FTA impact is only partially significant. Gamberoni (2007) finds that the EU unilateral trade preference has actually made the beneficiary countries' agriculture export more concentrated and that unilateral preference has little impact on the trade pattern of least developing countries. Martincus (2009) focuses on specific Colombian case and finds that Colombia FTA with the US

has induced further diversification in Colombian export structure but this effect lasts only temporarily. Dogruel (2010) examines Middle East countries' export diversification and finds that multilateral liberalization fosters diversification while regional integrations only enhances specialization.

In sum, the literature review suggests a rather ambiguous perspective on the impact of trade liberalization on export diversification. In particular, regional integrations do not always seem to consistently diversify the overall export structures when they are heavily concentrated on primary goods including agricultural products and natural resources. Therefore, this paper intends to examine the Chilean case, not only focusing on the overall change in Chile's export structure but also going deeper into the changes across the sectors since Chile's export structure is excessively dependent on a few natural resources such as copper.

FTAS' EXPORT DIVERSIFICATION EFFECT

Data

The panel data is constructed with Chile's export to 150 partners over the past 20 years (1990-2009). The trade data is based on export values of the highly disaggregated 5 digit SITC codes in the UN COMTRADE Revision 3. Macroeconomic data such as gross domestic product (GDP) and gross domestic product per capita (GDP per capita) are from the World Bank's World Development Indicators (WDI). Gravity data such as distances, common language, and geographical contiguity are from the CEPII.

The Chilean government has actively pursued trade liberalization policy by concluding FTAs with countries from different regions. As of December 2011, the Chilean Ministry of External Relations reports that twenty four FTAs are currently in effect, three negotiations are completed, and four are still in negotiation.[1] This paper considers the period from 1990 to 2009 and, therefore, uses the information of Chile's first 23 FTAs which embrace more than fifty-six trade partners from all over the world. Major partners include several Latin American countries, Mercosur, US, EU, EFTA, Korea, China, Japan, Pacific-4, and India.

This paper employs the three most commonly used indicators to capture export diversity. Although they are meant to represent the same concept

1 Webpage for Chile's Ministerio de Relaciones Exteriores (Ministry of External Relations): <www.direcon.gob.cl/pagina/1897>

'export varieties', each of them is calculated from a different aspect and, therefore, it is worth considering all of them for more accurate analyses. Also, some of the export diversity indicators have comparable matching pairs for export intensity. Therefore, this paper additionally examines those matching pairs of export intensity and diversity together in order to seek a complete set of analyses.

The first indicator for export diversity is the simple net count of export goods, which is compared with its export intensity indicator of per-product-export. The second indicators are the extensive and intensive margins devised by Hummels and Klenow (2005). The third measurement is the Herfindahl–Hirschman Index (HHI), an index originally used to explore the market structure of monopoly or perfect competition and recently applied to capture the trade structure of concentration or diversification.

Concerning the first pair, the export value from country *i* to country *j* at time *t* (X^t_{ij}) is decomposed into the number of export goods (N^t_{ij}) and per-product-export value (X^t_{ij}/N^t_{ij}) and this is given as

$$X^t_{ij} = N^t_{ij} \times (X^t_{ij}/N^t_{ij})$$

The first and second parts of the right hand side of the equation capture export diversity and intensity, respectively. At each period, some export goods are disappearing while others are appearing and the count of export goods (N^t_{ij}) inherently implies this net change. The increase in the number represents a net increase in export diversity. The per-product-export value (X^t_{ij} / N^t_{ij}) is the matching pair for export intensity. If the export value (nominator) increases faster than export diversity (denominator) expansion, export intensity enhances.

The second set of indicators are Hummels and Klenow's (2005) intensive and extensive margins, which are the two decomposed parts of the country *i*'s export market share in country *j*. The intensive margin is measured by country *i*'s export to country *j* divided by country *j*'s total export of the products that country i exports to country *j*. The extensive margin is represented by country *i*'s export product coverage over country *j*'s total import value – namely, country *j*'s import value of the products that country *i* exports to country *j* divided by country *j*'s total import value.

This paper slightly modifies the original Hummels and Klonow's intensive and extensive margins so that Chile's export coverage in trade with different partners is all weighted identically.[2] The identical weights are taken from

utilizing Chile's single export share reference rather than different importers' various import share references as has been the case in the original methodology. Thus, the modified calculation for the two margins follows

$$\sum_{g\in G_{ij}} X^{t}_{ijg} / \sum_{g\in G} X^{t}_{iwg} = \sum_{g\in G_{ij}} X^{t}_{ijg} / \sum_{g\in G_{ij}} X^{t}_{iwg} \times \sum_{g\in G_{ij}} X^{t}_{iwg} / \sum_{g\in G} X^{t}_{iwg}$$

The left hand side represents the share of the bilateral export from *i* to *j* in *i*'s total export. The bilateral export share in total export is decomposed into the modified intensive and extensive export margins on the right hand side. On the one hand, the modified intensive margin (hereinafter 'intensive margin') is measured by share of *i*'s export to *j* ($\sum_{g\in G_{ij}} X^{t}_{ijg}$) in i's export to the world *w* ($\sum_{g\in G_{ij}} X^{t}_{iwg}$), exclusively for the given set of export products g. The product set g represents each set of export products country *i* exports to country *j* whereas the product set G includes products of all these sets. An increase in the value means that the relevant destination (country *j*) takes up a larger share in country *i*'s total export. On the other hand, the modified extensive margin (hereinafter 'extensive margin') is measured by the share of country *i*'s export value of the products that country *i* exports to *j* ($\sum_{g\in G_{ij}} X^{t}_{iwg}$) in country *i*'s total export value ($\sum_{g\in G_{ij}} X^{t}_{iwg}$). An increase in the value means an expansion in export product coverage.

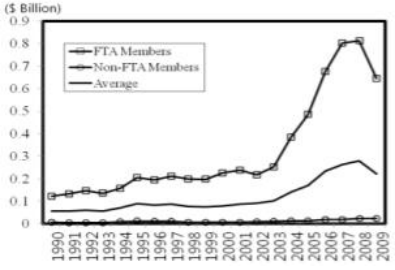
Lastly, this paper additionally applies the commonly used export structure indicator HHI. The HHI is calculated by the sum of the squared shares of the 30 largest export products in a bilateral trade. The value closer to zero indicates a stronger diversification while the value closer to one indicates a stronger concentration.

Chile's Export Diversity

This section provides a rough sketch of Chile's export diversity. Figure 1 exhibits the line of Chile's average export in the most recent two decades and the figures 2 through 4 graph Chile's average level of export diversity represented in the three indicators previously explained. The trends are the average of values for Chile's 112 partners, among which 56 are Chile's FTA partners. In all figures, the averages of the FTA group are higher

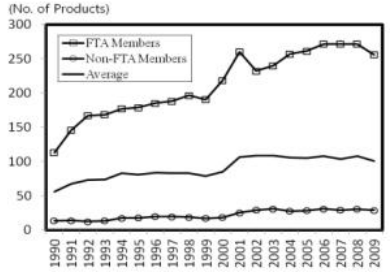
2 In principle, the original Hummels and Klenow intensive and extensive margins are somewhat limited when a single country's export performance is examined in multiple markets. In theory, the same bundle of export products should be represented in identical or at least similar values of export diversity indicator. However, there may arise a situation in which the same bundle of export products may be weighted with different importers' different import share references.

(or lower for HHI) than those of the non-FTA group, which means Chile has exported larger quantities and more diverse products to the FTA group on average than to the non-FTA group. The FTA group averages have relatively steeper slopes in most figures and this strongly suggests that there is a likely association between the FTAs and the export varieties.



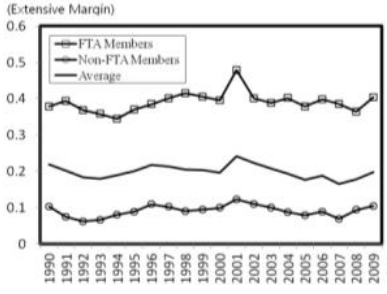
Source: Author's own elaboration based on COMTRADE, UN.

Figure 1. Chile's Export Value



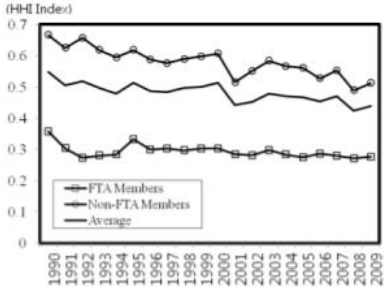
Source: Author's own elaboration based on COMTRADE, UN.

Figure 2. Chile's Number of Export Products



Source: Author's own elaboration based on COMTRADE, UN.

Figure 3. Chile's Export Extensive Margin



Source: Author's own elaboration based on COMTRADE, UN.

Figure 4. Chile's Export Product HHI

Figure 1 shows that Chile's average export growth (the line with no dots) was quite moderate in the 1990s and in the early 2000s but it significantly speeded up since 2003. The period of the soaring export coincides with Chile's aggressive FTA-signing with world's major traders such as EU (2003), US, Korea, and EFTA (2004), China and Pacific-4 (2006), and India and Japan (2007). This finding is more evident when the FTA average (the line with squares) is considered.

As shown in Figure 2, the overall growth of Chile's average export diversity is steady throughout the period, without any abrupt changes as found in the export value lines. The FTA group's average product number (the line with squares) has higher level and grew faster than the non-FTA group's average number (the line with circles). Figure 4 shows very similar trends of Chile's export intensity and diversity represented in HHIs. The FTA group's average HHI (the line with squares) has lower level (which means more diversification) and falls faster than the non-FTA group's average HHI trend (the line with circles). The average product numbers and the HHIs together imply that Chile's export varieties have generally increased over the period in which Chile has actively signed FTAs. This coinciding two incidents allow this paper to proceed a series of empirical estimations on the association between Chile's FTAs and export diversity.

However, Chile's average levels of extensive margin graphed in Figure 3 explain a rather unclear relationship between FTAs and export diversity. Unlike the other three figures analyzed above, the extensive margin lines have maintained almost the same level during the past 20-year period. The steady trend of the extensive margin can be explained by the effect of small initial volumes of new export products. Although the number of export product increased and the export structure diversified as in Figure 2 and 4, it is very likely that the minimal initial amounts of new exports have little affected the overall export product coverage represented in the extensive margin.

Encouraged by the rough sketches on Chile's export diversity, the next section estimates the statistical relationship between FTAs and export diversity in Chile. The expected estimation result is a positive relationship between Chile's FTAs and export diversity measured in terms of product counts and HHI. However, the forecast regarding the impact of FTAs on export diversity measured in the extensive margin is relatively uncertain.

Estimation

The estimation model of this paper is the gravity regression model. Since there is only one exporter, Chile, the regression model requires typical gravity variables that characterize importers only. The estimator of the analysis is panel OLS estimator. The panel OLS estimator has the advantage of resolving omitted variable bias that arises in a cross-sectional analysis. For the purpose of treating some cyclical trends in both dependent and independent variables, the model adopts time fixed effect or year

dummies. The resulting regression model is

$$\ln Y_{jt} = \beta_0 + \beta_1 \ln(GDP_{jt}) + \beta_2 \ln(GDPPC_{jt}) + \beta_3 \ln(Dist_{jt}) + \beta_4 FTA_{jt} + \beta_5 Contig_j + \beta_6 Lang_j + T_t + \varepsilon_{jt}$$

where Y_{jt} represents Chile's export value and each of the five indicators of export intensity and diversity – that is, count of export products and per-product export value, the intensive and extensive margins and the product HHIs. The independent variables are Chile's export destination j's GDP and GDPPC, distance between Chile and partner j ($Dist_{jt}$), border share ($Contig_j$), and language share ($Lang_j$). The last two cross sectional dummy variables take the value 1 if Chile and partner j share the border or language and 0 if otherwise. The effect of Chile's FTAs is represented in the dummy variable FTA_{jt}, which takes the value 1 if Chile has formed a FTA with partner j at time t and the value 0 if otherwise. The treatments for the period-fixed effect are year dummies represented in T_t, which allow different estimation intercepts across different years. ε_{jt} is the regression error term.

Table 2 summarizes the estimation results. The p-values for the fixed effect test indicate that the period-fixed effects are not redundant for models (3) through (6).

The coefficients for GDP are statistically significant in all models and the positive signs (negative for HHI) indicate that Chile exports large volume and diverse varieties to big markets. The coefficients for GDP per capita are statistically significant in all of the five models except for model (3) and the positive results (negative for HHI) lead to the conclusion that high income countries demand larger quantities (X), large per-product-volume (X/N), and diverse product varieties (N, EM, and HHI) of Chilean exports.

The distance effect on export intensity and diversity is statistically significant and negative in models (1), (3), (4) and (5). It is plausible that far-away export markets are less attractive to both existing and newly emerging products since a further distance incurs proportionally higher transaction costs. The statistically significant and positive result for per-product-export (X/N) in model (2) may be viewed in relation to the large distance effect on number of product in model (4). Since the geographical distance substantially reduces the variety of Chile's exports counted in number (N), such effect seems to have more than offset the negative distance effect on per-product-export (X/N), resulting in increasing intensity along with distance. The distance effect on HHI turns

out to be consistent with the result for per-product-export. The coefficient for HHI also has statistically significant and positive result and this means increasing distance enhances export concentration. In sum, Chile exports less quantity and less variety to far-away markets but the distance effect is larger on export diversity than on export intensity, thereby causing export concentration.

Table 2. OLS Estimation with Period Fixed Effect: All Products

	EXPORT INTENSITY			EXPORT DIVERSITY		
Dependent variables	(1) Log(EXP)	(2) Log(X/N)	(3) Log(IM)	(4) Log(N)	(5) Log(FM)	(6) Log(HHI)
Constant	-0.833	-1.227	-12.076***	0.394	-12.268***	-2.536***
	(-0.850)	(-1.624)	(-14.459)	(0.868)	(-15.647)	(-7.167)
LGDP	1.008***	0.450 ***	0.497***	0.558***	0.511***	-0.156***
	(46.596)	(26.999)	(26.953)	(55.696)	(29.557)	(-18.875)
LGDPPC	0.268***	0.116 ***	-0.021	0.153***	0.289***	-0.044***
	(8.734)	(4.881)	(-0.793)	(10.737)	(11.766)	(-3.805)
FTA	0.420***	0.216 **	0.388 ***	0.204***	0.032	0.176***
	(2.962)	(1.975)	(3.215)	(3.110)	(0.279)	(3.507)
LDIST	-1.185***	0.166 *	-0.598***	-1.351***	-0.586***	0.613***
	(-10.651)	(1.942)	(-6.315)	(-26.235)	(-6.593)	(15.257)
CONTIG	-0.372	0.111	0.017	-0.483***	-0.388	-0.455***
	(-1.090)	(0.424)	(0.057)	(-3.058)	(-1.423)	(-3.996)
LANG	1.599***	0.043	0.329***	1.556***	1.269***	-1.050***
	(10.723)	(0.374)	(2.591)	(22.535)	(10.649)	(-19.958)
R-squared	0.692	0.424	0.386	0.808	0.534	0.617
Obs. No.	2222	2222	2222	2222	2222	1788
FE test (p-value)	0.902	0.258	0.000	0.000	0.000	0.031

*** significant at 1%, ** significant at 5%, * significant at 10%. t-statistics are in parenthesis. Coefficients for time-fixed dummies are not reported for brevity.

As control variables, border sharing (CONTIG) and common language (LANG) are additionally used, and it is important to note that their coefficients are only exclusive to the Chilean case. It is found that the number of export products Chile exports to border-sharing countries is 48.3% point lower than the export product numbers to all others countries. Nevertheless, Chile's export structure to the border-sharing group is more diversified than the non-contiguous group. The common language effect is more consistent with the general perception. Chile export larger quantity and more diverse products to the countries that use the same language

with Chile. Also, the greater commonality helps diversify Chile's export structure.

The coefficients of FTA variable in model (1)-(3) show that the FTA effect on Chile's export intensity is clearly positive. The signing of FTAs increased Chile's export and per-product export by 42.0% and 21.6% points, respectively. Also, FTA partners became more important markets after the integration with Chile and, as a result, the share of Chile's export to the FTA destination generally increased by 38.8% points. This evinces that the export intensity constitutes a major proportion of the overall export growth caused by FTAs. Such a conclusion is consistent with the previous findings by Felbermayr and Kohler (2006), Helpman et al. (2008), and Besedes and Prusa (2011) that even if the role of export diversity is recently rising, the intensive margin is still an important aspect of trade growth.

The coefficients of FTA variables in models (4)-(6) are related to the FTA effect on Chile's export diversity. The coefficient for EM is insignificant and this is explained further in the following paragraph. What need more attention, however, are the seemly contradicting results for export diversity in terms of product number in model (4) and that in term of HHI in model (6). The direct interpretation for the results is that Chile's FTAs have increased the number of export products by 20.4% points but, in the meantime, FTAs have also enhanced Chile's export concentration by 17.6% point. The most likely explanation is that if the export intensifying effect of FTA is substantially large enough to surpass FTA's export diversifying impact, the net outcome would be an enhanced export concentration. In other words, FTA increases the selling volumes of both existing and new export products and new products are usually sold in relatively minimal amounts compared to existing products and, therefore, it is plausible that FTA's export intensifying effect exceeds its diversifying effect, resulting in an even higher export concentration. It is also plausible that Chile's export structure is already so concentrated that FTA's export diversifying effect could little affect the concentrated export structure.

As mentioned earlier, the FTA effect on the extensive margin is statistically insignificant. A possible explanation for this is also in line with the explanation about the small start-up quantity of new export products. Chile's FTAs may have increased export extensive margin as already proved by the coefficient of product number (N) but newly emerging export items are sold in small quantity in the beginning so that the overall coverage is little affected.

In short, Chile's FTAs have clearly increased its export intensity. In

the meantime, they also have expanded Chile's export diversity measured in terms of product numbers. However, the overall FTA effect is found to be a more concentrated export structure rather than export diversification. The most plausible explanation for the outcome is FTA's larger positive effect on export intensity than on export diversity when both effects are represented in export value.

FTA AND SECTOR ESTIMATION

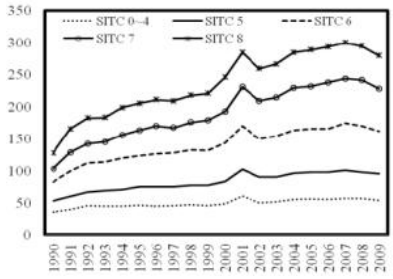
Chile's Export Structure

The estimation result shows that, in the Chilean case, FTA causes more concentration than diversification. Some literature including Gamberoni (2007) and Dogruel (2010) has the similar finding that regional integration encourages export concentration rather than diversification. They try to explain the concentration effect of FTA based on the exporters' export structure which heavily lean on a few primary sectors such as agricultural products or natural resources. In order to find out whether Chile's case fits into this hypothesis, this paper moves on to analyze Chile's export structure.

First, the whole set of SITC-3-digit disaggregate export data is rearranged into SITC-1-digit sectors and the five SITC-1-digit categories are assumed to be 5 representative sectors. The products in SITC 0 category through SITC 4 category represent primary items like food and beverage, crude materials, mineral and fuels and oils and fats. The SITC 5 includes products of chemicals, medicines, dyes and perfumes. The SITC 6 contains manufactures like rubber, leather, wood and metals. The SITC 7 encompasses industrial and office machines, telecommunication, electronic, and transport equipments. Finally, the SITC 8 includes other miscellaneous manufactures like architecture, furniture, clothing & shoes, and profession equipments.

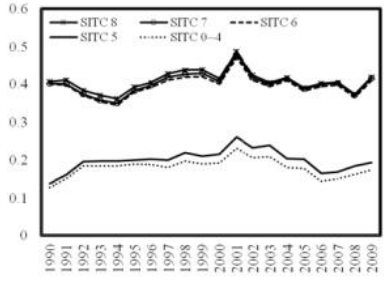
Then, (1) each sector's number of products, (2) each sector's extensive margins and (3) the proportion of top-product groups are calculated and graphed in Figures 5 through 7. All lines in figures are represented cumulatively.

Each sector's average number of products that Chile exports to its FTA partners is presented in an accumulative way in Figure 5. Over the past two decades, Chile has exported, on average, the largest number of products in SITC 6 category and the fewest in STIC 5 category to its FTA members. More importantly, however, it is noted that the product numbers are fairly evenly distributed across categories.



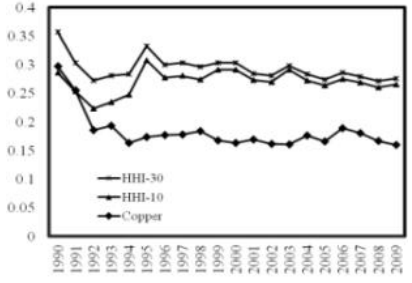
Source: Author's own elaboration based on COMTRADE, UN.

Figure 5. Product Number by SITC Sectors



Source: Author's own elaboration based on COMTRADE, UN.

Figure 6. Extensive Margin by SITC Sectors



Source: Author's own elaboration based on COMTRADE, UN.

Figure 7. Share of Major Products

Figure 5's export structure in terms of product number is compared with Chile's extensive margin in Figure 6. Although product numbers are evenly distributed across the sectors, the extensive margin of each sector differs substantially to each other. Particularly, the extensive margin for SITC 0-4 category and SITC 6 category are overwhelmingly large, which suggests that Chile's export structure is highly concentrated in SITC 0-4 and SITC 6 categories.

A further investigation into Chile's export products leads to the finding that only a handful of export items account for most of Chile's total export value. Figure 7 shows that the largest 30 products, the largest 10 products, and the largest export item, copper, respectively account for at least 30%, 25%, and 16% on average over the past two decades. This means that ten major products or 3.3% (=(10/300)*100) of total export varieties exclusively account for one fourth (25%) of Chile's total

export.

In sum, Chile's export structure is evidently concentrated on a few specific sectors or, to be more accurate, a few major products and it can be inferred from this finding that the variety expansion by FTAs virtually had little impact on the already highly concentrated export structure. As a result, the concentration impact of FTAs was more clearly represented in the estimation result.

Estimation by Sector

Based on the finding that Chile's trade liberalization has resulted in a more concentrated export structure, this paper undertakes another set of OLS estimations in order to find out which sector has been most diversified or concentrated due to FTAs. The sector analysis uses the identical gravity regression model and undertakes a similar set of OLS estimations as used in the previous estimation for all products. The estimations are carried out only for the FTA effect on export diversity since the FTA effect on export intensity is found to be clearly and consistently positive. The three export diversity dependent variables are product number, extensive margin and the HHI. Table 3 reports only the FTA coefficients of the 15 models (3 dependent variables for 5 sectors).

Table 3. OLS Estimation with Period Fixed Effect: By Sectors

	log (N)	log (EM)	log (HHI)
SITC 0-4	0.089 (1.524)	0.092 (0.999)	-0.042 (-1.060)
SITC 5	-0.085 (-1.309)	-0.245 * (-1.713)	0.149 *** (3.424)
SITC 6	0.120 * (1.925)	-0.069 (-0.383)	0.099 ** (2.328)
SITC 7	0.230 *** (2.976)	-0.105 (-0.765)	-0.107 ** (-1.968)
SITC 8	0.241 *** (3.620)	-0.193 (-1.555)	-0.137 *** (-2.917)

*** significant at 1%, ** significant at 5%, * significant at 10%. t-statistics are in parenthesis. Note that only the coefficients for FTA variables are reported. Coefficients for other variables are not reported for brevity.

The estimation results are mixed. However, the findings become more

straightforward if each sectors is considered together with other similar sectors. Particularly, SITC 5 and 6 together, and SITC 7 and 8 together show clearer and more distinctive results. First, the export diversifying impact of FTAs is most evident in SITC 7 and 8 sectors which include manufacturing products. Within these sectors, Chile's export products to FTA partners are about 23% or 24.1% points more diverse than those to non-FTA partners and Chile's HHI for FTA partners is about 10.7% or 13.7% points lower than those for non-FTA partners.

On the contrary, FTA's export concentrating effect is more clearly shown in SITC 5 and 6 sectors that are composed of products of industrial supplies, chemicals, and some primary manufactures. In SITC 6 sector, Chile's exports to FTA partners are 12% points more diverse than to non-FTA partners. However, FTAs' intensifying effect, –that is, FTA's effect of increasing already existing export items– seems to have been much larger and the export structure of SITC 6 sector is 9% points more concentrated for FTA partners than for non-FTA ones. In SITC 5 sector, FTA's export concentrating effect turns out to be strongest. The SITC 5 sector's extensive margin is 24.5% points lower for FTA partners than for non-FTA partners. Also, the export structure of SITC 5 is 14.9% points more concentrated for FTA partners than for non-FTA partners.

Finally, FTAs have no statistically significant export diversifying impact on Chile's export of SITC 0-4 products. Generally speaking, it is found to be considerably difficult to diversify products in agricultural and primary sectors.

Overall, Chile's FTAs have clearly diversified exports of manufacturing sectors (SITC 7 and 8). However, FTAs seem to have caused more concentration in exports of industrial supplies (SITC 5 and 6) and they had little impact in agricultural and primary exports (SITC 0-4).

CONCLUSION

There is a rising concern for export diversity and a bulk of existing literature suggests that trade liberalization is considered as an effective way to diversify export structure. This paper aimed at empirically testing the hypothesis of export diversifying impact of FTA, especially focusing on the Chilean case. The Chile's experience is particularly opted for its successful trade expansion and active trade liberalization policy.

In case of Chile, FTAs have no doubt enhanced export intensity. FTAs

have statistically significant and positive effects on Chile's total exports, per-product exports and the intensive margins originally constructed by Hummels and Klenow (2005). However, FTAs' export diversifying impact turns out to be less straightforward. Chilean FTAs have diversified export products in terms of number but the overall export structure became more concentrated. The estimations by sector show that FTAs have certainly diversified manufacturing products but this diversifying impact was limited regarding exports of industrial supplies. Moreover, FTAs had little impact on exports of agricultural and primary products.

Based on the estimation results, it is concluded that FTA's export diversifying impact is closely related to two factors: the export structure the country has previously maintained and which sector is under consideration. Chile's FTAs clearly increased export diversity in terms of product number. However, new export items are usually exported in small amounts and the diversifying impact was surpassed by FTA's export intensifying impact. As a result, Chile's overall export structure became even more concentrated after FTAs. In addition, Chile's already highly concentrated export structure has made it even more difficult for FTAs to diversify the overall structure. Nevertheless, FTAs' export diversifying effect was evident in manufacturing sectors.

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