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**THE EMERGENCE OF NEW SUCCESSFUL
EXPORT ACTIVITIES IN LATIN
AMERICA: THE CASE OF CHILE**

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ACTIVITIES IN LATIN AMERICA: THE CASE OF CHILE**

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Resumen

The discovery of new export opportunities has been an important trait of economic growth and development in Chile since the mid-1970s (Agosin, 1999; Meller, 1994; and Meller and Sáez, 1995). An additional aspect that makes Chile an interesting case study is that these opportunities have arisen almost entirely in segments of the food and forestry sectors.¹ This marks a clear distinction between Chile and the Asian countries, whose export growth has been driven by the creation of new comparative advantages in the manufacturing sector. In fact, manufacturing has been practically absent from the Chilean process.

Palabras Claves:

Growth, export.

The Emergence of New Successful Export Activities in Latin America: The Case of Chile

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I. Introduction

The discovery of new export opportunities has been an important trait of economic growth and development in Chile since the mid-1970s (Agosin, 1999; Meller, 1994; and Meller and Sáez, 1995). An additional aspect that makes Chile an interesting case study is that these opportunities have arisen almost entirely in segments of the food and forestry sectors.¹ This marks a clear distinction between Chile and the Asian countries, whose export growth has been driven by the creation of new comparative advantages in the manufacturing sector. In fact, manufacturing has been practically absent from the Chilean process.

Chile is interesting because of the diversity of cases of export growth and the variety of the likely causes for their success. Some important factors that have been identified in the national literature are: trade liberalization; strong exchange rate depreciation following the military coup of 1974; subsidies to specific sectors (especially forestry); the entrepreneurial activity of the state (through a semi-public venture-capital-cum-R&D undertaking, Fundación Chile); state-sponsored accumulation of factors of production indispensable for the development of specific sectors (agricultural and forestry sciences); and the encouragement of FDI in specific sectors where the country had undeveloped potential comparative advantages (through debt-equity swaps in the mid to late eighties, which favoured investment in pulp and paper). Exchange rate volatility and longish swings in periods of

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¹ These include wood products, pulp and paper, fruits and vegetables, fishmeal, other ocean products, cultivated salmon, pork meat, poultry, milk products, and wine.

depreciation (1974-77, 1982-89, and 1997-2003) and appreciation (1977-81, 1991-1997, and 2004 to the present) have also left their mark, not always favorable, on export growth and diversification (Agosin and Ffrench-Davis, 1995; Ffrench-Davis, 1979; Ffrench-Davis and Sáez, 1995).

After a brief review of the importance of non-mineral exports in growth, the paper will concentrate on the exports of three product groups and the factors that have influenced export growth at the sector and firm level. These products are wine, blueberries, and pork meat. We will also discuss the fruit sector in general, because it is easier to understand the success in exporting blueberries as part of the progressive diversification of fruit exports than if it is treated as a stand-alone case. Wine and pork, on the other hand, do not have antecedents the way blueberries do.

Wine, a product that began to be exported in significant volumes in the mid 1980s, is now a major industry, exporting close to US\$ 1 billion. Over time, Chilean exporters have travelled the distance from bulk, commodity wine to product differentiation in the segment of “good value for money”; now the effort is to consolidate at least part of the industry in the segment of premium wines, where monopolistic competition is fierce and product differentiation is essential for success.

The second product is blueberries, which emerged as an important export in the mid 1990s. Blueberries are more commodity-like than wine. Chilean exports have gone from nothing in the early 1990s to over US \$ 100 million at present. The third product is pork meat. During the course of our preliminary research, we discovered that Chile had become an important exporter of this product. While largely a commodity, export success has come precisely because the main Chilean producer has been able to place its product in a market segment commanding higher prices. Pork meat exports were less than US\$ 6 million in 1996, and most of these exports went to South American markets, which are less demanding in terms of quality than those of the developed countries. All of the growth since then has been accounted for by exports to non-regional markets, particularly Japan and Korea. The three leading firms, including a Japanese multinational, account for three quarters of total exports, which now exceed US\$ 300 million.

The importance of these three products in non-copper exports is shown in figure 1. Starting from negligible (pork, blueberries) or very small amounts (wine), all three have exhibited strong gains over the 1990-2005 period, although wine has seen its share decline during the current decade. While this may indicate that the exports of

other products have simply expanded more rapidly, it may also signal the need for innovation in order to continue to expand at the torrid rates of the 1990s. Interviews with exporters did reveal that the industry may indeed be at that kind of crossroad.

[Insert figure 1]

In the analysis of these three products, we will focus on the following questions:

- (1) What led the pioneer to enter the industry?
- (2) Was the basic factor driving new exports the effort to discover costs or the discovery of demand?
- (3) How did export production diffuse from the pioneer to followers?
- (4) Did followers cause prices to decline in destination markets, thus dissipating the rents garnered by the leaders?
- (5) Was leadership in exporting associated with foreign investors who have specific product knowledge related to either technology, marketing requirements, or access to markets? Or were foreign investors followers rather than leaders?
- (6) What was the role of the state in fostering export diversification? With regard to state support:
 - (a) Did the state deal at all with the fact that the social returns to pioneers may have been superior to their private returns?
 - (b) Did the state provide public goods necessary for export discovery and consolidation? These include infrastructure, market opening through the negotiation of free trade agreements, country image, and, in the case of food exports, the protection of the country's zoo and phytosanitary assets. Quality control also fits in this category. Poor quality exports by one producer will have negative externalities on other Chilean exporters.
 - (c) There are other private services which are subject to returns to scale which require their centralized provision if costs are to be low enough for individual producers to have access to them. We are referring to information and technical assistance in meeting sanitary and phytosanitary norms (SPN) in importing markets, generic export promotion for certain kinds of Chilean products, and support for technology adoption, diffusion,

or innovation. In the absence of a centralized effort to provide such services, individual firms will find it difficult or not impossible to export.²

(d) Was there an effort to solve the coordination problem when key non-traded inputs were necessary to make exports possible? We will be interested particularly in human resources and in the availability of credit to innovators.

(7) If the state did not perform these tasks, did other institutions do so, for example, business associations?

II. Exports and growth in Chile

A. The analytics of export-led growth

Most approaches to economic growth and development do not distinguish between exports and non-exporting production. In practically all growth models, be they neoknesian, neoclassical, or of the endogenous growth variety, the central variables explaining growth are the investment rate and technological progress. Those who advocate a key role for exports have an empirical problem: since exports are a part of GDP, and sometimes a rather large part, rapid increases in exports have an automatic impact on the rate of growth of GDP, without there being any particular causal relationship involved.

Is there, however, something special about exports? If there were indigenous sources of productivity growth, probably not. But this is not the case in small, open and industrially backward economies, where export growth and diversification are important for two reasons. In the first place, in the absence of home-grown sources of technological change, domestic markets are small and are unable to support, from the demand side, a sustained increase in GDP. Without technical change, any growth impulse that has its origin in domestic demand must have a tendency to exhaust itself, the sooner the smaller the economy. Activities with significant economies of scales are limited by the size of the domestic market. By contrast, for a small country, international markets are very large, and, usually, do not present constraints to growth from the demand side.

² The exceptions are, of course, firms whose exports are large enough to justify the sunk costs involved.

Another reason for small and backward economies to be unable to experience fast growth without being oriented toward export markets is that a large part of these economies' technical change is embodied in capital equipment imported from the advanced countries. And rapidly growing imports of new machinery are unsustainable in the long run without vigorous export growth, which in turn is difficult without the diversification of the export basket.

If exports are indeed special, successful growth performance might require policies that stimulate the increase and diversification of exports. It would become important to support the growth process through policies that correct market failures impeding export diversification; also, given that developing countries are far from the technological frontier, under some circumstances policy might need to be oriented to the support of "infant exporting sectors".

A recent literature has found that export diversification is a powerful contributor to growth. One of the authors of this paper finds that export diversification has considerable explanatory power in a cross-country empirical model of per capita income growth (Agosin, 2007). Other recent studies have found that countries that export products that are normally exported by countries with a higher income per capita tend to grow more rapidly (Rodrik, 2006; Hausmann, Hwang, and Rodrik, 2006). New exports have important externalities: they reveal costs (Hausmann and Rodrik, 2003) or demand (Vettas, 2000) *within* a particular sector; and they also allow *other* sectors with potential comparative advantage to emerge (Hausmann and Rodrik, 2006; Hausmann and Klinger, 2006). This is largely because sectors related to those that are opened up by a new exporter tend to use similar public goods or non-tradable inputs.

What is the specific market failure that should prompt policy makers to target new exports? In an influential paper, Hausmann and Rodrik (2003, HR) link discoveries of new exporting products and market failures. In their model, factor endowments broadly explain patterns of production; however, the production of individual goods is subject to unknown production technologies and experimentation, making profitable activities in particular sectors unknown *a priori*. Once an entrepreneur has discovered a profitable product and its production technology, others can imitate him, free riding on his experimentation costs. In some instances, the entrance of these new entrepreneurs will cause international prices to fall and will drive down the profits of the initial investor. If the pioneer expects this to happen, he will have an additional disincentive to invest in the potential discovery.

Even if prices do not decline as a result of imitation, left to their own devices, private agents will under-invest in new export products, because the high likelihood of imitation where discoveries cannot be patented implies that those who do not make the investment in information can do just as well as those who make the investment. Therefore, there will be an incentive to wait and observe what first movers do and the costs that they do effectively discover.

In addition, some producers, particularly small ones that are likely to invest in the gathering of information about export opportunities, may face liquidity constraints. If these investments have social returns that are higher than private ones, relieving the liquidity constraint may have positive impacts on welfare and growth.

Liquidity constraints are one manifestation of the coordination problem. There may be others: the absence of infrastructure, labor skills, processing facilities, or public goods that are sector-specific.

There may be other reasons why there is under-investment in experimentation. Vettas (2000) suggests that one source of uncertainty is that demand is unknown and must be discovered. In his model, foreign demand is endogenous and depends on past sales. Due to two types of externalities, the firm's learning and cultivation of the market, the level of entry in the industry tends to be too low. As in the HR model, there are other firms that free ride on the first mover's investment. This means that the pioneer, while incurring the costs of opening up a new market, is unable to reap all the benefits of her investment.

In the case of the Chilean blueberries, as HR's hypothesis suggests, the basic uncertainty was about technology and costs. The demand was there: prices in the off-season in North America were high, and blueberries from different countries are virtually indistinguishable. In wine and pork, however, Vettas' hypothesis appears to account for the observed behaviour of exports, since the basic uncertainty had to do with whether there would be demand for wines and pork meat such as those that could be profitably produced in Chile. Both of these products had a long history of being produced in Chile, but they were exported in very small volumes and basically to other Latin American countries.

Chilean wine production had to be adapted to international tastes, and technologies used in the major winemaking nations had to be imported in order to meet customer demand in target markets. Once demand was discovered (or created), many producers jumped on the bandwagon, often using the same marketing channels

as the pioneers. Since the pioneers were large firms, they did not face liquidity constraints. The followers, on the other hand, were generally smaller niche producers, who were liquidity-constrained in meeting the large sunk costs of gathering information about and penetrating foreign markets. Associations of independent producers, partially fostered by the government, were instrumental in allowing these smaller firms to enter export markets.

With regard to pork, Chilean producers had to learn to produce pork meat to the specifications of consumer tastes in importing countries (Japan and Korea). This was initially accomplished by association with a large Japanese trading company. Diffusion has been much slower than in the case of wine because of the large capital requirements involved.

B. Exports and growth in Chile, 1975 to the present

The stylized facts of the growth process in Chile can best be understood by dividing the period since 1960 into three subperiods: (1) 1960-73, marked by import substitution and the dominance of copper; (2) 1974-89, the period in which the pro-market reforms were introduced by the military government; and (4) 1990-2005, the period under democracy and with more pragmatism in economic and social policy.

Since 1974, export growth has led GDP growth (see table 1 and figure 2).³ This was due partly to import liberalization and the attendant real depreciation of the currency, albeit with significant ups and downs (figure 3). Tariffs were reduced from an average of about 100 percent (with large dispersion) to a flat rate of 10 percent in 1979. All non-tariff measures (quotas, multiple exchange rates for different types of imports, and prior import deposits) were eliminated. While the common tariff was raised to 35 percent as a consequence of the 1982-83 crisis, it was subsequently lowered gradually but consistently. It now stands at 6 percent; the effective tariff, however, is even lower, perhaps half that figure, owing to the large number of free trade agreements entered into by Chile since the mid nineties.

[Insert table 1 and figures 2 and 3]

During the period since the early 1970s, the degree of openness of the Chilean economy has increased dramatically (figure 4). In 1970, exports of goods and services

³ For evidence that in Chile exports cause growth rather than the other way around, see Agosin (1999).

represented about 15 per cent of GDP (current prices). This proportion has risen consistently to almost double that proportion at present. The growth in the share of non-mineral exports has also risen very significantly. While it was less than 15 percent in 1960, it is now above 50 percent.⁴

[Insert figure 4]

Not only have exports grown, they have also diversified: in 1963 Chile had exports in 238 sectors (four-digit SITC level), whereas in 2000 the number of sectors had risen to 494. In a sense, one of the objectives of the trade liberalization policies can be said to have been achieved: exports have effectively replaced import substitution as the engine of growth. In the process, large patches of the manufacturing sector (e.g., textiles, shoes, machine tools) disappeared, but other sectors eventually emerged, mainly oriented towards external markets.

Descending to the product level, we investigated the pattern of export discoveries and deaths through time using Feenstra's standardization of the COMTRADE database, which yields consistent export statistics at the four-digit SITC level for the period 1962-2000.⁵ We consider as a discovery in a particular year those exports that, from that time onward, have permanently surpassed a threshold of one million dollars in 2000 prices⁶ and that were initially below that threshold. Figure 5 shows the number of discoveries for each year, and the number over each bar represents the average number of years that it took the products to mature, defined as the number of years between the first year the product entered the database⁷ and the year in which it surpassed the US\$ 1 million threshold.

[Insert figure 5]

During the sixties there were almost no discoveries, whereas, once the liberalization process had been initiated in the second half of the seventies, and the real exchange rate had experienced a steep depreciation, there was a significant increase in the number of discoveries. Again, during the crisis of the first half of the 1980s, discoveries go back down to nothing. In contrast, most of the discoveries are

⁴ All ratios are expressed in 1996 prices. This makes the annual figures comparable and abstracts from the effect of the huge fluctuations in copper prices.

⁵ We tried to use COMTRADE for more recent years, but unfortunately there were incompatibilities in both classifications.

⁶ Using the US GDP deflator. We modify somewhat the definition of discovery used in Klinger and Lederman (2006) to fit Chilean data and experience.

⁷ It should be noted that a commodity group enters the Feenstra database only when it surpasses US\$ 100,000.

concentrated in the second half of the eighties and the first half of the nineties. During this period, the peso suffered an important real depreciation that ended at the beginning of the nineties. It is interesting that the subsequent appreciation was followed with a lag by a fall in the number of discoveries. These begin to grow again after a new bout of depreciation beginning in 1997.

Table 2 shows the share of non-mining exports accounted for by export discoveries over the period 1960-2000, based on Feenstra's database. We can observe that this share goes from nothing in the 1960s to 34 percent in the year 2000, a sizable proportion. Moreover, there appear to be two years during which big jumps took place: one is in 1984, when the share went from 9.6 to 26.2 percent; the other in 1989, with a jump from 24.3 to 30.9 percent. Why these two years we don't really know. It could be that discoveries could begin to make a quantitatively important contribution to export earnings only after the economy had settled down following the tumultuous period of the 1970s and early 1980s (trade liberalization, seesaws in economic policy, ending with the banking and balance-of-payments crisis of 1982). The real exchange rate depreciated dramatically after the 1982 crisis and the currency remained weak for the rest of the decade. It is interesting that the contribution of discoveries to non-mineral export earnings pretty much stagnated during the nineties, when the evolution of the real exchange rate again became unfavorable to exports. Unfortunately, we don't have consistent data for more recent years, but the contribution of discoveries to export earnings may have continued to rise. For example, two of the three products that we research in detail (blueberries and pork) have experienced their most dynamic behavior during the current decade.

[Insert table 2]

Figure 6 shows the number of products that constituted discoveries at some point in time (for at least two years) and then failed to maintain exports above US\$ 1 million (in 2000 US dollars) or simply disappeared. Most of the deaths are concentrated during the nineties and were probably associated with the sustained peso appreciation of the period 1990-1997.

[Insert figure 6]

In order to study the determinants of discoveries and deaths, we conducted a count data analysis with the data discussed above. Table 3a shows the results of running a Poisson model on two dependent variables: gross and net discoveries. Net discoveries are gross discoveries minus deaths (i.e., exports that had surpassed the

US\$1 million mark and dip below it, without ever regaining that level). It can be observed that the real exchange (RER) rate is a significant explanatory variable of the number of gross and net discoveries, and that it has a positive sign in all specifications. Tariffs, on the other hand, when significant, have a negative sign. This implies that higher tariffs reduce discoveries. Real non-mining export growth (Xgrowth) and real exchange volatility (RERvol, measured as the standard deviation of the real exchange rate within the year) are not significant at standard levels of confidence.

There might be an important lag between the moment in which exports of a discovery start from zero and the moment in which the volume of these exports surpasses the US\$1 million threshold. In order to test for the existence of lagged effects from the exchange rate to export discoveries, we ran the same equations reported in table 3a but lagged the exchange rate variable five years. In this manner, we attempt to capture partially the initial conditions faced by the entrepreneur at the moment of starting her business. Table 3b reports the results. Once again, our results show that the real exchange rate is a significant variable explaining the number of discoveries.

[Insert table 3]

A second question that arises when studying the pattern of new discoveries is whether they have been important for export growth. Meller et al (1995) found that the growth of non-mining exports had a positive impact on the growth of the rest of the economy. One of the plausible explanations is the existence of externalities from non-mineral exporting sectors to the rest of the economy. Thus it is particularly relevant whether discoveries are associated with faster growth of non-mineral exports. Table 4 shows regressions in which we study the impact of discoveries on non-mineral export growth. In regressions 1-4 we include the following explanatory variables, one at a time: discoveries, cumulative discoveries, net discoveries, and cumulative net discoveries, respectively. In regressions 5-8, we control for the effects on non-mineral exports of the real exchange rate and the price of copper.

[Insert table 4]

Regressions 1-4 show that the different measures of discoveries have a positive and significant impact on non-minerals export growth. Once we add the other controls, contemporaneous discoveries and net discoveries are no longer significant, whereas cumulative discoveries and cumulative net discoveries remain significant. Indeed, a one

percent increase in the number of cumulative discoveries (cumulative net discoveries) increases non mineral exports by 0.76 percentage points (0.85 percentage points). These effects are stronger than the impact of real exchange rate depreciation on non-mineral export growth. It should be remembered, however, that we have detected an effect that goes from exchange rate depreciation to discoveries. Therefore, the total effect of exchange rate depreciation could be two-fold: it may lead to new discoveries and it may encourage additional exports from established exporting sectors.

In short, we have found that the real exchange rate (and also tariffs) has significant impacts on the pace of discoveries of new successful exporting sectors and on non-mineral exports generally; discoveries, on the other hand, are important contributors to non-mineral exports. In turn, previous work had established the importance of the growth of non-mineral exports for overall economic growth.

III. Wine

A. The Chilean wine industry in historical perspective

Winemaking is a traditional economic activity in Chile that goes back to colonial times. However, the kinds of wines produced by Chilean winemakers up to the mid-1980s were not acceptable to consumers in developed countries, and technological change on a large scale was needed for Chilean wines to sell abroad. Although Chile had exported some wine for several decades, wine exports took off only after 1985, when exports were about US\$ 10 million. As already noted, the most rapid growth began after 1990.

Figure 7 shows the evolution of export values in 2000 US dollars from 1962 to 2005. We observe a relatively steady level of exports that grows slowly since the sixties and that peaks at the beginning of the eighties, in the midst of a crisis in the industry, after which exports decline significantly until they begin a remarkable turnaround in the second half of the 1980s and consolidate their upward movement during the nineties. The rate of growth of exports has slackened considerably during the current decade, as the industry matures and needs to innovate in order to improve quality, consolidate itself in higher-price segments of the market, and reach new consumers.

[Insert figure 7]

Wine prices have been very volatile. With the data in 2000 US dollars and export quantities, we were able to construct a unit value index (figure 8). During the wine export surge of the 1990s, wine prices faced by Chilean exporters (relative to the US GDP deflator) rose by about 55 percent. Since then, prices have tended to fall, with some recovery since 2003. In the main, prices reflect trends in the world market, of which Chile is a small supplier (about 4 percent of world imports). The rise in prices during the nineties could have been the result of the successful efforts by Chilean vineyards to position themselves in higher-price segments of the market and to substitute bottled wine with denomination of origin for bulk wine bottled in the importing country.

[Insert figure 8]

The main foreign markets for Chilean wine correspond roughly to the geographic distribution of wine consumption. The main destination is the European Union (EU, excluding the United Kingdom, UK), which takes up 38 percent of exports, followed by the UK with the 19 percent, and the US with about 17 percent. Latin America concentrates 7 percent of exports. We observe a steady increase in the number of destinations, which peak in the year 2003, reaching over a hundred countries.

The climate of Chile's Central Valley, with its cold and rainy winters and hot and dry summers, is ideally suited to wine production. Wine production in Chile also benefits from the country's natural isolation: its western border is the Pacific Ocean, and, to the East, it is protected by the Andean mountain range. This gives Chilean winemaking excellent phytosanitary conditions, avoiding the diseases that can be fatal to vines. For example, during the late 19th century, Chile was the only winemaking country in the world free of phylloxera, a plague that decimated the European wine industry.

The art of winemaking in Chile dates back to the 16th century. Lore tells us that it was the priest Francisco de Carabantes who brought the first vines to the country in order to elaborate wine for the celebration of Mass. Due to favorable climate, the cultivation of grapes grew rapidly in the central region of Chile. During the following three centuries winemaking used rudimentary techniques and Spanish grape varieties. In the middle of the nineteenth century there was a substantial change, with by the introduction of French varieties. Grapes as the Cabernet Sauvignon,

Merlot, Sauvignon Blanc, etc were introduced and since then have constituted the bulk of the Chilean wine production.

During the nineteenth century several entrepreneurs, some of them linked to the exploitation of minerals, started growing vines, finding in this activity reputation and the recognition of high social status. These entrepreneurs were also responsible for developing a wide network of irrigation channels that shaped winemaking in the central valleys of Chile.

At the beginning of the twentieth century, the introduction of an alcohol tax discouraged the development of the sector. By 1938 the area planted to vines was frozen by the government; in addition, the authorities prohibited the use of table grapes for winemaking. These regulations caused the industry to stagnate, a situation that lasted until the mid seventies. During this entire period there was little or no technical change in the industry, due mainly to the restrictions imposed on the sector by official policy. Import substitution policies and the resulting overvaluation of the peso also contributed to an orientation toward the domestic market and the complete neglect of exporting.

According to Bordeu (1995), as a consequence of the sector's stagnation, the quality and types of wines produced in Chile fell significantly behind the evolution of international demand, which emphasized lighter wines. Exports were largely restricted to markets in which wine quality was not important (e.g., other Latin American countries). The great advantage of Chilean wine was its cost and the absence of serious competition in these markets, which also applied high import duties to wines produced beyond the region.⁸ During this period, white wines were oxidized and red wines were aged excessively in large oak barrels, conforming to Chilean tastes but deviating significantly from the lighter wines being demanded in developed countries. These characteristics of supply increased the difficulties faced by Chilean wines to gain access to international markets.

B. Innovation and the export drive

In 1974 the law that restricted the plantation of vines was derogated, even with the opposition of some winemakers, who argued that the law was needed to discourage alcoholism. In 1979 a modification of the law allowed the production of wine from

⁸ Since the early 1960s, Chile has participated in regional trade preference schemes.

table grapes and grapes rejected for the export market. These changes allowed producers to renew plantations and to incorporate new technology, even in the face of increasing competition from substitutes such as beer, pisco,⁹ and sodas, which had made enormous gains in the market for beverages.

Thus, by the beginning of the eighties, new vines, planted after 1974, were entering into production despite the fact that total area planted had declined. In this manner the yield per hectare increased by the replacement of old low-yield vines. Furthermore, the industry went through a process of inverted creative destruction¹⁰ as a consequence of the crisis created by the easing of previous restrictions and the erosion of its position within the domestic beverage market. These developments made producers begin to understand that they had to orient their output to international markets. The sharp real depreciation of the Chilean peso that ensued as trade was rapidly liberalized after 1974 also encouraged producers to look toward export markets.

Led by Viña Cánepa, a traditional Chilean winery, and Miguel Torres, a Spanish firm that set up Chilean production facilities in 1981, one of the early technological changes introduced into the industry was the use of stainless steel vats in place of wooden vats. Almost at the same time, Miguel Torres introduced the usage of small (220-liter) oak barrels, already in use nearly everywhere else, to replace the old 4,000-liter “fudres” in which all Chilean red wines were kept. These two innovations revolutionized the industry and raised the quality of Chilean wine, at a time when the industry was redirecting its production to international markets. The exemplary role of the success enjoyed by Viña Miguel Torres in exporting high-quality wine moved other firms to seek to enter the export market.

1. The stainless steel revolution

In 1980, Viña Cánepa, was the first Chilean-owned vineyard to introduce the use of stainless steel vats, through an importation of Vallefondri vats from the United States. These vats were very robust, having a thickness of 4-6 mm; today vats are built with better technology and are just 2-3 mm thick. Cánepa bought vats of 50, 80, 100, and 200 thousand liters. This huge investment was undertaken at a time when the

⁹ A high-alcohol liquor made from grapes.

¹⁰ We say “inverted” because the crisis was what triggered innovation and not the other way around.

peso was appreciating in real terms, and the dollar had been fixed at a price of 39 pesos. In what would become the undoing of the firm later, the investment was financed with a foreign credit. Don Pepe Cánepa was the son of an Italian immigrant who kept close contacts with the wine industry in Italy, from where he would have gotten the idea of introducing this kind of vats.

Since the vats were bought in parts and pieces, assembly was needed. By 1980, there was no experience in stainless steel welding, so Vallefondri sent an expert to Chile who could train some workers in the task. The firm in charge of the assembly was Marmevit, which had been created by a former production manager of Viña Santa Rita who realized the need for well-trained maintenance teams and equipment suppliers in the industry. Thus, Marmevit learned how to assemble imported vats and carried out the task during 1981. Soon afterwards, it started to produce small vats itself and assisted in the assembly of larger imported vats for other vineyards.

Almost at the same time, Miguel Torres was also importing stainless steel vats, and had the problem that nobody in Chile knew how to assemble them, so it had to rely on the technical support of the vats' provider, Herpa SA, from Spain, who also trained some Chileans in the assembly work.

By 1983 Marmevit and Herpa workers assembled a new lot of vats for Miguel Torres. Then Marmevit followed with the assembly of vats for Viña Santa Rita during 1986-87 and for other vineyards such as Concha y Toro. Concha y Toro also began importing Staineker vats by the mid 1980s. During this period Marmevit started sending workers to train in Spain.

In 1994, Marmevit and Herpa S.A. created a joint venture, Herpa Chile, with the objective of selling Herpa vats, while retaining the assembly work of Marmevit. This joint venture soon fell apart due to management problems, whereas Marmevit kept assembling and importing Herpa equipment on its own. By 1999, Marmevit had decided to import from Spain only the cooling system of the vats, which could not be produced economically in Chile.

The introduction of stainless steel vats, an apparently minor innovation, allowed producers to bring the quality and taste of Chilean wines up to international standards. These vats have some important properties that allow wine to be exported safely from a sanitary point of view. Moreover, in contrast to concrete tanks and large wood barrels, the stainless steel vats do not retain wine residues that can affect the taste and smell of the wines the following season. Finally, steel vats allow the

producer to control the temperature of the wine during the process of fermentation, which is fundamental when producing a good quality wine.

At the same time as the stainless steel revolution, there was another important change in the industry: the emergence of the production line in the first half of the eighties. Before, the introduction of the production line, bottling and corking were not standardized; in spite of the fact that all bottles contained three quarters of a liter, bottles were reutilized and had different shapes. By the beginning of the eighties, through their business associations, bottle characteristics were made uniform, bottle recycling was eliminated – and with it all the problems of untoward smells that cling to bottles that were used to store other products, including kerosene – and the modern production line became the industry norm.

2. Other technical improvements

Benavente (2006) has documented the fact that, until the nineties, most of the industry's innovations were transferred from abroad rather than the result of R&D activities by Chilean firms. Since then, innovation in the Chilean wine industry has evolved along several different lines. The first channel may be denominated “learning by looking”, and it consisted of foreign travel at harvest time by Chilean oenologists and viticulturists to the international centers of winemaking, mainly France and the United States. Indeed, today it is not rare for a young oenologist to make his first vintage in Chile after having participated in a few abroad. Some of the expenses of this travel abroad were originally defrayed by the government development agencies.

The second channel has been the participation of foreign oenologists in the Chilean harvest season. Some of them were sent to Chile by supermarket chains and distribution channels. In this manner, a direct exchange of experiences was produced between the main actors in wine production, the oenologists. Since then, traditional channels such as participation in professional congresses, international wine fairs, courses and seminars have become routine activities for Chilean winemakers.

As will be discussed below, during the nineties there was also a growing cooperation between Chilean and international winemakers. In addition, since the mid nineties there has been a remarkable growth in the area planted, to the levels existing at the beginning of the 20th century. Table 5 shows the evolution of the area planted by type of grape. It can be noted that the area planted to *cepa país* (the most ordinary

type of grape) has remained stable whereas other varieties have grown remarkably: by factors of 50 (cabernet franc), 6 (carmenère) or 4 (cabernet sauvignon).¹¹

[Insert table 5]

But technology transfers have not been circumscribed to the vineyard level. To improve fruit quality, wine producers have transferred newly acquired knowledge to grape growers. It is now a common practice that business contracts specify handling procedures, irrigation systems, and performance indicators such as yield per hectare. Wine producers also offer technical assistance in the field. The Chilean Development Corporation (Corporación de Fomento de la Producción, CORFO) has a subsidized technical assistance program for the development of suppliers (Programa de Desarrollo de Proveedores, PDP) that has been used extensively by wine makers to improve the quality of grapes produced by external suppliers.

Some firms have stated that an important factor promoting wine exports from the mid eighties until the mid nineties was the recession and the strong depreciation of the peso (resulting from the financial and balance-of-payments crises of 1982-83), which allowed producers to purchase at very low prices land that was suitable for the production of wines. The growth of the industry has been also linked to the discovery and bringing into production of land in new valleys devoted to growing grapes for winemaking (such as Casablanca by Viña Morandé and Apalta by Viña Montes).

Last but not least, a factor explaining the growth of wine production and exports was the evolution of world demand for wine during the eighties and nineties. According to Vergara (2000), during the second half of the eighties Chilean exports focused on the US market, due to the fact that this market shifted from demanding mainly European products in which the denomination of origin was fundamental towards producers that offered varieties utilizing modern production processes (and yielding lighter wines). Later, by the end of the eighties, Chilean producers intensified their efforts to export to Europe.

¹¹ It is interesting to note that carmenère is a variety that disappeared from France during the phylloxera crisis and now is planted only in Chile, where rootstocks had been taken prior to the onslaught of the disease in France.

C. First mover and market leader: two different actors.

1. The first mover

The Spanish vineyard Miguel Torres was what we consider the first mover in starting the new stage of wine exporting activities in Chile. This is both because this firm was the first to introduce new technology and because of its export orientation. Miguel Torres started selling wine in 1870, although the Torres family had been producing wines for about two centuries before that date. Today, Miguel Torres is a winemaker with an international reputation known for producing high-quality wines and brandies.

During the seventies, Miguel Torres, one of the descendants of the original family, went to France to study, and there he befriended Alejandro Parot, a Chilean who convinced him that the central valley of Chile presented good investment opportunities in the wine industry. It was a region with the right climate and conditions, it was free from phyloxera and had a long-standing wine making tradition, albeit one that had remained behind as regards modern production and consumption trends. Thus, in 1979 Miguel Torres made its first investment in Chile buying the Maquehua farm, comprising 90 hectares suitable to the production of high-quality Merlot and Cabernet Sauvignon. Since then, Miguel Torres has bought four other “fundos” apt for the production of other grape varieties. These investments were fully funded by Miguel Torres from retained earnings. Indeed, an important characteristic of Viña Miguel Torres is that it reinvests 95 percent of its profits and does not rely on outside finance.

Miguel Torres introduced into Chile the stainless steel vats together with the smaller, 220-liter oak barrels. These changes allowed the firm to produce a wine with international characteristics in Chile. A fundamental element in the launching of Torres' new products was the presence of a leading oenologist from Spain, tradition that is maintained until today. This was very important because this oenologist knew the characteristics of international demand and made a Chilean wine to those specifications.

In a first stage, Miguel Torres was oriented to the domestic market, but by the mid eighties it started to export. In Chile, Torres concentrated on the production of premium quality wines using its brand recognition. In addition, the firm did not

require a lower-end product for international markets, because it already had one. The output from the Chilean vineyard was marketed abroad through the distribution channels that Miguel Torres already had in its main markets. Thanks to this advantage, Miguel Torres became the first Chilean producer to export premium wines, initiative that was soon imitated by Concha y Toro in 1988.

Thus, from the early to mid-eighties, Chilean firms were able to witness the introduction of new winemaking technology, the production of wine of much higher quality, and the success of a foreign firm in exporting high-quality Chilean wine. This natural experiment, a pull factor, and the crisis that afflicted the sector at that time, the push factor, were the main determinants of the transformation of the Chilean wine industry.

We must clarify that there was no government intervention whatsoever in the investment decision and further development of Miguel Torres. Only recently has the firm received government funds to develop irrigation canals and improve the quality of their input providers.

We consider Miguel Torres to be the first mover and pioneer of Chilean wine exports. Although both Miguel Torres and Cánepa introduced the new technologies at about the same time, it was Miguel Torres that became the reference point for other Chilean winemakers. Miguel Torres succeeded in launching exports and producing a new wine to international specifications for both export and the domestic market, whereas Viña Cánepa got caught up in the financial crisis that affected the Chilean economy in the early 1980s. Moreover, after the death of one its owners, the company suffered from some managerial problems, which led to the vineyard being split into Cánepa and Terramater. Today Miguel Torres is a leader in the domestic market and its exports reached almost US\$ 10 million in 2005, whereas Cánepa's businesses have languished, with exports of about US\$ 5 million in 2005.¹²

2. The national leader

Soon after the first signs of success by Miguel Torres, the larger and traditional Chilean winemakers started redirecting their efforts towards the export market. The most outstanding imitator was Concha y Toro, a winery that had started

¹² It should be noted that Miguel Torres has a worldwide presence and that its Chilean operation is a relatively small component of its total business.

production in 1883, when it was founded by Marquis Don Melchor de Concha y Toro. This firm went public in 1933; that same year it shipped its first exports to the Netherlands.

From that time until the second half of the eighties the level of exports grew at a slow pace. An important event took place in 1965 with the release of what was then a premium wine: Casillero del Diablo. However, exports didn't take off until much later.

The technological renewal of the production process at Concha y Toro was symbolized with the release in 1987 of what is likely to be the best and most famous Chilean wine, the super premium Don Melchor. In 1986, samples of Don Melchor had been sent to Bordeaux in order to test its quality; the feedback was that there was a great potential in the wines of the company's Puente Alto vineyard, were this wine is made. The firm released the wine the following year.

In 1988, Concha y Toro signed an agreement with one of the largest distribution chains in the US, Banfi. This led to significant export growth for Concha y Toro and, as Chilean wines gained recognition abroad, for the rest of the industry. Then, during the nineties, Concha y Toro increased significantly its exports to Europe. Today total exports of the vineyard are about US\$ 215 million, and the firm's stock market value is close to US\$ 1,150 million.

With respect to funding, Concha y Toro follows the strategy of reinvesting 60 percent of their profits. In 1994, the company issued ADRs on the New York Stock Exchange, becoming the first wine producer to be listed through that mechanism. Concha y Toro has also had recourse to credits to finance its growth.

Until recently, Concha y Toro had not received governmental aid. Today, it makes use of the PDP (supplier development program), and it is also collaborating in a water management research project funded by the government.

3. Followers

The number of exporters has grown very rapidly since the mid 1980s. In 1995, the first year for which we have export data at the firm level, there were 62 exporters, whereas in 2005 there were around 330.¹³ As can be seen, the growth in the

¹³ From interviews, we gather that the number of exporters in the eighties was close to 60.

number of firms has been almost linear. In spite of the relatively large market share of Concha y Toro, Chilean wine exports exhibit a relatively low degree of concentration. Even in 1995, the Herfindahl index of export concentration was only 0.074; by 2005, it had fallen to 0.049, a level that is consistent with those found in non-concentrated industries.

There is a large array of firms participating in the industry. Some firms produce a wide variety of brands, some aimed at the low end of the market, others at more sophisticated segments. Santa Rita, Santa Carolina, and Cánepa are in this category. Other firms are small and specialize on wines that can be considered “good value for money”, up to now the staple of Chilean wine exports (among our interviewees, Morandé, Bouchon, Viu Manent). Others, also small, are already aiming at the premium niche of the market (Montes).

D. Foreign investment and strategic marketing alliances

Given the natural advantages of Chilean valleys, investors, mainly from the US and France, have centered their attention on forming joint-ventures or investing directly in the country with the objective of exporting. According to the Foreign Investment Committee (the institution dealing with approval and monitoring of foreign investment), the amount invested between the years 1974 and 1989 did not exceed US\$ 4 million. Between 1990 and 1994, FDI in the industry was a paltry US\$ 7.3 million, whereas between 1995 and 2000 these investments were over US\$ 100 million. Between 2000 and 2005 foreign investments were close to US\$ 33 million (see figure 9). These figures are consistent with the notion that foreign investors in this industry have been largely followers. With the exception of Miguel Torres, they arrived on the scene after the export wine boom had started.

[insert figure 9]

According to Agosin, Pastén, and Vergara (2000), at the beginning of the nineties Kendall Jackson (USA) established Viña Calina, followed later by Cuvee Mumm (Canada), Domaine Oriental (France), Canadaigua Brands (USA), with other vineyards.

But there is a second type of foreign investment: the joint-venture. These start at the end of the eighties. Chateau Lafite Rothschild invested together with the Chilean family Eyzaguirre-Echeñique in the Los Vascos vineyard. Together with the

Rabat family, Marnier Lapostolle created Casa Lapostolle. Mondavi (USA) and Viña Errázuriz set up Caliterra. Chateau Mouton Rothschild formed an alliance with Concha y Toro and created Viña Almaviva, which produces one of Chile's most expensive super premium wines.

Agosin, Pastén and Vergara (2000) observe that joint ventures have different objectives for Chilean and foreign vintners. For foreign companies, they are the part and parcel of their efforts to diversify into new product varieties in order to obtain some market power in different segments of the market. Chilean firms find that prestige and access to distribution networks are the main reasons why they decide to associate with foreign partners. The benefits for small vineyards also include access to foreign technology and markets.

In many cases, a foreign partnership gives Chilean producers not only distribution channels and market access but also a deeper knowledge of foreign demand. Indeed, frequently the foreign partner or distributor provides information about wine characteristics (color, taste, bouquet) that is useful to position the product in a particular market segment. As already noted, this information flow on demand characteristics started in the eighties, and it continues until today.

Some distributors have used an interesting market penetration technique for climbing up the quality ladder. They request from a vineyard a presence in at least two price segments, let us say a low- and a high-price wine. In a first stage of market penetration, it might be important to have a “war horse” wine that has an outstanding quality-price ratio which opens the market and creates a brand image. This seems to be a basic requirement on the consumer's side, before they even try a wine in the more expensive segment.

E. The role of government policy

Policies or programs specifically directed at the wine industry have been rather modest. However, the industry has benefited from generic or functional promotion policies. For example, the sector took advantage of a technology-transfer program directed at the agricultural sector in general; this program was designed to create formal links between producers and government institutions such as INIA (Instituto Nacional de Investigación Agropecuaria; see Benavente, 2006).

After 1990, CORFO initiated the creation of Centers for Business Development (Centros de Desarrollo Empresarial). ChileVid, the consortium of small and medium-size wine producers oriented toward exports, was originally funded through this instrument. The other major consortium, the Chilean Wine Corporation (Asociación de Viñas de Chile, AVC), was also created with support from CORFO. As we shall see, these sector organizations have proven to be extremely important as providers of public goods that are essential for the success of the industry in the long run.

For over thirty years, the government has had an active export-promotion agency (ProChile). Since the early 1990s, the wine industry has been an important focus of its activities. Although the volume of resources spent have not been very large, ProChile has had an important role in organizing wine tasting events abroad, promoting the image of Chile as a wine exporting country, and providing marketing information to producers. However, a major criticism to the work of ProChile has been its lack of success in establishing a strong and positive association of Chile in the minds of consumers, much as Argentina is associated with tango, good soccer, steak, etc.

CORFO's Proyectos de Fomento (PROFO) program, in the wine industry run jointly with AVC and ChileVid, has also had a favorable impact on the sector. The PROFOs are associations of independent small and medium-scale producers for various purposes, such as technology transfer and joint foreign marketing. There are sunk costs in these activities which tend to be very large for small producers, who cannot internalize all of their benefits. The associations' objective is to overcome this size limitation. According to Benavente (2006), there are 16 PROFO projects under current development in the wine industry.

A recent activity that will probably be important in the future is the sponsorship by CORFO of R&D activities that attempt to bring together business associations and universities (INNOVA). The basic idea of these associations is the organization of a business firm jointly by universities and business associations for the purpose of conducting research that is directly beneficial to producers. The technological innovations would then be sold to member firms. AVC recently was awarded about US\$3 million for setting up such a firm together with two local universities. The total assets of the firm (VINNOVA) amount to about US\$5 million. The activities involved include research into consumer tastes and various ways of

improving wines (bouquet, aroma, color, presentation, and market positioning).¹⁴ A similar amount has been awarded to ChileVid, which set up a firm in partnership with three universities. The results of these activities will be shared between these two R&D efforts.

F. The role of industry associations

For the industry, today, it is clear that the wine-country image is fundamental, and that there are important externalities in affecting it, either positively or negatively. This has been taken as a lesson from foreign experiences as the boycott of French wines due to the nuclear tests carried in the Muroroa Atol, the French opposition to the Iraq war in the American market, or the poisoning of Austrian wine in the nineties. Each one of these events has had negative consequences for the producers of the affected countries and, at the same time, has been a market penetration opportunity used to good advantage by Chilean producers. In the opinion of some winemakers, the return to democracy in 1990 was a positive image change that had a favorable impact on Chilean wine exports to Europe. If one looks at the export figures, it becomes clear that exports to Europe took off only in the nineties, while exports to the US had begun earlier.

In the industry there is a high level of awareness that the success of one producer has important positive spillovers for others and for the industry as a whole. This has led to more cooperation than competition. For example, it is not rare to see an oenologist from one vineyard consulting or working directly for another one. At the level of producer associations, the quality of marketing (labeling, branding, the art work in the label, names and blurbs used, etc) of individual producers is continuously evaluated and suggestions are made to producers for improvement.

The two business associations in the wine industry, AVC and ChileVid, have been extremely important in providing public goods indispensable for export success. In addition, they are the main link between government policy and the industry.

The business associations have played an important role in the move of Chilean wine up the quality ladder. They have been involved in relaying to producers key information about the requirements of foreign markets (quality, labeling, types of

¹⁴ Interview with Ms. Elena Carretero, Chief Executive of VINNOVA.

bottles required, cork specification, the move toward bottles that are used only once) and organizing the attendance of producers at major wine fairs of the world (trips that have been partially subsidized by ProChile and CORFO programs).¹⁵

These activities have been transferred almost entirely to a new entity created jointly by AVC and ChileVid, Wines of Chile, which is mainly in charge of marketing the concept of Chilean wine through fairs and other activities, and providing information on foreign markets. Now the effort of the two business associations have turned toward the technological innovations that are required if the industry is to enter into a new and more sophisticated level of development.

IV. Fruits and vegetables

Fruits and vegetables are particularly interesting because one would think, on an a priori basis, owing to the country's mild Mediterranean climate, that Chile should have a comparative advantage in their production. However, the protectionist policies prevalent until the early 1970s (with its effects in appreciating the exchange rate) and the absence of appropriate human capital to develop these sectors prevented them from emerging as important contributors to the country's export basket.

The promotion of sector-specific human capital played a very important role in the discovery of these exports (Escobar and Contreras, 1995). In 1965, the Ford Foundation funded an exchange program between the University of Chile (a public university) and the University of California (Programa Chile-California) designed to allow Chilean professors and students to train in California and to bring University of California professors to carry out research and establish new teaching programs at the University of Chile. Although the program was broad and covered a number of areas, it was used mostly in agricultural sciences, and particularly in fruticulture.¹⁶ The University of California trained more than 80 Chilean professors and technicians, and there were upward of 300 exchanges of high-level personnel between these two universities. The two campuses of the University of California where most of this activity took place were Davis and Berkeley. The program, which eventually disbursed about US\$ 10 million, ended in 1978 owing to the changed political environment in Chile and also a shift in Ford's funding priorities.

¹⁵ Interview with Mr. Jorge Gutiérrez, Vice President, ChileVid.

¹⁶ Some oenologists also trained at UC Davis under this program.

It should be noted that the Central Valley of Chile and California have great similarities with regard to soil and climate conditions, and it had long been thought that fruit production for export could be very profitable, in particular to take advantage of the difference in seasons between the United States and Chile. Thus the conditions were ripe for a programa such as Chile California to be very successful. Indeed, unwittingly, the program may be the first instance of a new industrial policy oriented toward creating comparative advantages in sectors where the potential for them was particularly high.

A. The development of the fruit and vegetable cluster

Fresh and processed fruit and vegetables have played a key role in Chile's efforts to diversify its exports. Export efforts began back in the 1940s; however, one can talk of an export drive only beginning in the mid 1970s. The first two varieties to be exported were apples and grapes. Gradually, other varieties came to be included in the export mix (peaches, pears, apricots). The commonality of these products is that they can use the same logistics and instalations as the first two products. Thus, in this first stage economies of scale were developed in these traditional fruits sectors. At the end of the eighties and beginning of the nineties, certain new varieties were introduced that are categorized by exporters as exotic or non-traditional. These include kiwis, strawberries, blueberries, avocados, and others. These varieties require different handling techniques, their own specific industrial instalations, and, in some cases, a more delicate transportation process. In addition, an increasing number of firms have entered the markets for processed fruits and vegetables, such as frozen and dehydrated fruit, marmalades, canned fruits and vegetables, juices, and vegetable and fruit seeds.

There are several factors which explain the country's basic comparative advantage in fruit and vegetables. In the first place, its mild Mediterranean climate makes Chile ideally suited for the production of temperate climate fruits and vegetables. Second, Chile produces in the off season in the Northern Hemisphere. Therefore, its output does not compete with that of domestic producers, and, in addition, it can fetch higher prices. Third, its relatively isolated geography, with its two long natural borders (the Andes mountain range to the East and the Pacific Ocean to the West) endows the country with excellent phytosanitary conditions and allows it to remain free from plagues. Fourth, the length of the country's territory and the many

climates along its geography that are suitable to the production of fruit crops allow its producers to supply the same products during a relatively long season. Fifth, the industry as a whole is able to supply different products to the same buyers practically throughout the year. Sixth, through sustained efforts, over time the industry has won a reputation for reliability and high-quality products.

Diversification has occurred in a variety of ways. Some of the multinational and big Chilean traders that purchase fruit from independent producers have branched out from the original variety to new ones. Buyers in export markets, after having had success with one variety, have inquired about others that were in high demand. Producers who are themselves packers and exporters have made trips abroad to explore the markets and have discovered business opportunities in new varieties.¹⁷

But perhaps most importantly, practically all fruit and vegetable exports – and, indeed, food exports in general – require a common set of public goods. The public good that is most important is meeting the sanitary and phytosanitary requirements of sophisticated importing countries. And, once achieved, if they are to continue to have access to foreign markets, Chilean producers must be protected from imported plagues and diseases. These tasks have been undertaken for decades by the Servicio Agrícola Ganadero (SAG), a government agency that works closely with producers and exporters. As we will discuss below, the trade associations in the sector have played an important role in this respect as well.

Some fruit crops can use the same or very similar logistic services: the complex transport and trading arrangements that must be made to take the product from the producer to a consumer who is located thousands of kilometers away. Once in place to export one product, the network of services (cold storage and transport, the marketing and relationships with traders and supermarkets, etc) can be used by exporters of different species.

Today there are about 75 different species of fresh fruit exported by the Chilean industry. The fruit industry has even spawned an innovation designed to protect the quality of fruit from the time it is packed to the time it reaches supermarkets in faraway destinations. This device, a generator of sulphur dioxide, emits a gas that prevents the packed fruit from developing fungi. There are six

¹⁷ Interviews with Miguel Canala-Echeverría, General Manager, ASOEX (Asociación de Exportadores) and Andrés Luna, Sales Manager, Dole Chile.

Chilean companies manufacturing it, and it is now exported to other fruit exporting countries.

In the fresh fruit segment of the market, exporting firms number over 550, over 90 percent of which are small enterprises. Exporters produce fruit themselves and/or purchase it from over 16,000 producers. Thus, while exports are concentrated in a few major traders, some but not all of which are multinationals (for example, Dole and Del Monte), there exist a diversity of arrangements that allow small firms to participate.

Perhaps the most interesting characteristic of fruit exports is the remarkable diversification that has taken place in recent years in the varieties of fruit and fruit products exported. In 1990 there were only 10 products with exports above US\$ 40 million (in 2000 US dollars), whereas this number had grown to 23 products by 2005. In addition, there are other species with much smaller export volumes that show great promise and have had an explosive rate of growth. In fact, the most rapidly growing exports in the period 1990-2005 were those that had small export volumes or were not exported at all in 1990. It is estimated that, currently, fresh fruit production (about 90 percent of which is for export) represents about 1.3 percent of GDP and employs around 450,000 workers, or 7.1 percent of the labor force (ASOEX, 2006).

Of course, there were failures in this sector as well over the period 1990-2005. This was the case with exports such as canned tomatoes and beans, which had reached export volumes of about US\$ 10 and US\$ 50 million respectively in 1990 (at 2000 prices) and have now practically disappeared from the export mix. As we will discuss below, fresh strawberries, raspberries and blackberries have also been practically abandoned by Chilean exporters. However, the successes have far outstripped the failures.

It is interesting to note that export growth in this sector has taken place through the addition of new products to the export basket or by faster export growth in products with relatively modest export values. Splicing together three different data sets,¹⁸ we were able to come up with long export series for Chile's major fruit exports (see table 6). While in the early 1960s fruit exports were concentrated in grapes, apples and pears, these varieties have exhibited rather slow export growth since the

¹⁸ These are: Feenstra's and COMTRADE, which are available at the four digit SITC level; and the Central Bank's database, which singles out items of export interest to Chile, regardless of its statistical classification.

early 1990s. The star products have been more recent additions to the export basket: kiwis, lemons, oranges and tangerines, avocados, processed fruit (marmalades, jams, juices), and, particularly, blueberries.

[Insert table 6]

The Central Bank does have a more complete database for exports from 1990 onwards, and one that is especially tailored to Chilean exports. We proceeded to calculate export growth rates for products whose export value (in 2000 US dollars) was below US\$ 10 million in 1990. These products and their export values in 1990 and 2005 are shown in table 7. The table also shows the date at which an item crossed the US\$ 1 million mark and became an export discovery, according to the criterion we use in this study. All the products whose exports individually were less than US\$ 10 million in 1990 recorded a rate of growth of exports of almost 15 percent in the period 1990-2000, or three times the rate of growth of total exports. Several of these products have become major exports, in particular blueberries and other frozen berries. All together, these exports accounted for 22 per cent of all exports in 2005.

[Insert table 7]

B. Price impacts and dissipation of rents from early entrants

Did the entry of new exporters from Chile dissipate the rents obtained by first movers from learning the business of exporting? We estimated the price change for each exported product (or group of products in some cases) relative to the US GDP deflator by comparing the change in value in 2000 US dollars with the change in volumes between 1990 and 2005 (figure 10). The change in price has as often a positive sign as it does a negative one. In some cases, it seems that price increases in international markets may have encouraged entry by Chilean exporters. This seems to have been the case of blueberries, canned and frozen fruit, tangerines, oranges, lemons, and seeds. In none of these products are Chilean exports important enough on the world market to affect price.

[Insert figure 10]

This suggests that the direction of relative price change could have gone either way and that competition from new Chilean entrants was probably not the most important factor. Only in the largest export varieties (grapes and apples) do Chilean exporters have any significant market power. In the case of grapes, Chilean grapes

account for about 75 percent of US imports (all of which are out-of-season). In apples, this percentage is around 30 percent. In blueberries, in 2004 Chilean exports to the US represented one third of total United States imports, most of the rest being imported from Canada and Argentina. However, during the off season in North America, Chile and Argentina account for almost the totality of US imports,¹⁹ with the Chilean product accounting for about two thirds of total imports. As stated by some of the executives interviewed for this study, in the fruit industry generally, competition takes place more between Chilean exporters and those from other countries in the market (South Africa, Australia, New Zealand) than among Chilean exporters themselves.

There have been, of course, some cases of falling prices owing to the exuberance of Chilean exporters. Perhaps the most dramatic is kiwis. Between 1985 and 1993, the entry of Chilean exporters caused a huge decline in relative prices: the price of kiwis deflated by the US GDP deflator fell by about 85 percent! The Chilean industry recovered only after 1997, and has continued to grow strongly since then, partly at the expense of producers from higher-cost countries. In the case of avocados, there have also been precipitous price declines, although these are unlikely to have been caused by Chilean producers, since their exports represent a relatively small percentage of world consumption, Mexico being the largest producer.

C. The provision of public and semi-public goods: government and business associations

According to industry representatives, the government has played four basic roles in promoting the cluster. Pride of place is taken by the Agriculture and Livestock Service (Servicio Agrícola Ganadero, SAG), a branch of the Ministry of Agriculture in charge of sanitary and phytosanitary norms (SPN). Protecting Chile's naturally sound phytosanitary conditions has been a permanent concern of this agency, and this has played a major role in Chilean food export development. The SAG also disseminates information on best agronomical practices, it ensures that SPN norms in importing countries are met by individual producers, it issues SPN certificates for export to major markets, and it negotiates agreements in this area with importing countries.

¹⁹ Information provided by Felipe Julleriat, Marketing Director, Vital Berry.

A second government action in providing a key public good has been the negotiation of free trade agreements with practically all importing countries: the United States, the European Union, Korea, China, Mexico, most Latin American countries, and, most recently, Japan. Chile is one of the countries that has negotiated the most free trade agreements. Practically all executives interviewed began by stating that these diplomatic successes had been a key factor behind the growth of fruit exports.

Third, in recent years there has been a great deal of attention to R&D, and several government agencies have become involved in this task. As already noted when discussing wine, The INNOVA program provides funds on a competitive basis to consortia of a business association and universities for technological innovations. The Exporters' Association (ASOEX) is participating in one of these projects through a special business unit, with the objective of developing new varieties of fruit through the application of vegetable genomics and other biotechnological advances.

The fourth area of government involvement has been export promotion, through the campaigns of ProChile in the creation of a "country image" and the dissemination of commercial information. Participation in fruit fairs abroad was cited by several of those interviewed as being of particular importance. ProChile personnel work closely with industry executives and business associations in organizing participation in these fairs.

Despite these undoubtedly beneficial actions, what strikes the observer is the relatively modest role of the state in the development of the industry. Beside the efforts mentioned above, there hasn't been a great deal of deliberate industrial policy toward the sector. This may now be changing as the emphasis shifts from producing commodity-like crops to genetic engineering, which requires R&D as a basic input.

The most insistent complaints of the business people interviewed had to do with the uncompetitive level of the exchange rate (which has appreciated very substantially in the past two years as copper prices and export volumes have soared). Given the huge importance which this activity has for exporters, most of those interviewed, while praising SAG, complained that the volume of resources allocated to the institution was too small and that it was too slow in granting its permissions and certifications.

Both in the case of fruit as in that of wine, business associations, and in particular ASOEX, have provided important public goods to exporters, which would

have been very difficult to finance by individual firms. Its role in R&D has already been mentioned. In addition, it has provided sanitary certifications and quality control procedures that are demanded in importing countries. There is a bewildering array of regulations in the major importing markets that have to be met in order to be able to sell in them. ASOEX has developed a norm of good agricultural practices, ChileGAP, based on the European Union's (EUREPGAP). It has obtained recognition for these norms from European supermarkets, and now it is enough for Chilean exporters to meet Chilean quality norms to be acceptable by European Union importers. It should be noted that the industry is moving rapidly toward the elimination of intermediaries, and fruit is tending to be imported directly by supermarket chains, thus giving supermarkets a much larger role in the importing decision.

Along the same lines, ASOEX negotiated with the United States to have Chilean fruit inspected by the US Department of Agriculture before it leaves Chilean ports. For this service, it charges its members a fee to defray costs.

V. Blueberries

Berries, and particularly blueberries, are one of the success stories of Chilean exports in the period since 1990 (see figure 13). Berries were not an important export item in the early 1990s. In fact, out of total non-copper exports of US\$ 4.2 billion, berries accounted for about US\$ 25 million in 1990, with blueberries not even reaching US\$ 200,000. Fresh and principally frozen raspberries and blackberries began to be exported in 1982, but the explosive growth in berry exports took place after the mid 1990s. Although berry exports in general have grown rapidly since the mid 1990s, it has been blueberries that have exhibited one of the fastest growth rates among all fruit and vegetable exports; indeed, among all Chilean export products. Whereas it barely appears among Chilean exports in the early 1990s, by 2005 it had become the fifth largest fruit export in value terms. The rate of growth in the value of exports of blueberries (deflated by the US GDP deflator) was over 40 percent per annum between 1990 and 2005. It was only as recently as 1993 that blueberry exports surpassed the US\$ 1 million mark (in nominal terms). In 2005, blueberry exports were US\$ 95.3 million. Whereas in 1995 there were only two exporters, only one of which exported more than US\$ 1 million, in 2005, 59 firms exported blueberries, of which 11 exported values higher than US\$ 1 million.

[Insert figure 11]

A. Why did Chilean producers begin to export blueberries?

Blueberries are not consumed in Chile. Therefore, from the beginning, production aimed at the export market, particularly that of the United States. The US is the main export market for the three exporters interviewed, Vital Berry, Hortifruit, and Driscolls, but they do export to Europe and Asia. Vital Berry and Hortifruit are Chilean firms; the former is owned by five partners who are also growers, the latter is a family firm with important interests abroad. Driscolls is a major multinational in berry trading.

The principal advantages of Chilean blueberries are those of Chilean fruit generally: off-season production, high-quality fruit, climate conditions favorable to blueberry cultivation, good phytosanitary conditions. Hortifruit and Vital Berry began exporting raspberries back in the early 1980s and were able to use to good advantage what they had learned when they decided to switch to blueberries.

Blueberries arrived to Chile in 1979 through a governmental initiative carried out by the INIA (National Institute for Agricultural Research). The government wanted to extend the development of agriculture southward in the the Central Valley to climates that were colder and more humid than those of the traditional agricultural zones of the country. For this purpose, INIA tested the adaptation of blueberries, sarsaparilla and redcurrants, among others, to Chilean climate and soil. About twenty plants of 12 varieties each were planted. The results indicated that blueberries adapted well to the soil and climate of the Regions IX and X (in the south of the Central Valley). During the period that followed, INIA developed micropropagation techniques, trained researchers in the production of blueberries and provided technical assistance to potential users of its research. All these activities were fundamental in the subsequent development of the industry.

Commercial blueberry production was initiated by Fundación Chile and private partners in the blueberry-producing region in 1985.²⁰ Fundación Chile and its

²⁰ Fundación Chile is a venture-capital-cum-innovation firm owned 50 percent by the government and operated as a profit-making enterprise. In the early 1980s it was responsible for the introduction to Chile of cultivated salmon production and exports, perhaps the greatest success in new export production in Chile over the last decades. It should be noted that Chile is now the second largest exporter of salmon in the world, behind Norway.

partners set up a private firm (Berries La Unión) to experiment with the planting and production of blueberries. In this task Fundación Chile was able to draw on the information gathered by INIA, and utilized its experience. The country was just emerging from the banking and balance-of-payments crisis of 1982-83, and Fundación Chile was prospecting for new exports that could be produced profitably in a particularly depressed geographic area (Regions IX and X). There were other experimental efforts in blueberries at the time, by Universidad Austral, in Valdivia, now one of the major blueberry production centers (Region X), and by UTC, a fruit exporter. What these efforts revealed to other, potential entrants was that high-quality blueberry production could be undertaken in Chile to meet out-of-season demand in the United States market at very profitable prices.

In 1992, after production proved to be successful, Fundación Chile sold its participation. Nonetheless, the entirely private firm that emerged from that venture went bankrupt owing to poor management decisions, and its assets were sold to a producer that sells its output of blueberries to one of the medium-size exporters, Sun Belle Berries.²¹

The rapid growth of blueberry production was the result of investments made by other firms, in particular the two market leaders, Vital Berry and Hortifruit, firms that began exporting them in large quantities toward the mid 1990s. These firms have the business savvy that Berries La Unión lacked.

B. First movers and followers

Vital Berry is the product of an association of five exporters of raspberries, who founded the firm in 1989 with the objective of ensuring the availability of raspberries for the US market. The first partner to produce and export blueberries in 1994 was Ignacio del Río, who settled in the Temuco area (in Region IX), where weather is cool and winters are rainy, after making a trip to the US to explore the market for blueberries. Del Río did have some contacts with INIA and learned about blueberries from them. Although we don't know for sure, the experience of Fundación Chile with Berries La Unión was probably common knowledge among producers of small fruit

²¹ Information provided by Plutarco Dinamarca, consultant on berries for Fundación Chile in the 1980s.

crops in Chile. Now, practically all of Vital Berry's fresh berry exports are blueberries.

The second largest exporter, Hortifruit, is a family-held firm. It also started out exporting raspberries in 1982, and during the the late 1980s turned to blueberries, which now represent about 80 percent of all its exports. It started planting blueberries in 1985-87.

In fact, exports of fresh strawberries, raspberries, and blackberries have tended to decline and be replaced by blueberries. The main difficulty for Chilean producers is the distance to consumer markets and the high attendant transport costs. In the case of raspberries, the delicate post-harvest process makes maritime transport unviable, and air freight costs are much higher than for competitors that are much closer to the consumer markets, such as those of Mexico. Blackberries grow well in many climates, and Mexican producers, again, are much closer to the market. They have completely displaced Chilean exporters from the US market. Strawberries are highly perishable, a fact that makes distance an important stumbling block to their export from Chile. Fresh blueberries, on the other hand, are sturdier and do require special climate and soil conditions that are met in certain regions of Chile (and also Argentina) but not in Mexico. In the case of frozen berries, of course, the situation is quite different, since they don't require special handling. In these products, Chile has remained highly competitive. The remarkable difference in the export performance of fresh and frozen strawberries can be seen clearly in figure 12.

[Insert figure 12]

The major exporters of blueberries are Vital Berry, Hortifruit, Agroberries, Vitafoods, Driscolls, and Comercial Frutícola. All of these firms export more than US\$ 5 million each and, together, the value of their exports represents 85 percent of all blueberry exports from Chile. There are 51 other smaller blueberry exporters identified in ProChile's database by exporting firm. The largest exporters produce their own blueberries but also purchase significant quantities from independent producers. Hortifruit claims that it sells plants to its suppliers at preferential prices, but there doesn't seem to have been any effort to develop a customer base for plants, such as was the case with the pioneer blueberry exporter in Argentina (see Sánchez, Rozemberg, Butler, and Ruffo, 2006, prepared for this project). Exports are still dominated by the largest companies in the sector.

How did the production of blueberries for export disseminate from Vital Berry and Hortifruit to other exporters? According to the executive interviewed, information is readily available and there are no impediments to entering the market, other than the fact that a large initial investment is required (estimated by him as about US\$ 80,000 per hectare). On the other hand, the owner of Hortifruit claims that the firm lost highly qualified workers, both in the exporting and production fields, to other newcomers to the export business.

A key input is, of course, finance. Vital Berry itself faced severe financing constraints in the beginning, which were overcome through advances from the trading firms that bought their products in the US. There was no assistance by the government to relax these financial constraints.

The executives interviewed did not think that prices had declined owing to the rapid growth of Chilean exports, although one of them warned that the market would not be able to absorb at current prices the large increases in Chilean exports that can be foreseen in the next few years. As can be seen in figure 13, unit values (in 2000 prices) have held pretty steady, in spite of the surge of US imports from Chile and Argentina. Prices have in fact already declined from their highs in 2000, but they are still considerably above their levels in the early 1990s; and they are judged to be very profitable by exporters.

[Insert figure 13]

C. The importance of the marketing connection

Both Hortifruit and Vital Berry invest in other producing countries. Both firms produce in Argentina, which allows them to complement their supply of produce from Chile at a later time in the season, when the Chilean crop has already been exported and Argentinean production is coming on stream. Hortifruit is also a large producer of blackberries in Mexico. Both firms have joint ventures in the US, Hortifruit through a company in which it has a one-third ownership,²² and Vital Berry with a large

²² This company is called Global Berry Farms. Its partners, besides Hortifruit, are the Michigan Blueberry Growers Association (MBGA), a large marketing cooperative representing 25 to 30 percent of North America's cultivated blueberries, and Naturipe Berry Growers, a California marketing cooperative that represents 8 to 10 percent of California's fresh strawberry sales. Prior to the founding of this joint venture, Hortifruit had a marketing contract with MBGA dating back to 1991.

marketing firm. In the US, both firms sell exclusively through their joint ventures. In Europe and the UK, Vital Berry channels all of its sales through specialized traders.

On the other hand, Driscolls is itself a multinational firm from the US and one of the largest marketers of berries in the world. It used to purchase blueberries from a Chilean firm (SRI); it bought SRI a year ago and set up a subsidiary in Chile. It should be noted that SRI was one of the pioneers in the exports of Chilean blueberries in the early 1990s, together with Vital Berry and Hortifruit. SRI had begun in the fruit export business exporting “big” fruit (grapes, nectarines) to Brazil, Argentina, and Mexico. The problems experienced by Mexico and Argentina after the December 1994 financial crisis led SRI to attempt to diversify to other fruits and markets. Thus it started to sell blueberries in the US through a contact the owner had made with Driscolls. Now Driscolls is mainly an exporter of blueberries produced by others. It purchases about 70 percent of the blueberries it exports, through long-term contracts with producers, to whom it gives technical assistance in production and quality requirements in various markets (mainly the US and Europe). Driscolls has brought in its own technical staff from abroad for these purposes.

D. The role of government, now and in the next stage

All of these relatively large exporters have worked closely with independent producers in order to meet their export objectives. This has involved technological assistance, quality control, and help meeting SPN. In the latter, SAG, again, has played an important role. In addition, all firms have used CORFO’s program of supplier development (PDP), already mentioned above.

The importance that CORFO is now attaching to R&D is likely to be welcome by the major blueberry producers. The larger exporters have started to stress the need to carry out more R&D to differentiate their products and to improve quality (taste, juiciness, color, size, etc). In fact, Vital Berry has begun investing in R&D. These investments are oriented not only to blueberries but also to other varieties that are not yet exported in large quantities because of technical reasons or because Chile has not yet subscribed SPN protocols in these crops with the importing countries. Thus Vital Berry is actively researching the technical requirements for exporting persimmons, kakis, and figs, for which purpose it has an agreement with a university in the United States to undertake research leading to the export of these new products. The

executive interviewed claimed that what had been learned exporting blueberries, the contacts made and the logistic chains used would be very useful in any incursion into the markets for other products.

Hortifruit is already diversifying into other products such as figs and asparagus. In addition, as noted, they have diversified locations to make use of the comparative advantages of different countries in the production of different products.

VI. Pork meat

A. A new star is born

Pork meat is an even more recent export discovery than blueberries, and perhaps an even more successful one. There had been some exports of this product since the late 1980s to the less demanding Latin American markets, but it was in 1997 that they took off, going from US\$ 6.6 million (in 2000 US dollars) to US\$ 26.5 million. In the period 1996-2005, exports grew at a rate of 51.1 percent per annum! Exports today are US\$ 272.3 million (2000 dollars; US\$ 305.6 million in current dollars). Figure 14 shows this remarkable growth.

[Insert figure 14]

Pork shares some of the advantages of Chilean fruit in the international market. Chile's geographic location between the Pacific Ocean, the Andes the Atacama Desert, and the South Pole have prevented the introduction of most exotic swine diseases. The only three that have been detected (FMD, Newcastle, and Swine Fever) have been eradicated. Benign climate conditions (low humidity and rainfall, and moderate temperatures ranging from 30 to 90 degrees Fahrenheit) favour swine reproduction and productive efficiencies, and reduce energy costs. One big disadvantage of pork production and exports is the relative capital-intensive nature of any successful operation, which means that there are entry barriers that prevent a rapid spread of the export discovery.

B. Market structure

Exports outside Latin America began when Nippon Meat, the subsidiary of a Japanese multinational in the food business, began exporting frozen pork meat to the Japanese

market. Nippon Meat arrived in Chile with the intention of exporting sea urchins. While it is still in that business, pork exports are now its chief business in Chile. It started prospecting for suppliers of pork for the Japanese market in the mid 1990s when foot and mouth disease hit Taiwan and Denmark, the two main suppliers of pork meat to Japan. It found that Agrosuper, a diversified producer of food products, already exported pork to Latin American markets. So did other firms. The first export to Japan, by Nippon Meat, which purchased the product from Agrosuper, took place in 1997. The advantage of Nippon Meat is its marketing channels in Japan and its knowledge of the Japanese language and culture, which are barriers for Chilean firms. The advantage of producing in Chile is that the country has excellent phytosanitary conditions, such as being free of foot and mouth disease. The executive interviewed said that SAG certification had made an important contribution, because it had gained recognition from the Japanese authorities. European destinations are now appearing attractive, but the European Union requires its own certification, and Chile has only three plants that are certified by the EU.

Nippon Meat does not produce pork meat. It has a supply contract for export to the Japanese market with Agrosuper. All of its exports from Chile are purchased from Agrosuper. Originally, it also sourced pork from FRIOSA (Frigorífico O'Higgins S. A.). FRIOSA withdrew from this tripartite agreement in 2001, seeking to sell its product through traders rather than through Nippon Meat. The intention of the agreement was to create a brand that could differentiate the product and be adapted to the tastes of Japanese consumers. In this, the relationship between Agrosuper and Nippon Meat has been extremely successful. Between the two of them, they export almost US\$ 200 million, while FRIOSA's exports have remained below US\$ 35 million.

Agrosuper is a very interesting company. It is family held and now its sales, within Chile and for export, are worth about US\$ 1,200 million. It started out as a producer of eggs in 1955, later branching out to chickens and chicken meat. It created a brand name (Super Pollo) that has wide recognition within Chile. Later, through greenfield investments and acquisitions, it diversified into fresh and processed fruits, turkey meat, salmon, wine, pork, sausages and hams, and, very recently, olive oil (a new export product, with an excellent chance of becoming an export discovery). It is a vertically integrated firm producing feed, raising hogs, and processing them into pork meat. This helps them insure the quality of the pork produced, which is tailored

specifically to individual consuming markets. In the case of Japan, with the assistance of Nippon Meat, they developed a brand that was suited to the demands of Japanese consumers (Japan Andes Export), which has similar characteristics to the pork that is consumed in Japan. In order to achieve this, Agrosuper practiced genetic engineering with the objective of obtaining products that would sell in the demanding Japanese market (in terms of taste, juiciness, color, consistency). In Japan, Agrosuper's exports (through Nippon Meat) now represent three percent of imports.

Likewise, in Korea, the second largest market for Agrosuper's pork exports, Agrosuper's share of imports is now 15 percent, exceeding that of US producers, who are a traditional source of imported pork. Its success is due to its diligence in producing a product that is tailored to the demands of Korean consumers. Agrosuper sells to three large importers exclusively and has developed a specific product for each importer. Its emphasis is on long-term relationships with importers. The executives interviewed claimed that Korean consumers were unable to tell the difference between domestically produced pork and Agrosuper's product. This allowed the latter to be considered "Korean" and to fetch higher prices than other imported pork. For US and European exporters, the Korean market is treated as a residual, and they do not tailor their products to the market or have exclusive sales arrangements with importers. This has given Agrosuper's products an edge: not only are its costs lower, but its products fetch higher prices at the wholesale level.

Agrosuper uses the latest technology in the whole chain of production. It does R&D at the level of breeding, but in the processing operation it uses imported technology. It does not appear to have a financing constraint. This may be due to the fact that it is a conglomerate and that it applies profits from one product to fund investments in others. Its executives claim that the firm does not lose personnel to competing firms, because it pays above-market wages and working conditions are such that workers are highly motivated to remain with the firm.

Another source of strength is the fact that Agrosuper has developed its own international marketing network with its opening of offices in Tokyo, Atlanta, Mexico City, London, and Milan. These offices are in charge of the marketing aspects of exports, including product development to suit the demands of local consumers. The Tokyo offices handles marketing in Korea and other parts of Asia.

There are other Chilean exports of pork meat, but they are much smaller. As already noted, Nippon Meat and Agrosuper account for about two thirds of Chilean

exports.²³ Other exporters do not produce all of the hogs they process and must rely on other producers, without being able to control the quality of the product. They rely on traders in the destination markets for their exports.

Agrosuper executives claim that it is difficult to replicate the firm's model, because it requires the development of vertically integrated production, something that is highly unlikely for domestic firms, given the capital requirements of such an operation. They suspect that the only competition could come from foreign investors with financial clout who might discover the very favourable conditions of producing pork meat in Chile. In fact, expansion of pork exports looks likely to come mainly from Agrosuper itself. Plans are well-advanced to invest in an integrated hog farm cum processing operation in the northern end of the Central Valley (Huasco), at a cost of US\$ 500 million. In addition, the company will build a special feed facility specifically for this operation. This area presents excellent phytosanitary conditions, is close to a major port, and land and labor are cheap. As a result of this investment, Agrosuper's pork exports are planned to double by 2010.

Nonetheless, other smaller producers have also been able to export pork. One such firm is Agrícola Industrial Lo Valledor, whose exports of pork started up in 2000 with a very small volume (less than US\$ 150,000) and now surpass US\$ 20 million. Lo Valledor is a large producer of beef for the Chilean market. It also has exported beef since the mid-1990s. It started in the pork export business as a result of inquiries from its buyers of beef. In fact, it started producing pork for export markets and then diversified to the domestic market. The exports of pork have received a big boost from Japanese (Mitsui) and Korean traders that have come looking for pork suppliers, partially as a result of the successes of the Nippon Meat-Agrosuper partnership. They do not produce all of the hogs they slaughter and must buy supplies from independent producers. They claim to make efforts to meet quality requirements of Japanese and Korean customers. However, the fact that they do not have hog-raising facilities is an impediment to the total quality control exercised by Agrosuper. SAG inspectors work inside their plants to ensure they meet SPNs in their major markets.

²³ Since all of Nippon Meat's exports are purchased from Agrosuper, they should really be considered to be Agrosuper exports.

B. The role of government

The government has played a marginal role in the development of pork exports. Perhaps the largest contribution comes from the quality-control and phytosanitary preservation activities of SAG. But even this is contested by Agrosuper executives, who claim that SAG is woefully understaffed and that the company has had to defray most of the costs of supervising quality norms that must be met to export to different markets.

In the future, the recently negotiated free trade agreements with major importers could provide the necessary space for a major increase in exports. In the case of Korea, the FTA went into effect in April 2004. Korea has a tariff of 25 percent on pork imports. As a consequence of the FTA, it was immediately reduced to 20 percent and will continue to decline annually in a linear fashion, reaching complete free trade in 2014. China is a potentially huge market for Chilean pork, and Chile and China signed an FTA in 2005, that went into effect on January 1, 2006. Pork imports are affected by tariffs that range between 12 and 20 percent. The treaty calls for a linear reduction of all tariffs on these products in five to ten years, depending on the product line. Negotiations of an FTA with Japan are expected to be concluded in November 2006; given the sensitivity of pork for Japan, imports of this product have not been negotiated and are unlikely to be liberalized very significantly. Japan has a system of domestic price supports for pork, implemented with a variable tariff. Even so, Chilean exports to that market have soared.

The role of the trade association, ASPROCER (Asociación de Productores de Cerdo) is very incipient. It has worked mainly in disseminating information on the quality requirements of different export markets. Given the dominance of one company, it is really Agrosuper that supports ASPROCER rather than the other way around. Agrosuper executives claim that ASPROCER is mainly a medium of communication with the government.

VII. Export discoveries, diffusion, and policy

A. The emergence of new export activities

It comes as no surprise that the three export discoveries we have concentrated on (wine; fruit, with an emphasis on blueberries; and pork) have been in the food sector. Although not by design, many new exports have arisen in these industries. Climate and land resources – in short, comparative advantage – in Chile is undoubtedly in this sector.

Why did these products not develop earlier? Wine, fruit, and pork have long been produced for the domestic market, but not with the quality that would have permitted significant exports. Only after the opening of the economy – with falling tariffs, that made producers look at export markets, and the availability of foreign exchange with which to import capital equipment suitable for export production – did large volumes of exports become a possibility. The exchange rate depreciation that followed the opening up to trade also helped to orient producers to foreign markets. Still, there were many obstacles to be surmounted. The major one was producing products that were of the quality demanded in foreign markets. In two fruit varieties (apples and grapes), this was achieved earlier than in other products. But the logistics of exporting these varieties and the building up of the public goods that were specific to the food industry proved crucial to the spread of food exports to other products.

B. Foreign and domestic first movers

Foreign investment has played a major role in the activities of the pioneer in both the wine and the pork stories. In wine, it was the arrival of Miguel Torres and this company's introduction of steel vats and small oak barrels that made it possible for a Chilean winery to produce products to European and US consumer specifications. In the case of pork, a foreign trader, Nippon Meat, had a large role to play in the modernization of the industry in the mid 1990s. Its association with Agrosuper was essential for kick-starting the expansion of Chilean pork exports.

The case of blueberries is somewhat different. There were no foreign first movers. An initial effort (Berries La Unión) failed, but for reasons other than the suitability of Chile as a location for blueberry production. This experience seems to

have encouraged others to try again. The leaders, Hortifruit and Vital Berry, were extremely successful and now have operating facilities in Argentina and their own marketing arrangements in the United States.

C. Diffusion

In the wine industry, the followers learned basically by looking and taking cognizance of the new methods imported by Miguel Torres. The crisis of the domestic-oriented Chilean wine industry in the early 1980s, together with the huge depreciation of the exchange rate following the balance of payments crisis of 1982, were certainly persuasive as to the advantages of exporting. Some of these followers, particularly Concha y Toro, the leading winery in Chile today, surpassed, and by much, the export volumes of Miguel Torres, whose production is now concentrated on serving the domestic market. To put it in a nutshell, Miguel Torres occupies number 24 in the list of exporters. Its exports are less than US\$ 10 million, compared with Concha y Toro's exports of about of US\$ 215 million.

How did diffusion take place? We have already mentioned "learning by looking". In addition, some oenologists who had trained with traditional wineries decided to try the new methods and started their own businesses. This was the case of Aurelio Montes, who was the chief oenologist for San Pedro, a traditional firm. With three partners he started Montes, devoted to the production of premium wines for export. The firm now has production in Chile and Argentina and is starting a joint venture in California. Other first class oenologists hired out their services to start-up firms. This was the case of Viu Manent, a boutique producer of fine wines, which received technical assistance from Aurelio Montes.

Foreign investors were also present in the diffusion process. Once Chilean wines had established a reputation abroad, several large firms with strong international reputations came calling.²⁴

Diffusion has involved not just copying what the leader did but a great deal of innovation by creative oenologists and ingenious marketing experts. Chilean producers were quick in adopting new technologies. They have also experimented

²⁴ Parenthetically, that is precisely what happened in salmon. Foreign investors arrived *after* Fundación Chile had been successful in demonstrating that salmon cultivation for export was feasible and profitable.

with many grape varieties that are not traditional to Chile. They have even rediscovered a variety, carmenere, which had disappeared in Europe during the phylloxera crisis of the 19th century. New wineries and new endeavors by established enologists seem to sprout every day.

A key element of their success was the creation of a reputation for Chilean wines by the pioneers (not only Miguel Torres, but also Concha y Toro and Los Vascos, a vineyard that is a joint venture between a Chilean winemaker and Chateau Lafite, of France). Thus, the first movers created demand for a Chilean product, an investment from which many others profited.

In the case of blueberries, diffusion was technically easy but economically difficult. The investment cost of setting up an operation for export is large by Chilean standards. Nevertheless, there has been quite a bit of diffusion. There are a large number of smaller exporters and many more producers of blueberries who export through the larger firms. The arrival of a foreign firm, the world's largest trader of blueberries (Driscolls) is indicative that foreign investment may play a role in the future.

More generally, in fruit exports, there is evidence of what we could call "horizontal" diffusion, akin to Hausmann and Klinger's (2006) analysis of firms jumping from producing one product to export markets to others that require the same or similar public goods and non-tradable inputs. That is, the emergence of a new variety seems to lead exporters and producers to attempt to develop yet other products for export markets. Both established firms and newcomers show a keen interest in experimenting with new varieties of fruit exports.

Diffusion has been limited in the pork industry. Most of the followers of the agreement between Nippon Meat and Agrosuper are small and produce a basically different and lower-quality product. Given the high capital intensity of this type of export and the need to have vertically integrated production facilities to produce the kind of product demanded by consumers, it seems that the expansion of exports, which could be very strong, will come basically from established producers or from foreign entrants. Very recently, the Perez Companc holding (one of Argentina's largest economic groups) purchased Friosa, the firm that pulled out of the agreement with Nippon Meat. This may be a harbinger of a large capital injection, leading to much larger exports. Thus the first mover, Agrosuper, may, perhaps, soon be followed by at least one large follower. In addition, the successes enjoyed by Agrosuper have

encouraged other meatpackers to try to sell through traders in pretty much the same markets (Japan, Korea, and other Asian countries). Traders themselves have appeared looking for supplies.

D. Counterfactuals

All three products present interesting counterfactuals. In the wine industry, Cánepa failed to take off because it got caught up in the financial crisis of 1982. It had financed its technology investments with dollar-denominated credits at the fixed exchange rate prevailing between 1979 and 1982; the depreciation of the currency as a result of the crisis almost caused it bankruptcy. And, while it exported part of its production, the largest share was for sale in the domestic market. By contrast, Miguel Torres is an extremely conservative company, financing all of its investments through retained earnings. Moreover, it has the very broad financial shoulders of its Spanish parent company. Concha y Toro, too, is very loathe to take on debt. These latter companies, particularly Concha y Toro, were extremely successful and widely emulated.

In other words, in an emerging-market setting, there are macroeconomic risks that must be addressed. Those who do so tend to survive and even prosper; those who don't, fall on hard times.

In berries, the original push to export fresh strawberries, raspberries, and blackberries didn't pan out. Due to their delicate nature, these products must be exported by air. Chile is very far from consumer markets, and Mexico is right next to the United States, with the additional element that these products do not require the special climatological conditions of blueberries and can be grown in climates.

In pork, experience showed that producing a commodity-like product is much less profitable than working to the specification of clients. However, this latter option is much more demanding, requiring vertically integrated production and a financial clout not available to many firms.

What these experiences appear to tell us is that *discovery of comparative advantage* (fresh blueberries and frozen berries, rather than fresh raspberries or blackberries), the *creation* of demand (varietal and premium wines from the specific Chilean *terroir*) and the *adaptation to existing customer demand* of products with cost advantages (pork) are key to success. Those firms that produce generic products

without worrying about demand conditions or about creating a demand for a niche product will do much worse or will wind up going out of business.

E. The role of government

1. The bad news first

Government has played a relatively modest role in the emergence of these new exports. There is little evidence of a deliberate policy to promote particular sectors or even new exports in general. In fact, the official stance of policymakers has been one of complete neutrality. To their own peril, Chilean policy-makers certainly do not subscribe to the view that they are “doomed to choose”. Subsidization of new sectors has been almost totally absent since the military coup, and these policies have largely been continued by the democratic governments in power since 1990.²⁵

Policy makers have been skimpy even in the realm of horizontal policies Even that preserve neutrality at the sectoral level. Perhaps the exception has been the fostering of R&D at the enterprise level through a series of funds that are open for bidding by consortia of firms and universities from any sector. However, R&D remains a weak link in the competitiveness of Chilean enterprises. The new emphasis on profitable R&D undertakings between business associations and universities in already successful industries may yield better results than throwing money at any project that can win a bidding contest.

One of the main complaints of the firms interviewed, especially the medium-size and small ones, refers to the scarcity of financing, both for investment and for working capital. In fact, the most successful firms among those interviewed were those that had developed over time a strong financial clout and did not need to seek financing from the market for their investment plans. This was the case of Agrosuper and Concha y Toro, firms that finance investments exclusively or largely out of reinvested earnings. In addition, Agrosuper is a food conglomerate, which enables it to have an internal capital market. Others, such as Miguel Torres or Driscolls, are

²⁵ Of course, the major, and glaring, exceptions have been the forestry sector, which received a large helping hand from the government in the mid-1970s (see Agosin, 1999; and Rossi, 1995); and the debt-equity swaps of the 1985-89 period, which were used, deliberately or unwittingly, to subsidize investment in some sectors, including pulp and paper (but also in finance!). By and large, these interventions went in the direction that comparative advantage considerations would have suggested.

multinationals with access to financing beyond the confines of the Chilean financial market. The relatively slow rate of diffusion perhaps has something to do with the overly prudent approach of policy-makers to the finance issue. Chilean development agencies do not seem to have yet solved the riddle of how to provide financing for new ventures without incurring in the moral hazards that such activities may engender.

2. Programa Chile California: An inadvertent paradigm?

Programa Chile California shows the importance of the transfer of skills and existing foreign technologies. It is hard to think of a more successful program from the point of view of social profitability. With a mere US\$ 10 million grant from Ford Foundation to the University of Chile, an entire export industry was given an indispensable boost. Could the industry have developed without the program? Of course, we will never find out. It is probable that it might, but at a much slower pace. This experience should have demonstration effects, and, up to now, they have been scant indeed. The next step in the development of Chilean food exports, and perhaps in the exports of many other products, is biotechnology research. Why not take a page from Programa Chile California? A foreign foundation is no longer needed to finance a training program abroad and the import of such skills and knowledge from leading countries in the world.

3. Fundación Chile: An export discovery engine?

In the past, the process of export discovery has had an important boost from the activities of Fundación Chile, a semi-public institution whose main job is to research potentially profitable technologies and products that are new to the Chilean economy, adapt them to Chilean conditions, start up production, and then sell the resulting concerns to the private sector. While its capital came originally from a settlement between IT&T and the military government for the expropriation of the Chilean telephone company, whereby each party contributed 50 percent of its capital, it has been profitable over the years. It is precisely the kind of institution that would fill the need to foster discoveries, in the sense of Hausmann and Rodrik (2003). Its activities straddle the fence of technology inventor/adaptor and venture capital firm.

In both these activities, markets fail or are non-existent in developing economies in general and also in Chile (in spite of its relatively developed capital markets). As already noted, R&D is a weak spot in the Chilean private sector; and the venture capital industry is in its infancy.

Fundación Chile's major success was the salmon industry, which it started in the early 1980s by adapting Norwegian technology to the cultivation of salmon in the Southern lake district. It later sold a successful enterprise to Nippon Suisan, one of the largest food traders in the world. Now Chile is the second largest exporter of salmon, with exports well over US\$ 1.5 billion.

Fundación Chile has been marginally present in the wine industry through efforts to develop certain specific varieties and new wine-growing areas in the south of the Central Valley, where it was not believed that wine production would be successful. As we have already recounted, in blueberries, Fundación Chile played an initially important role in setting up a viable export concern. This was a genuine discovery, in the sense that it showed that blueberries for the out-of-season United States market could be profitably produced in Chile. Never mind that the initial effort eventually went bankrupt. The two largest followers, Hortifruit and Vital Berry, which were really the leaders of the successful stage in the export of blueberries, had a lot to learn from the initial attempt. Of course, there is no major secret in producing blueberries, but this is the main characteristic of export discoveries in a developing country context: the successful adaptation of production to local conditions or the introduction of a non-patentable technology that is in use elsewhere.

Fundación Chile is a true institutional innovation. If Chile is to intensify its export discovery process, it needs to be strengthened, made more independent of the government, and coaxed to become a true and more aggressive venture capital firm, with all the risks that this entails. Its successes of the past suggest that it can play an important role in encouraging export discoveries. In a regional context, it deserves to be studied carefully to ascertain what parts of its experience are transferrable to other settings.

3. The provision of industry-specific public goods

Where the Chilean public sector has excelled, and indeed concentrated most of its industrial policy, has been in the provision of sector-specific public goods or in the

provision of services with large sunk costs which would not have been affordable by most producers, with the probable exception of a handful of the largest ones. There have been several agencies involved in this effort. These activities and their usefulness for the three sectors we have examined here are shown in table 8.

(insert table 8)

Undoubtedly, the major contribution to the development of new food exports has been the strong – although not as strong as many interviewees would have desired – support received from SAG (Servicio Agrícola Ganadero). The activities of this institution in the sanitary and phytosanitary area represent the major public good for Chilean exporters of food products. However, more financial and technical resources will be required if SAG is to play this role in a food export sector that is several times its current size. The interesting thing about SAG is its economies of scale and scope: once established, its services can be useful to an entire industry and, indeed, to a whole sector.

SAG's activities have been complemented by business associations, which have been extremely active in assisting producers to meet quality requirements in foreign markets, reaching quality agreement with major buyers, and even developing quality norms that are acceptable abroad. This is something that, obviously, individual producers are unable to do – owing to the huge sunk costs of the activity – but which an association can more easily undertake. The government has also played a hand in supporting, through CORFO, the setting up of these associations. This has been particularly the case in wine.

Research in agriculture and the adaptation of foreign technologies have been other areas where government agencies have been active. Mention has already been made of Fundación Chile's activities. In the agricultural field, INIA (Instituto Nacional de Investigación Agropecuaria) has also had a leading role. As we have discussed at length above, INIA and Fundación Chile both played a role in bringing blueberry production and exports to Chile. Given the fact that most agricultural producers are small and unable to carry out R&D, INIA should be strengthened with an injection not only of funds but also of qualified scientists and technicians.

As food export industries mature, the emphasis has naturally switched from adapting foreign technologies to developing new technologies to enhance their international competitiveness. The recent program (INNOVA) to foster R&D by encouraging business associations to join up with universities has already been

mentioned. In our products, there are three such projects. It is, of course, too early to evaluate the impact of these programs on exports, since they have been launched very recently.

The negotiation of free trade agreements with practically all of Chile's trading partners is clearly another example of the provision of public services needed by new exports.

Several of CORFO's development instruments have played a role in permitting the emergence of these new exports. One of them, PROFOS (Proyectos de Fomento), have allowed smaller producers to band together and to reach sufficient scale to finance the sunk costs involved in exporting. Small wineries have made use of this instrument. Another CORFO instrument, PDP (Programa de Desarrollo de Proveedores) has been important in helping suppliers of exporters of blueberries and pork to meet quality standards demanded in importing countries. However, even here, the larger firms (Vital Berry and Driscolls, for example) claim that they undertake a good part of this activity themselves.

ProChile has been of assistance to new exports by organizing tours abroad and participating in food and wine fairs in major importing countries. Some of these activities are done in conjunction with producer associations such as ASOEX and Wines of Chile. Also, the generic campaigns to associate the name "Chile" with good food and wine products are considered to have had a positive impact. However, some exporters claimed that the scope of these efforts has been too small.

4. The exchange rate: an inconclusive debate

A clearly negative impact on exports has been the volatility of the real exchange rate. The sharp appreciation since mid-2003 was quoted as being a very negative factor by practically all the executives interviewed.²⁶ As we have seen, the number of export discoveries is indeed encouraged by a competitive exchange rate. At present, the exchange rate is being influenced by the record-high levels of copper prices and export volumes. Wine exports are already being hit. As is evident from the figures shown above, the rate of expansion in these exports has slowed down

²⁶ With the notable exception of Agrosuper's. This company imports the inputs for its feed production and, thus, the negative impact of appreciation on exports is somewhat dampened.

considerably. Several smaller wineries have gone out of business, and there has been consolidation in the industry.

In addition to the current squeeze on new exporters on account of exchange rate appreciation, the problem of the exchange rate goes further. History tells us that Chile is one of the countries with the highest degrees of real exchange rate volatility in the world. Not only is the exchange rate volatile, but its swings have a great deal of persistence. By introducing noise into the investment decision in exportables, this volatility may be as adverse a factor as the overvaluation one can observe in any given period.

Some may argue that exchange rate variability is not a problem, because the exports that disappear with appreciation will reappear when the exchange rate depreciates again. This view ignores that, as in any investment decision, investment for exports has sunk costs, and that these are not likely to be undertaken when the degree of uncertainty is as large as the one that arises from large and unexpected exchange rate fluctuations that may last for a long time.

The development of new exports was a deliberate and explicitly announced objective only during the period from 1984 to 1997. Such considerations have disappeared from the pronouncements of policymakers in more recent years. During the nineties, there was a lot of talk among policymakers and informed observers that Chile needed to enter a “second stage of export development” (allegedly toward manufacturing); it was thought that the first stage had been accomplished during the seventies and eighties, a period that had seen the appearance of “easy” new export products, meaning by this that they did not require large investments in technology or knowledge and that they hewed close to the country’s comparative advantage. The maintenance of an exchange rate that was favorable to exports was viewed as an important component of an export-oriented development strategy. Even so, with the instruments used it proved impossible to prevent a significant appreciation in the real exchange rate during the 1990s (up to 1997), as capital inflows were extremely large.²⁷

²⁷ There has been an inconclusive debate as to whether the unremunerated reserve requirements imposed on financial investors during the 1990s proved ineffectual in containing capital inflows. Some claim they were not effective, citing the slide in the real dollar price. Others suggest that they should have been stiffened in the presence of huge capital inflows. In the event, these capital inflows dropped dramatically with the sudden stop of 1998-99, as the country experienced contagion from the Russian crisis.

Over time, the monetary authorities have wavered between a “productivist” view of the exchange rate and a more conventional, “financialist” view. The first view emphasizes the use of the exchange rate to assist structural change, basically toward new exports. Nowadays, the slogan is “Chile, a world food power”. Of course, this new catchword could well go the way of the “second stage of export development”, if nothing is done to lend greater stability to the real exchange rate, and keep it in a range that renders profitable investment in new tradables. Those who adhere to the financialist view, who are the most vociferous, and numerous, appear to believe that the real exchange rate is not susceptible of being affected by the authorities, as it depends on fundamentals over which policy has no control.²⁸ The current conventional wisdom is that the best exchange rate regime is a free float, which allows the monetary authorities to adopt an “inflation targeting” approach to monetary policy. A more pragmatic approach, balancing the need to control inflation with that of encouraging structural change, seems to be called for in an economy that is still struggling to modernize its production structure and market institutions.

²⁸ The debate is largely semantic, since, obviously, changing the nominal exchange rate is ineffectual in affecting the real exchange rate. But the authorities can affect fundamentals by, for example, using time-varying capital controls, or, in current circumstances, dampening exchange rate appreciation by investing abroad the large increase in copper profits of the state-owned mining giant, CODELCO, or even a good part of the huge budget surplus expected in 2006 (about 8 percent of GDP) and 2007.

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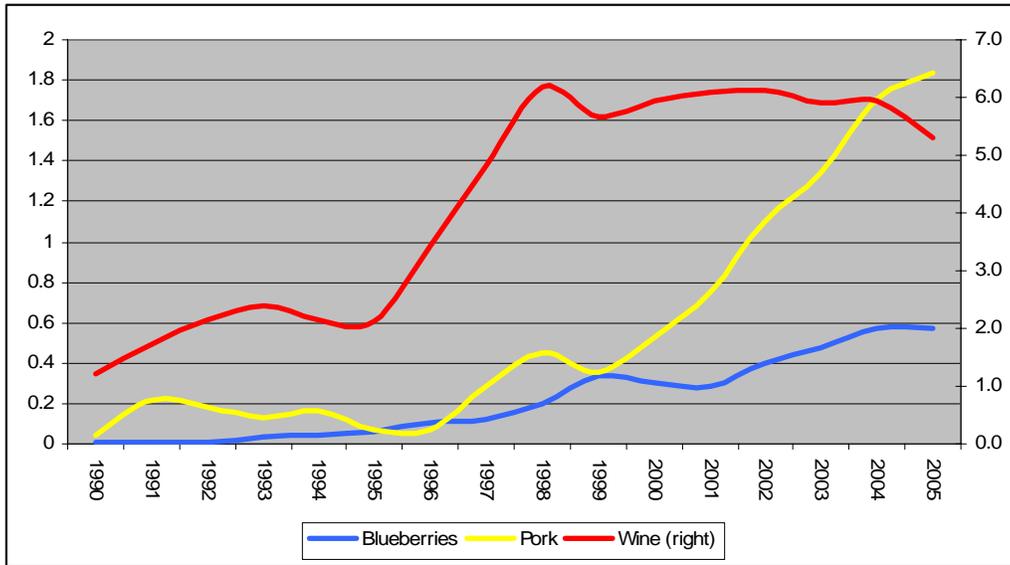
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Figure 1
Wine, pork meat, and blueberries: share of non-copper exports, 1990-2005
 (percentage)



Source: Authors' calculations, based on data of the Central Bank of Chile.

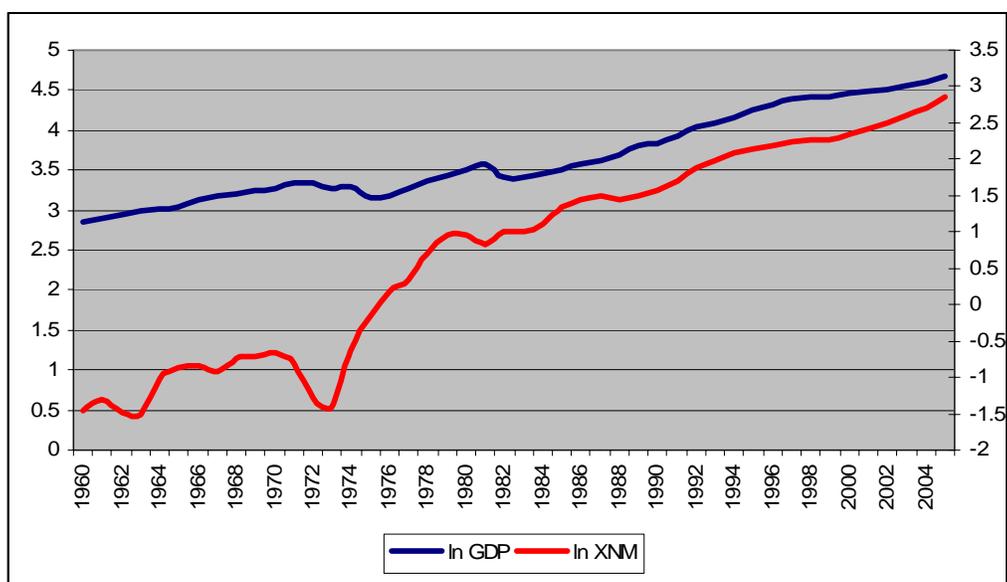
Table 1
Growth and export performance, 1960-2005
 (average annual growth rates, in percentage)

	1960-1973	1974-1989	1990-2005
Rate of growth of GDP	3.4	3.3	5.6
Rate of growth of total real exports	3.2	9.2	7.9
Rate of growth of non-mineral real exports	0.4	14.2	8.9
Gross fixed investment (% of GDP)	22.3	18.2	24.9

Source: Authors's calculations, based on data of the Central Bank of Chile.

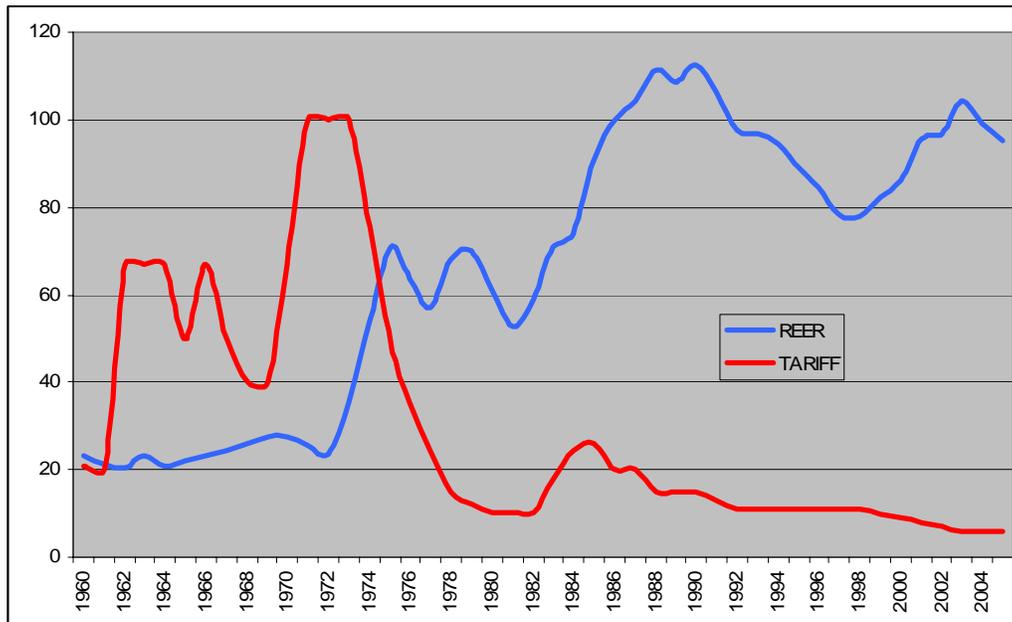
Note: GDP and export data are in 1996 prices.

Figure 2
Non-mineral exports and GDP, 1960-2005
 (natural logs of billions of 1996 US dollars)



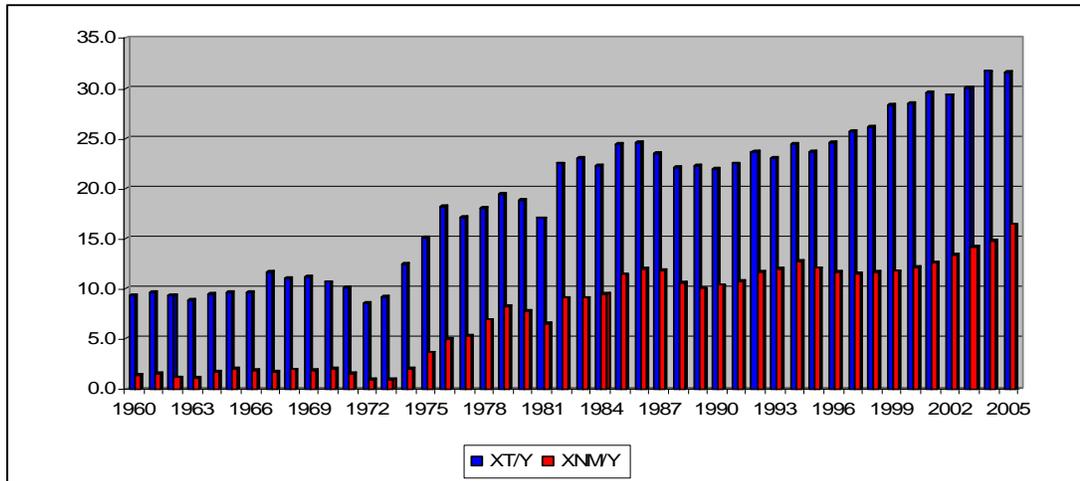
Source: Authors' calculations, based on data of the Central Bank of Chile.

Figure 3
Real effective exchange rate and average tariff, 1960-2005



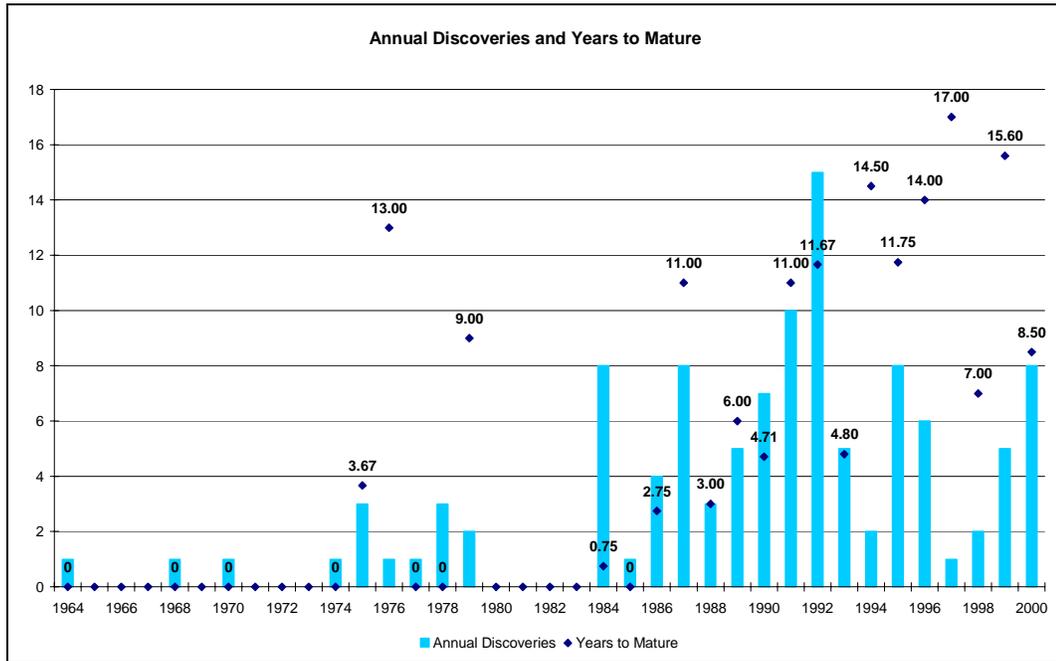
Source: Authors' calculations, based on data of the Central Bank of Chile.

Figure 4
Share in GDP of exports of goods and services and non-mineral exports,
1960-2005
 (percentage; original data in 1996 prices)



Source: Authors' calculations, based on data of the Central Bank of Chile.

Figure 5
Number of export discoveries and average number of years to maturation



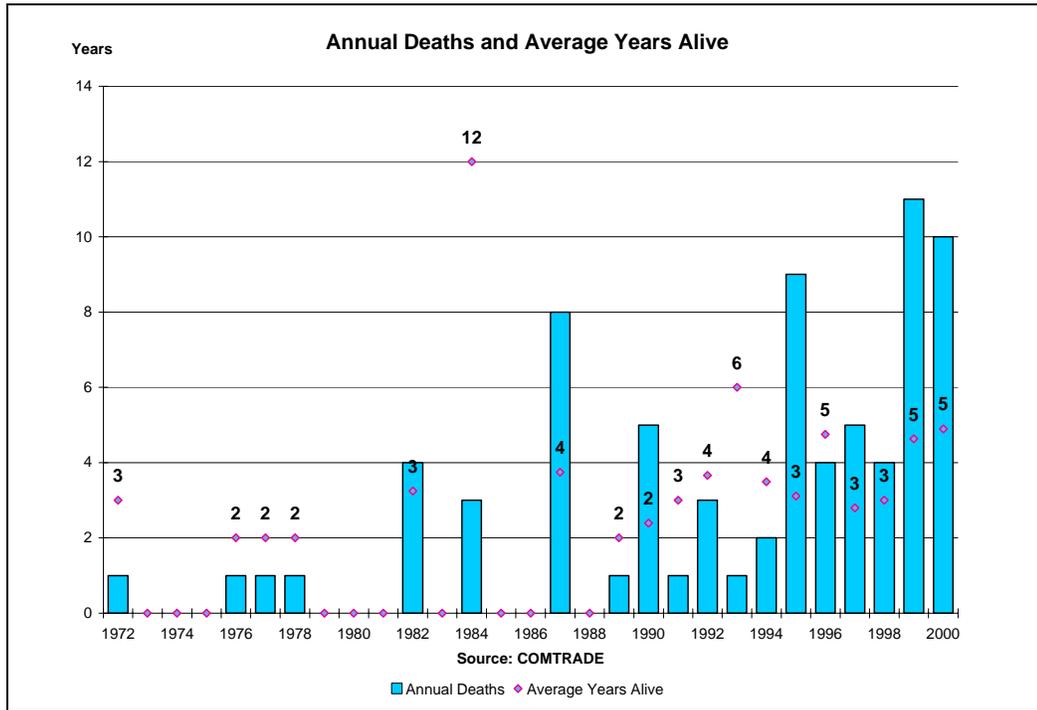
Source: COMTRADE, by way of Feenstra database.

Table 2
Value of export discoveries and share of discoveries in non-mining exports
(in millions of 1995 US dollars)

Year	Discoveries	Non-mining exports	Share of discoveries (percentage)
1962	1.6	273	0.6
1963	2.0	274	0.7
1964	4.0	466	0.9
1965	3.7	516	0.7
1966	4.3	546	0.8
1967	2.8	417	0.7
1968	4.8	431	1.1
1969	5.7	465	1.2
1970	12.0	528	2.3
1971	14.3	575	2.5
1972	8.7	385	2.3
1973	13.5	385	3.5
1974	40.7	982	4.1
1975	42.6	1,248	3.4
1976	58.6	1,599	3.7
1977	81.7	1,803	4.5
1978	103.8	2,082	5.0
1979	139.4	3,124	4.5
1980	202.8	3,563	5.7
1981	182.2	2,585	7.1
1982	155.5	2,323	6.7
1983	202.4	2,112	9.6
1984	601.5	2,299	26.2
1985	527.9	2,224	23.7
1986	592.4	2,708	21.9
1987	785.4	3,396	23.1
1988	949.2	3,901	24.3
1989	1,179.3	3,821	30.9
1990	1,425.7	4,214	33.8
1991	1,636.5	4,940	33.1
1992	1,788.4	5,634	31.8
1993	1,734.3	5,443	31.9
1994	2,123.5	6,544	32.5
1995	2,274.0	8,174	27.8
1996	2,550.8	7,930	32.2
1997	2,728.5	8,236	33.1
1998	2,573.1	7,948	32.4
1999	2,625.4	8,170	32.1
2000	3,048.2	8,960	34.0

Source: Authors' calculations, based on information from Feentra's database.

Figure 6
Number of annual deaths and average number of years alive, 1962-2000



Source: COMTRADE, by way of Feenstra database.

Table 3a
Determinants of gross and net discoveries, 1962-2000
(Poisson model)

	(1) Gross discoveries	(3) Net discoveries	(4) Gross discoveries	(6) Net discoveries
log(RER)	2.387** (0.408)	2.623** (0.550)	2.738** (0.481)	2.868** (0.605)
log(tariff)	-0.198 (0.237)	0.409 (0.305)	-0.617+ (0.357)	0.123 (0.481)
log(RERvol)			0.128+ (0.077)	0.072 (0.098)
log(Xgrowth)			-0.151 (0.598)	-1.297 (0.826)
Constant	-8.665** (2.138)	-12.070** (3.008)	-9.635** (2.285)	-12.602** (3.049)
Observations	37	37	37	37

Table 3 (b)
Determinants of gross and net discoveries, 1962-2000
(Poisson model)

	(1) Gross discoveries	(3) Net discoveries	(4) Gross discoveries	(6) Net discoveries
log(RER (t-5))	2.009** (0.430)	2.159** (0.610)	2.005** (0.450)	2.260** (0.658)
log(tariff)	0.469 (0.350)	0.897+ (0.474)	0.456 (0.425)	0.812 (0.560)
log(RERvol)			0.002 (0.098)	0.043 (0.131)
log(Xgrowth)			0.307 (0.583)	-0.97 (0.818)
Constant	-8.590** (2.723)	-11.096** (3.851)	-8.571** (2.749)	-11.429** (3.945)
Observations	36	36	36	36

Notes:

1. The volumes of non-mineral exports are obtained from the national accounts and converted to constant 1996 US dollars.
2. The real exchange rate is a real effective exchange rate estimated by the Central Bank. The base is 1986.
3. The tariff series is the average unweighted tariff. Authors' calculations.

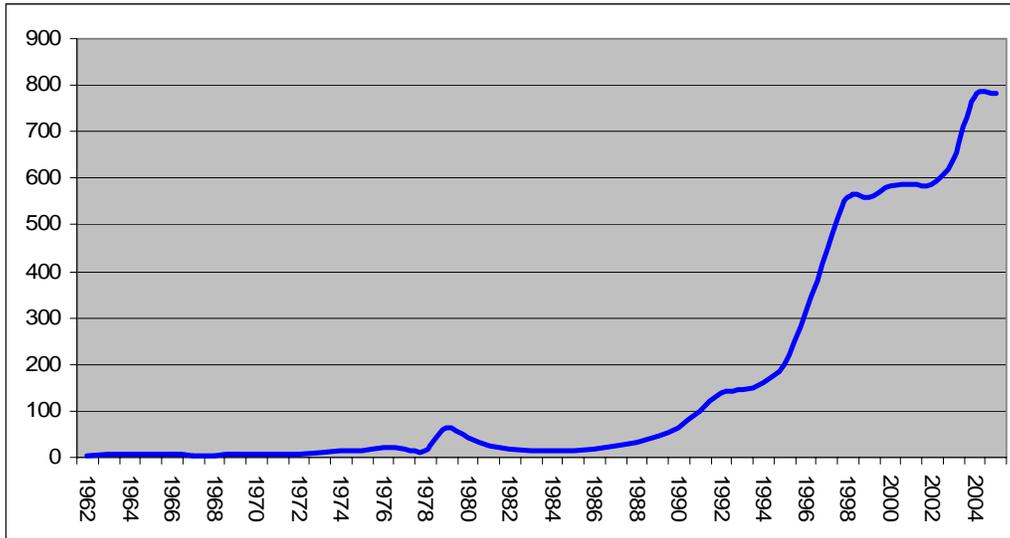
Table 4
Impact of discoveries, net discoveries, cumulative discoveries, and cumulative net discoveries on non-mineral exports, 1962-2000
(Dependent variable: log of volume of non-mineral exports; OLS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(discoveries)	0.767** (0.182)				0.224 (0.175)			
log(Cum. Disc.)		0.785** (0.030)				0.759** (0.078)		
log(Net Disc.)			0.924** (0.264)				0.207 (0.223)	
log(Cum. Net Disc.)				0.906** (0.040)				0.850** (0.106)
log(Copper Price)					0.375 (0.532)	0.004 (0.219)	0.271 (0.555)	0.046 (0.249)
log(RER)					1.497** (0.410)	0.081 (0.228)	1.469** (0.405)	0.133 (0.266)
Constant	7.155** (0.256)	5.533** (0.101)	6.888** (0.312)	5.461** (0.118)	1.409 (1.743)	5.273** (0.779)	1.367 (1.702)	5.066** (0.896)
Observations	26	42	17	42	26	42	17	42

Standard errors in parentheses

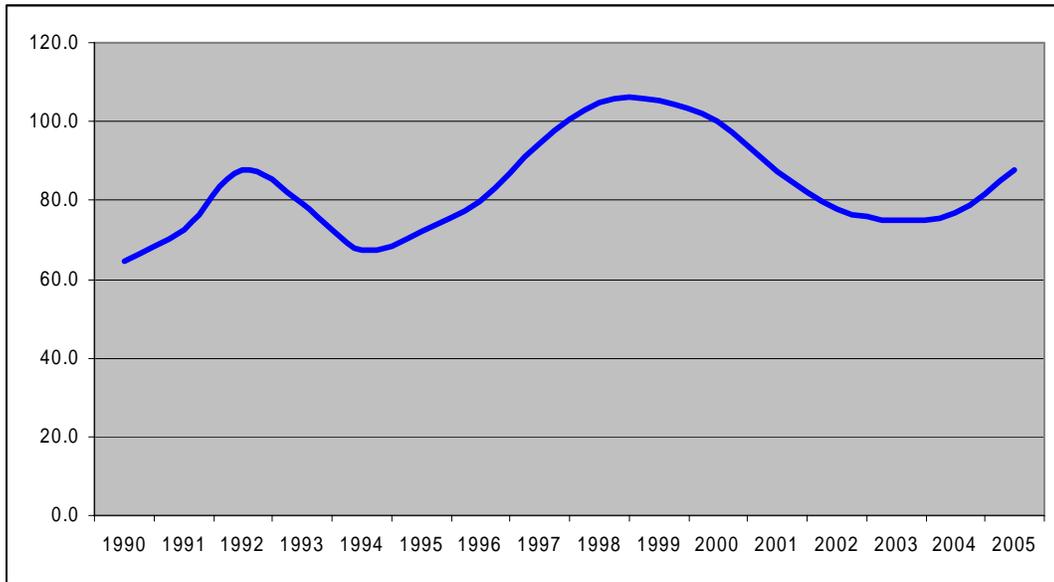
+ significant at 10%; * significant at 5%; ** significant at 1%

Figure 7
Wine exports, 1960-2005
(2000 US dollars)



Source: Authors' calculations, based on data of the Central Bank of Chile.

Figure 8
Real unit value index for exported Chilean wine
(2000=100)



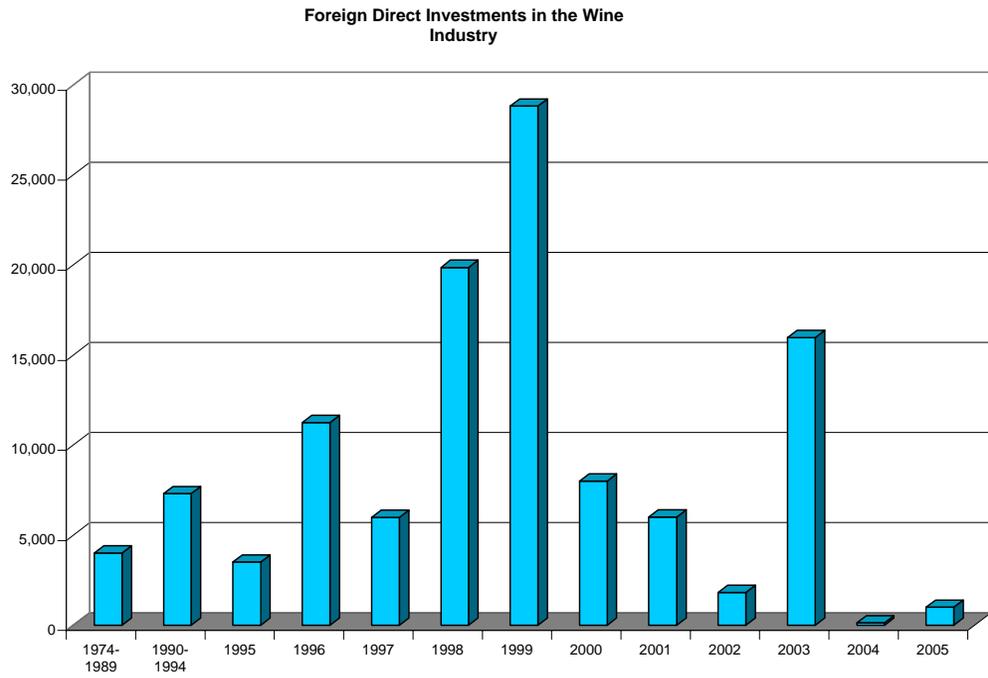
Source: Authors' calculations, based on data of the Central Bank of Chile.

Table 5
Hectares planted to wine varieties of grapes

Grape	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
Cab. Sauvig.	11.112	12.281	13.094	15.995	21.094	26.172	35.967	38.227	39.261	39.731	40.086
Merlot	2.353	2.704	3.234	5.411	8.414	10.261	12.824	12.887	12.768	12.879	12.942
Chardonnay	4.150	4.402	4.503	5.563	6.705	6.907	7.672	7.567	7.561	7.565	7.722
Sauvignon Blanc	5.981	6.135	6.172	6.576	6.756	6.564	6.790	6.673	7.041	7.368	7.741
Ch Blanc	103	106	93	98	104	95	76	49	52	51	76
Pinot Noir	138	215	287	411	589	839	1.613	1.450	1.434	1.422	1.440
Riesling	307	296	317	338	348	286	286	286	283	288	293
Semillón	2.708	2.649	2.616	2.427	2.425	2.355	1.892	1.860	1.843	1.821	1.715
Pais	15.990	15.280	15.280	15.241	15.442	15.457	15.179	15.070	14.949	14.953	14.865
Carmenère				330	1.167	2.306	4.719	5.407	5.805	6.045	6.545
Syrah			19	201	568	1.019	2.039	2.197	2.347	2.468	2.754
Cabernet Franc			17	64	138	316	689	823	869	925	1.056
Others	10.251	10.324	10.371	10.895	11.638	12.780	14.130	14.475	14.356	14.580	14.821
Totals	53.093	54.392	56.003	63.550	75.388	85.357	103.876	106.971	108.569	110.097	112.056

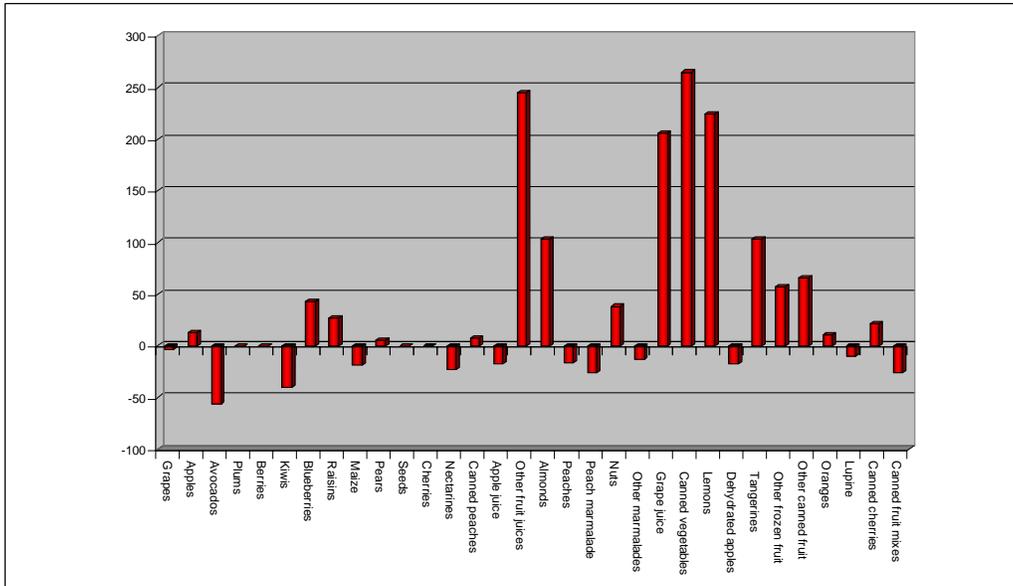
Source: Catastro Vinícola Nacional 2004, SAG.

Figure 9
Foreign investment in the wine industry
(thousands of current US dollars)



Source: Foreign Investment Committee

Figure 10
Fresh and prepared fruit export unit value changes, 1990-2005
 (in 2000 US\$)



Source: Authors' calculations, based on data of the Central Bank of Chile.

Table 6
Export values and growth rates of major fruit exports, 1962-2005
(2000 US dollars)

	1962	1990	2005	Growth 1963-1990	Growth 1991-2005
Grapes and raisins	7.4	464.0	870.3	15.9	4.3
Apples	5.3	131.7	296.5	12.2	5.6
Pears	7.7	55.8	65.6	7.4	1.1
Nuts and almonds	15.9	22.3	80.1	1.2	8.9
Oranges, tangerines	0.0	0.3	26.3	...	34.7
Lemons	1.2	0.7	19.9	-1.9	25.0
Avocados	0	37.6	150.3	...	9.7
Blueberries	0	0.2	84.5	...	48.2
Other berries	0	30.7	110.6	...	8.9
Kiwis	0	33.9	97.3	...	7.3
Processed fruits	9.8	80.1	329.4	7.8	10.6
Total	47.2	919.0	2,564.2	11.2	4.8

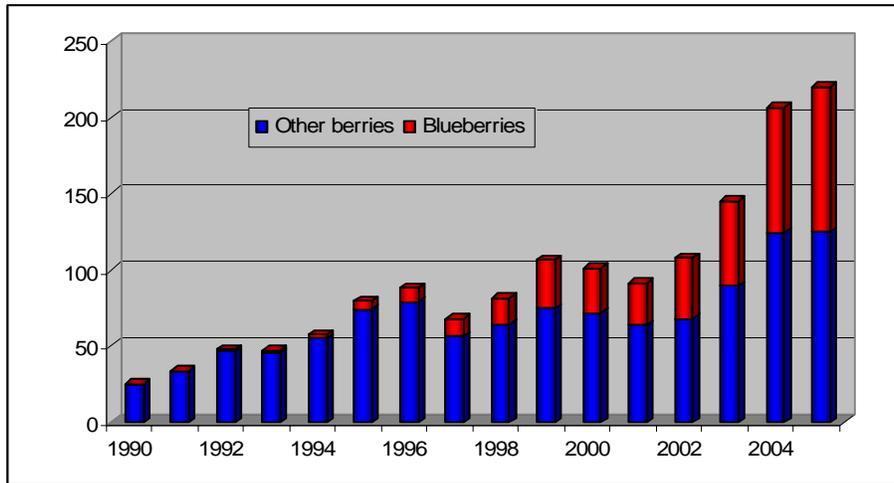
Source: Authors' calculations, based on Feenstra database, COMTRADE, and Central Bank of Chile trade database.

Notes: Feenstra's data base is available from 1962 through 2000; COMTRADE has data from 1984 through 2004. Both are at the four-digit SITC level. The Central Bank uses its own classification of data, in order to highlight Chile's main export products. Most data are at the five-digit level. The rate of growth for total fruit exports for 1991-2005 was estimated with Central Bank data, which are somewhat higher than in the other two data bases. Thus the Central Bank estimate of total fruit exports for 1990, when converted to 2000 dollars, is US\$ 1,263 million, which is the figure used in the calculation of the growth rate. The figure for processed fruit exports in 2005 corresponds to 2004 and is taken from COMTRADE. Therefore, the growth rate for processed fruit exports for 1991-2005 corresponds to 1991-2004.

Table 7
Exports of Chilean fruits and vegetables with values of less
than US\$ 10 million in 1990
(2000 US dollars)

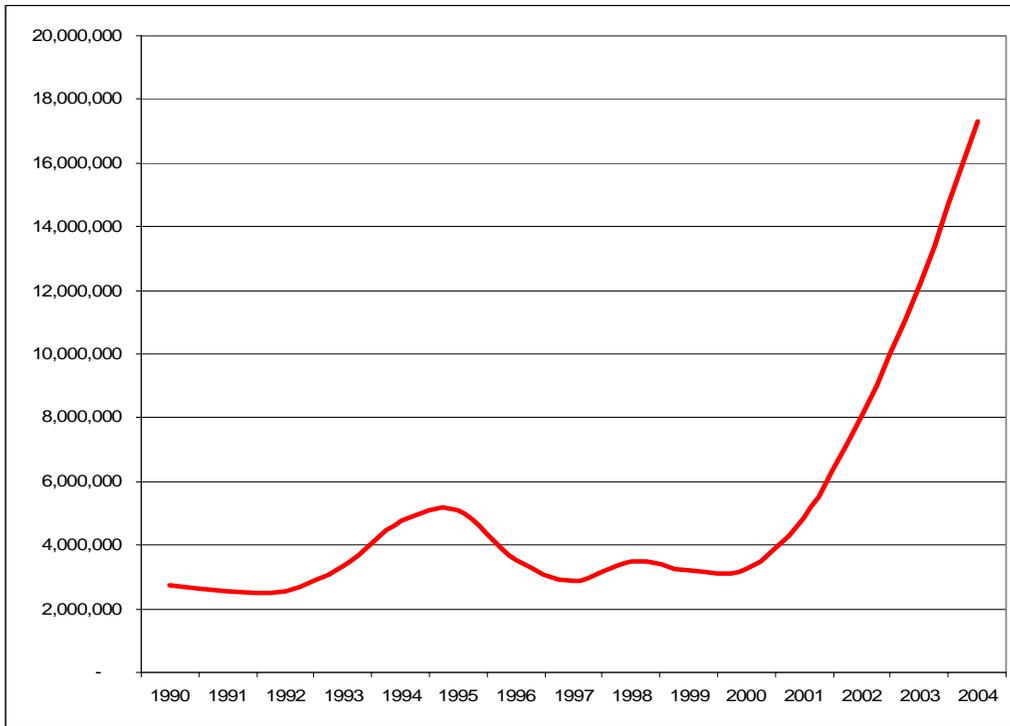
	1990	2005	Growth rate (%)	Year of discovery
Blueberries	0.2	84.5	48.3	1993
Frozen raspberries and redcurrants	8.7	62.4	14.0	
Vegetable seeds	10.2	43.4	10.2	
Other fruit juices	3.3	40.8	18.3	
Shelled almonds	2.6	40.6	20.1	
Peach marmelade and pulp	2.3	28.6	18.3	
Shelled nuts	3.2	28.0	15.5	
Other fruit marmelada and pulp	3.5	23.8	13.7	
Grape juice	2.4	22.0	15.9	
Canned vegetables without vinegar	1.9	21.3	17.7	
Lemons	0.9	19.4	23.2	1993
Tangerines	0.0	16.8	80.5	1996
Other frozen fruit	3.8	16.7	10.3	
Frozen strawberries	2.7	15.4	12.2	
Other canned fruit	2.8	11.9	10.2	
Seeds from herbaceous plants	0.1	9.7	37.5	
Oranges	0.4	9.5	23.7	2000
Lupine	1.7	9.2	12.0	
Melon and watermelon seeds	4.8	9.0	4.3	
Frozen blakberries	3.4	8.9	6.5	
Canned cherries	3.9	8.1	5.1	
Canned fruit mixes	1.4	7.6	11.9	
Other seeds	2.0	5.2	6.6	
Sunflower seed	0.9	4.8	11.5	1992
Oregano	1.7	4.7	6.8	
Chickory	0.0	3.6	40.6	1992
Other canned vegetables	0.2	3.3	20.5	1993
Unshelled almonds	0.5	1.9	9.2	2004
Total	69.5	561.3	14.9	
Total fruit and vegetable exports	1,263.00	2,564.2	4.8	

Figure 11
Exports of blueberries and other berries, fresh and frozen
(in million US dollars)

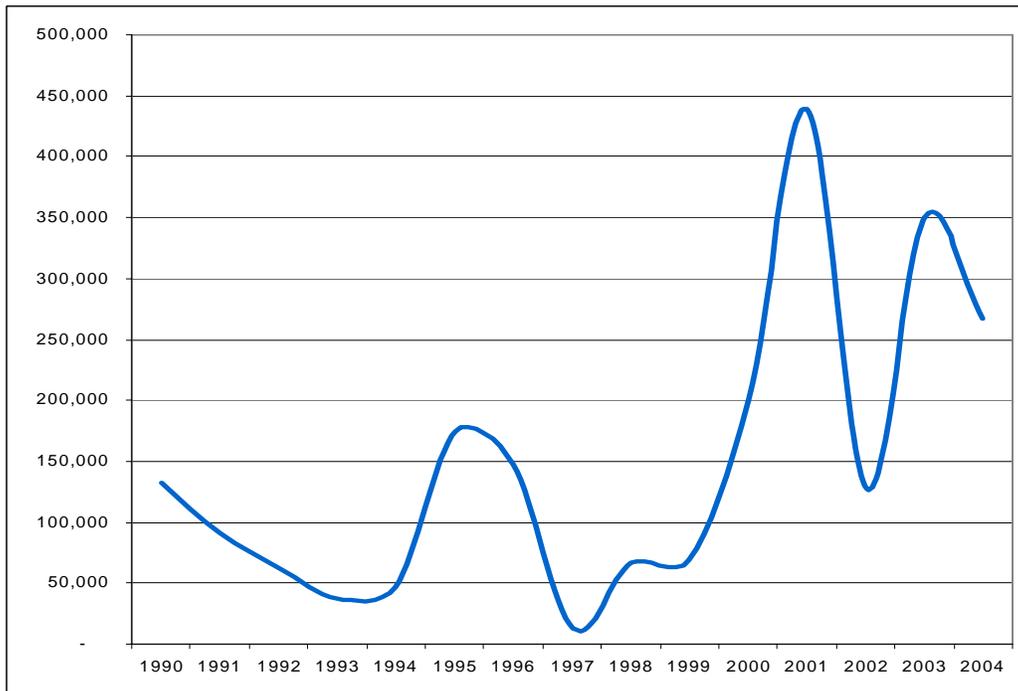


Source: Authors' calculations, based on data from the Central Bank of Chile.

Figure 12
Exports of fresh and frozen strawberries, 1990-2004
 (in 2000 US dollars)
Frozen

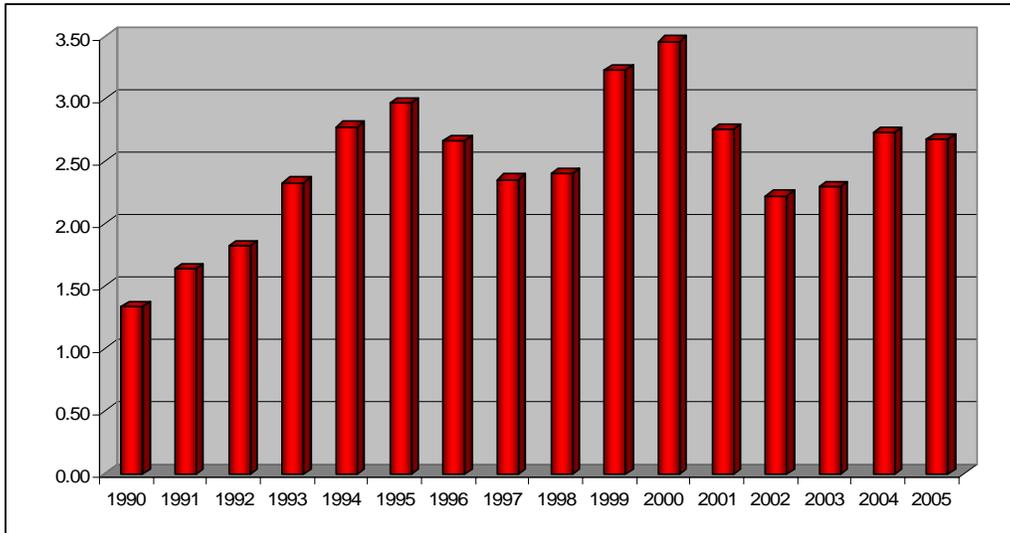


Fresh



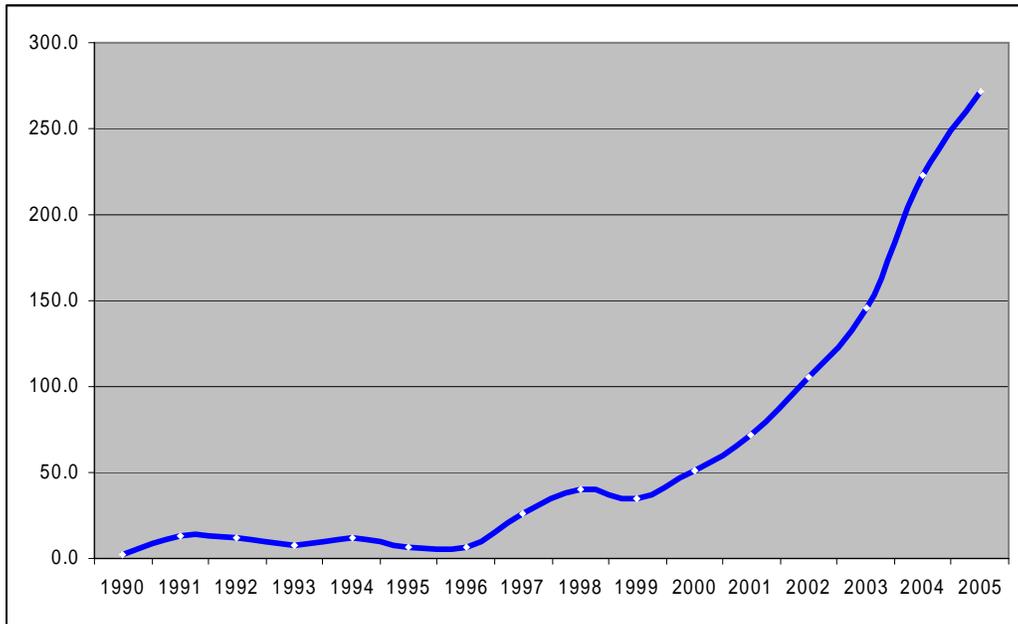
Source: Authors' calculations, based on data of the Central Bank of Chile.

Figure 13
Unit value of Chilean blueberry exports, 1990-2005
(unit values in US dollars deflated by the US GDP deflator)



Source: Authors' calculations, based on data from the Central Bank of Chile.

Figure 14
Real pork meat exports, 1990-2005
(in millions of 2000 US\$)



Source: Authors' calculations, based on data from the Central Bank of Chile.

Table 8
Sector-specific public and semi-public goods provided by government or business associations

Public/semi-public good	Agency (Public/<i>Business associations</i>)	Wine	Fruit	Pork
Pure public goods				
Technology investment/ Ag. reseach	INIA/Fundación Chile	Moderately useful	Very useful in blueberries	Not used
Negotiating FTAS	Ministry of Foreign Affairs	Very useful	Very useful	Very useful
Negotiating sanitary agreements	SAG	Indispensable	Indispensable	Indispensable
Protecting natural assets	SAG	Indispensable	Indispensable	Indispensable
Ensuring quality standards	SAG; and <i>ChileVid, AVC, and ASOEX</i>	<i>ChileVid, AVC</i> – very useful	ASOEX – very useful	Mainly SAG and large private producers – very useful
Promoting country image	ProChile; and <i>ChileVid, AVC, and ASOEX</i>	Very useful	Moderately useful	Not needed – mostly private efforts to ensure quality
Developing food safety standards that are acceptable to major buyers	ASOEX	Not needed	Very useful for penetrating European market	Done privately by large producer
Semi-public goods/Services with economies of scale				
Training/technology transfer	Programa Chile California 1965-78 (Ford Found./U. of Chile/U.Califonia)	Very useful	Indispensable	Not used
Promoting association of small producers	CORFO: PROFOs	Indispensable for boutique vineyards	Not important	Not important
Promoting business associations	CORFO	Very useful	Not used	Not used
Quality of input suppliers	CORFO: Supplier Development Program	Indispensable	Indispensable	Not important
Attendance at fairs in major markets	ProChile	Very useful	Useful	Not important
Inspections in Chile by USDA	ASOEX	Not needed	Very useful	Not needed
Promoting R&D through joint ventures with universities	CORFO: INNOVA; and <i>ChileVid, AVC, and ASOEX</i>	New program used by <i>AVC and ChileVid</i>	New program used by ASOEX	Not used

Firms and individuals interviewed

Name of firm/person	Type of firm/Role
Wine	
Concha y Toro	Market leader
Miguel Torres	Technological innovator – large
Cánepa	Technological innovator – medium
Santa Carolina	Large producer for domestic market and exports
J. Bouchon	Small exporter
Viu Manent	Small exporter
Santa Rita	Large producer for domestic market and export
Montes	Medium-size exporter of premium wines
Morandé	Small exporter
Marcial Mena	Wine industry consultant
Jorge Gutiérrez	Vice President, ChileVid
Elena Carretero	Manager of Vinnova
Jacobo Alvarez	Owner of Marmevit.
Luisa Cánepa	Daughter of José Cánepa
Fruit	
Miguel Canala-Echeverría	General Manager, ASOEX
Andrés Luna	Sales Manager, Dole Chile
Blueberries	
Hortifruit	Market leader
Vital Berry	Market leader
Agroberries	Large berry exporter
Driscolls de Chile	Diversified fruit exporter
Plutarco Dinamarca	Consultant, berries, Fundación Chile in 1980s
Alex Sawadi	ProChile berry specialist
Ignacio del Río	Partner of Vital Berry
Carlos Muñoz	Berries expert of the INIA
Pork meat	
Nippon Meat	Foreign trader
Agrosuper	Market leader
Frigorífico O'Higgins (FRIOSSA)	Medium-size exporter
Lo Valledor Aasa	Medium-size exporter