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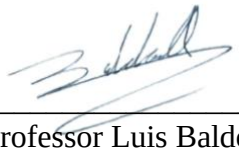
The Effect of Subsidies on Small Exporting Sectors in Chile

A thesis submitted in partial fulfillment of the requirement
for the degree of Bachelor of Arts / Science in Department from
William & Mary

by

Leah Damelin

Accepted for Honors



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Abstract

This paper measures the impact of a widespread trade subsidy program on the exporting sectors in which Chile faces comparative disadvantages (i.e., small exporting sectors). More specifically, I analyze the effect of export subsidies on the changes in exports experienced by these sectors in Chile between 2002 and 2013. My regression analysis utilizes data on Chilean exports from Chile's National Customs Service. It also uses information on the eligibility requirements for receiving the aforementioned subsidies — which are worth three percent of the value of an export — from the Chilean government. This information is provided by annual legal documents that are sourced from Chile's Library of Congress. My results suggest that the low values of subsidies provided by this program in Chile are not large enough to allow small exporting sectors to overcome the comparative disadvantages faced by Chile. Overall, the results of this study imply that the impact of a widespread subsidy program on an exporting sector depends on both subsidy size and whether the country has a comparative disadvantage in that sector.

Keywords: export subsidy, 'simplified' drawback program, small exporting sector, comparative disadvantage

1 Introduction

International trade is a key determinant of the performance of national economies. Due to its importance, many countries engage in strategies meant to bolster export flows so as to increase the amount of funds flowing into their economies. Therefore, many of the tactics used to boost trade have the same goal, which is to increase a country's exports; all of these tactics fall under the umbrella category of export promotion strategies. Empirically studying trade promotion strategies, including export subsidies, is helpful to policymakers because it allows them to better understand the cost-benefit relationships of such policies.

I analyze the effect of export subsidies on the value of goods exported from sectors in which Chile experiences comparative disadvantages (i.e., small exporting sectors). I conduct this analysis in the context of Chile, using export data from Chile's National Customs Service and subsidy data from the Chilean Library of Congress. Although Chile's major export promotion program was primarily implemented in the late 20th century, I focus on what remains of the program today, following its official termination approximately two decades ago. I take advantage of the fact that the monetary cutoffs that determine eligibility for this program are solely based on an exogenous price index defined by Chile's Central Bank. Overall, I conclude that Chile's current export subsidies — which are worth three percent of the value of a firm's exports — do not result in an increase in the growth of annual exports among the sectors that are beneficiaries of the program in comparison to those sectors that do not benefit from these subsidies.

There is no consensus in the economics literature regarding the empirical impact of export promotion or export subsidies on the performance of exporting sectors. However, basic international trade theory suggests that they result in an increase in exports. According to a few previous studies, export promotion strategies (e.g., subsidies) are at least capable of benefitting exporters in the short run (Desai and Hines (2008), Martincus and Carballo (2008), Cadot, et al. (2015)).[1] Others, however, have found that export promotion barely affects export growth at all (Ohashi (2005)).[2] Additionally, Weinberger, et al. (2021) find that a decrease in the benefits provided by an export promotion program is detrimental to the sectors that benefit from said program.[3] This finding lends support to the theory that Chile's initial export promotion program for small exporting sectors, which provided them with much larger subsidies, would have been successful, or at least more effective than it has been since the turn of the century.

It should also be noted that past studies regarding the effect of trade subsidies on exporting sectors are quite sparse, although the 2009 working paper by Helmers and Trofimenko is a notable exception. These authors find that export subsidies can, in conjunction with political

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[1] Mihir A. Desai and James R. Hines, "Market Reactions to Export Subsidies," *Journal of International Economics* 74, no. 2 (2008): pp. 459-474, https://doi.org/10.1016/j.jinteco.2007.04.006; Christian Volpe Martincus and Jerónimo Carballo, "Is Export Promotion Effective in Developing Countries? Firm-Level Evidence on the Intensive and the Extensive Margins of Exports," *Journal of International Economics* 76, no. 1 (September 2008): pp. 89-106, https://doi.org/10.1016/j.jinteco.2008.05.002; Olivier Cadot, Jaime de Melo, and Marcelo Olarreaga, "The Protectionist Bias of Duty Drawbacks: Evidence from Mercosur," *Journal of International Economics* 59, no. 1 (January 2003): pp. 161-182, https://doi.org/10.1016/s0022-1996(02)00084-3.

[2] Hiroshi Ohashi, "Learning by Doing, Export Subsidies, and Industry Growth: Japanese Steel in the 1950s and 1960s," *Journal of International Economics* 66, no. 2 (July 2005): pp. 297-323, https://doi.org/10.1016/j.jinteco.2004.06.008.

[3] Ariel Weinberger, Qian Xuefeng, and Mahmut Yaşar, "Export Tax Rebates and Resource Misallocation: Evidence from a Large Developing Country," *Canadian Journal of Economics* 54, no. 4 (November 2021): pp. 1562-1608, https://doi.org/10.1111/caje.12556.

connections, positively impact firms' export levels.[4] However, this study looks at the effect of subsidies that are individually applied to firms, rather than how a subsidy program (like that in Chile) can affect small exporting sectors. I hope to contribute to the literature surrounding the effectiveness of export promotion strategies, particularly in the form of export subsidies. To my knowledge, no other research has been conducted on how an export subsidy program — especially one that is nationwide — can promote exports in sectors where Chile has comparative disadvantages.

Section 2 discusses economic theory regarding the effect of export subsidies in small countries. In section 3, I will discuss Chile's conventional and 'simplified' drawback programs, why the latter was disbanded, and the current trade subsidies that Chile provides to firms in small exporting sectors. In section 4, I will discuss the data that I have collected on Chilean exports for a 12-year period in the 21st century, as well as how my two initial datasets were constructed. In section 5, I will discuss the empirical model utilized for the purposes of this study, which includes four different treatments. Section 6 presents the results, which primarily include regression results which suggest that the trade subsidies currently provided by Chile to firms in its small exporting sectors have been unable to achieve their initial goal. Finally, in section 7, I summarize my findings and discuss the possible implications of this study for both future research and the implementation of similar export subsidies in other countries.

2 Theory

Following years of import-substitution industrialization (see Section 3.1), Chile switched to engaging in export promotion strategies. Export promotion strategies can range from providing exporters with grant opportunities, to running "programs to develop export skills," to giving exporters subsidies.[5] Export subsidies, which are the focus of this study, "are used by developing and industrial countries alike to support their industries."[6] In the case at hand, the Chilean government clearly used them to support its small exporting sectors, particularly when it initially implemented its 'simplified' drawback program in pursuit of "export-led growth."[7]

Based on the aforementioned discussion of existing literature, it is clear that economists and governments are concerned with questioning the relationship between different forms of export promotion and export growth. There are many unanswered questions about the effectiveness of these programs, what factors affect their effectiveness, whether their effects look different in the short run and the long run, and so on. A key question that I seek to address, although there is still so much more research to do, is how export subsidies affect export growth.

The following graphs detail international trade theory regarding the impact of export subsidies on a small country under perfect competition. Current theory suggests that, for a small country, the implementation of export subsidies will result in a larger quantity of exports (as the graph depicts) but a decrease in welfare. As the graph demonstrates, when a small country begins trading a good with the world, the price of that good rises. When the exporters of that good are also given a subsidy, the supply curve shifts right in the export market, and the amount of goods

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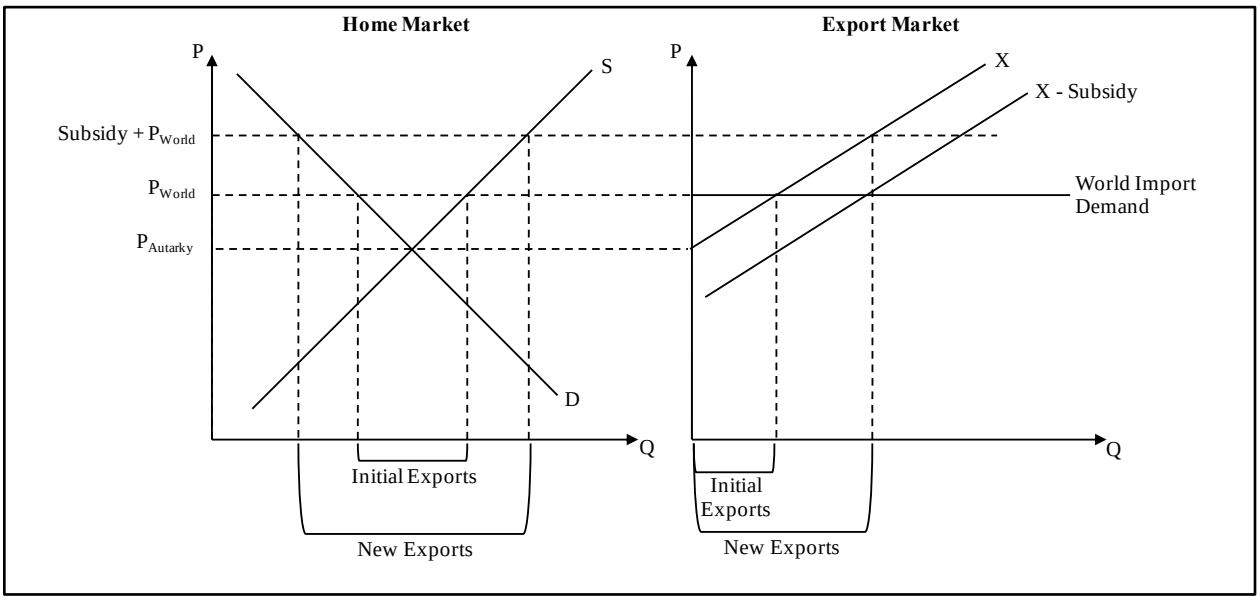
[4] Christian Helmers and Natalia Trofimenko, "Export Subsidies in a Heterogeneous Firms Framework" (Kiel Institute for the World Economy, January 2009), http://hdl.handle.net/10419/24872.
[5] Nathan Associates Inc., "Best Practices in Export Promotion" (USAID, April 2004), https://pdf.usaid.gov/pdf_docs/Pnadf539.pdf, 37.
[6] Robert C. Feenstra, *Advanced International Trade: Theory and Evidence*, 2nd ed. (Princeton, New Jersey: Princeton University Press, 2016), 284.
[7] Manuel R. Agosin, "Trade and Growth in Chile," *CEPAL Review* 68 (August 6, 1999): pp. 79-100, 79.

exported increases. However, there is also deadweight loss that occurs, since the rise in producer surplus that results from export subsidies will not be high enough to overcome both the loss in consumer surplus and the cost of the subsidy in a small country.[8]



3 Context

3.1 Chile's Drawback Programs

Chile was governed by the dictator Augusto Pinochet for more than fifteen years in the late 20th century following a military coup that overthrew Chile's democratically elected president, the Socialist Salvador Allende. Before Pinochet seized power, Chile had engaged in decades of import-substitution industrialization (ISI) and had begun moving in the direction of adopting public reforms that some considered to be Socialist policies.[9] ISI, for instance, involved "blocking imports of manufactured goods [… so as to increase] the demand for domestically produced goods."[10] During Pinochet's rule, however, the Chilean government engaged in "the expansion and diversification of exports."[11] Towards the end of his reign, in the mid-1980s, Chile's government began implementing two different export promotion programs that were aimed at helping to achieve further "export-led growth." One of them was a 'simplified' drawback program, known as the *Reintegro Simplificado* (RS) program in Chile. This export promotion program aimed to promote exports in Chile's many small exporting sectors by providing firms belonging to those sectors with trade subsidies. This 'simplified' drawback program was the precursor to Chile's current export promotion strategy, which is the focus of this research.

[8] Feenstra, *Advanced International Trade*, 284.
[9] Agosin, "Trade and Growth in Chile," 81.
[10] Douglas A. Irwin, "Peterson Institute for International Economics," *Peterson Institute for International Economics* (blog) (Peterson Institute for International Economics, July 8, 2020), https://www.piie.com/blogs/trade-and-investment-policy-watch/import-substitution-making-unwelcome-comeback.
[11] Agosin, "Trade and Growth in Chile," 97.

Chile's 'simplified' drawback program differs from a traditional drawback program in that beneficiaries are reimbursed using a different method, and the former program only benefits small exporting sectors in Chile (see Section 3.2 for eligibility requirements). Chile also implemented a traditional drawback program starting in the late 1980s; in this type of program, "the import duty on inputs used for the manufacture of exports is recovered after the exports are sold."[12] Therefore, a key difference between the traditional drawback program and the RS program (and what remains of it) in Chile is that the former does not provide actual subsidies to the exporters who can receive benefits; instead, they allow exporters to recover the value of duties that they have paid in the past. Although the traditional drawback program can benefit exporters that belong to larger exporting sectors in Chile, one major issue with it is that benefitting from such a program is quite costly in terms of both time and finances.[13] Therefore, for firms in sectors where Chile faces comparative disadvantages, it is generally more difficult to benefit from the country's traditional drawback program, particularly since it would be quite risky if these firms needed to receive their duty drawbacks within a certain period of time. All in all, the aforementioned obstacles discourage Chilean exporters in small exporting sectors from receiving duty drawbacks; that is where export subsidies come in.

3.2 Chile's *Reintegro Simplificado* Program

Chile's RS program was established in 1985 with the aim of benefitting small exporting sectors.[14] As part of this program, firms that belonged to these sectors could receive cash subsidies worth up to 10 percent of the value of their exports (in lieu of benefitting from traditional duty drawbacks).[15] The size of the cash subsidies was based on the value of goods exported from a small exporting sector; the sectors in which Chile experienced the largest comparative disadvantages generally benefitted the most from this program.[16] Furthermore, in order to receive an export subsidy through this program, at least 50% of the materials utilized in those exports had to be sourced nationally.[17] Initially, sectors could not benefit from the RS program if the value of goods that they exported was worth more than $7.5 million annually.[18] This limit, however, severely increased over time, since the program adapted this monetary cutoff for program eligibility to changes in inflation.[19]

In 1991, the method used to determine the subsidy size (as a percentage of the value of an export) given to the beneficiaries changed again, following a smaller change in 1987.[20] In a given year, each sector was sorted into one of three groups based on the value of goods exported in the past year; the group in which a sector was sorted determined the subsidy size received by the firms in that sector.[21] When this change was first implemented in 1991, the cash subsidy rate

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[12] Agosin, "Trade and Growth in Chile," 93.
[13] Agosin, "Trade and Growth in Chile," 93.
[14] Agosin, "Trade and Growth in Chile," 93.
[15] Agosin, "Trade and Growth in Chile," 93.
[16] Agosin, "Trade and Growth in Chile," 93.
[17] Rodrigo Céspedes Proto, "El REINTEGRO SIMPLIFICADO DE GRAVAMENES ADUANEROS," *Revista Chilena De Derecho* 28, no. 1 (2001): pp. 59-86, http://www.jstor.org/stable/41613160, 79-80.
[18] Manuel R. Agosin, Christian Larraín, and Nicolás Grau, "Industrial Policy in Chile" (Inter-American Development Bank [IDB], December 2010), https://publications.iadb.org/publications/english/document/Industrial-Policy-in-Chile.pdf, 25.
[19] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.
[20] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.
[21] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.

was worth between 3 percent and 10 percent of an exported good for firms in small exporting sectors.[22] Less than a decade later, however, Chile chose to dismantle the RS program due to the country's desire to join the World Trade Organization (WTO).[23]

Between 1998 and 2003, the Chilean government annually lowered the subsidy rates allocated to firms in small exporting sectors until all of the firms in these sectors could receive cash subsidies worth only three percent of the value of any given exported good.[24] I evaluate the most recent version of Chile's export subsidy program for the country's small exporting sectors, in which the firms in these sectors receive subsidies worth three percent of their exports' values. Data constraints prevent me from studying past versions of this program that existed before 2002.

3.3 Subsidies for Small Chilean Exporters in the 21st Century

As of 2003, a firm can qualify for a subsidy rate worth three percent of the value of exported goods so long as it meets two main requirements. First, the sector to which it belongs must be a small exporting sector, which means that the total value of goods exported from a firm's sector must be below the monetary cutoff for export subsidies in a given year. Second, the exported goods must be at least halfway sourced by imported goods.[25] Clearly, the percentage values of the cash subsidies received by small Chilean exporters are generally much smaller than they used to be before the RS program was dismantled. Furthermore, this program is also less attractive due to this change in requirements regarding the ratio of imported to exported materials used in their exports. It must also be noted that not all firms in sectors with export values below or equal to the monetary cutoff in any given year can actually benefit from the program. This is because there is an exclusion list for each year which excludes some sectors that would otherwise be eligible from the program, for instance because they are in sectors in which Chile has a comparative advantage or due to the second eligibility requirement.

Additionally, the monetary cutoff that determines eligibility for the subsidy program changes on an annual basis. Therefore, if one sector exports goods worth more than the monetary cutoff in one year, it will not immediately be eligible for the program the next year, but it is possible that it can become eligible again if it stays below the monetary cutoff in a couple of years. It is crucial to note that these changes in the cutoff have consistently been based on exogenous inflationary pressures. The January 2003 version of Law #18480, which was initially published in December 1985 in order to establish the RS program, states the following about how the distribution of cash subsidies adjusts accordingly based on changes in inflation:

> The amounts of exports shown above will be readjusted annually in accordance with the relevant average price index for Chile's foreign trade, as certified by the Central Bank of Chile, taking the year 1990 as a base, and will serve to set the annual list of exclusions provided in article 3.[26]

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[22] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.
[23] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.
[24] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.
[25] Agosin, Larraín, and Grau, "Industrial Policy in Chile," 25.
[26] Ministry of Finance, Law No. 18480, ESTABLECE SISTEMA DE REINTEGRO DE GRAVAMENES QUE INCIDAN EN COSTO DE INSUMOS DE EXPORTACIONES MENORES NO TRADICIONALES, Diciembre 17, 1985, Biblioteca del Congreso Nacional de Chile [BCN].

Essentially, the monetary cutoff below which an industry's total value of exports must fall in a given year so that firms within that sector can qualify for this program is dependent upon changes in inflation that are exogenous to sectoral exports. These changes in inflation are measured in a price index by Chile's Central Bank, and their exogeneity stems from the fact that the price index is based on a basket of exports which represents the evolution of the entirety of Chile's economy (versus the dynamics of one sector). To see the relevant list of cutoffs (marking the maximum value of exports that a sector may have in any given year), see Table 1.

4 Data

4.1 Eligibility Requirements and Exports

I combine two datasets in order to determine the impact of the aforementioned export subsidies on small exporting sectors in Chile between 2002 and 2013, which includes the end of the country's RS program and the first decade of its current subsidy program. 2002 serves as a base year for data analysis. By the beginning of this period of analysis, small exporting sectors could only benefit from export subsidies worth three percent of the value of exported goods.

Legal Exclusion Lists[27]

The first dataset was constructed using the legal exclusion lists published every year due to Chile's Law #18840, which initially established the RS program and continues to determine what industries can benefit from export subsidies in Chile. The documents containing these legal exclusion lists are decrees published by Chile's Ministry of Economy, Development, and Tourism. They are sourced from the Chilean Library of Congress, and each contains two important sections. The first is an exclusion list, which includes a list of all of the sectors that are excluded from receiving an export subsidy from the government, regardless of the value of goods exported from those sectors. Essentially, the legal exclusion lists exclude many sectors (at the level of 8-digit Harmonized System (HS) codes) that are ineligible according to the law, for instance based on the ratio of imported to exported inputs utilized in the creation of exported goods.[28]

The second important section included in each document is the monetary cutoff for receiving an export subsidy in the relevant year. In any given year, if the value of a sector's exports falls below this cutoff and the sector is not listed on the legal exclusion list, then firms in that sector are eligible for the program. My first dataset consists of these legal exclusion lists for each year between 2002 and 2013 (based on the first section of each document). As was previously mentioned, the sectors are defined using 8-digit HS codes.

[27] Ministry of Economy, Development, and Tourism, FIJA LISTA DE MERCANCÍAS EXCLUIDAS DEL REINTEGRO A EXPORTACIONES DE LA LEY Nº 18.480 Y SEÑALA VALORES DE LOS MONTOS MÁXIMOS EXPORTADOS, Biblioteca del Congreso Nacional de Chile [BCN], 2003-2014.

[28] Ministry of Economy, Development, and Tourism, Decree No. 56, FIJA LISTA DE MERCANCIAS EXCLUIDAS DEL REINTEGRO A EXPORTACIONES DE LA LEY Nº 18.480 Y SEÑALA VALORES DE LOS MONTOS MAXIMOS EXPORTADOS PARA EL AÑO 2002, Marzo 14, 2003, Biblioteca del Congreso Nacional de Chile [BCN].

Exports by Sector[29]

The second dataset was primarily constructed using data from Chile's National Customs Service. For each year between 2002 and 2013, the data from this source indicates the value of goods exported from each of Chile's sectors as defined by 8-digit HS codes. Therefore, for every year in the 12-year time frame, this dataset contains a list of all of the 8-digit HS codes of Chilean exporting sectors, as well as the corresponding list of the values of goods exported by those sectors.

4.2 Small Exporting Sectors in Chile

For each year, Chile had 9,714 sectors according to the data sourced from Chile's National Customs Service. My analysis suggests that this is an approximate number, as there were a small number of sector codes that were included on legal exclusion lists, but not in the lists of sectors provided by Chile's National Customs Service. In addition, Table 1 demonstrates that, for each year in my 12-year period of analysis, the mean value of goods exported is significantly higher than the median value of goods exported. In 2013, for instance, the average value of goods exported by a Chilean sector was approximately $7.9 million, whereas the median was about $425. This trend suggests that Chile has a small number of sectors that are exporting the majority of its exported goods, and a large number of small exporting sectors. Additionally, many of the sectors that are part of the exclusion lists are sectors that produce commodities, from minerals to fish. Furthermore, a number of the sectors with values of goods exported that are above the monetary cutoff seem to be concentrated in raw materials, such as copper and steel.

5 Empirics

5.1 Empirical Model

For each year between 2002 and 2013, I have two data sheets. The first data sheet contains three columns: the first contains a list of all of the sectors (based on their codes), the second lists the corresponding values of goods exported for each sector, and the third indicates whether or not each sector is eligible for export subsidies based on the relevant year's monetary cutoff. The second data sheet includes a list of sectors that are listed in the relevant year's legal exclusion list (based on their codes).

I use the following empirical model (Equation 1) to analyze the effects of each treatment on Chile's small exporting sectors. This regression equation is used to determine how each of my four treatments affects changes in export values (see Section 4.2 for details). I also utilize this equation in order to determine the effect of the treatment on export values.

$$E_{it} = \alpha + \theta_{2\text{-digit F.E.}} + \beta_1[\text{Treatment}]_{it} + \varepsilon_{it}$$

[29] National Customs Service of Chile, *Archivos Excel en Monto ($US) por Código Arancelario: Información Annual Desde Año 2002 al 2020* [Excel Files in Amount ($US) by Tariff Code: Annual Information from 2002 to 2020] (Chile: National Customs Service of Chile), https://www.aduana.cl/exportacion-por-codigo-arancelario/aduana/2018-12-14/095532.html.

- E_{it} is the outcome of interest. I analyze three different outcomes: the log of export values, the level of export values, and the annual change in exports (in $U.S.).
- $\theta_{2\text{-}digit\ F.E.}$ represents two-digit sector fixed effects. Considering that firms were analyzed at the 8-digit HS code-level, this variable was included in order to control for sectors' time-invariant characteristics at a highly aggregated sectoral level (i.e., 2-digit HS codes).
- β_1, which is the parameter of interest, represents the effect of the subsidies for small exporting sectors on the values of their exports.
- $[\text{Treatment}]_{it}$ represents whether or not firms in industry (i.e., sector) i could receive a subsidy in year t.
- ε_{it} is the error term.

5.2 Treatments

I apply four different treatments to my dataset. Treatment 0 reflects the reality of the program's requirements and effects on small exporting sectors. Treatments 1, 2, and 3 are included so as to check for robustness. In Treatments 1 and 3, there end up being more observations in the treatment group, as well as less observations in the control group, than there are in reality. These treatments check for robustness by looking at how statistically significant the impact of just one of the two determinants of eligibility for the program is on changes in export values over time. Treatment 2 is similar to Treatment 1, except that the former does not have an endogeneity problem. For each treatment, observations are part of the control group if they cannot receive the treatment; in other words, sectors belong to the control group if they are not eligible for the subsidy program based on the relevant treatment.

Treatment 0: Cutoff and Exclusion List.

This treatment is based on the real scenario in which the ability to receive a subsidy is contingent upon both the exclusions list and monetary cutoff for each year. Additionally, this treatment is applied to the whole dataset (i.e., no observations are dropped).

Treatment 1: Cutoff.

This treatment is based upon a hypothetical scenario in which the ability to receive a subsidy is solely contingent upon the monetary cutoff. This treatment analyzes the whole dataset, which poses an issue because the whole dataset includes observations that should be excluded from the program but are considered eligible for it solely because of the monetary cutoff. This has two consequences. First, it reduces the number of sectors that are in the control group. Second, it considers some sectors which should be part of the control group (because they are included in legal exclusion lists) to be part of the treatment group. Therefore, when Treatment 1 is conducted, there are some observations in the treatment group that should be in the control group.

Treatment 2: Cutoff with Dropped Observations.

Like Treatment 1, this treatment is based upon a hypothetical scenario where the ability to receive a subsidy is solely contingent upon the monetary cutoff. However, this treatment does not analyze the whole dataset. Instead, as part of Treatment 2, all observations that are eligible based on the monetary cutoff but ineligible because they are listed in the legal exclusion lists are dropped from the dataset before the regression analysis occurs. Therefore, unlike Treatment 1, Treatment 2 is exogenous to sectoral exports. Any sectors that are considered eligible for the program based on the monetary cutoff, but in which Chile also faces a comparative disadvantage, are dropped from the dataset.

Treatment 3: Legal Exclusion.

This treatment is based on a hypothetical scenario in which the ability to receive a subsidy is solely based on whether or not a sector is included in the exclusion list for the year at hand. In other words, this treatment is only based upon the sectors included in the annual exclusion list, and not the monetary cutoff for each year. This treatment is applied to the whole dataset, which has two consequences. The first effect is that some observations that should be in the control group based on the monetary cutoff are in the treatment group because they are not included in an exclusion list. The second effect is that, because of the first effect, this treatment decreases the number of sectors in the control group. Therefore, there are some observations in the treatment group that should have been in the control group.

5.3 Elasticity Interpretation

My goal is to demonstrate how $[\text{Treatment}]_{it}$ — a dummy variable — affects the value of goods exported by small exporting sectors in Chile. As part of my analysis, I run log regressions; however, beta coefficients on independent dummy variables have been subject to bias in log regressions in past studies.[30] Therefore, I interpret the β_1 values that result from my log regressions using the following formula from Kennedy (1981) so as to diminish bias.[31]

$$g^* = exp[\hat{c} - (½)V\hat{}(\hat{c})] - 1$$

- The variable g*, when multiplied by 100, represents the percentage impact of receiving the aforementioned subsidy on the value of Chilean sectors' exports.
- The variable ĉ represents an estimate of the standard error of β_1.
- The variable V(ĉ) represents an estimate of the variance of β_1.

[30] Peter E. Kennedy, "Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations," *The American Economic Review* 71, no. 4 (September 1981): p. 801, https://www.jstor.org/stable/1806207?seq=1&cid=pdfreference# references_tab_contents.
[31] Kennedy, "Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations."

6 Results

6.1 Summary Statistics and Monetary Cutoffs

Table 1: Summary Statistics for Sectoral Exports (in Millions of Current $U.S.)

Year	Mean	Median	Standard Deviation	Cutoff	Number of Sectors Excluded
2002	1.8	0.0002058	46.7	17.951400	496
2003	2.2	0.0002742	54.6	19.803600	502
2004	3.3	0.000303	100.4	21.537000	511
2005	4.2	0.0004296	128.7	23.185800	518
2006	6.0	0.0003427	212.8	24.301800	589
2007	6.9	0.0004914	249.9	26.224200	600
2008	6.7	0.0003794	226.2	29.471400	605
2009	5.5	0.00033	191.1	27.766800	613
2010	7.3	0.000458	275.7	29.349000	614
2011	8.3	0.0006407	296.4	32.306400	829
2012	8.0	0.00083	280.9	32.308200	834
2013	7.9	0.000425	261.5	32.365726	839

Table 1 includes the median, mean, and standard deviation of the value of goods exported by Chilean sectors (in millions of current $U.S.) for every year between 2002 and 2013. As was previously mentioned, the median value of exports per year is consistently much smaller than the average, which suggests that the majority of Chilean exporting sectors are quite small, and that a small number of sectors produce the majority of exports. This suggests that the subsidy program at hand impacts the majority of sectors in Chile.

Additionally, Table 1 features the monetary cutoffs that determine eligibility for the program for each year between 2002 and 2013. As was previously discussed, one eligibility requirement for receiving export subsidies is that the value of goods exported from a sector must not exceed the monetary cutoff in any given year. Table 1 also contains the number of sectors listed on the exclusion list for each year.

6.2 Discussion of Log and Level Regression Results

Before conducting growth regressions in order to determine the impact of each treatment on export growth, I conducted log and level regressions for each treatment (see Table 2). The results are robust to different specifications, as these log and level regressions were conducted for each of the four treatments. Furthermore, the results are mostly significant even when these regressions are conducted on modified versions of the dataset that only contain observations within $5 million or less of the cutoff (see Tables 11-13 in the Appendix).

Table 2: Value of Exports and Subsidies to Small Exporters: OLS

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-81.4***	-76.2***	-328.4***	-315.8***	-328.6***	-314.8***	-72.4***	-69.3***
Robust S.E. (in Millions)	9.5	8.5	38.6	36.5	38.6	36.2	8.7	8.0
Num. Obs.	117,828	117,828	116,556	116,556	116,088	116,088	117,828	117,828
Adjusted R2	0.01	0.02	0.04	0.05	0.04	0.05	0.01	0.02
2-Digit HS Fixed Effects	X		X		X		X	
Panel B. Log Regressions								
Treatment	-5.8***	-6.8***	-12.7***	-12.9***	-13.1***	-13.9***	-4.6***	-5.8***
Robust S.E.	0.08	0.08	0.03	0.06	0.03	0.06	0.08	0.08
Interpretation (Kennedy 1981)	-0.9969	-0.9989	-1.0000	-1.0000	-1.0000	-1.0000	-0.9900	-0.9970
Num. Obs.	117,828	117,828	116,556	116,556	116,088	116,088	117,828	117,828
Adjusted R2	0.06	0.15	0.07	0.15	0.08	0.18	0.04	0.13
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β) and coefficients expressed as elasticities (Interpretation). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Based on Table 2, it is clear that the sectors that are able to benefit from this subsidy program are those with lower levels of exports. Even when the exemptions are included, this is clearly the case. According to Treatment 0 (when applied with sector fixed effects), the exports of small Chilean sectors are worth $76,185,191.50 less than the exports of larger sectors. These results confirm that the export subsidies are targeted at small exporting sectors in Chile, as they are meant to be. Overall, this table clearly demonstrates that the sectors that receive export subsidies in Chile are those in which the country clearly faces comparative disadvantages.

6.3 Interpretation of Growth Regression Results

Most significantly, I use two different growth-related regressions — also based on Equation 1 — to determine the effect of each treatment on small exporting in Chile. The first regression is used to analyze the impact of the program on annual export growth (in U.S. dollars), and the second is utilized to analyze the impact of the program on annual export growth rates. First, I conduct these two regressions on growth (see Table 3) and growth rates (see Table 4) in the whole dataset (i.e., the dataset from which no observations are dropped based on their exports' proximity to the monetary cutoff in 2002). In other words, for my first analyses of the treatment's impact on export growth and export growth rates, no observations are dropped from the original dataset for Treatments 0, 1, and 3; the only observations dropped for Treatment 2 are those which are small in terms of value but included on the exclusion list.

I also analyze the effect of the treatment on export growth and export growth rates for three modified samples. For my second round of analyses, I only consider observations for which the value of exports in 2002 was within $1 million of the cutoff (in either direction). For my third round of analyses, I only consider observations for which the value of exports in 2002 was within $2 million of the cutoff (in either direction). Lastly, for my final round of analyses, I only consider the observations for which the value of exports in 2002 was within $5 million of the cutoff (in either direction). Decreasing the number of observations included in the analysis based on their proximity to the cutoff is helpful, since the smaller the group of observations, the more similar those observations will be.

When looking at the impact of the treatment on growth rates, analyzing these modified samples is particularly helpful, since there are many small sectors in Chile that export very little over time. This is especially important to note because, as was previously mentioned, Chile is a country in which the majority of exports are highly concentrated in a small number of sectors. Overall, decreasing the dataset to include observations within $1 million, $2 million, and $5 million of the cutoff is very helpful for verifying the effect of this treatment on growth and growth rates.

Table 3: Growth of Exports and Subsidies to Small Exporters

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-10.01***	-9.83***	-41.48***	-40.88***	-42.57***	-41.93***	-8.69***	-8.69***
Robust S.E. (in Millions)	2.24	2.03	9.20	8.74	9.20	8.67	2.06	1.92
Num. Obs.	108,009	108,009	106,843	106,843	106,414	106,414	108,009	108,009
Adjusted R2	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 4: Growth of Exports and Subsidies to Small Exporters Within $5 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-7.79**	-8.45***	-11.70**	-12.83***	-14.54***	-17.45***	-6.02*	-6.12**
Robust S.E. (in Millions)	2.52	2.23	3.59	3.51	2.28	2.31	2.56	2.24
Num. Obs.	616	616	616	616	374	374	616	616
Adjusted R2	0.01	-0.03	0.02	-0.01	0.10	0.07	0.00	-0.03
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

First, my growth regressions demonstrate that the change in export values over time is negative for small Chilean exporters, even when sectors have the opportunity to receive trade subsidies. These results are especially significant for the whole sample (see Table 3), as well as for the dataset that only includes observations with export values that were within $5 million of the cutoff in 2002 (see Table 4). For instance, in Table 3, the annual fall in exports is approximately $9.83 million more for small exporters (compared to those who do not receive the treatment) when Treatment 0 is applied with two-digit sector fixed effects. When the dataset is limited to observation within $5 million of the cutoff, the annual fall in exports is approximately $8.45 million more when this treatment is applied. Although the results are not all statistically

significant for the smaller datasets (see Tables 7 and 8 in the Appendix), they are all still negative and primarily statistically significant.

Overall, these results suggest that — even though treated sectors receive small subsidies from the Chilean government — their annual growth (in $U.S.) is not as high as it is among sectors that are not receiving these subsidies. This could suggest that demand is increasing more quickly for exports from untreated sectors than it is from treated sectors. Another possibility is that there are other government programs in place that are leading to more growth in untreated sectors. One more potential implication is that these subsidies are not large enough to help small exporting sectors overcome the comparative disadvantages faced by Chile within them, meaning that they are unable to grow their exports.

Table 5: Growth Rate of Exports and Subsidies to Small Exporters

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment	14.77	42.62	27.23***	69.27	31.07***	81.02	15.09	43.16
Robust S.E.	10.80	28.88	8.10	43.75	8.01	51.90	10.89	28.97
Num. Obs.	57,650	57,650	57,650	57,650	54,228	54,228	57,650	57,650
Adjusted R2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 6: Growth Rate of Exports and Subsidies to Small Exporters Within $5 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment	-0.48***	-0.43***	-0.49***	-0.46***	-0.65***	-0.73***	-0.40***	-0.33***
Robust S.E	0.09	0.08	0.12	0.12	0.07	0.07	0.09	0.08
Num. Obs.	546	546	546	546	262	262	546	546
Adjusted R2	0.01	0.01	0.03	0.03	0.30	0.32	0.01	0.01
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Second, my growth rate regressions in the modified samples reveal that the annual growth rate of exports among treated sectors is smaller than that of untreated sectors. These results are statistically significant based on the $5 million sample; they also seem to be supported by the regression results for the $1 million and $2 million modified samples (see Tables 9 and 10 in Appendix). For instance, in the $5 million modified sample, the results of Treatment 0 with 2-digit sector-fixed effects imply that the annual percentage change in treated sectors is -43% more

than it is in untreated sectors. However, even though the regression results from the three modified datasets all support the conclusion that growth rate is smaller and negative for the treated sectors, the results of the growth rate regressions in the whole sample are positive. These growth rate results for the whole sample are statistically significant based on Treatments 1 and 2 with the two-digit sector-fixed effects, but not based on any other treatments (see Table 5). This contradicts the findings from the growth rate regressions in all three of the modified samples, likely because there are so many small sectors that do not experience much — if any — growth over the period of analysis and who export far less than the monetary cutoff in each year. Therefore, the estimate of growth rates in the whole dataset is likely much less representative of the program's effect on small exporting sectors that are exporting closer to the cutoff than are the results from the analyses of the modified datasets. Overall, one possibility is that subsidies have a negligent impact on sectors that consistently export close to $0, although more research would be required in order to determine if this is what is happening in Chile.

7 Conclusion

For this paper, I used quantitative data and legal documents from Chile's National Customs Service and Library of Congress in order to study the effect of small trade subsidies on exporters in the country's nontraditional sectors between 2002 and 2013. As I discussed earlier, Chile's current subsidy program for small exporting sectors is what remains of the former RS program, which was meant to bolster the exports of firms in sectors where Chile has comparative disadvantages. One important benefit of this program was that firms in small exporting sectors which would have trouble benefitting from a traditional drawback program were able to receive large subsidies from this RS program.

Based on my empirical findings, I have drawn two major conclusions. First, the firms in Chile that are able to receive subsidies from the country's current trade subsidy program are those which belong to sectors in which Chile faces comparative disadvantages. Second, in those sectors that can access export subsidies from Chile, exports' annual growth is lower than it is in sectors which cannot benefit from this program.

My research has a couple of important implications. First of all, it suggests that it would be useful for future research to analyze the effect of subsidy size on exports in small exporting sectors. The goal would be to determine if it is the small values of these subsidies in Chile that prevents small exporting sectors from growing their exports as much as larger sectors. As I mentioned, the current subsidies that firms in small exporting sectors can receive are worth three percent of their exports' values. Therefore, other countries that want to try providing trade subsidies to firms in small exporting sectors would likely benefit from providing larger subsidies to them.

Second of all, based on the previously discussed summary statistics, Chile seems to have many small exporting sectors on one hand, and a small number of sectors that are exporting a lot on the other. Therefore, future research could be done to determine which subsidy programs and other forms of export promotion are best for small exporting sectors in countries like Chile where a small number of industries dominates the market (even though there are many sectors that export goods).

Finally, more research could consider how subsidies and other export promotion programs aimed at larger exporting sectors indirectly impact smaller exporting sectors. In a country like Chile, where it clearly seems that most sectors are small exporting sectors, subsidies

benefitting the much larger exporting sectors could potentially be harmful to the profits of smaller ones.

Appendix

Table 7: Growth of Exports and Subsidies to Small Exporters Within $1 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-32.60	-37.16	-13.33**	-18.54*	-19.69*	-22.32*	-13.89	-16.66
Robust S.E. (in Millions)	23.90	26.60	4.38	7.08	9.69	10.20	19.70	23.80
Num. Obs.	99	99	99	99	55	55	99	99
Adjusted R2	0.12	0.09	0.07	0.03	0.08	0.04	0.02	-0.03
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 8: Growth of Exports and Subsidies to Small Exporters Within $2 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-10.63	-10.13*	-13.38	-13.94***	-16.88**	-19.68***	-7.45	-6.32
Robust S.E. (in Millions)	6.68	5.03	8.22	3.63	5.18	4.55	6.79	4.89
Num. Obs.	220	220	220	220	132	132	220	220
Adjusted R2	0.00	-0.05	0.01	-0.05	0.07	0.02	0.00	-0.05
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 9: Growth Rate of Exports and Subsidies to Small Exporters Within $1 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment	-0.61**	-0.62**	-0.48**	-0.79	-0.91***	-0.92***	-0.23	-0.22
Robust S.E.	0.22	0.21	0.18	0.42	0.18	0.17	0.24	0.25
Num. Obs.	96	96	96	96	41	41	96	96
Adjusted R2	0.01	-0.05	0.06	0.05	0.53	0.55	-0.01	-0.06
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 10: Growth Rate of Exports and Subsidies to Small Exporters Within $2 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment	-0.52**	-0.37*	-0.77**	-0.84**	-0.71***	-0.75***	-0.44*	-0.27
Robust S.E.	0.19	0.15	0.26	0.29	0.12	0.11	0.19	0.15
Num. Obs.	205	205	205	205	95	95	205	205
Adjusted R2	0.00	-0.01	0.04	0.02	0.28	0.31	0.00	-0.01
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 11: Value of Exports and Subsidies to Small Exporters Within $1 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-23.42***	-29.22***	-42.76***	-44.75***	-48.11***	-54.34***	-3.35	-8.51
Robust S.E. (in Millions)	4.42	5.78	4.66	7.49	5.61	10.30	14.20	16.90
Num. Obs.	108	108	108	108	60	60	108	108
Adjusted R2	0.03	0.22	0.47	0.49	0.41	0.44	-0.01	0.17
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 12: Value of Exports and Subsidies to Small Exporters Within $2 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-48.51***	-23.32***	-83.84***	-46.44***	--55.49***	-42.78***	-43.46***	-17.57***
Robust S.E. (in Millions)	7.55	3.91	12.50	8.38	6.06	5.23	8.54	4.60
Num. Obs.	240	240	240	240	144	144	240	240
Adjusted R2	0.03	0.56	0.18	0.59	0.34	0.44	0.03	0.56
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

Table 13: Value of Exports and Subsidies to Small Exporters Within $5 Million of Cutoff

	T0	T0	T1	T1	T2	T2	T3	T3
Panel A. Level Regressions								
Treatment (in Millions)	-32.68***	-24.30***	-57.49***	-52.48***	-47.37***	-39.59***	-28.95***	-19.61***
Robust S.E. (in Millions)	3.14	2.27	5.57	4.91	2.78	2.42	3.45	2.68
Num. Obs.	672	672	672	672	408	408	672	672
Adjusted R2	0.05	0.26	0.20	0.37	0.40	0.50	0.04	0.25
2-Digit HS Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Contains coefficients (β). Robust standard errors in parentheses. 2-Digit HS Fixed Effects are based on two-digit sector codes derived from Harmonized System (HS) tariff codes. *p<0.05; **<0.01; ***p<0.001

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