REBUILDING TECHNOLOGICALLY COMPETITIVE INDUSTRIES: LESSONS FROM CHILE'S AND ARGENTINA'S WINE INDUSTRY RESTRUCTURING

by

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ABSTRACT

The general question motivating this dissertation is how firms that are lagging technologically in newly liberalized economies can catch up to world standards and develop a capacity for continuous learning. Based on the uneven restructuring of the Chilean and Mendozan (Argentina) wine industries this research challenges the conventional views that market institutions and state tutelage automatically supply the kind of knowledge that firms need in order to achieve technological world standards. It hypothesizes that upgrading requires "learning institutions," where members of a professional community can rework and improve through application, received knowledge embodied in new capital equipment, production techniques and market information. The systematic, wide, unprejudiced discussion of tacit knowledge from production and marketing experience is what helps firms discover what works best for them locally, and allows them to map out a set of incremental standards they can aspire to meet to rebuild their competitiveness.

This study suggests how learning institutions that generate such a discussion might be created. In Chile and Mendoza two natural experiments show how firms, knowledge professionals, and the state inadvertently are building fora for the discussion of tacit and received knowledge and the formulation of targetable production standards. One is a consortium of wineries with an evaluation committee; the other is a set of broad subregional wine evaluation panels. Both collectively rework and improve received knowledge based on making tacit experience explicit. Both set standards, monitor their members' progress, and recommend improvements. Both avail themselves of private sector knowledge and discrete public programs in coherent ways. Knowledge professionals play an important hand in organizing both initiatives. This does not seem accidental; as knowledge becomes more important to industrial competition the individuals and groups that carry it have grown in importance, especially when they have a strategic understanding of the value chain and of how conception and execution relate to each other.

These findings suggest ways in which the state can induce the private sector to provide the kind of assistance firms need most, and in so doing, help reconstitute more competitive firms and promote more constructive interfirm relations and private-public sector relations. Knowledge professionals need not be the direct targets of these initiatives but their inclusion is likely to be crucial to their success.

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CHAPTER 1

Understanding Technological Change: Tacit Knowledge, Professional Experts, and New Learning Institutions

Introduction

This dissertation concerns the role of knowledge in industrial restructuring and upgrading in developing countries.[1] The importance of knowledge to development cannot be overstated. In its 1998/99 World Development Report (WDR) the World Bank suggests that...

> "For countries in the vanguard of the world economy, the balance between knowledge and resources has shifted so far toward the former that knowledge has become perhaps the most important factor determining the standard of living--more than land, than tools, than labor. Today's most technologically advanced economies are truly knowledge-based. And as they generate new wealth from their innovations, they are creating millions of knowledge-related jobs in an array of disciplines that have emerged overnight: knowledge engineers, knowledge managers, knowledge coordinators."[2]

While growth accounting has yet to provide precise measures of the role of knowledge in economic growth, it suggests that neither land, nor physical capital, nor education (human capital) *per se* satisfactorily explain all of total factor productivity growth (TFP). If knowledge can be

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[1] I refer to the restructuring processes that were triggered during the 1970s and 1980s when structural adjustment programs (SAPs) were implemented in closed economy developing countries, with the purposes of getting the prices "right", liberating factors of production, and removing obstacles to competition. SAPs include some combination of policies to liberalize firms' economic environment--e.g., removal of price controls and licenses to import, export promotion and import-protection reduction, new codes to encourage investment, modification of legislation to make more flexible conditions of employment, wages, and dismissal of labor. For descriptions of these policies see, for instance, Lieberman (1990) and Weaver (1995).

[2] The World Bank. 1999. *World Development Report 1998/99*. Washington, DC; p. 16.

defined as a smarter, better ways of doing things, there is a case to be made for paying close attention to how factors of production are put together and used.[3] Unfortunately, newly liberalized economies that need to close significant knowledge gaps have no guarantee of access to knowledge of the "right" kind because it often cannot be bought off the shelf easily. Knowledge has public good characteristics--once in the public domain it is non-rival and non-excludable--and is therefore subject to disincentives to its private supply. The problem is even more complex if one takes into consideration that each firm has different knowledge needs that vary depending on, say, the sector in which it competes, the market size, its technology, etc.

Thus, the general question motivating this dissertation is how newly liberalized economies that are lagging in technology[4] can achieve broad, deep, and continuous industrial upgrading. By "technology" I refer not only to explicit knowledge embedded in hardware and product and process designs,[5] but especially the tacit (practical, implicit) knowledge on how to make best use of it. (This distinction is explained further below.) By "broad" I mean to involve more of an industry than a minority of firms, for example, those participating in international supply chains. By "deep" I refer to improvements up and down supply chains rather than limited to discrete segments, for example, processors but not raw input suppliers. Last, by "continuous" I am

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[3] Economic history suggests that one way to grow is by developing unexploited land or by accumulating physical capital--roads, ports, factories, telephone networks; another possibility is to expand the labor force and its education and training. But the relation between these factors and growth is not strictly linear: some countries have seen economic growth despite having little land (e.g., Singapore, Hong Kong) or natural resources (Japan, Korea). Conversely, even the Soviet socialist republics' greater accumulation of physical capital and substantial investments in education during the '60s, '70s, and '80s were unable to match East Asian increases in living standards (e.g., in Hong Kong, Korea, Singapore, and Taiwan). WDR 1998/99, *op cit.*

[4] Throughout the dissertation I use the terms knowledge and technology interchangeably. However, there are many types of knowledge. The one I refer to here is knowledge about technology, also known as technical knowledge, or know-how as used in the WDR 1998/99, *op cit.* Najmabadi and Lall (1995:107) define technology as the stock of ideas, or the "set of recipes" available to combine and transform material factors of production such as land, labor and capital into output. This existing knowledge is embedded in the available machinery and equipment and in the training of the work force.

[5] In market theory technology consists solely of capital equipment and product and process designs, and is modeled as a production function; productivity is the same in an industry and in all countries. In practice, technology is becoming the same in all countries, because capital goods suppliers and engineering consulting firms increasingly operate globally. However, technology consists of more than machinery, equipment and designs, what Amsden calls "alpha technology". It includes "...supporting institutions, such as management systems, labor relations, shopfloor practices, subcontracting arrangements, and public policies--call them beta technology. Beta technology is by no means similar in the same industry in all countries and is probably responsible for a large part of the differences in productivity observed in the same industry around the world." (Amsden 1992: 57-58).

thinking of firms developing an organizational capacity for continuous learning beyond a one-time purchase of hardware or adoption of world-class work practices.

Current restructuring experience shows that while there is no shortage of examples of individual firms that have adopted the latest hardware the greatest difficulties are, first, finding strategies that increase the number of "boats" rising with the tide, and second, creating the capacity for continuous improvement within firms and in their supply chains.[6] As will be shown later, the recent Southern Cone[7] wine sectors' adjustment with which this dissertation is concerned is no different in the unevenness of the restructuring and the discontinuity of the improvement effort. Given this, the interesting questions in industrial upgrading are how to get more people and firms to achieve technological world standards, how they can learn to learn faster, and how they can use factors of production in smarter, better ways. These questions are posed in the current political and economic context of liberalization, where most forms of public assistance to firms are suspect, and government action is constrained.

Hypothesis and Argument

Hypothesis

Based on the Chilean and Mendozan wine industry restructuring experiences my hypothesis is that **in situations of significant technological backwardness, neither market institutions nor state tutelage may automatically supply the kind of knowledge that firms need to achieve technological world standards. Knowledge embodied in new capital**

[6] Reports of impacts of SAPs in manufacturing in the '80s and early '90s were generally disappointing: manufacturing employment and the number of firms in most late-industrializing countries typically fell. Often manufactured exports had not grown and diversified as rapidly as was expected. Rather than 'graduate' to higher skill or technology-intensive production, at best, some of these industries had only seen growth in small firms in low productivity sectors. For reviews see edited collections by Fontaine (1992), Meier & Steel (1989), Lall (1995), Lall *et al.* (1994), and Parker *et al.* (1995) for Africa; Aswicahyono *et al.* (1996) for Indonesia; Dussel et al. (1995) and Pozas (1993) for Mexico, Arriagada (1985), Barros (1989), Corbo and de Melo (1985), Chudnovsky *et al.* (1996), Fanelli *et al.* (1992) and Ominami (1991), for Southern Cone countries (Argentina, Brazil, Chile); and Senses (1994) for Turkey.

equipment, production techniques, and market information needs to be reworked and improved locally based on the systematic processing of tacit information from production and marketing experience. What firms require is knowledge that can help them map out a set of incremental standards they can aspire to meet. Broad, deep, and continuous upgrading requires as a *sine qua non* condition the existence of learning institutions that promote this kind of wide unprejudiced discussion of market and production possibilities.

The components of the hypothesis are as follows:

1.Tacit Knowledge

Received (explicit) knowledge on new machinery, techniques, and market segments--obtained through tutelage from technology suppliers (machinery producers, retailers, licenses), joint ventures with foreign direct investment (FDI), international buyers, etc.--is not enough for most firms to upgrade because much knowledge is tacit, specific to particular markets, localities, resources, and firms. Firms ultimately need much more detailed information from production and marketing experience itself to map out alternative restructuring paths, understood as a set of incremental, achievable standards to which they can aspire.

2. Business Models As Paths and Prejudices

Received knowledge or "models" are useful is spelling out specifically the standards that firms need to meet to participate in certain market segments. By definition, they privilege certain resources, strategies, market segments, etc., to the neglect of others. The shortcoming of received models is that they don't necessarily explain how to achieve those standards; nor are they especially likely to help determine, for instance, how to make best use of local resource endowments most are unfamiliar with. Further bias may come from

[7] "Southern Cone" is a term of general usage that I adopt here to refer specifically to Argentina and Chile, the two contiguous countries at the end of the South American continent. I therefore leave out Brazil and Uruguay, often included in the term "Southern Cone".

the economic agents that provide the tutelage, because their knowledge and experience is also likely to be locality/endowment specific.

3. Reworking Tacit Knowledge

To overcome these limitations and to be of use received knowledge must be reworked and adapted locally based on an organized discussion of tacit knowledge from production and marketing experience. This is the information firms need to put together cognitive "maps" on alternative business opportunities and restructuring paths--what standards need to be met and how to get there. With this information, strategic players in supply chains can thus take quick action and avoid the problems of uncertainty (e.g., paralysis, isomorphism, or scatter-shot strategies) when confronted with the need to restructure. They can more quickly sort through strategies which work and which do not, and understand the set of incremental steps they need to take to achieve their goals.

4. Social Process of Construction of New Learning Institutions

Because tacit knowledge is individual- and organization-specific, to be of use the local discussion and reworking of received and tacit knowledge must be a socially organized process, in effect, the construction of new "learning" or coordinating institutions. The knowledge creation that takes place in them must be the product not only of individual invention, but the result of a wider community debate (e.g., professional or organizational). Furthermore, it needs to be continuous and systematic (what markets value changes continuously), and unprejudiced (not influenced, for example, by historical beliefs on the value of certain competitive assets but rather determined by unbiased empirical testing).

5. Middle Managers/Knowledge Professionals

Technical professionals in middle management positions who have intimate experience and knowledge of several segments of a supply chain are likely to play an important role in these sectoral discussions when and if they emerge. Because they are directly in touch with upper management as well as with shop floor workers, they are likely to be among the best positioned to synthesize and reconcile explicit and tacit knowledge.

6. State and Market

Neither market nor state are guaranteed to automatically organize these coordinating institutions on their own, but under certain conditions may contribute to their supply. However, the state may be able to play an especially important role by providing an environment in which economic agents are encouraged to organize, to identify and meet specific market needs in a systematic way.

Assumptions

The assumptions on which this hypothesis is based depart significantly from how we typically think about knowledge. First, I am assuming that technical know-how is not completely explicit, codifiable, embodied in capital equipment and production techniques. Rather, much of it has a tacit component. In an analysis of knowledge creation in Japanese companies Nonaka and Takeuchi (1995:8-9) make the distinction between one and the other:

> "Explicit knowledge can be expressed in words and numbers, and easily communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles. ... These can easily be 'processed' by a computer, transmitted electronically, or stored in databases. ...(But) knowledge expressed in words and numbers represents the tip of the iceberg. (Japanese companies) view knowledge as being primarily "tacit"--something not easily visible and expressible. Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others...in any systematic or logical manner.[8]

[8] Subjective insights, intuition, and hunches fall into the category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideals, values, or emotions he or she embraces. Tacit knowledge can be segmented into two dimensions, one technical, the kind of informal and hard-to-pin-down skills or crafts, such as the wealth of information developed by a craftsman after years of work experience. The other dimension is cognitive, consisting of schemata, mental models, beliefs, and perceptions that people take for granted. These implicit models cannot be articulated very clearly but shape the way people perceive the world (Nonaka and Takeuchi 1995:8-9).

Furthermore, tacit knowledge gained using particular technologies and techniques is often time- and space-specific, especially with respect to the production of agricultural inputs. Ultimately, tacit knowledge is embodied in the fragmented experience of individuals and organizations (such as firms). It may be taught by demonstration, on the job in the process of production.[9] But to be shared and communicated it has to be reworked. Thus, I am assuming that although developing country firms can borrow world class technology, its full transfer, use, and improvement require production experience and a systematic conversion from tacit to explicit.

The differences with the traditional assumptions of market theory are significant. In the latter, information is thought to be more or less perfect, explicit, and therefore easily transferable. Industrial countries, the theory goes, produce far more knowledge that developing economies. However, developing country firms can catch up and acquire knowledge by tapping and adapting knowledge available elsewhere in the world. To do so only requires that they maintain open trade so that knowledge can flow easily across borders through direct purchases, FDI, or licensing agreements. Alternatively, knowledge can also be produced locally. One result of this assumption of knowledge as open, explicit, and easily transferable, is that productivity across and within sectors should be equal.

Admittedly, economists do recognize problems with this assumption: if there were perfect information, knowledge gaps among countries should be narrowing rapidly, but they are not. In fact empirical studies have shown for some time the existence of significant productivity differences among firms, even within the same sector and country.[10] To explain these observations the mainstream voice in development thinking, the World Bank, points to the existence of a set of problems that while real, are different from the ones I refer to, and lead to quite different solutions and policy implications. To begin with, in addition to the challenge of acquiring knowledge, in its

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[9] In the U.S. garment industry tacit knowledge is acquired on the job with people working side by side. Inspectors watch what workers are doing, pick up the faults which the new inspectors miss, and point out to them case by case what is wrong with the garment. Dussel *et al.* (1996: 16).

[10] For example, productivity can vary widely even among firms using the same hard technology. One explanation is that over time, incremental in-house innovations can add up to significant productivity improvements. Well-known studies providing empirical evidence for these arguments include Pack (1984) for East Asia, and Katz (1987) for

1998/99 World Development Report (WDR)--"*Knowledge for Development*,"--the Bank draws attention to the challenges developing countries face absorbing and communicating knowledge. Solutions to these challenges seem almost like preconditions for knowledge to flow freely, for example, universal basic education, lifelong learning, support for tertiary education, telecommunication infrastructure for communication and dissemination, etc. It may not be possible to have perfect information if any one of these factors is missing. With the problem thus defined, the policy prescription is that all these factors need to be addressed and put into place. Furthermore, the Bank draws attention to the fact that knowledge falls into the category of a public good. Because it is nonrivalrous and non-excludable, private agents may not be able to capture the full innovative return to their efforts. If so, there is likely to be a disincentive to its private supply, a classic instance of market failure, in which case the government may need to step in. For example, it may have to strengthen institutions that protect intellectual property rights (IPRs), provide monetary incentives, or assume personal responsibility for its supply. Moreover, the 1998/99 WDR takes the argument one step further. Even if knowledge gaps between industrial and developing countries could be closed, the latter might still face other kinds of market failures: information problems (or knowledge about "attributes") may arise, such as the quality of a product, the diligence of a worker, or the creditworthiness of a firm. To alleviate these problems requires mechanisms such as product standards, training certificates, and credit reports; it requires a variety of market and nonmarket mechanisms to collect and disseminate information that has to be generated on the spot and continuously refreshed. Because many of these mechanisms are weak or lacking in developing countries these also need to be put into place.[11]

While the deficiencies observed by the Bank are often quite real, their selection remains colored by a particular understanding of knowledge embodied in technology as generally explicit and transferable, subject to the noted constraints inherent to public goods.[12] If, however, one is

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Latin America. Mody *et al.* (1992) provide a theoretical argument and examples of superior organizational innovations. See work by Pratten (1976a,b), Jones and Prais (1978), noted in Nelson (1981) for industrial countries.

[11] Williamson (1985) and North (1990) deal with some of these issues in the framework of transaction costs.

[12] Amsden (1992) has also noted a separate weakness in this framework: an argument for "markets" that uses "market failures" as an analytical category is tautological, impossible to falsify.

willing to suspend the assumption of perfect information on a different basis--that much knowledge is tacit, embodied in individuals and organizations, experience- and locality-specific, and therefore hard to codify--the analysis may proffer a different set of problems and solutions to technological catch up. These are likely to be quite different, and perhaps complementary, to those suggested by market theory. My proposition is that at the most micro-level, the mechanisms by which developing country manufacturing firms can achieve technological world standards does not lie exclusively in the "processing" of received (explicit) information, but rather in a complementary **knowledge creation effort** that consists of a systematic conversion of tacit into explicit knowledge. But tacit information is held by individuals, the product of highly personal experience. Thus, to be of use to the organizations in which they work (e.g., firms), it needs to be shared with others, discussed collectively, and reworked to be made explicit. Understood this way the organizational needs for a "knowledge creation" effort are quite different to those required for an "information processing" effort, and so are the catch up challenges and policy prescriptions for developing countries.

Theoretical Antecedents

The claims that make up this proposition are not entirely new. Parts of them have been made elsewhere and often in the past, in various implicit and explicit ways. What is different is the way they are integrated into a broader theory that provides a more complete explanation of the pace of current restructuring in some Latin American industries than the working models we have right now. Many commentators studying industrial patterns of adjustment have focused on structural factors to explain differences in adjustment patterns, for instance, the nature of competition in each industry, government regulation, firm size, production process, etc. While all these variables are important, my contribution is to clarify some aspects of adjustment that these models do not illuminate, and that may provide important clues on how to channel assistance. Given that knowledge gaps among countries and industries are not narrowing as rapidly as neoclassical models suggest they should, what are the specific challenges that developing country firms face? What seem to be the more successful paths firms are taking to achieve world technological

standards? Why are certain knowledge professionals playing more important roles in this catch up process than they did in the past? What makes the institutions of sectoral coordination in which they participate the most innovative? Are they new or extensions of the old? How do they resolve the shortcomings of current and traditional forms of public support and private action?

Several heterodox economic and institutional theories illuminate and provide partial structure to some of the claims made above. To further clarify the distinctions between explicit and tacit knowledge it is useful to review first the strong theoretical tradition in American management schools that actually disbelieves or plays down the value of tacit, implicit, practical knowledge. To begin with, Frederick Taylor's (1911) studies at the turn of the century proposed finding the one best method for implementing a job, but left the task in the hands of managers, not the workers themselves who actually knew more about what they did. Herbert Simon (1945, 1958, 1973), author of the notion of "bounded rationality", shows a similar disbelief in tacit knowledge when proposing that organizations in complex environments should distribute information among their units as little as possible to reduce information load. In addition, Simon proposed a passive view of organizations, not as knowledge generators but as passive reactors to changes in the environment through adjustments in their information-processing structures. More recently, the Business Strategy school of Michael Porter (1990) is built on a very top-down understanding of knowledge creation and organizational decision making. For example, managers are assumed to have explicit knowledge on variables or "forces" that allows them to make rational decisions on which sectors to compete in and which ones to exit from. In sum, none of these traditions dwells on the fact that employees may have important capabilities as knowledge generators themselves, and therefore do not explore the mechanisms by which organizations make use of that practical knowledge.

In contrast, a group of economic and firm-level theories recognizes the importance of tacit knowledge. One of the earliest is Hayek's (1945), who noted that the market is the process through which *individual* knowledge is mobilized socially. In turn, Schumpeter's (1951) theory of creative destruction had a somewhat related theme, highlighting the value of new "combinations" of knowledge. However, they were both too focused on making efficient use of existing knowledge

to include any specific discussion of how the tacit portion of individual knowledge is made explicit. A theory by Penrose (1959) proposed the existence of tacit knowledge at the firm level. She argued that firm inputs (called "services") are a function of the experience and knowledge accumulated within the organization; but ultimately she did not elaborate on the organizational mechanisms through which such knowledge is accumulated and codified. Again, it is not clear how knowledge is created within the organization. Other theories develop more fully how organizations may learn from tacit knowledge. Argyris and Schön (1978) and Argyris (1994) proposed that organizational learning consists of two different types of activities. One type of learning is obtaining know-how to solve specific problems based upon existing premises. The latter type of learning is establishing new premises--paradigms, schemata, models, or perspectives--to override the existing ones. Argyris and Schön call them single loop and double loop learning. In this theory tacit knowledge is an important part of double-loop learning, but the focus is not on how it is produced, made explicit, and put to use to compete, but rather how to overcome organizational resistance to change. In addition, the conception of double loop learning is not as useful in that it is episodic, not continuous, occasionally triggered by someone who decides to put it into practice.

One of the most complete and helpful firm-level theories of organizational knowledge creation is that of Nonaka and Takeuchi (1995) who hypothesized that firms' competitive advantage does not come from "processing explicit information" (as is deeply ingrained in the Western management traditions) but rather from "creating knowledge" out of the systematic conversion of tacit into explicit knowledge. (In this view, East Asian firms have been misrepresented and shortchanged in the literature, for their portrayal as successful imitators and adaptators, but not really all that innovative.) Organizations cannot create knowledge on their own without the initiative of individuals; but to be useful, highly personal knowledge needs to be converted into explicit knowledge that can be shared with others in the firm. This model is useful because it captures several of the knowledge generation issues to which I allude: it spells out the mechanisms by which individual experience in Japanese firms is converted into organizational knowledge. It also proposes that middle managers play an important role as "knowledge engineers" because they

involve top management and front-line workers. On the other hand, the model focuses exclusively on knowledge sharing and reworking within the firm to the detriment of interactions of individuals with outside entities.

The significance of tacit knowledge appears in several other theories but I mention the next ones to draw attention to other issues I raise in my hypothesis. For example, the problems of knowledge transfer of tacit information from industrial to opening developing economies are a theme recognized more or less explicitly in several models. Falling into this category are the product life cycle theory (Vernon 1966) and the international division of labor theory (e.g., Froebel *et al.* 1980), in which technological innovation in the former and rising wages in industrialized countries in the latter, encourage multinationals to take mature technologies to developing economies. In other words, knowledge transfer is "smoothened" by FDI that consists not only of capital but also the knowledge embodied in the participating organizations and their employees. These theories are, however, mute about parallel challenges of adaptation to particular local environments (especially with agricultural products).

By the same token, my ideas on "models" providing paths that both facilitate and prejudice have antecedents. In their discussions on tacit knowledge Nelson and Winter (1982) suggested that innovations are unpredictable mutations of routines, and proposed the existence of technology "regimes" as cognitive beliefs about what is feasible or at least worth attempting. Firms typically are familiar only with technological options similar to the ones they are currently employing. Put differently, firms may make certain technological "bets" that may affect subsequent choices. At a more macro level, in her discussion of late industrialization outside the north Atlantic economies, Amsden (forthcoming) also proposes that the identity of a role model is an important explanator of postwar variations in the behavior of late industrializing countries' firms, governments, and exports.

The issue of the reworking of tacit information into explicit knowledge has one of its most recent antecedents in Amsden's (1989) theory of late industrialization, that of 20th century countries that compete on the basis of mature borrowed technologies. Firms achieve competitiveness in these technologies, the argument goes, through incremental improvements in

their production plants. Production experience is the source of the knowledge required for improvements. Amsden also provided an antecedent to the important role of knowledge professionals--in her case they are the shop floor engineers, key players making tacit information explicit in hierarchically managed modern industrial enterprises. She did not elaborate, however, on how the changing self-conceptions of these technicians may have affected the knowledge creation effort inside and outside the firm as I propose to do. Amsden does not note whether engineers may have participated in the creation of industry-specific new economic development institutions.

One of the strongest models on reworking of tacit knowledge and the increasing role of knowledge professionals is Sabel's (1994) theory of "learning by monitoring". In this model tacit knowledge is the main building block of economic growth: economic learning involves change and therefore instability in relations among coordinating agents within firms and between them, and between firms and the state. Because of this instability institutions of "monitoring" or coordination are required. Tacit knowledge from coordination is central to their functioning: it is discussed and reworked to fit new circumstance and to redefine parties' relation to each other. What is particularly useful about this theory is that it recognizes explicitly that new learning demands may quickly outdate the usefulness of old divisions of labor in firm hierarchies. Because of this, relations among top executives, middle managers/technicians, and workers are not cast in stone as is typically assumed in firm hierarchies, but rather are in a state of flux. While this theory doesn't directly focus on the increased role that middle technicians may play within firms and in broader economic development institutions, it suggests reasons why they might.

Another argument that draws specific attention to "received knowledge" in the form of "models", regarding to how technological paths are chosen, and to the role of professional experts or "knowledge-bearing elites", is Ziegler's (1997). His argument is that choices of technological paths are strongly affected by knowledge-bearing groups--scientists, engineers, technicians, skilled workers--and the way these "elites" conceive of their roles in public efforts of innovation. These groups see alternative policies in terms of their compatibility with established jurisdictions and professional self-images. While this explanation suggests a quite different set of drivers of the role

of knowledge professionals to those enunciated by Sabel, it still draws attention to the self-conceptions of professional groups as an important variable. In this last version what remains unclear is under what conditions self-conceptions of professional groups may be used positively to facilitate industry adjustment.

Finally, my claim that there is a strong need for new coordinating institutions that process tacit into explicit knowledge is illustrated vividly through Amsden's (1989) point that competitive assets such as natural resources, low wages, and especially government intervention (e.g., to create "wrong prices") provide firms the opportunity to gain some initial production experience and become competitive. But in the new political economy of liberalization, most developing country firms cannot rely on government protection to pick up initial production experience; the political support for these kinds of measures is no longer guaranteed. The question then is, "How can firms make up for the loss of this major competitive asset, government protection?" In knowledge-intensive sectors where low wages and cheap land are weaker competitive assets, what alternative competitive assets do firms have to quickly obtain the production experience that will move them up the learning ladder and make them competitive?

The Chilean and Mendozan wine industry adjustments are two natural experiments that may provide some useful answers to these important questions.

Figure 1.1
LOCATION OF THE SOUTHERN CONE WINE INDUSTRIES

The Cases: Restructuring in the Southern Cone Wine Industries

The recent Southern Cone wine sectors' upgrading experiences provide insights on how formerly protected manufacturing industries might be able to "bootstrap"[13] themselves out of technological "backwardness." In this study I consider why some firms and market segments within the wine industry have upgraded quicker than others, to draw some general lessons on the actors, policies, and institutions that can facilitate firm learning. The adjustment process has taken place as the governance and economic development mechanisms associated with the import-substitution industrialization (ISI) state collapsed or were eliminated by liberalizing central governments.

Summary of the Adjustment Processes

Until the '70s, both Chilean and Mendozan (Argentina) supply chains produced wine of very poor quality for a rising domestic demand. But when local consumption began to fall in the late '70s the industry had to adjust.

In Chile wine producers reoriented to serve foreign markets. A first wave of large firms acquired new winemaking knowledge, began to plant hundreds of hectares of fine varietals, and quickly expanded processing plants with new stainless steel technology. But these investments were carried out without proper site selection. In addition, irrigation was pumped up excessively to increase yields at the expense of quality. These were the wineries that shaped Chile's initial international image as exporter of good value cheap "fighting" varietals.[14] Starting in the early

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[13] Bootstrapping refers to the process which industrialized countries have used to catch-up with one another when they have fallen behind in international competition, such as Japan did after World War II, and the United States and Western Europe with respect to the former in the 1980s. It is based only in part on the appropriation of management and production techniques used by the leader. Key to the bootstrapping strategy are (1.) that companies develop a set of standards and benchmarks to identify where performance is deficient, (2.) that they identify the institutions and practices which differentiate the benchmark procedures and practices from their own, and (3.) that they initiate a series of internal debates and discussion on the critical elements of the benchmark, whether they should be adopted whole, or how they might be altered to fit into their own organizational practice. See Dussel *et. al.* (1996: 30-31), and Sabel (1995).

[14] "Fighting" varietals refers to those grape types that have greatest acceptance with international consumers--e.g., Cabernet Sauvignon, Chardonnay, Merlot, and to a lesser extent Sauvignon Blanc and Riesling. They are the

1990s a second wave of smaller firms, spin-offs and foreign joint ventures with far improved technological knowledge made the first attempts to give a more "indigenous" personality to the local fighting varietals. They became more discriminating with respect to where they placed their vineyards, reduced watering and yields, and incorporated oak barrel aging. A third phase has begun in the last two years, with several firms moving into the production of ultrapremium wines of distinctive local character. The concentrated nature of the Chilean wine industry has given the restructuring effort significant breadth and depth, and its continuity has been sustained largely through individual purchases of foreign know-how and through foreign participation.

In Mendoza the process unfolded less coherently and with a few years delay, with far less breadth, and with little impetus in its export drive. Two large firms were active initially in upgrading to international style wine making, with smaller firms and foreign participation following after. Some firms leapfrogged to the second phase directly with varietals with a more "indigenous" personality, while others started out like the Chilean pioneers in the "good value" segment. But overall, the breadth and depth of the restructuring effort in international varietals has been far narrower in Mendoza than in Chile. In fact, most of the industry consists of undercapitalized table wine supply chains that are upgrading by the "bootstraps", gradually accumulating savings to finance their investments in new hardware and knowledge acquisition. As will be seen, this difference is associated with the Argentine province's small share of international varietals and a far more diverse ampelograhic collection of intermediate and low quality grapes.

The Drivers of Technological Catch Up

In the context of a growing internationalization of fine wine production and a drop in consumption of cheap table wine, tutelage from market agents such as international wine traders, machinery suppliers, enological laboratories, and international consultants has been key to the upgrading of Chilean and Mendozan fine wine supply chains. They have provided tried and tested varietal clones, wine making and grape growing techniques and work practices, the enological

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preferred grapes for wineries that wants to launch into exports and want to ensure there is a general consumer

inputs, the processing machinery (and the finance)--in sum, a working model to follow--that is allowing them to improve their quality and participate in exports. In addition, in some instances the state has also helped with adaptive research on the main international varietals, marketing assistance, etc. Especially in Chile this effort has been sustained largely through individual purchases of foreign know-how and foreign participation.

On the other hand, most table wine suppliers have been less fortunate, far more dependent on their own local capabilities to upgrade, with fewer market agents to help them, and as will be seen, with historical prejudice working against them. In contrast to the first group, they do not have a working model to follow: they have little or no new machinery, varietal clones, or export experience, hence their exposure to international tutelage is modest at best. They use intermediate and low quality grapes that unfortunately have not been the focus of domestic or international research. Nor do they benefit from much tutelage from domestic buyers: supermarkets offer little of the kind of helpful advice international wine traders provide. Given most table wine producers' weak financial capacity, improved technology and knowledge needs to come in small increments, and must be homegrown, i.e., tailored specifically to the varietals and equipment available to them. Assistance from the state for research on second-tier varietals or other services has not been forthcoming either, or has been modest at best.

While in some ways the technological gap between fine wine makers and table wine makers has widened, reflected by a greater dispersion of wine retail prices, the first group of producers also has problems of its own. International tutelage has helped firms upgrade their production plants and vineyards to world standards, but it hasn't necessarily taught them mechanisms for continuous improvement. Growers may have followed international consultants' advice on how to retrain their vines to better concentrate flavors and aromas, and wineries may have incorporated the latest stainless steel processing and storage technology, and adopted many of the wine making techniques developed by the best Australian, French and Californian enologists. Yet almost none of them has been able to leapfrog several quality categories; most have started in the bottom rung with simple

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acceptance of their product. Chile has extensive acreage of the first four varietals.

varietals and slowly worked their way up. The best wineries in general have found that upward quality movements from the popular premium market segment to superpremium and ultra premium, and ultimately to a *grand cru*, are very hard to make. In fact the process is so painstaking that most domestic producers who have tried to accelerate their movement up the learning curve have continued to rely on foreign experts and joint ventures, on some occasions with only modest success.

Thus in what may seem paradoxical, both fine wine and table wine producers face some common challenges. Technological upgrading involves not only hardware, but especially the tacit knowledge on how to make best use of it. To progress beyond the production of a generic international-style varietal whose origin cannot be differentiated, to one that can be recognized as distinctly and attractively Chilean or Mendozan, requires significant local experimentation. For example, it requires testing variations in vine training systems that may be more suitable to a particular microclimate, it may require the use of a particular indigenous yeast that better elicits the grape's flavors and aromas, or it may demand a more prolonged maceration of grape juice and skins at a different temperature than is practiced in, say, France or California. With time, approximate rules of thumb can be developed firm by firm through local experimentation in the lab or through trial and error in the vineyard and processing plant. But to accelerate this process of discovery and obtain a more definitive understanding of which varietals do better under what conditions requires a broader discussion within the wine-making community of each individual's experiences. Currently the industry has few mechanisms for collective discussion and learning from production experience that can boost the local upgrading effort.

The same applies to the production of intermediate and low quality wines where local experimentation may produce even greater returns. For example, in France the Malbeck grape is considered of intermediate quality, but in Mendoza's climate and soils it appears to have adapted especially well; the existing 9,000 hectares can produce wines of very good quality. The opportunity is there to develop a truly unique Mendozan world class wine. However, the know-how cannot be purchased in France; it will require significant local research. By the same token, some

high-yielding intermediate and low quality varietals that have historically been written off for their poor quality can produce surprisingly good wines when processed correctly with the right technology. Because of their high yields they can produce especially competitive wines in certain market segments. But to turn them into a profitable business opportunity requires detailed knowledge of the various market segments to which they can be targeted, a clear economic analysis defining the basic production parameters for which they can turn a profit, and a specific understanding of how the grapes' quality behave as various growing and processing techniques are altered. Again, faster progress can be made by encouraging an organized communal discussion of these individual experiences.

Among several important insights that emerge from this study of Chilean and Mendozan restructuring are, first, the diminished direct protagonism of the public sector in technological change, the loss of relevance of corporatist forms for organizing social and economic interests, and the reorganization of some of those interests in new or different forms. Second, while there is no shortage of examples in both countries of individual firms that have adopted the latest hardware the greatest difficulties are finding strategies that increase the number of "boats" rising with the tide, and creating the capacity for continuous improvement within firms and in their supply chains. Third, despite these deficiencies there are some interesting homegrown bootstrapping experiences that suggest how they can be overcome, and explain why social and economic interests in the wine industry are reorganizing and rebuilding. I claim these are new economic development institutions in that they are not extensions of previously existing programs, policies, or organizations. Examples are enologists' evaluation events and particular kinds of firm consortia. Their strength lies in that they promote wide unprejudiced discussion and systematic processing of tacit information from production and marketing experience. Knowledge professionals, especially enologists supported by enological laboratories, play a protagonistic role in these institutions. That they do so is not accidental: as knowledge becomes more important to industrial competition the individuals and groups that carry it grow in importance. Qualified enologists have become key coordinators of fine wineries' upgrading efforts, and generators on their own of significant

technological knowledge, partly thanks to substantial tutelage from buyers and suppliers, and partly because of their strategic command of the value chain. They understand how conception and execution relate to each other starting from vineyard, through production, and all the way to marketing, to identify what improvements are required where, and how they can be implemented. A final motivation for activism comes from long-postponed professional expectations for status and public recognition that their profession is accorded in other parts of the world.

Structure of the Dissertation

The dissertation is structured in five chapters. Chapter 2 describes Chile's and Mendoza's wine industry adjustment in three parts: first, the basic conditions from which firms started in the early 1980s, second, how the process unfolded in each country describing the producers that participated in it, and third, those who were left out. I briefly review the origins of the poor quality wine made in both countries until two decades ago. I then provide a number of indicators showing that in the last 15 years conditions have changed substantially. There are many positive signs of upgrading of production capacity to international-style wine making. Next, I describe how the restructuring process unfolded in the last fifteen years, and the firms that participated in it. Last, I explain the breadth and depth of the restructuring in each country, greater in Chile than in Mendoza, yet more exclusionist in the former than in the latter--in the former, one segment of table wine producers has been entirely left out. In contrast, Mendoza table wine producers have also made some, if modest, improvements.

In Chapters 3 and 4 I attempt to answer a set of questions on why not all wine sector participants are on an upgrading path, why, despite improvements, the value added gap between Southern Cone wineries and the world's leading wine producers is still significant, and what is required to continue to close it? Chapter 3 is in eight parts. I review the various forms of market tutelage that Chilean and Mendozan wine supply chains received from machinery suppliers, consultants, international wine buyers, from wineries themselves, and a few others. First, I describe

in detail the kinds of learning challenges leading Californian and French wine supply chains faced in the '70s to improve wine quality. Second, I provide some quantitative evidence and benchmarks on the mixed progress made by Chilean and Mendozan wine supply chains with respect to international competitors like Australia, California, Italy, and France. Third, I lay out evidence on why low labor and land costs offer comparative advantage within limits; further progress requires more purposeful quality improvements. Next, I detail the various market mechanisms wine supply chains have used to date to upgrade their capabilities, to explain the current pattern of advances and bottlenecks in technological learning. Typical technology transfer has come through interactions with buyers and suppliers, hiring of consultants, joint ventures. The advances are uneven, and both fine wine and table wine supply chains face similar needs to make tacit knowledge on grape growing and wine processing techniques more explicit, and to integrate better conception and execution. I close with an example of a firm that has successfully implemented the continuous improvement systems to quickly move up the learning ladder and some ideas on how tacit knowledge can be managed more effectively to induce wine supply chains to learn faster.

The first part of Chapter 4 looks at the role of the state as a source of tutelage for the wine sector. The second part examines examples that suggest how deficiencies in public sector programs can be overcome. The discussion is in three parts. First, I turn to the Chilean and Mendozan wine industries and discuss the relative effectiveness of various public sector programs and liberalization reforms to assist wine supply chains formulate what they needed most: a realistic set of incremental standards that could provide a road map to eventual international competition. Some programs and reforms were completely ineffective or harmful, and a few had partial success. Second, I present a pair of home-grown initiatives that appear to generate continuous learning. Both include different types of wine evaluation committees for the systematic discussion of tacit knowledge. I argue that these are new kinds of institutions, not extensions of existing government programs, business associations, or individual initiatives. Third, I discuss the logic behind the emergence of these evaluation events: why the driving force behind them are the enologists and the enological labs, not the heads of wineries, nor the public sector.

Chapter 5 presents my conclusions. It casts the findings in the literature on technological learning and draws some policy implications.

Research Design: The Decision to Focus on Technical Knowledge

I chose to examine upgrading in the Chilean and Argentine wine industries for a number of reasons. The first advantage is the possibility to examine same-sector performance across two countries, controlling the effects of nation-specific structural factors such as resource endowments and market size. A second advantage suggested itself as I became familiar with my two cases: there are instances in which subregional differences in winery restructuring experience within each region have been quite stark. Thus, the two wine industries allow one to study the different trajectories of firms across particular subregions and localities in the same country. Third, a number of peculiarities of the wine sector also provide richness to the cases. For example, given the complexity of agroprocessing supply chains, there is an opportunity to examine technological catch-up in a mix of activities in agriculture and manufacturing of varied capital and labor intensities. Also interesting, as an agroindustrial activity based on a perennial crop it requires long term investments that pose a number of particularly difficult supply-chain coordination problems. Similarly interesting, because of the relative scale-neutrality of the technology the firm population is heterogeneous in size, degree of technological development, and in organization of production. In Chile it is more heavily concentrated in a few integrated publicly-traded firms; in Mendoza supply chains are less integrated, and there is a greater presence of cooperatives and bulk producers that serve the large domestic market.

A fourth factor is that the initial technological conditions in both countries were similarly obsolete in the preliberalization period. At least until the early '80s both Chile and Argentina had long traditions in mass-production of very poor quality table wine, focused almost exclusively on undemanding domestic markets and only exporting in years of surplus relatively small amounts that were not consumed internally. Hence, they lend themselves well to observe common trajectories

and departures in the technical and organizational solutions to overcome technological backwardness. Last, in both countries there is a long, rich history of public sector support and intervention, with policies that range across the spectrum. Thus, it provides an opportunity to examine in detail to what extent and in what ways the state contributed, if at all, to the apparent success in firm catch-up in each country.

I structured my fieldwork to understand the extent to which technical upgrading had taken place up and down wine supply chains and horizontally across the sector, and what key actors had been involved in the learning process at each stage. I started with field visits to lead wineries in fine wine production and then diversified into other market segments. I began my fieldwork in Mendoza and later continued in Chile. For reasons that I will detail in a moment, I focused most of my attention on the instruments and institutions that promoted broad debates on market and production possibilities, especially the role of enologists in the acquisition, creation, diffusion and absorption of technical knowledge. In all, I conducted over 150 interviews and collected evidence from over 100 wineries, grape juice processors, and grape growers.

The Upgrading "Leaders"

To understand the depth, breadth, and continuity of the wine industry restructuring I first focused on those Mendoza wineries that the sectoral specialists to whom I initially spoke identified as the upgrading "leaders". There turned out to be an identifiable isomorphism in their restructuring style, what I call an "international" path. Most of them were well-capitalized export pioneers, competing in the popular premium and super premium market segments.[15] They were the first to purchase the new world class stainless steel processing technology and import nursery-certified cloned vine plantings for new drip-irrigated vineyards. Most were located in the prime fine grape growing vineyards close to the Andes piedmont, cooler and with more direct access to snow-melt water than the rest of the province. They competed on the basis of the four most popular "fighting" varietals. They had all purchased roughly the same machinery and implemented similar

vineyard and processing practice changes. They all spoke of the new emphasis on vineyard management and had learnt well the lesson that a good wine begins with a quality grape. At these firms I spoke principally to enologists and managers, but also to agricultural engineers and growers from whom they bought fine grapes, to find out how they had gone about identifying bottlenecks and implementing quality-enhancing changes in processing plants and vineyards. The interviews were semistructured, to determine the origins of the firm, which markets it competed in, what technological bottlenecks it had faced, and what resources it had drawn from to overcome them. In many instances these conversations served as points of departure to explore other links in their supply chains. It quickly became clear that this group of lead wineries and growers was small: as will be seen in Chapter 2 it involved no more than four dozen wineries--half of which had just started to upgrade--and a few hundred growers with "fighting" varietals, meaning that most of the industry was not upgrading or was on a separate track.

I also spent the initial weeks understanding the basic concepts of grape growing and wine processing, the technological improvements that the new machinery involved, and the economics of the new technology, to begin to sort out the various hypotheses that might explain why some firms were likely to upgrade and others not. Three key related insights came out of this work: one was that differences in labor costs mattered little in providing competitiveness in fine wine market segments; second, the new machinery that was used to make a bottle of export quality wine worth $5-7 was almost the same as that used to make a bottle worth $50; third, what explained the price difference between one bottle and the other was partly marketing, but most importantly technical knowledge. Various aspects associated with technical knowledge such as bottlenecks, sources, and diffusion paths, suggested themselves as the big topics to research.

Towards an Expanded Definition of "Leadership"

I quickly moved from the lead processing firms to interview public sector research and extension agents who had a broad view of the sector and could therefore inform me on what the

[15] Popular premiums sell for US$3-7 a bottle and super premiums for $7-14 a bottle in the U.S. retail market (IWA

majority of the wine industry was doing. These conversations were the first in which I heard alternative formulations of what the path to progress might be, and allowed me to understand that Mendoza's wine sector involved an heterogeneous mix of economic agents. Each had very different competitive assets, conceptions of what the road to progress involved, and what means might get them there. For example, export-oriented firms that targeted the superpremium niche markets needed to implement quite different vineyard practices compared to those targeting the popular premium consumer--the former were more likely to restrict water to decrease yields and concentrate grape flavors and aromas. Conversely, growers that sold their production for grape juice concentrate needed to water their vineyards abundantly to increase their yields and their sugar content.

Thus as I expanded my understanding of what upgrading "leadership" involved, in more than four dozen interviews I spoke to people in a varied set of wineries and supply chains, from leading table wine producers and bottlers, through successful first and second degree cooperatives, business association leaders, grape juice makers, and enological labs, to exporters of modest quality fine wines. I also spoke to a dozen processing/bottling equipment manufacturers and retailers, and a similar number of other suppliers of inputs and services, such as enological laboratories, vine nurseries, glass bottle manufacturers, irrigation equipment retailers, and technical consultants. These visits took me far beyond the prime Mendoza piedmont growing area to the hotter, less desirable, eastern part of the province. The most interesting findings emerged from these interviews: they provided examples of successful alternative technological upgrading paths, indicated the general lack of knowledge most of the industry had about them, as well as the existence of large knowledge gaps on profitable business opportunities in the production of intermediate quality wines based on medium-yield, intermediate quality varietals.

As will be seen next, the key agents of change turned out to be the enologists, who nurtured and channeled in useful directions sectoral debates on the possibilities of restructuring.

1998:13)

The Focus on Enologists and their Discussion Groups

Industry participants resolved many of the uncertainties of the restructuring process through continuous discussion with their colleagues. The most ubiquitous lines of communication seemed to be among enologists, who shared information on productive experience freely among themselves and in small discussion groups. In addition, wine evaluation events seemed to be particularly valuable sources of information in that they resolved in useful ways fierce sectoral debates on the possibilities of restructuring. Many actors participated in organizing these discussions, but enologists also seemed to be at their crossroads. Thus, I focused a significant amount of my time in Mendoza studying the history of wine evaluation events and reconstructing the role of enologists, especially in the subregion of Eastern Mendoza where the knowledge gaps and the prejudices regarding its productive possibilities were historically the greatest.

The Emergence of Chile's Smallest Wine Exporters

Based on what I had learned in Mendoza, I designed my research in Chile differently. Because I had already observed the "international" track to progress in Mendoza, my first visits were not to the large lead wineries that had taken the same direction, but to small exporters. The sectoral specialists I initially interviewed pointed me towards them as the new dynamic actors in the wine sector. I interviewed firm owners and enologists at roughly three dozen of these firms to understand their origins and the resources they had tapped to overcome the typical bottlenecks associated with size. I later contacted some of the largest wineries to find out about their own initial experiences.

Several insights emerged from these interviews. First, different from Mendoza, both large and small wineries were following similar technological paths in that they all processed the same fine varietals that were widely accepted internationally, and all had purchased similar processing and storage technology. The statistics later confirmed that Chile had far fewer varietals than Mendoza, and the majority of the vineyard surface area consisted of the four most valued internationally. Second, intermediate and low quality varietals were principally two, *País* and *Moscatel de*

Alejandría. In 1996 they represented only 38 percent of total vineyard surface area. Half of it was handled by the large integrated wineries and two cooperatives. The remainder was produced in the *secano* with rudimentary techniques for own consumption, and wasn't even registered on most studies of the industry. (The *secano* is an impoverished area of subsistence agriculture in the southern part of the Chilean wine region, with average plots of 2.1 hectares and no irrigation.) In sum, Chile's wine industry didn't have anything like Eastern Mendoza's producers; its population of firms was far more homogenous in its grape endowments, technology and export orientation. There seemed to be a greater consensus on what the restructuring path might look like. Thus, I restricted my interviews to the group of large and small fine wine producers. In effect, the Chilean wine industry's homogeneity and concentration made it far less complex and interesting than its Mendozan counterpart.

Third, small wineries had gained much of the technical knowledge through consultants. When I asked who were the specific people involved the same set of names began to repeat itself. It did not take long to discover this was an elite of enologists who had previously trained (and often still worked) for the largest export wineries during the 1980s. At that point I decided to follow the trajectory of these knowledge professionals to understand how they had obtained their training and expertise and to what extent it had diffused through the industry.

The Rise of Elite Enologists

Given the relative homogeneity of the industry in terms of varietals and market niches targeted I spent much of the rest of my time in Chile mapping out the trajectories of this elite group of enologists: where they had received their education, where they obtained their practical training, and for whom had they worked as consultants, to measure the diffusion impact of their work. I documented part of this material through direct interviews with enologists, and part I reconstructed through firm interviews, conversations with leaders of their professional association, and with the academics who trained them and interacted with them on a regular basis.

I complemented my field work with more than twenty interviews of personnel at public sector regulatory and technical agencies, and with other supply chain actors such as enological laboratories and machinery retailers. I visited several more than once.

Quantitative Data

Several sources of information provided sectoral background and context for my interview questions. During parts of 1997 and early 1998 I assembled a number of quantitative and qualitative databases from published sources on sectoral evolution in the two countries. Many of these historical databases go back to the 1960s and in some instances as far back as the preceding century.[16] The databases available in each country were not always comparable. For instance, in Mendoza I was able to learn much on the primary sector because the national wine regulatory agency had kept very good data. Conversely, quantitative evidence on the evolution of Mendoza's processing sector is sketchy because the only information available is from an industrial census carried out every ten years, using a five digit code. By the same token, export data is not as disaggregated as in Chile. One representative survey of manufacturing firms carried out by colleagues at MIT provided some information on firm-level export performance.[17]

In contrast, Chilean data on hectares, size of harvests, wine produced, etc., are poorer than in Mendoza because following the downsizing of the Ministry of Agriculture in the 1970s and deregulation of grape growing, few if any records were kept. On the other hand, the Chilean census bureau, *INE*, continued a yearly manufacturing survey that monitors firms that employ more than ten workers. Hence, I was able to get a good sense of how output per capita, investment levels, productivity, employment, etc., of Chilean wine processors had evolved for the last twenty years (since mid-1970s to mid-1990s).

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[16] They included statistics such as hectares of vineyards specified by different grape varieties, vineyard size across subregions in each country, harvest sizes for various types of poor and high quality grapes, number of wineries involved, prices of grapes and wine (wholesale and retail for different grapes), production costs, input, labor, machinery, and capital costs, export quantities of various types of wine, etc.

[17] MIT/CIT-Mendoza Project, 1995-1997.

CHAPTER 2

Two Paths of Technological Catch Up

Introduction: The High Road, The Low Road, and No Road

In this chapter I describe the restructuring of Chile's and Mendoza's wine industry, the basic conditions from which they started in the early '80s, how the process unfolded in each country, which firms participated in it, and which were left out. While there are similarities, each industry evolved quite differently. First, the upgrading from table to premium wine has been far more widespread in Chile than in Mendoza. Currently over 50 percent of Chile's wine production consists of four major varietals, the majority of which are sent to export markets. The pioneers were the largest wineries that made the first investments in new technology and started exports of premium varietal wines in the early 1980s. However, from the early 1990s on the population of firms grew and diversified, especially with "boutique" integrated wineries. Yet despite this diversity, the most striking characteristic of the Chilean wine industry is the convergence in the high value-added upgrading path that most wine supply chains have followed. Based principally on the four most popular varietals, they are either occupying the low end of the popular premium segment ($4-6/bottle) or trying to upgrade to the production of superpremiums and ultrapremiums.

By contrast, in Mendoza the industry seems to have split into a minority of firms following a high value-added upgrading road (as in Chile), and the majority attempting to get on a low value-added upgrading road. A few large firms were pioneers in export-quality premium varietal wines, but between them they concentrate a much smaller share of wine production than in Chile. The population of varietal wine producers has diversified to include more boutique wineries, but production of premium varietals still represents no more than a few percentage points of total output. On the other hand, in the early 1990s a group of supply chains embarked on a low value-added road of high-volume commodities and is slowly but steadily upgrading, some with tutelage

from foreign brokers, others by the bootstraps. The province currently has a flourishing grape juice concentrate export industry. The quality of table wine production is also improving considerably, and exports of table wine are growing. The table wine industry is still very large: it is mostly focused on the domestic market, absorbing more than 60 percent of the province's production. In terms of volume, the greatest flurry of upgrading activity is taking place not in the premium to superpremium categories, but among supply chains attempting to break out of the cheap $0.80-$2 table wine segment to upgrade into the lower end of the popular premium market--$2-$5.00--with intermediate quality varietals.

In each country, those that are on the "no road"--neither on the "high" nor the "low" roads--and therefore not participating in the upgrading push have some similarities, but are also quite different. In both countries they tend to be the smaller growers (under 5 hectares) and processors that work with poor quality varietals. In Chile they live in the *secano*, dry lands that marginal not only economically because of their low yields, but also politically. In Mendoza, small growers in the eastern part of the province are most representative of the province's "laggards". On the other hand, the differences between the two groups are stark: the former are marginal to the Chilean wine industry; in contrast, Eastern Mendoza's laggards are part of a subregion that represents more than half of the province's wine output. One more important difference is that the latter growers are politically very active. They built a reputation for their willingness to use aggressive political tactics to seek redress from the public sector during economic downturns.

Recent Evidence of Quality Improvement in Southern Cone Wines

Overview

The Southern Cone wine industries are located contiguously on both sides of the Andes mountains. On the western side, Chile's entire wine region stretches north to south along a three-hundred mile corridor extending from Ovalle in the north to Concepción in the south. This area of roughly 40,000 square miles contains all of the country's vineyards and wineries, nested in a series

of valleys with Mediterranean climate. The valleys run east-west for 50-80 miles, starting in the Andes foothills and ending in the coastal hills next to the Pacific Ocean. In 1996 most of the wine came from 4,800 vineyards covering 43,000 hectares, with an additional 13,000 hectares of unproductive, low quality vineyards, for a total of 56,000 hectares. Of those, 28,000 hectares were of the finest quality varietals. All added, the vineyards account for less than 7 percent of the total surface area. Official statistics for 1995 place the number of wineries employing 10 and more people at less than 50, but separate evidence such as export data and association memberships show that there is an increasing number of smaller wineries, perhaps another 70-100. At the producer level, the Chilean wine industry's 1995 output was $425 million.

On the opposite side of the Andes mountains lies Mendoza in Argentina, the largest wine-producing province, responsible for roughly 70 percent of the country's wine production and almost 100% of its wine exports. Most of the province's 60,000 square miles is a desert, with agricultural activities located in three small oases. Mendoza has close to 19,000 vineyards, with a total surface area of just over 140,000 hectares, less than one percent of the provincial total but two and a half times as large as Chile's. The 1993 Census numbered Mendoza wineries at 451. Industry output for 1993 was $775 million (Table 2.1).

Table 2.1
SUMMARY STATISTICS OF CHILE'S AND MENDOZA, ARGENTINA'S WINE INDUSTRIES

Wine Industry	Chile		Mendoza	
	1978*	1996*	1979*	1996*
Vineyard Surface Area (1996)	107,000 hectares	56,000 hectares	231,000 hectares	143,000 hectares
Number of Vineyards (1996)	31,400	11,000	29,400	19,000
Average Vineyard Size (Hectares)	8.1 hect. (excludes VIII Region)	9 hect. (excludes VIII Region)	7.9 hect.	7.5 hect.
Number of Wineries	271 (138 w/10+ employees, 133 w/5-9 employees in 1979)	120-150 (43 w/10+ employees in 1995)	1,050 (1973)	451 (1993)
Wine Storage Deposits	668	?	1,298	1221 (1992)
Employees in Wine Processing	6,300 (3,960 for firms w/10+ employ. 1979)	4,600 (w/10+ employees in 1995)	9,200 (1973)	7,400 (1993)
Average Winery Size (employees/firm)	23 (43 for firms w/10+ employees)	106 (firms w/10+ employees in 1995)	9 (1973)	16 (1993)
Gross Output in U.S. $ (constant)	$179 million	$426 mill. (1995)	$? million (1973)	$775 million (1993)
Gross Output in Liters	561 million	388 million	1,777 million	897 million
Number of Exporting Wineries	n.d.	95	n.d.	60 (approx. those that reconverted, 1997)
Wine Exports in U.S. $ (current)	$9 million	$412 million (1997)	$6.9 million	$116 million
Wine Exports in Liters	11 million	216 million (1997)	9 million	134 million
Value Export Wine (U.S. $/liter)	$0.87	$1.90 (1997)	$0.81	$0.87
Country Population	10 million	14 million	25 million	33 million
Consumption per Capita/Year	45 liters	15 liters	82 liters	41 liters
Year of Liberalization	1975		1991	

Source: Based on ProChile, I.N.E.. and S.A.G. for Chile, and on I.N.V., I.N.D.E.C. for Mendoza.
*Most data are for 1978 and 1996 for Chile, and 1979 and 1996 for Mendoza. Year changes are noted in parentheses if different..

Initial Conditions

Until well into the 1970s Chilean and Argentine consumers drank very poor quality wines, what is normally labeled "table" wine. During import substitution industrialization (ISI) the average winery produced wine exclusively for domestic consumption: it bought or processed growers' grapes for a fee, turned it into generic white or red table wine, and sold it in bulk to an oligopolistic market of bottlers/distributors. Intermediaries made a commission of a few percentage points facilitating transactions between wineries and bottlers. The latter were a small group of very large firms based in the urban centers where they distributed the wine. The few bulk producers that integrated forward survived by targeting niche regional markets in demijohns. These firms processed intermediate and poor quality but high-yield grapes, with techniques that diluted flavors, aromas, and color. Most enologists running these bulk wineries were employees with little training, writing standardized "prescriptions" in their labs for foremen to execute. Their responsibilities were limited to the production plant, disconnected from marketing or vineyards. Most were

technical high school graduates with an extended secondary education. Until the late 1970s over 90 percent of Mendoza's production consisted of cheap table wine.

Grape quality in the vineyards had deteriorated gradually during most of the century.[18] Especially visible in Mendoza, over the years the relative weight of poor quality, high yielding varietals increased over that of low volume, fine varietals, those with more concentrated flavors and aromas.[19] In addition, until as recently as the mid 1980s, local ampelographic knowledge--information that allows one to distinguish varietals from each other and their different characteristics--was poor at best, so that growers often confused one grape for another and had a sketchy idea of the relative quality of their own vineyards. It was not uncommon that the same row in a vineyard was planted with several different varietals, thus diluting the contribution of the best plants. Moreover, it was common belief among growers that plant variety actually improved pollination, hence the incentives to preserve purity were low. Finally, faced with a continuously growing internal consumer demand that at the time seemed completely undiscriminating in its tastes, throughout the 1950, 1960s, and early 1970s growers preferred varietals and vine guiding techniques that increased grape volume regardless of whether they diluted flavors and aromas (Table 2.2). They even irrigated their vineyards generously right before the harvest to increase the weight and volume of the grapes, further watering down their flavor.[20]

Table 2.2
Share of Mendoza's Vineyard Surface Area with High Yield/High Volume Orthogonal Trellis Systems

Mendoza Province	Decade 1950s	Decade 1960s	Decade 1970s	Decade 1980s	Decade 1990s
Provincial Average	10%	15%	33%	43%	56%

Source: Based on data from INV, Mendoza

[18] Quality is generally ascribed to grapes that are more likely to produce wines with persistence of aroma/bouquet, a brilliance, clarity and depth in their color, and intensity, balance, and persistence of taste. All wine critics include grapes such as Chardonnay, Sauvignon Blanc, and Riesling for white wines, and Cabernet Sauvignon, Merlot, and Pinot Noir for red wines, in their short list of the best varietals. See, for example, Schuster (1989).

[19] Higher yields are generally associated with poorer enological quality. Yields vary depending on the variety, but especially in relation to the amount of water provided to the plant during the growing season. Well-watered vineyards produce poor quality grapes because they dilute aromas, tannins, and colors, and enhance unwanted herbal flavor due to vine robustness. For best results in fine wine making, quality vineyards are provided limited water, especially when close to the harvest date.

[20] For a general account of these and other shortcomings of the Argentine wine industry see Foster (1995).

A second part of the reason for the poor quality of Southern Cone wines lay in the poor machinery used by the wineries themselves. On both sides of the Andes the equipment that processed and fermented grapes was mostly of Argentine make, the local manufacture of which was encouraged by ISI restrictions on the importation of capital goods.[21] These machines were not necessarily of poor construction; in fact many of them were well known for their robustness. But therein lay their problem: they were purposely designed to process large volumes of grapes rather than to attend to quality. For example, the push to favor volume over quality meant that at harvest time grape pickers would make little effort to remove leaves and stems when they clipped the grapes. Thus destemmers and grape presses were primarily designed for robustness and speed to handle high volumes of these elements, rather than for quality. The result was that a large portion of broken leaves, stems and crushed grape seeds made their way into the tanks and ended up fermenting with the grape juice, passing on a distinctly herbal flavor to the wine. In contrast, today's grapes are pressed with pneumatic bladders over several hours, thereby avoiding crushing the seeds. As important, in the past not all the mechanical parts in contact with the grapes were made of stainless steel as they are now, hence rust further contributed to the deterioration of wine quality.

Perhaps the greatest damage to wine quality used to take place in both regions' storage tanks, large containers made of wood or cement that paradoxically their owners saw as their pride and glory. At the turn of the century wineries competed with each other to own the largest wooden casks. Later during ISI, they outdid themselves to build the largest cement tanks. Among the problems with these huge containers was the difficulty to clean them, hence allowing bacteria to grow on their walls that later attacked the wine. In addition, given their size, wine sat in them for months, oxidizing quickly and losing its color, flavor, and aroma. Finally, until 15 years ago none of the two regions' wineries had any temperature control equipment, a piece of hardware that is now widely accepted as essential, especially to process white wines.

The third and by far the most important reason for the low quality of Southern Cone wine lay in the absence of continuous improvement practices. Not even cutting-edge technology on its own could resolve this shortcoming. The point is simple: a bottle of wine with a retail value of $50 is made with roughly similar technology as one worth $5-7. A small part of the price differential may be explained by better marketing, but the major portion is a result of learning to grow a flavorful and aromatic grape and make a "complex" wine.[22] This requires a methodical mapping of the grape's microbiological and biochemical behavior under different conditions of sun, water, and foliage density, identification of those variables that best concentrate a grape's flavors and aromas, knowledge of the particular yeasts and enzymes that elicit its best characteristics during fermentation, and an understanding of the wine's behavior over time and when exposed to oak barrels. A grape's behavior also differs significantly depending on the varietal from which it is picked, on the microclimate in which it is grown, and the history of a particular growing season. All these variables behave in predictable ways, but to identify them requires the implementation of numerous systems to document and analyze them. More broadly, records need to be kept to make explicit tacit knowledge from production experience, from trial and error experiments, from information passed on by colleagues by word of mouth, from specialized magazines, or from controlled experiments in the laboratory. Much of this knowledge can only be generated and acquired locally. Without these systems in place, wine supply chains can learn very little from their own and their competitors' successes and mistakes. In Chile and Mendoza, no table wine supply chains had any of these systems in place.

Conditions were not that much better at the few niche wineries responsible for the remaining percentage points of production, that of higher quality wines. Typically these were smaller integrated wineries with a few well known brands, with at least some hectares of fine quality vineyards, modest bottling facilities, and small, often personalized marketing and distribution

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[21] Until the mid-'60s Chilean wineries didn't even have basic equipment such as filters (Hernandez 1996: 11). Bordeu (1995:90) notes that because of restrictions on technology imports during ISI, Chilean wineries had access only to Argentine equipment of mediocre quality through the A.L.A.L.C. trade treaty.

[22] This simple but critical point was brought to my attention by numerous enologists and machinery suppliers during my interviews.

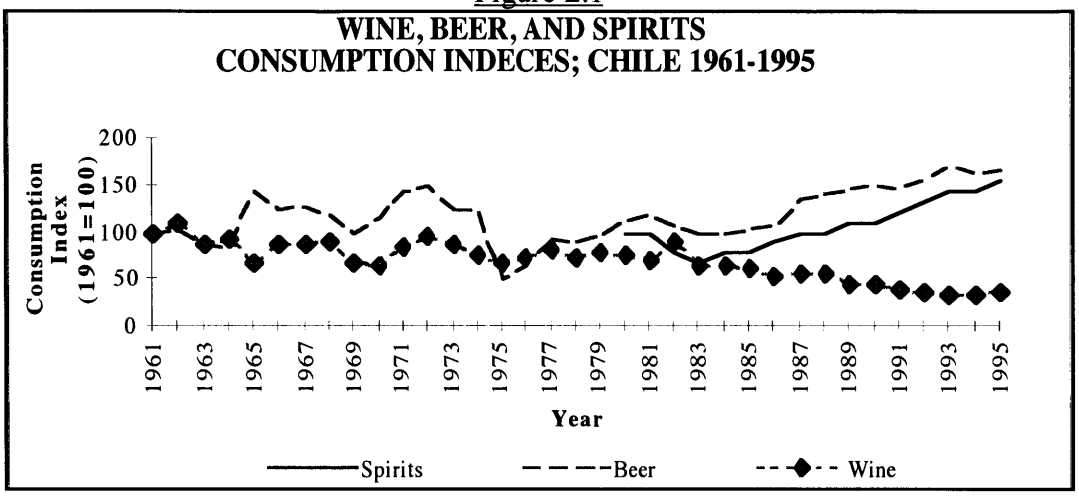
departments. But the rustic machinery available to the technicians and few university-trained enologists that worked in these niche wineries severely limited their ability to control wine quality. Although their knowledge of wine making techniques was superior and the grapes they used were better than average, the wines quickly lost their best attributes as a result of the intense oxidization they were subjected to when aged in large wood vats for months and years, also disqualifying them for export. Despite continuously prodding their bosses to invest in new technology, professional enologists at these integrated wineries were basically ignored. Winery owners were risk-averse businessmen, partly due to macroeconomic turbulence associated with ISI, and partly because steady demand for relatively cheap wine dissuaded them from making big changes.

In sum, by the early to mid-1980s, almost ten years into the new liberal regime in Chile and towards the end of ISI in Argentina, the general technological conditions in the two countries were similarly poor. On both sides of the Andes wineries had the same old processing and bottling machinery, and storage facilities. At least as important as the lack of infrastructure, there was little or no knowledge of how to make international quality wine. And there were no institutions nor work practices that focused on quality improvement. Wineries focused almost exclusively on undemanding domestic markets and only exported in years of surplus relatively small amounts. Neither did they have the capabilities to begin to document systematically their own successes and failures.

From the late '70s on, however, Chilean and Argentinean domestic consumption of cheap table wine fell quickly (Figures 2.1, 2.2), competition from alternative beverages increased, and wineries faced serious overproduction crises and price collapses (Figures 2.3, 2.4). As had happened a decade earlier in the West European wine consuming countries, interest in fine wine also rose so that some fine wine makers started paying attention to what their skilled enologists had been recommending for some time. Seeking to adapt to the changing circumstances, they decided to upgrade their technology to make more "modern" wines. Especially in Chile where domestic demand for table wine was falling dramatically and the economy had liberalized since the mid-70s, wineries felt pressured to revert plummeting sales with exports. Conversely, macroeconomic

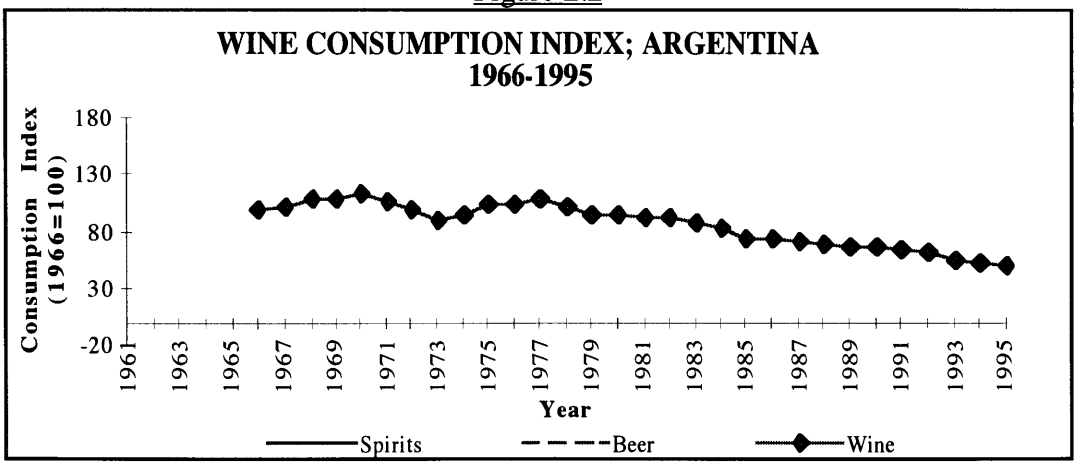
instability in Argentina held back investments and delayed Mendoza wineries' interest in exports until the 1990s. But despite the somewhat different time frames, the changes this initial batch of wineries needed to introduce were somewhat similar in both countries, and were a radical break from the past: they needed to make strong, deliberate efforts to overcome severe infrastructure backwardness, lack of knowledge to reach a minimal export quality, and total absence of systems capabilities.

Figure 2.1



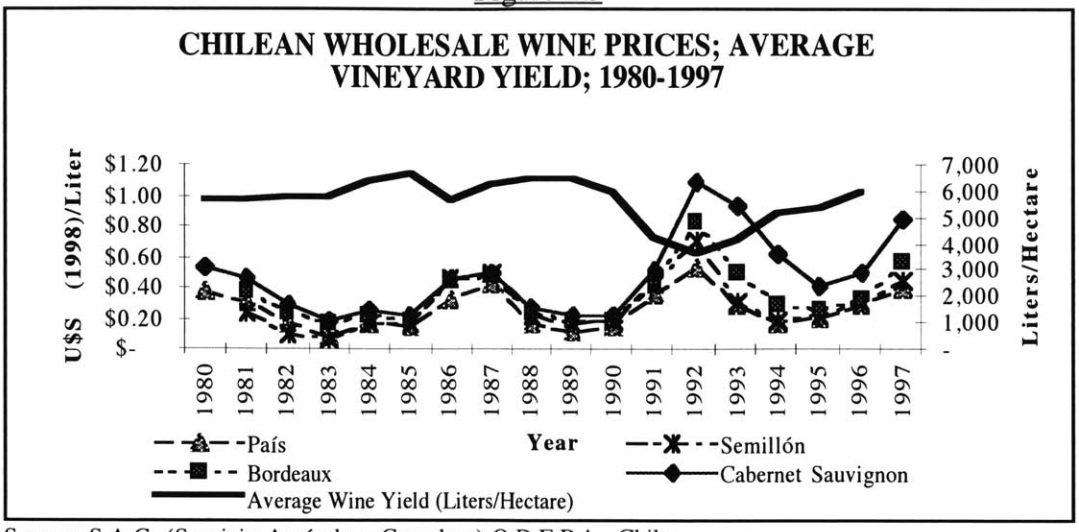
Source: World Drink Trends 1996.

Figure 2.2



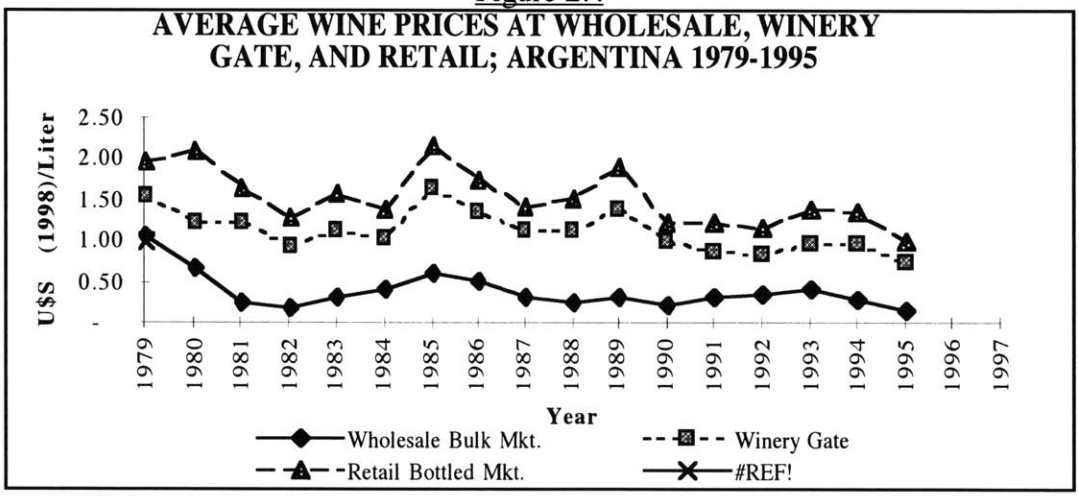
Source: I.N.V. (Instituto Nacional de Vitivinicultura), Mendoza, Argentina.

Figure 2.3



Source: S.A.G. (Servicio Agrícola y Ganadero)-O.D.E.P.A., Chile.

Figure 2.4



Source: I.N.V., Mendoza, Argentina.

Restructuring and Evidence of Improvement

Following liberalization the wine industries in Chile and Mendoza restructured roughly following the expected neoclassical economics model.[23] In both regions these reforms induced a more efficient allocation of resources and a better use of their comparative advantages in land and labor. In the Chilean wine processing sector for which there is specific evidence, between 1975 and

[23] Tariffs and other import barriers were reduced (at least initially, down to 10 percent in Chile and an average of 12 percent in Argentina), factors of production were gradually deregulated, public firms were privatized, and state spending was cut. See, for example, Corbo and Fischer (1994), and Hachette (1992) for Chile, and report by the Ministry of the Economy (1993) for Argentina.

1979 labor and inputs expanded (Table 2.3), capital was used more efficiently, and plant size grew. So did the number of small firms in specialized markets. Output and wages also rose (Table 2.4) as did exports (Figure 2.5).[24] These changes were congruent with the evolution of Chilean manufacturing in general, that experienced a rapid increase in total factor productivity. However, improvement came about through a more efficient use of existing resources rather than because of an upgrading of the capital stock.[25] When the economy went into a recession and wine consumption dropped in the early 1980s output fell. Exports were especially hard hit because wineries had not made the requisite changes in the production infrastructure to allow them to shift their offerings to more demanding markets. The sector's recovery began slowly in 1986 with accelerating increases in the capital stock in the 1990s, reflecting the significant commitment by the industry to improve the productive technological base. Although for Mendoza there are no comparable statistics, anecdotal evidence suggests similar processes at work.

Table 2.3
ANNUAL PERCENTAGE CHANGES IN FACTORS OF PRODUCTION; CHILEAN WINE PROCESSING; 1975-1995

Period	Output (Q)	Inputs (M)	Labor (L)	Capital Stock (K)
1975-1979	34.4%	39.4%	12.8%	14.1%
1980-1981	-10.9%	-12.8%	-16.0%	-5.1%
1982-1985	-4.5%	-0.7%	-3.4%	5.2%
1986-1992	15.8%	17.9%	3.4%	5.2%
1993-1995	-0.1%	2.9%	0.9%	18.8%

Source: Based on I.N.E. data.

Table 2.4
ANNUAL PERCENTAGE CHANGES IN OUTPUT/LABOR AND WAGES; CHILEAN WINE PROCESSING; 1975-1995

Period	Output/Labor
1975-1982	34.4%
1983-1989	-10.9%
1990-1995	-4.5%
1975-1995	15.8%
1983-1995	-0.1%

Period	Wage Rise
1975-1981	21.4%
1982-1986	-7.4%
1986-1995	7.9%
1975-1995	9.2%
1982-1995	2.5%

Source: Based on I.N.E. data.

[24] These changes are all congruent with market theory. See Scherer (1980).
[25] See Agacino and Rivas (1995).

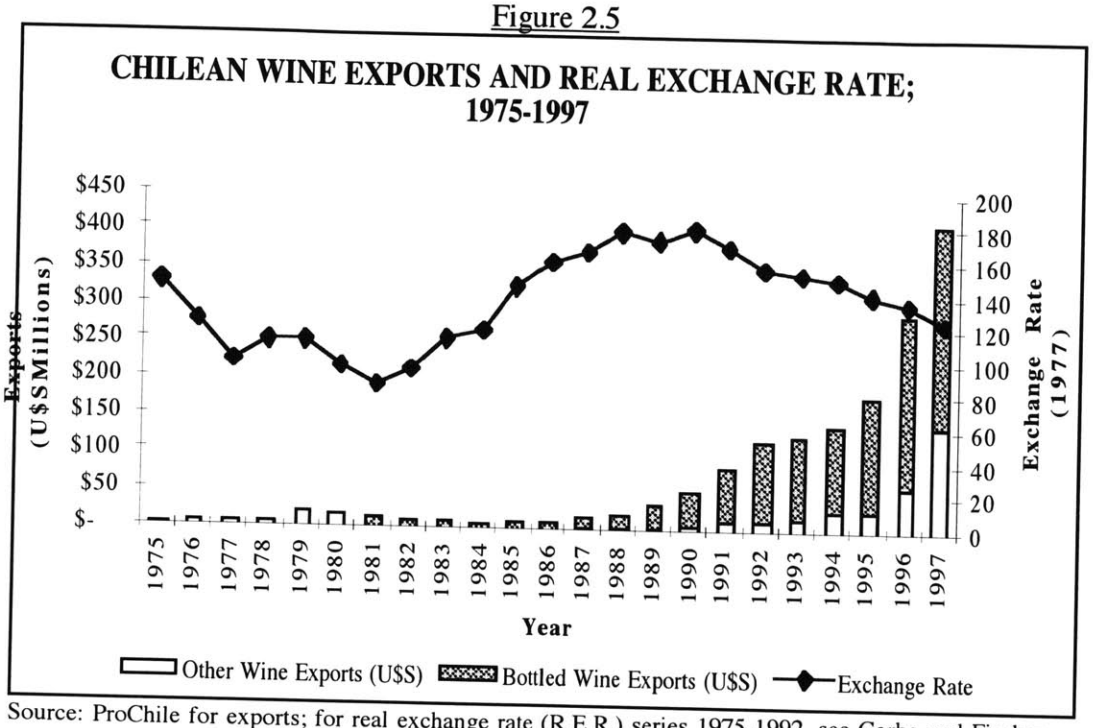
The modesty of initial conditions in Southern Cone wine supply chains' production infrastructure and knowledge in the early 1980s, makes the subsequent successes all the more impressive. Wine industry supply chains have tended to specialize. Large growers with a comparative advantage in high-yield, sugar-rich grapes, and vineyards that are easy to mechanize are increasingly dedicated to the grape juice industry, looking for ways to further increase their yields and sugar content. By the same token, many of those with smaller vineyards and grapes of better enological value are now working closer with fine wine makers to learn ways to better concentrate aromas and flavors. Among those doing well, some have integrated forward into their own processing and marketing. In both countries, those with vineyards of poor enological quality that, in addition, are not productive enough to sell to the grape juice industry, are having the greatest difficulty to survive. Their problems are compounded if they don't have the capital to restructure, as quite often is the case.

Macroeconomic stabilization, deregulation and economic opening have also allowed wine supply chains to make the most of scale economies and weed out the less efficient. In the past, scale was less important because many inefficiencies were masked due to inflation, interest group pressures, administrative or regulatory actions (e.g., legislation, state subsidies, price setting agreements), etc. Now small grape growers that do not have scale economies are facing extraordinary difficulties remaining competitive. The same is true of small wineries and grape juice processors that do not have the scale to survive on thin profit. Ownership in most market niches has tended to concentrate. Similar to what happened with the wine industry across the world, in the last fifteen years large foreign and domestic corporations bought up numerous Southern Cone wineries to feed into their distribution chains. Starting in Chile in the mid 1980s and in Mendoza towards the end of the decade, these corporations provided the much needed infusion of capital the industry required.

Many wine supply chains launched themselves into exports of low-priced varietals and gradually accumulated capital and skill to upgrade to higher quality market niches. First in Chile and several years later in Mendoza, wine exports exploded. In the former country export sales

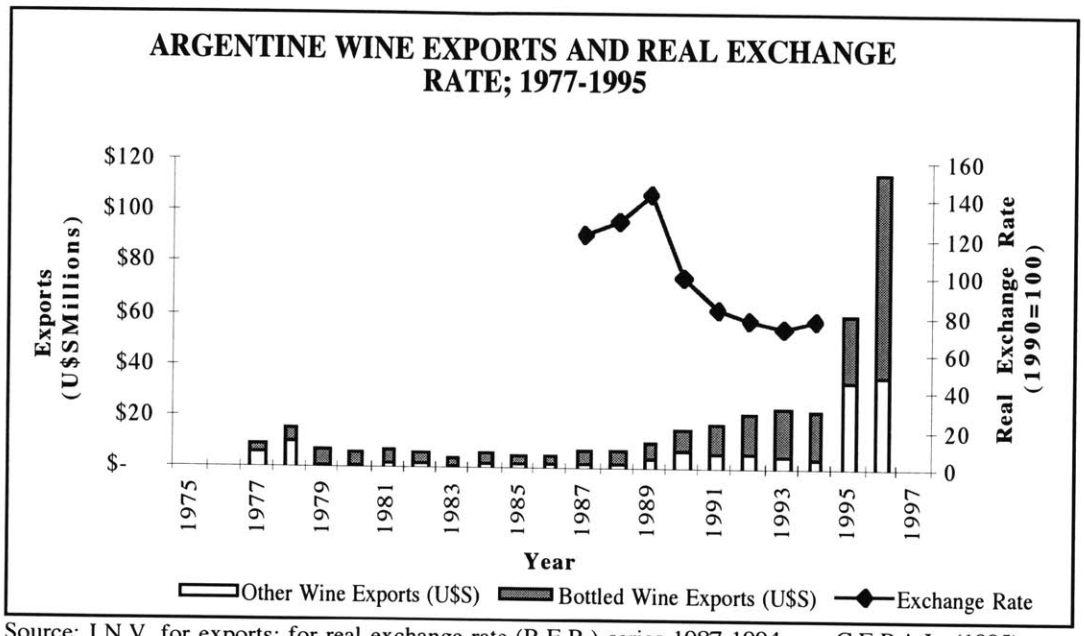
jumped from $10 million in the mid-1980s to $400 million in 1997 (Figure 2.5). Albeit starting at a later date and with lower value per liter, Argentine exports also grew quickly, from $10 million in the late 1980s to $116 million in 1996 (Figure 2.6).

Figure 2.5



Source: ProChile for exports; for real exchange rate (R.E.R.) series 1975-1992, see Corbo and Fischer (1994). For series 1992-1997 see I.M.F. (1999).
Note: An increase in the RER denotes a real depreciation of the domestic currency.

Figure 2.6



Source: I.N.V. for exports; for real exchange rate (R.E.R.) series 1987-1994, see C.E.P.A.L. (1995).
Note: An increase in the R.E.R. denotes a real depreciation of the domestic currency.

As impressive is the fact that this growth occurred even as both countries' exchange rates appreciated, reducing their competitiveness from 1990 on. During the 1990s Southern Cone wine export growth far outpaced that of the rest of the world at a time when aggregate wine consumption fell (Table 2.5). Wineries did not remain concentrated supplying the "easier" markets but instead diversified, reaching far beyond less demanding Latin American consumers to more sophisticated markets in North America and Europe (Table 2.6).

Table 2.5
CHILE'S AND ARGENTINA'S SHARE OF THE WORLD'S WINE EXPORT MARKET; 1976-1996
(Millions of Liters)

	1976/80 (Avg.)	1981/85 (Avg.)	1986/90 (Avg.)	1990	1991	1992	1993	1994	1995	1996
World Consumption	**28,430**	**28,048**	**23,702**	**23,600**	**23,462**	**22,930**	**21,635**	**21,548**	**21,847**	**n.d.**
% Change		-1.3%	-15.5%	-0.4%	-0.6%	-2.3%	-5.6%	-0.4%	1.4%	
World Exports	**4,655**	**4,945**	**4,394**	**4,441**	**4,371**	**4,455**	**5,003**	**5,441**	**5,406**	**n.d.**
% Change		6.2%	-11.1%	1.1%	-1.6%	1.9%	12.3%	8.7%	-0.6%	
Chilean Exports	**14**	**9**	**23**	**43**	**65**	**74**	**87**	**100**	**129**	**184**
% Change		-36.8%	151.4%	90.2%	52.1%	13.1%	17.0%	14.9%	19.6%	42.7%
% Share of World Exports	0.31%	0.18%	0.52%	0.97%	1.50%	1.66%	1.73%	1.83%	2.39%	
Argentine Exports	**36**	**18**	**22**	**44**	**28**	**23**	**25**	**22**	**222**	**134**
% Change		-48.8%	21.3%	101.5%	-37.0%	-19.4%	9.5%	-10.1%	897.0%	-39.5%
% Share of World Exports	0.76%	0.37%	0.50%	1.00%	0.64%	0.51%	0.49%	0.41%	4.10%*	

Source: Based on data from Bulletin de L'O.I.V., S.A.G., and I.N.V.
* Sudden increase mostly reflects greater bulk table wine exports to Spain where wine production fell temporarily due to a drought.

Average Yearly Growth of World Consumption (1990-1995): **-2.1%**
Average Yearly Growth of World Exports (1990-1995): **4.6%**
Average Yearly Growth of Chilean Exports (1990-1996): **28.2%**
Average Yearly Growth of Argentine Exports (1990-1996): **133.4%**

Table 2.6
DESTINATION MARKETS OF CHILE'S AND ARGENTINA'S WINE EXPORTS; 1978-1996
(% of Liters)

Destination Chilean Exports	**1978**	**1980**	**1985**	**1990**	**1993**	**1995**	**1996**
Latin America	75%	88%	70%	37%	23%	23%	15%
U.S.A. & Canada	7%	10%	27%	44%	42%	39%	43%
Europe	5%	2%	3%	17%	28%	31%	34%
Asia	12%	0%	0%	0%	2%	3%	3%
Other	0%	0%	0%	2%	5%	4%	5%
Total	100%	100%	100%	100%	100%	100%	100%

Source: Based on ChileVid, Asociación de Exportadores y Embotelladores de Vino.

Destination Argentine Exports	**1978**	**1980**	**1985**	**1990**	**1993**	**1995**	**1996**
Latin America	9%	61%	14%	21%	35%	10%	21%
U.S.A. & Canada	2%	12%	8%	13%	14%	1%	4%
Europe	25%	24%	66%	56%	31%	81%	50%
Asia	46%	3%	11%	9%	18%	2%	10%
Other	17%	0%	1%	1%	2%	5%	15%
Total	100%	100%	100%	100%	100%	100%	100%

Source: Based on I.N.V. export data.

Argentina's exports of grape juice concentrate also grew from less than ten thousand tons a year in the early '80s to 114,000 tons in 1996 (Table 2.7) Liberalization increased the incentives to produce a commodity that local markets were slow to demand but for which international markets were paying handsomely. Since commercial opening in 1991, Eastern Mendoza's abundant supply of cheap, high yield, high sugar content grapes, has allowed it to become the world's powerhouse of grape juice concentrate production. The subregion is also specializing in exports of table wine,

increasingly supplying the neighboring country's domestic market. Chile's big integrated wineries prefer to subcontract their table wine needs to Eastern Mendoza producers, and focus their production capacities on fine varietals.

Table 2.7
EXPORTS OF GRAPE JUICE CONCENTRATE; ARGENTINA 1990-1996

Year	Tons	U$S
1990	62,016	35,277,900
1991	35,532	23,662,600
1992	38,777	41,253,100
1993	4,120	4,819,300
1994	11,118	9,998,000
1995	82,812	60,199,190
1996	113,796*	n.d.

Source: Based on I.N.V. data
*Preliminary data.; "n.d." means no data available.

The Protagonists of the Restructuring

In the sections that follow I review how the restructuring process unfolded, and who was involved in it. Starting in the mid 1980s, lead wineries in Chile and Mendoza took what I will call an "international" high road: they acquired the wine making know-how to satisfy international tastes by sending their enologists to train to Californian and French wineries and hired the best international wine consultants to visit them in Chile and Mendoza; they invested heavily in world class processing equipment, and they planted new vineyards with the finest international "fighting" varietals--Chardonnay, Sauvignon Blanc, Merlot, and Cabernet Sauvignon--those that were widely accepted by consumers in the major advanced country markets. Based on purchases of fine grapes and base wines to local growers and on their expanding quality vineyards they launched varietal wines in addition to the blends they had always made.

Upgrading Convergence in Chile

The timing and location of the first winery to make investments in modern wine processing equipment was the result of a chance event rather than a studied strategy. Miguel Torres, an

established Spanish wine-maker met respected Chilean enologist Alejandro Parot in Montpellier, France, in the late '70s, who initiated his curiosity in the Southern Cone country's productive possibilities. Torres charged him with identifying a vineyard for purchase to start a "modern" wine operation. Because Parot was from Curicó in 1978 Torres ended up purchasing a 100 hectare vineyard in that area. A year later he opened a processing plant that incorporated the first stainless steel tanks, temperature controls, and refrigeration equipments ever seen in Chile. For *Torres*, the business risk was smaller than it seemed for outside observers; the presses, bottling lines, and refrigeration unit came out of his Spanish wineries, equipment that had fully depreciated and was due for replacement. In the Chilean wine world it created a sensation, but mostly in the form of skepticism rather than admiration. Wineries saw no reason to change what they were doing; at that time winegrape vineyards totaled 103,000 hectares, with 17,500 of fine varietals. The worst wine overproduction crisis in Chilean history had yet to strike; consumption remained relatively stable at 48 liters per capita through the 1970s, and there was no competition from imports.

A year later conditions deteriorated quickly as the grape supply increased and domestic demand fell. Even undemanding exports to Latin America collapsed as several countries went into a recession with balance of payments problems in the early '80s; these exports could not be redirected to U.S. and West European markets because they did not have sufficient quality to meet more demanding consumer expectations. From 1980 through 1983 wine prices collapsed to under ¢10/liter and never fully recovered until the late 1980s. Sales were dramatically reduced and profits turned negative when wine prices couldn't even cover marginal costs. Small firms were the worst hit (Table 2.8); small integrated fine wine makers closed down or changed hands, many of them purchased for their labels by the large integrated wineries that had dominated the sector throughout the 1970s. For example, *Viña San Pedro* purchased *Viña Santa Helena*; *Viña Concha y Toro* bought *Viña Tocornal*; *Viña Santa Rita* took over *Viña Carmen*; and *Viña Santa Carolina* acquired *Viña Ochagavía*. Others dumped wine on the black market to avoid heavy alcohol taxation, unfairly competing against wineries that paid the full tax burden. Among those hurt most were a dozen

cooperatives.[26] Poor management and the difficult competitive conditions led to heavy losses during the 1980s.[27] One by one they were sold off; in 1997 only three cooperatives were still open and they operated more like private firms than cooperatives. Most of the wine traders located in the Vicuña Mackenna area of Santiago that bought bulk wine, and bottled and distributed it to retailers, also went out of business. They were overwhelmed by the superior marketing and business management techniques of the large integrated wineries.

Table 2.8
NUMBER OF WINERIES, EMPLOYEES, AND AVERAGE FIRM SIZE; CHILE 1975-1995

CHILE	Number of Firms			Employees			Firm Size		
Year	Small	Medium+	Total	Small	Medium+	Total	Small	Medium+	Total
1975	20	35	**55**	437	3,359	**3,796**	22	96	**69**
1979	102	36	**138**	1,931	3,960	**5,891**	19	110	**43**
*Census '79	235	36	**271**	2,345	3,960	**6,305**	10	110	**23**
1985	43	23	**66**	866	2,733	**3,599**	20	119	**55**
1990	26	20	**46**	578	3,312	**3,890**	22	166	**85**
1995	22	21	**43**	503	4,073	**4,576**	23	194	**106**

Sources: I.N.E. Annual Manufacturing Survey of firms with more than 10 employees. Small firms are those with 10-49 employees; medium+ firms are medium and large enterprises with 50+ employees.
*The 1979 survey was broader: the "Small firm" category includes microenterprises with 5-9 employees.

By 1985 the wine industry had changed considerably from the late '70s: close to 40,000 hectares of grapevines were eradicated or switched to export table grapes, and wine production had become concentrated in a handful of the same large integrated wineries--principally, *Concha y Toro*, *Santa Rita*, *San Pedro*, and *Santa Carolina*. They became the leaders of the turnaround, the only ones with the capital to absorb substantial losses but ride out the crisis, and to make the requisite investments in processing equipment to redirect production from domestic table wine to export-quality varietals. These wineries were controlled by a local elite of families and domestic business groups with deep financial pockets from other business activities. They borrowed extensively using their assets as collateral. The largest five or six wineries also raised capital through the stock market by going public. Many large firms also benefited from access to cheaper lines of credit than

[26] Based on Barría, Cereceda, and Echeverría (1991) and own research.
[27] CORFO (February 1986).

the rest of the firms in the economy.[28] The upside of this concentration was that in just a few years most of Chile's wine industry was on the restructuring path, with exports of fine varietals jumping from a few percentage points to over 50% in 1997.

The integrated wineries were also helped by the fact that at the time of the crisis, the industry already had 15,000 hectares of the most prized varietals--Chardonnay, Sauvignon Blanc, Cabernet Sauvignon, and Merlot (Table 2.9). Thus they did not need to wait for the basic raw inputs required to produce the wines international consumers preferred. In fact, they continued to make investments in fine varietal vineyards at a staggering rate. Between 1985 and early 1996 total vineyard surface of the finest varieties more than doubled to 28,000 hectares, grew to 37,000 hectares by the end of 1997, and based on planting programs in progress was expected to expand a further 7,000 hectares during 1998 (IWA 1998). Most of these new vineyards were put in by the largest firms. The primary sector investments alone total more than a half billion dollars. In turn, stainless steel storage and processing capacity rose from literally zero to over 130 million liters by 1998 (total stainless steel storage could be between 160-200 million liters when all are counted) (Table 2.10).

Table 2.9
SURFACE AREA WITH VITIS VINIFERA CULTIVARS CLASSIFIED BY QUALITY; CHILE 1978-1996
(Hectares)

	1978	1985	1992	1996
Major Grapes of High Enological Quality*	17,484	14,720	24,027	27,670
Other Grapes of Medium & Low Enological Quality	28,769	13,704	12,978	7,099
Major Grapes of Low Enological Quality^	56,781	38,715	21,825	21,235
Total Grapes for Wine Making	**103,034**	**67,139**	**58,830**	**56,004**
Proportion of High Quality Grapes	**17.0%**	**21.9%**	**40.8%**	**49.4%**
Proportion of Medium and Low Quality Grapes	83.0%	78.1%	59.2%	50.6%

Source: Based on S.A.G. data.
*Includes Chardonnay, Riesling, Sauvignon Blanc, as white grapes, and Cabernet Sauvignon, Cabernet Franc, Merlot, Pinot Noir, and Syrah as red grapes.
^Includes Moscatel de Alejandría and País grapes

[28] See Agacino and Rivas, *op. cit*; Galvez and Tybout (1985).

Table 2.10

TOTAL STORAGE, STAINLESS STEEL, OAK, VINEYARDS, & PRODUCTION OF PRINCIPAL WINERIES; CHILE 1998*

Winery	Type Firm^	Storage (Mill. Liters)	Stainless Steel (Mill. Liters)	Oak Barrel (Mill. Liters)	Fine Grapes (Hectares)✞	Exports (Mill. Liters)	Domestic. (Mill. Liters)
Concha y Toro	Publ./Fam.	91.2	22.8	3.0	2,800	36.1	54.6
Santa Rita	Publ./DBG	45.4	8.7	2.6	1,800	6.5	32.3
Santa Emiliana	Publ./Fam.	18.4	1.8	n.d.	1,330	9.9	8.5
San Pedro	Publ./DBG	35.5	16.5	1.0	1,300	11.6	24.6
Santa Carolina	Publ./DBG	25.0	4.5	0.7	600	17.9	15.5
Carta Vieja	Priv. Dom.	6.0	0.5	yes	550	10.3	
Lomas Cauquenes	Coop.	20.0	0.0	0.0	550	0.3	3.5
Undurraga	Publ./Fam.	14.0	0.8	n.d.	540	5.8	6.0
Cánepa	Priv. Dom.	11.0	6.5	1.2	500	5.1	
Tarapacá	Joint Vent.	4.0	3.0	n.d.	500	2.1	1.9
Gracia	DBG	6.2	6.0	0.2	500	0.6	4.4
La Rosa	Fam.	3.2	7.0	n.d.	470	1.7	1.5
Bisquertt	Fam.	5.0	n.d.	n.d.	450	3.0	n.d.
Carmen	DBG	7.9	5.5	0.5	400	2.2	3.4
Itata/Fund. Chile	Non. Prof.	1.0	0.9	0.1	350	n.d.	n.d.
Casa Lapostolle	Joint Vent.	3.2	2.0	0.3	350	0.8	1.0
Caliterra	Joint. Vent.	n.a.	n.a.	n.a.	340	4.6	n.d.
Casablanca	DBG	n.a.	n.a.	n.a.	340	0.9	n.d.
J. Bouchon	Ex-Bulk	2.2	1.6	yes	330	1.1	n.d.
Errázuriz	Fam.	2.3	1.0	0.3	320	2.5	n.d.
Santa Inés	Fam.	6.8	2.5	1.1	300	3.5	n.d.
Cono Sur	Fam./DBG	4.6	2.0	n.d.	300	n.d.	n.d.
Los Vascos	Joint Vent.	3.7	1.5	0.5	300	2.3	n.d.
Santa Ema	Family	3.0	1.0	0.4	300	2.0	n.d.
Cousiño Macul	DBG/Fam.	2.0	1.5	0.5	300	1.3	0.7
Veramonte	FDI	3.0	2.5	0.4	300	2.0	n.d.
Macaya	Ex-Bulk	4.4	n.d.	n.d.	300	n.d.	n.d.
Henriquez	Ex-Bulk	3.0	n.d.	n.d.	300	n.d.	n.d.
Los Robles	Coop.	19.0	0.3	0.1	300	1.8	4.2
Viu Manent/S. Cls.	Ex-Bulk	3.5	1.2	n.d.	250	0.6	0.4
Chateau Los Boldos	FDI	2.0	1.0	0.5	250	0.7	0.6
Miguel Torres	FDI	2.2	1.0	0.2	225	1.0	n.d.
L.F. Edwards	Fam.	3.0	1.2	0.9	210	0.3	n.d.
Discover	Priv. Dom.	3.0	2.0	0.4	200	1.9	n.d.
Mont Gras	Priv. Dom.	5.1	4.8	0.3	200	1.7	2.3
Manquehue	DBG	4.0	n.d.	n.d.	200	0.0	n.d.
Astaburuaga	Ex-Bulk	1.8	n.d.	n.d.	200	n.d.	n.d.
La Fortuna	Fam./DBG	4.4	0.1	0.1	185	0.3	0.6
Coop. Loncomilla	Coop.	14.6	0.0	0.0	160	n.d.	10.0
Torreón de Paredes	Fam./DBG	2.0	1.0	n.d.	150	1.3	n.d.
Portal del Alto	Enol. Dom.	n.d.	n.d.	n.d.	150	0.3	0.3
Morandé	Enol. Dom.	7.4	6.0	n.d.	150	3.0	n.d.
Domaine Oriental	FDI	1.8	1.0	0.1	130	1.4	n.d.
Villard Fine Wines	Joint Vent.	0.9	0.6	0.3	120	0.3	n.d.
Terranoble	FDI	1.0	0.6	n.d.	120	1.0	n.d.
Segú Ollé	Priv. Dom.	4.0	0.1	yes	110	0.6	1.4
Anakena/Porta	Joint Vent.	0.6	n.d.	0.2	100	0.4	0.2
Cremaschi-Barriga	Fam.	1.5	0.5	yes	100	n.d.	0.3
Balduzzi	Fam.	1.0	0.3	0.1	100	0.1	0.5
San Gerardo	Priv. Dom.	0.8	0.2	n.d.	100	n.d.	n.d.
La Posada	Priv. Dom.	0.8	0.3	n.d.	100	n.d.	n.d.
Santa Mónica	Enol. Dom.	5.2	n.d.	n.d.	90	2.1	n.d.
de Larose/C. Toqui	Joint Vent.	1.1	1.0	0.1	90	0.1	0.6
Tabontinaja	Priv. Dom.	n.d.	n.d.	n.d.	70	n.d.	n.d.
Valdivieso	DBG	8.0	5.0	0.9	70	1.5	n.d.
Echeverría	Ex-Bulk	1.3	n.d.	n.d.	70	0.5	0.3
William Fevre	Joint Vent.	0.5	0.1	n.d.	70	0.1	n.d.
Francisco Aguirre	Coop.	3.4	3.2	0.2	60	n.d.	0.6
San Miguel Huique	Priv. Dom.	0.8	0.2	n.d.	55	n.d.	n.d.
Santa Laura	Fam.	n.d.	n.d.	n.d.	50	n.d.	n.d.
Doña Javiera		n.d.	0.8	yes	50	n.d.	0.7
Doménico Correa	Ex-Bulk	n.d.	n.d.	n.d.	50	n.d.	n.d.
Rothschild	Joint Vent.	0.5	n.d.	n.d.	44	0.3	n.d.
Quebrada Macul	Enol. Dom.	n.d.	n.d.	n.d.	15	n.d.	n.d.
Ravanal	Priv. Dom.	1.5	n.d.	n.d.	n.d.	n.d.	n.d.
Viñedos del Sur	Priv. Dom.	0.2	0.1	n.d.	15	n.d.	0.1
Valle del Itata	Non-Prof.	n.d.	1.5	n.d.	n.d.	n.d.	n.d.
Calina	FDI	0.4	n.d.	n.d.	0	0.1	n.d.
Viñedos del Maule	Private	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Total		**433.9**	**133.5**	**17.2**	**21,179**	**155.5**	**164.9**

Source: There are no official statistics. Table assembled from various data sources including Mathäss (1997), Guía de Vinos de Chile,

ProChile, individual firm reports filed with the Bolsa de Comercio, and own interviews.
*Data reflect firms' status sometime between 1996 and 1998; export data are for 1996.
^Publ.: publicly-traded winery; FDI: foreign direct investment; DBG: domestic business group; Ex-Bulk: ex-bulk wine producer; Enol. Dom.: Chilean enologist; Priv. Dom.: private domestic firm.; Fam.: family firm; Non-Prof. : non-profit; Coop.: cooperative.
✞ The vast majority of the vineyard surface area consists of four varietals--Chardonnay, Sauvignon Blanc, Cabernet Sauvignon, and Merlot, with minority participation of Riesling, Cabernet Franc, Pinot Noir, and Syrah.

Table 2.11
WINERY RESTRUCTURING, CLASSIFIED BY YEAR, OWNERSHIP, AND SIZE; CHILE 1979-1997*

Year **Hectares of Own Vineyards**	**1979/80**	**1981/82**	**1983/84**	**1985/86**	**1987/88**	**1989/90**	**1991/92**	**1993/94**	**1995/96**	**1997/98**
100-200 hect.					Santa Mónica Torreón	Aquitania Dom. Oriental Villard Wines Tabontinaja	Fco. Aguirre William Fevre Echeverría Valdivieso Porta/Anakena Cremaschi-B. Portal del Alto Terranoble Segú Ollé	Calina Sn. Gerónimo Santa Laura San Gerardo Santa Alicia San Miguel Millahue Balduzzi de Larose San Pablo	Morandé La Ronciere Doña Javiera Casa Silva Santa Eugenia La Posada	Viñedos del Sur Valle del Itata Quebrada Macul Viña Rothschild Camino Real Domén. Correa Porta
200-500 hect.	M. Torres	Cousiño Macul			Discover Wine Los Vascos Errázuriz	Los Boldos J. Bouchon Caliterra Itata	Manquehue Astaburuaga Viu Manent Macaya Lapostolle Carmen Lomas Cauqenes La Rosa	Mont Gras L. Edwards Santa Ema Ravanal Cono Sur Santa Inés Henriquez Casablanca Bisquertt Gracia	Loncomilla Veramonte	
500-1,000 hect.		Cánepa			Santa Carolina		Undurraga Tarapacá	Los Robles	Carta Vieja	
1,000-2,000 hect.			Santa Rita	San Pedro Sta. Emiliana						
2,000+ hectares		Concha y Toro						Viñedos del Maule		

Source: Based on Mathäss 1997, Guía de Vinos de Chile 1997, Bolsa de Comercio, and own interviews.
*List contains principal wineries that restructured but may not be 100% complete. Position of wineries is organized according to the earliest date they started upgrading either in production processes, vineyards, or world class stainless steel equipment. Most wineries started with improvements in production processes, and later improved vineyards.

Borrowed wine making know-how was initially purchased through international consultants and by training domestic technicians abroad. More capital and knowledge came in the late '80s on, in the form of foreign direct investment and joint ventures, especially from France and California.

The Publicly Traded Large Wineries

Viña Concha y Toro was the first domestic winery to anticipate the times for change. Established by the local nobility in the nineteenth century but a publicly traded firm since the 1960s, the winery was lucky enough to have been intervened during *Allende*'s presidency by an able administrator who kept it reasonably productive and with relatively low debt ratios. By 1980 when the local wine market collapsed *Concha y Toro* already owned 900 hectares of vineyards, and was in the process of grafting them and planting 270 new ones with the finest varietals. It already exported wine, if mostly to less demanding Latin American markets. That same year it started an aggressive marketing campaign that included full page advertisements in the New York Times and made its first sales to England. Exports consisted of nothing more than cheap varietals that the company processed with same old technology, but now bottled quickly to avoid the loss of color and flavor from oxidization in large vats. It was in 1981 that the firm made its first serious investments in a small number of stainless steel tanks and refrigeration equipment to control fermentation of white wines. More stainless steel capacity and machinery such as pneumatic presses came in 1986/1987, once the worst years of the wine industry recession were ending. In 1994 it raised $53 million on the New York Stock Exchange to finance investments, and by 1997 it had built up more than 2,800 hectares of fine vineyards and 23 million liters of stainless steel storage capacity. In 1998 it was poised to displace an Italian competitor as the top volume importer to the United States.

Viña Cousiño Macul and *Viña Santa Rita* followed soon after. The former, an established family firm with 300 hectares of high quality vineyards and business interests in many other sectors, incorporated stainless steel tanks to process its white varietals, but paradoxically retained many of the same wine processing techniques. The latter was the second largest Chilean winery,

and was acquired in 1980 by a businessman with investments in several other manufacturing activities. It had no vineyards and depended on grape purchases from local growers, but had an important share of the local table wine market. The winery initiated a large scale export project by introducing the first pneumatic press to Chile for the 1984/1985 harvest; it followed with a second one a year later. *Santa Rita* also led the pack with the industrial-scale introduction of small 225-liter oak barrels for aging. A year later two other domestic business group-owned wineries--*Viña San Pedro* and *Viña Santa Carolina*--purchased modest amounts of stainless steel storage capacity in 1985 and began small experiments with temperature-controlled fermentations. Because of shortage of funds they postponed larger scale investments till the early 1990s. The exceptional innovative family winery was *Viña Cánepa*, whose owner had the deep pockets to purchase modern wine making equipment, if in a somewhat disorganized way. He traveled to Italy in 1982 and returned with a container full of machinery, including the latest stainless steel tanks and refrigeration units, but including outdated continuous presses rather than the more gentle pneumatic versions. Ironically, similar to *Cousiño Macul* the winery continued with the same vinification processes it had always used--its knowledge on how to make full use of the new technology still modest. In sum, while *Torres* and *Cánepa* provided initial demonstration effects, most of the charge to acquire new technology in large scale was led by domestic business groups, most of them publicly traded.

Even as the largest wineries continued their investments in new technology and led an export recovery from 1985 on, they were also the source of a series of spin-offs and joint ventures (Table 2.12). For example, in 1986 *Concha y Toro* spun off one of its labels--*Viña Santa Emiliana*--as a publicly traded independent winery with over 600 hectares of vineyards, owned by the same holding. A year later *Viña San Pedro*'s enologist and export manager resigned from the firm to team up with two other associates and create Discover Wine, dedicated exclusively to exports. In 1989 *Villard Fine Wines* emerged as a joint venture between a French supplier of oak barrels (and grape grower) in Chile with one of *Concha y Toro*'s best enologists and *Santa Emiliana*. The latter not only provided part of the initial capital, but also shared its processing and storage facilities until the start-up winery finished building its own processing plant in 1997. In

1991 a member of the family controlling *Concha y Toro* started out another winery, *Cono Sur*, run independently and with a completely different marketing strategy but within the family holding. In 1992 *Santa Rita* came out with its own spin-off, *Viña Carmen*, dedicated entirely to fine wines for export and for the domestic market. A year later *Viña Santa Carolina* created a new firm, *Viña Casablanca*, run independently by its best white wine enologist, and sharing one of its processing plants. In the early 1990s the same *Concha y Toro* enologist who had participated in *Villard* started his independent winery in association with other investors. They rented processing and storage space from various other wineries in Chile and Mendoza until they finished building their own facility in 1995. In 1992 one of the two large cooperatives that produce *pisco*, a grape juice distillate, built a separate winery, *Viña Francisco de Aguirre*.

Table 2.12
STORAGE CAPACITY OF LARGEST WINERIES AND SPIN-OFFS: TOTAL, STAINLESS STEEL, OAK BARRELS ; VINEYARDS; CHILE 1997

Largest Wineries	**Total Storage Capacity (Million Liters)**	**Stainless Steel Storage Capacity (Million Liters)**	**Oak Barrel Storage Capacity (Million Liters)**	**Surface Area Fine Varietals (Hectares)**
Viña Concha y Toro	91.2	22.8	3.0	2,800
Viña Santa Rita	45.4	8.7	2.6	1,800
Viña San Pedro	35.5	16.5	1.0	1,300
Viña Santa Carolina	25.0	4.5	0.7	600
Viña Cánepa	11.0	6.5	1.2	500
Subtotal	**208.1**	**59.0**	**8.3**	**7,000**
Spin-off Wineries	**Total Storage Capacity (Million Liters)**	**Stainless Steel Storage Capacity (Million Liters)**	**Oak Barrel Storage Capacity (Million Liters)**	**Surface Area Fine Varietals (Hectares)**
Viña Santa Emiliana	18.4	1.8	n.d.	1,330
Viña Cono Sur	4.6	2.0	n.d.	300
Viña Discover	3.0	2.0	0.4	200
Viña Carmen	7.9	5.5	0.5	400
Subtotal	**33.7**	**11.3**	**0.9**	**2,230**
Total Largest Wineries & Spin-offs	241.8	70.3	9.2	9,230
Total Industry (approx.)	650	160	20.0	30,000
Share Largest Wineries & Spin-offs	**37%**	**44%**	**46%**	**31%**

Source: Based on Table 2.8

The Next Round of Dynamic Actors: Joint Ventures and FDI

In the mid to late 1980s the first export-oriented foreign investment projects and joint ventures made themselves visible (Tables 2.11 and 2.13). All were medium- to small-size projects with their own vineyards to control grape quality and very well established export-marketing chains;

at least initially, not a case remained in Chile. *Caliterra* was the first partnership between an established California winery, Franciscan Vineyards, and the Chadwick family, owner of another well known local vineyard. The partnership was dissolved in 1992 but another one re-established with Robert Mondavi three years later. (Franciscan Vineyards went on to set up its own independent winery, *Veramonte*, in 1995. *Viña Los Vascos* was the first of a set of international partnerships between French winemakers and Chilean landowners. In 1988 *Viña Los Vascos* brought together the Eyzaguirre family's 300 hectares of fine varietal vineyards with famous French winemaker Rothschild who contributed the capital for a processing plant and the winemaking know-how. In 1991 William Fèvre, a producer from the French Chablis region, did the same with Victor Pino who supplied 70 hectares for *Viña William Fèvre*. *Casa Lapostolle* followed in 1992, a product of Grand Marnier and the Rabat family that set aside 350 hectares of its best vineyards. In 1994 a Bordeaux-based winery, Larose-Trintaudon, teamed up with the Granella family who supplied 90 hectares of vineyards to form *de Larose/Casas del Toqui*. A slightly different arrangement was *Viña Aquitania* set up in 1990 as a joint venture between two well-known Bordeaux winemakers from *Cos d'Estournel* and *Chateau Margaux* and a Chilean enologist: together they bought 25 hectares of land and set up vineyards and a small winery. The most prominent recent partnership was established in 1997 between *Concha y Toro* and Bordeaux's *Mouton-Rothschild* to jointly produce a *grand cru* wine.

Table 2.13
WINERIES THAT RESTRUCTURED CLASSIFIED BY YEAR INITIATED AND BY OWNERSHIP; CHILE 1979-1997

	Total	'79/'80	'81/'82	'83/'84	'85/'86	'87/'88	'89/'90	'91/'92	'93/'94	'95/'96	'97/'98
FDI	**16**	**1**	**-**	**-**	**-**	**1**	**5**	**5**	**1**	**1**	**1**
Wholly Owned		1					2	1	1	1	
Joint Ventures						1	3	4			1
Domestic	**63**	**-**	**3**	**1**	**2**	**5**	**3**	**14**	**21**	**8**	**6**
Private								1	4	4	2
Public/DBG			1	1	2	1		1	2		
DBG			1			2		3	1		1
Family			1					2	7	1	1
Enologist						2	1	1	1	1	1
Ex-Bulk							1	4	4	1	
Non-Profit							1				1
Coop.								2	1		
TOTAL	**79**	**1**	**3**	**1**	**2**	**6**	**8**	**19**	**22**	**9**	**7**

Source: See Table 2.8

The first entirely foreign-owned winery was the 1989 purchase by four French investors of *Domaine Oriental* with 110 hectares and their modernization of its processing plant and storage facilities. *Chateau Los Boldos* with 250 hectares followed the next year, purchased by French company Massenez, a holding from the Alsace region. *Viñedos Terranoble* was started in 1992 with five other partners, 120 hectares of vineyards brought from France, and a new winery. Kendall-Jackson established as a first step a winery--a processing plant--in 1993, and relied on selected growers for grapes.

Rising with the Tide: Local Family Wineries, Bulk Producers, Enologists, Entrepreneurs

As the price of fine varietal grapes and wines recovered in the late 1980s the list of new entrants to the industry grew and diversified (Tables 2.11 and 2.13). Several family-controlled integrated wineries followed *Cánepa's* early footsteps: *Viña Santa Mónica*, a small winery purchased by a Chilean enologist in the mid-'70s made modest technology investments and began to experiment with international-style winemaking techniques. The *Paredes* family that had made its money in the metallurgical sector and had purchased a winery in 1979 did the same. Most started with modest investments in stainless steel technology and expanded gradually.

Growers who had previously sold their grapes and wines in bulk to the big four wineries also found themselves with enough income to attempt independence. Tempted by the low interest rates offered by European machinery manufacturers, they bought new processing machinery and integrated forward into bottling and exports. *J.A. Bouchon* was the first to follow this path in 1990. In subsequent years *Viñas Porta/Anakena*, *Echeverría*, *Astaburuaga*, *Cremaschi-Barriga*, and others followed suit.

By the mid 1990s the list of firms starting up projects continued to broaden: the domestic business group *Corpora* that had never participated in the wine sector before set aside land from its other agroindustrial operations and put up vineyards and a winery, *Viña Gracia*. Several local enologists with significant technical and commercial experience started up their own independent projects in addition to the numerous joint ventures in which they already participated. Renowned

wine expert, university professor, and later president of the Paris-based Organisation Internationale du Vin (O.I.V.), Alejandro Hernandez, was one of the first with his winery *Portal del Alto*. Others followed such as Casablanca Valley pioneer Pablo Morandé with *Viña Morandé* , and Chardonnay/Sauvignon Blanc expert Ignacio Recabarren with *Quebrada de Macul.*

In sum, despite the increasing concentration of the industry in very few hands in the early 1980s, from the end of the decade on the population of firms diversified noticeably. Given that less than a third of them are FDI and domestic business group (DBG) projects that often start with significant capital and access to borrowed know-how, a rising number of medium and small "boutique" wineries employing less than fifty people rose by the bootstraps. They assembled the finance to purchase the machinery, mastered the quality-enhancing wine making techniques, found the export markets, and quickly scaled up to cover the minimum $100,000 costs of the smallest export marketing department. Quality improved significantly, beyond the export of cheap fighting varietals. This is visible in the increased number of firms that exported quality DOC wines between 1993 and 1996 (Table 2.14).

Table 2.14
NUMBER OF WINERIES THAT EXPORTED HIGH VALUE ADDED (DOC*) BOTTLED WINE; CHILE 1993-1996

FOB Bottled Wine Export Sales	**1993**	**1994**	**1995**	**1996**
$10,000,000+	2	2	3	5
$1,000,000-$10,000,000	13	13	17	28
$500,000-$1,000,000	4	6	11	10
$150,000-$500,000	16	18	16	11
$60,000-$150,000	8	5	5	6
$30,000-$60,000	7	6	6	7
$5,000-$30,000	17	20	16	14
$1,000-$5,000	14	15	17	14
Total Number of Exporting Wineries	**81**	**85**	**91**	**95**
% Change		4.9%	7.1%	4.4%
Total Bottled DOC Wine Exports	**$82,468,500**	**$91,440,500**	**$123,585,100**	**$187,280,600**
% Change		10.9%	35.2%	51.5%
Average Exports per Winery	**$1,018,100**	**$1,075,800**	**$1,358,100**	**$1,971,400**
% Change		5.7%	26.2%	45.2%
Biggest Exporters' Average Market Share^	**17.0%**	**15.4%**	**12.4%**	**9.0%**
% Change		-9.3%	-19.5%	-27.3%

Source: Based on ProChile data
* In Chile DOC refers to wines made out of specific grapes originating from established geographic areas. These typically retail for no less than $6 in U.S. stores.
^Includes wineries with $10 million+ in exports

Average Yearly Growth of Firm Participation: **5.5%**
Average Yearly Growth of Total DOC Exports: **32.5%**
Average Yearly Growth of Exports per Firm: **25.7%**
Average Yearly Drop in Dominance of Largest Exporters: **-18.7%**

Mendoza's Heterogeneous Restructuring Paths

The Mendozan wine industry's restructuring shows some similarities to Chile's and also some stark differences. As for the similarities, a group of firms is taking the same "international" restructuring path, based on the four or five most prized varietals, purchases of world class stainless steel technology and small oak barrels, and borrowed know-how obtained through the same international consultants. As in Chile, the industry is also seeing its good share of FDI and joint ventures that want to take advantage of the relatively low land costs of the province's best locations for fine grape growing. As for the differences, Mendoza's wine industry has taken at least two restructuring roads (or even three), depending on how one characterizes them. Considering the value added per liter that each supply chain generates, those on the "higher road" are the participants in the "international-style" fine wine restructuring push; those on the "lower road" are wine supply chains competing in intermediate quality wines, table wines, and in grape juice processing. By contrast, as was shown in the preceding section, most of the Chilean wine industry is focusing on export-quality fine wine production; local production of intermediate and table wine, and grape juice production are comparatively smaller in Chile.

The reasons for Mendoza's peculiar split are several, especially related on the demand side to the strength of domestic demand for table wine. As important are supply side factors: the Argentine province has relatively few hectares of the finest varietals and conversely, thousands of hectares of high-yield intermediate and low quality grapes with high sugar content that grow well in the hotter eastern provincial plains (Table 2.15). Varietals like *Cereza* and *Criolla Grande* have high sugar levels that are excellent for grape juice concentrate, used in beverages as a natural sweetener. In addition, processed with the right technology--hyperoxigenation (to quickly remove solids before fermentation), proper storage (in epoxy-protected tanks to avoid bacterial growth), and with temperature control (to preserve aromas)--they make good table wines at very competitive prices. Their enological quality and color can also be improved by blending them with intermediate

quality varietals. As a result, a small but growing number of Mendoza wine supply chains are currently specializing in the production and export of concentrated grape juice, intermediate quality wine, and table wine.

Table 2.15
SURFACE AREA WITH VITIS VINIFERA CULTIVARS CLASSIFIED BY QUALITY; MENDOZA 1978-1996
(Hectares)

	1978	1985	1992	1996
Major Grapes of High Enological Quality*	9,035	8,474	5,035	8,176
Other Grapes of Medium & Low Enological Quality	136,793	99,201	68,482	67,586
Major Grapes of Low Enological Quality^	107,100	100,400	71,700	68,100
Total Grapes for Wine Making	**252,928**	**208,075**	**145,217**	**143,762**
Proportion of High Quality Grapes	**3.6%**	**4.1%**	**3.5%**	**5.7%**
Proportion of Medium and Low Quality Grapes	96.4%	95.9%	96.5%	94.3%

Source: Based on I.N.V. data.
*Includes Chardonnay, Riesling, Sauvignon Blanc, as white grapes, and Cabernet Sauvignon, Cabernet Franc, Merlot, Pinot Noir, and Syrah as red grapes.
^Includes Criolla Grande and Cereza grapes.

The "High Road" of International-Style Restructuring

Mendoza's international restructuring hasn't yet achieved the breadth and depth of Chile's for a number of reasons. An elite of no more than 50-60 wineries has replicated the international upgrading style of the leading Chilean firms, but has been far more conservative than its neighbors in the scale of new vineyard and processing plant investments. Since 1992 this group added roughly 5,000 new hectares of vineyards and 40 million liters of stainless steel storage capacity.

The reasons are several. On the demand side, domestic consumption of table wine did not plummet as it did in Chile, thus the urgency to adapt to international tastes was not there (Figures 2.1 and 2.2). Argentine per capita table wine consumption in the early 1980s was almost twice as high as Chile's, and is currently three times greater. Domestic fine wine consumption started to grow from the early 1980s on, but the wine-making techniques did not change significantly because most consumers still enjoyed oxidized wines. It was only in the early 1990s that consumers began to switch to more aromatic, fresh wines. In fact, the international-style modernization that began in earnest in the early 1990s initially targeted domestic consumers of fine wine, not the export market. Proof is that as recently as 1996 total fine wine exports still represented only 3 percent of

Mendoza's total wine output, whereas the domestic fine wine market had grown from a few percentage points in the 1980s to 35 percent of total sales.

On the supply side, there was a significant delay in incorporating stainless steel technology that leading wineries in California and France had been using since the 1970s. Argentina opened up to international technology influences five or ten years after Chile, depending on which variables one measures. During the 1980s the domestic economy remained closed and continued to experience strong inflation, so that the import and export incentives and uncertainties faced by local wine supply chains were quite different to those in Chile.

Another factor explaining the modest breadth and depth of the international-style restructuring is that the provincial wine industry did not shake itself out and concentrate as quickly in a few well-heeled firms as it did in Chile when it began to downsize in the early 1980s. Even though wine prices collapsed first in Mendoza (in 1979) before they did in Chile (in 1980), by 1985 the Argentine province still had most of its wineries and vineyards intact (Tables 2.15 and 2.16), and the industry didn't seriously restructure until 1990. A number of public policies delayed the shake-out (see Chapter 3). (By contrast, between 1979 and 1985 Chile's wine industry lost 52 percent of its wineries and 35 percent of its vineyards.)

Table 2.16
NUMBER OF WINERIES, EMPLOYEES, AND AVERAGE FIRM SIZE; MENDOZA 1958-1993

Year	Number of Firms			Employees			Firm Size		
	Micro	Other	Total	Micro	Other	Total	Micro	Other	Total
1958			868						
1964			968			10,879			11
1973^	683	367	1,050	1789	7,419	9,208	3	20	9
1985			969			10,824			11
1993			451			7,361			16

Sources: I.N.D.E.C. Censo Manufacturero. Microenterprises consist of firms with 1-5 employees; Other firms include small, medium, and large firms employing 6 or more employees.
*The 1973 survey was broader.

Yet another difference between Mendoza's and Chile's wineries and growers is that the former did not have the financing available to some of their neighbors. For one, the province proportionately had far fewer large integrated wineries associated to domestic business groups (DBGs) than did Chile, with the ability to pull capital out of other activities and finance the new

technology investments. For example, to this day Mendoza still does not have a single publicly-held winery. The closest equivalent to Chile's largest *viñas* are a few family-held DBGs like *Peñaflor*, *Catena*, and *Cartellone*, but only the first two seriously committed themselves to upgrade their wines to international quality (Tables 2.17 and 2.18). During the 1980s other wineries such as IMPSA's *Lagarde* and Los Andes's *Martelén* received little support from their DBG owners to finance a technological conversion. Only in the 1990s did they begin to make upgrades. *Catena* is the only DBG that has purchased family wineries in the 1990s and begun to modernize them. Most of the majority of wineries and growers were family-owned businesses with winemaking as their principal economic activity, with few alternatives from where to draw capital. After a decade-long recession it was difficult for them to bootstrap themselves out of their condition.

Table 2.17

MENDOZA WINERY RESTRUCTURING, CLASSIFIED BY YEAR, OWNERSHIP, AND SIZE; 1979-1997*

Year **Hectar. Own Vineyards**	**1979/80**	**1981/82**	**1983/84**	**1985/86**	**1987/88**	**1989/90**	**1991/92**	**1993/94**	**1995/96**	**1997/98**
100-200 hect.						Vistalba/ Cavexport?	Etchart Balbi	Martins Domingos Escorihuela	Cavas Banyuls	Simonassi Lyon Orfila
		Navarro Correas				Toso	Martelen Lagarde		Fantelli	Coop. Medrano
200-500 hect.		San Telmo	Esmeralda			Norton	Nieto Senetiner La Rural Valentín Bianchi Lavaque	Berruti y Chini Santa Ana	Gonzalez Videla Suter Coop. Luján Patagonia	Santa Gimena Santa Rita
			Chandon	La Agrícola	Saint Valery	L. Bosca		Goyenechea Flichman		Crotta
500+ hectares		Trapiche					FeCoVita			

Source: Based on Albarracín 1994, A.V.A. 1997, Foster 1995, and own interviews.
*List contains principal wineries that restructured but may not be 100% complete. Position of wineries is organized according to the earliest date they started upgrading either in production processes, vineyards, or world class stainless steel equipment. Earliest wineries started with improvements in production processes. Almost all of the new processing equipment was purchased from 1989 on.

Table 2.18
TOTAL STORAGE, STAINLESS STEEL, OAK, VINEYARDS, & PRODUCTION OF PRINCIPAL WINERIES; MENDOZA 1998*

Winery	Type Firm^	Total Storage (Mill. Liters)	Stainless Steel (Mill. Liters)	Oak Barrel (Mill. Liters)	Fine Grapes (Hectares)✞
Trapiche/Peñaflor	DBG	225.0	5.0	0.7	520
Crotta	Fam.	18.0	no	no	500
Flichman	FDI	4.6	1.8	yes	495
Luigi Bosca	Ex-Bulk	6.8	0.3	0.2	480
La Agrícola	DBG	13.0	2.0	0.2	440
Chandon	FDI	19.3	8.0	0.5	476
Viña Santa Rita	FDI	n.d.	n.d.	n.d.	400
S.Valery/Cartellone	DBG	104.0	no	no	375
Berruti y Chini	Fam.	17.3	no	no	300
Luján	Coop.	17.5	no	no	295
Valentín Bianchi	Joint Vent.	14.3	2.5	0.1	280
Norton	FDI	10.0	4.0	0.5	280
Lavaque	Fam.	8.6	0.4	n.d.	272
Nieto y Senetiner	Ex-Bulk	13.5	2.0	0.1	250
Esmeralda	DBG	10.5	3.0	0.4	250
Gonzalez Videla	Fam.	10.1	n.d.	n.d.	250
Suter	Joint Vent.	7.0	n.d.	n.d.	220
San Telmo	Joint Vent.	5.0	n.d.	n.d.	210
Orfila	Joint Vent.	7.0	n.d.	n.d.	200
Santa Ana	FDI	132.0	1.8	n.d.	195
Lagarde	DBG	3.2	1.0	0.2	180
Toso	Joint Vent.	10.0	2.0	n.d.	180
Navarro Correas	Joint Vent.	5.0	2.0	0.4	180
Fantelli	Fam.	5.4	1.0	n.d.	170
Martelen	DBG	25.0	n.d.	no	166
Viña Patagonia	FDI	2.4	2.4	n.d.	150
EscorihuelaΔ	DBG	19.0	no	no	140
Gaete	Fam.	7.0	no	no	135
Balbi	FDI	3.0	n.d.	n.d.	100
Martins Domingos	Joint Vent.	2.1	0.5	yes	55
Etchart	FDI	6.0	n.d.	n.d.	52
Domaine Vistalba	FDI	0.3	0.3	yes	30
Banyuls	Fam.	0.5	n.d.	n.d.	30
Cavas de WeinertΔ	DBG	1.7	n.d.	n.d.	n.d.
Medrano	Coop.	20.0	n.d.	n.d.	
Total		**754.1**	**44.0**	**3.3**	**8,255**

Source: There are no official statistics. Table assembled from various data sources including A.V.A. 1997, Foster 1995, Albarracín 1994, own interviews.
*Data reflect firms' status sometime between 1996 and 1998.
^Publ.: publicly-traded winery; FDI: foreign direct investment; DBG: domestic business group; Ex-Bulk: ex-bulk wine producer; Enol. Dom.: Chilean enologist; Priv. Dom.: private domestic firm.; Fam.: family firm; Non-Prof. : non-profit.; Coop.: cooperative.
ΔAcquired by a DBG in the 1990s.
✞ The vast majority of the vineyard surface area consists of four varietals--Chardonnay, Chenin, Ugni Blanc, Torrontés Riojano, Cabernet Sauvignon, Merlot, Sangiovesse, and Malbeck, with minority participation of Riesling, Sauvignon Blanc, Tocai, Cabernet Franc, Pinot Noir, and Syrah.

The Family-Controlled Domestic Business Group (DBG) Export Pioneers

Bodegas Trapiche was Mendoza's pioneer fine wine exporter (Tables 2.17 and 2.18). It was purchased in the early '70s by *Peñaflor*, a family-run local business group. It was also owner of one of the large bottlers/distributors in the monopolistic table wine market, and producer/distributor of beer, juice, and mineral water. The firm was a pioneer in the provincial wine industry in several ways: it made an early commitment to become a dedicated exporter of fine wine, and persisted despite often unfavorable exchange rates. It began exporting the same wine it sold

locally, first, into Latin American markets, and between 1972-1975 to the U.S., where it set up a commercial office in a consortium with other Mendoza wineries. All these activities were financed through its profits in its other operations. The consortium failed because of quality control problems and *Trapiche*'s partners bailed out, but the firm remained steadfast in its export dedication. In the early 1980s it changed its approach, and much like the Chilean pioneers it began to export cheap varietals. Much of its early technological learning came from tutelage through bulk exports of wine to Japanese clients. They sent their own enologists to supervise production in Mendoza. In the early 1980s *Peñaflor* was also a pioneer in the use of "hyperoxigenation" devices, a technology that quickly separates solids from liquids to improve table wine quality. It was also a pioneer in the domestic mass-marketing of table wine in *Tetrabrik*, a carton container with an aluminum foil core. But it was only since 1990 that the firm moved beyond the cheap "fighting" varietals and into higher price categories. From then on it hired international consultants such as Pomerol's Merlot expert Michel Rolland, and New Zealand viticulturist Richard Smart. *Trapiche* improved its vineyard operations, made big financial commitments in new stainless steel machinery and oak barrels, and introduced more sophisticated wine making techniques. However, by 1997 *Peñaflor/Trapiche* had debt levels so high that it lost control of the company and sold out to a national bank representing a consortium of local and foreign investors.

Credit for being Mendoza's pioneer international-style wine maker goes to *Bodegas Esmeralda*. Part of another holding run by the Buenos Aires-based Catena family, it is also owner of one of the big half-a-dozen bottlers/distributors in the monopolistic table wine market. In the late 1970s and early 1980s two of the Catenas traveled to California, to observe first hand the wine revolution that was taking place in research at UC-Davis and in Napa Valley's best wineries. Even though Argentine consumer tastes still favored light, oxidized wines, upon their return to Mendoza the Catenas made the commercial decision and financial commitment to change to international-style wine making techniques in anticipation of future changes in those tastes. Bodegas Esmeralda started with vineyard experiments with two international varietals--Chardonnay and Cabernet Sauvignon--to improve grape concentration of flavors and aromas. The next major step took place

in 1988 when it hired an experienced California enologist, Paul Hobbs, as a consultant. (Hobbs also consulted for *Viña Valdivieso* in Chile.) Simultaneously it purchased world-class stainless steel tanks, crushers, presses, and pumps. The investments were significant, and were financed from profits from table wine operations. As important, the winery adopted statistical processing techniques, to help it document the results of its mistakes and improvement efforts, and provide clues on how to do even better. In 1991 *Bodegas Esmeralda* launched itself into exports. It did not follow the typical path of starting from the bottom and slowly improving quality. Because it committed significant resources to finance the learning, it successfully leapfrogged its two varietals into the low end of the ultrapremium market ($15+), two segments above the popular premium category where most Chilean pioneers had started ($3-$7).

The Domestic-Market Varietal Pioneers

While *Trapiche* and *Esmeralda* initiated Mendoza's exports of quality wines, in the late '70s several boutique wineries mirrored the shift to varietal wine production, but with domestic consumers in mind. This was a significant innovation in a market that consisted of almost 100% cheap table wine. *Bodega Navarro Correas*, *San Telmo*, and the multinational *Chandon* (established in Mendoza since 1959), were among the first (Tables 2.15 and 2.16). Others like *La Agrícola* followed soon after. Except for the French multinational, these were wineries run by creative businessmen coming from other sectors, who were able to look beyond the overproduction crisis that immersed the wine industry since the early 1980s, and to devise strategies on how to break out of it. The shift was in some ways radical; even though it did not involve significant capital investments in new hardware, it required a thorough reorganization of production. To process varietal wines involved independent crushing and fermentation of grapes (separate from other varietals), better temperature control, and aseptic conditions to avoid contamination from yeasts used to ferment other grapes. Also, because many varietal characteristics are typified, by deciding to produce varietals wineries voluntarily set themselves up to be evaluated against certain standards.

This is not the case with blends, marketed under generic, non-standardized names like Bourgogne and Chablis, which gave winemakers enormous latitude to mask variations in the results.

The New Dynamic Actors: FDI, Joint Ventures, and DBGs

Aside from the initiatives taken by the handful of pioneers just described, the next round of dynamic actors didn't surface until the end of the decade, and it came from abroad. The 1980s were a difficult decade for the Mendoza wine sector. As domestic consumption dropped and wine prices fell, the regulatory and development agencies belonging to the federal and provincial governments attempted to distribute broadly the costs of the industry's restructuring with administrative policies such as price supports and subsidies to eradicate vineyards, rather than allow the market to determine the collapse of the smaller, less efficient, or less capitalized producers. The sector downsized gradually from 253,000 hectares to just over 140,000 hectares, much of it towards the end of the decade. Ultimately there were no clear "winners" with capital to restructure. What remained was a group of weak firms, some of which were ripe for purchase.

When the economy finally stabilized and then opened in 1991 foreigners moved in (Table 2.19). They gradually set up joint ventures and purchased every available boutique winery that had a recognized domestic brand. As in Chile, most of these foreign investors already had well-established international commercial networks and enological knowledge; they simply linked their new acquisitions to their distribution networks. But in contrast to Chile, all continued to sell fine wine on the domestic market, and only increased their exports gradually (since the late 1970s cheap table wine consumption in Argentina dropped systematically, whereas that of fine wine grew quickly; Figure 2.7). Typically, they quickly incorporated labor-saving technologies, especially in bottling lines, and subsequently invested in processing machinery and more modestly, in vineyards. None, however, came even close to match the scale of vineyard expansions seen in Chile.

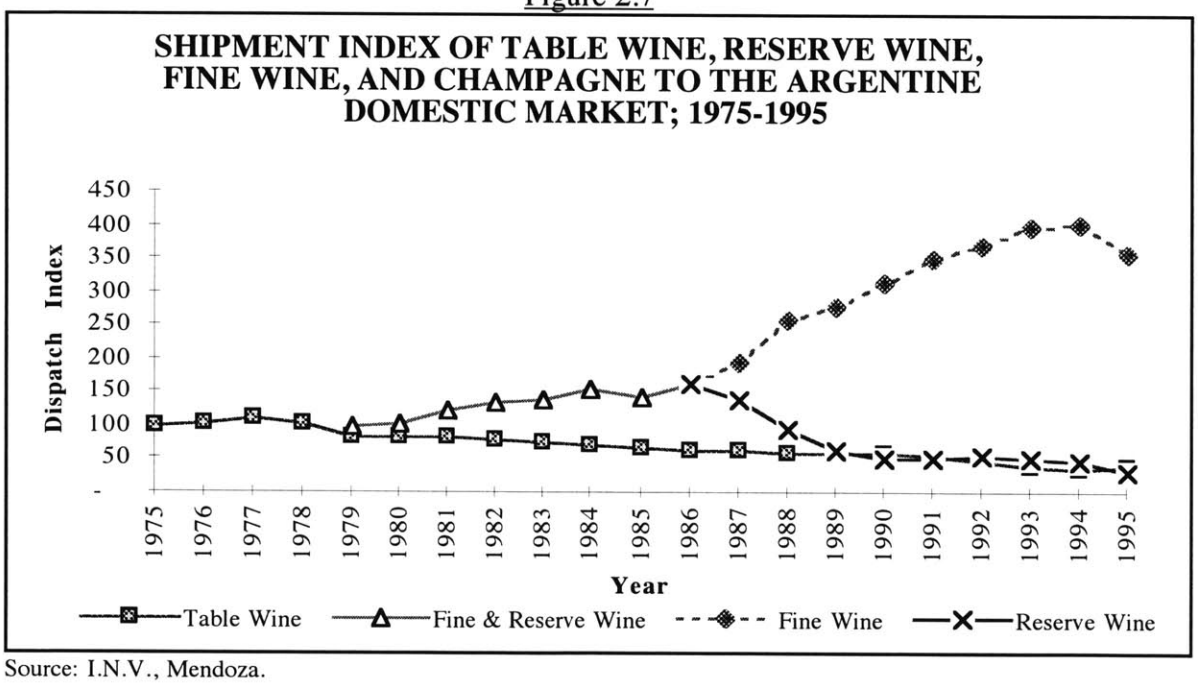
Table 2.19

WINERIES THAT RESTRUCTURED CLASSIFIED BY YEAR INITIATED AND BY OWNERSHIP; MENDOZA 1979-1997

	Total	'79/'80	'81/'82	'83/'84	'85/'86	'87/'88	'89/'90	'91/'92	'93/'94	'95/'96	'97/'98
FDI	**12**			**1**			**2**	**3**	**2**	**2**	**2**
Wholly Owned				1			1	2	1	1	1
Joint Ventures							1	1	1	1	
Domestic	**26**		**3**	**1**	**1**	**1**	**2**	**6**	**4**	**4**	**4**
Private			+1						^1		
Public	o										
Family Enologist						+1	*1		2 1	3	2
DBG			^+2	1	1	1		4			2
Ex-Bulk Non-Profit							1	1			
Coop.								1		1	
TOTAL	**38**		**3**	**2**	**1**	**1**	**4**	**9**	**6**	**6**	**6**

Source: See Table 2.16
^Became foreign-owned in mid '90s.
+Became joint venture in mid '90s.
*Became DBG-owned in mid '90s.

Figure 2.7



Source: I.N.V., Mendoza.

To meet their production targets, these boutique wineries have restarted a grape market in fine varietals that had been dormant for several decades. The advantage to them was that they could better control the quality of their inputs without having actually to own the vineyards. Through these tutelage arrangements they are upgrading close to 1,800 grape growers and 14,000 hectares. The 1990s average share of purchased grapes (first six years) rose 5 percent over the 1980s average,

while that processed by third parties has fallen (Table 2.20). A share of the increase reflects juice processors that are working closer with high-yield grape growers. With the promise of short-to-medium-term contracts, higher prices, and guaranteed returns, growers let the wineries specify and supervise their vineyard practices and learn better grape growing techniques.

Table 2.20
Form of Acquisition of Grape; Mendoza 1950s-1990s

Mendoza Province	Decade 1950s	Decade 1960s	Decade 1970s	Decade 1980s	Decade 1990s
Own	40%	39%	40%	38%	37%
Purchased	55%	40%	17%	5%	10%
Processed for Third Parties	5%	21%	42%	57%	53%

Source: Based on data from I.N.V., Mendoza

The first purchase was *Bodega Norton* in 1989, one of the traditional family wineries founded at the turn of the nineteenth century, bought by a Swiss investor linked to the California distributor and winery The Hess Collection (Table 2.15). When the Argentine economy liberalized in 1991 it was followed by a series of acquisitions and distribution agreements by foreign beverage bottling/distribution giants such as Allied Domecq (Bodegas Balbi), Pernod-Ricard (*Bodegas Etchart*), and the CINBA/Cinzano Group (*Navarro Correas*). In the mid 1990s three of the four Chilean giants also crossed the border into Mendoza and started their own projects. In 1995 Chile's *Viña Santa Carolina* acquired *Bodegas Santa Ana*, one of the strongest competitors in the lowest rung of the domestic popular premium market. *Concha y Toro* and *Santa Rita* followed in 1996. These and California's *Kendall-Jackson* were the first foreigners to invest in new vineyard plantations. Simultaneously, entrepreneurs associated with *Jugos Chile*, another Chilean firm that had already been in operation in Mendoza for several years in the grape juice processing business set up its own "virtual" winery. They teamed up with reputed Chilean enologist Pablo Morandé, rented processing equipment and storage, purchased grapes, and charged Morandé with the processing and marketing of the wine.

Most boutique wineries that stayed in local hands and still managed to make investments were associated with domestic business groups (DBGs) that provided the finance. By the mid

1990s the corporate owners of wineries such as *Lagarde*, *Martelen*, and *Flichman* convinced themselves that the country's macroeconomic conditions of openness and the trend towards lower but finer wine consumption would persist, and began to make investments in new technology. (The latter firm was also eventually purchased by a Portuguese group in 1997.)

As happened in Chile, the rise of fine wine and fine grape prices since the early '90s in Mendoza created opportunities for a few bulk producers to integrate forward and incorporate new technology, for example, *Luigi Bosca/Arizu* and *Santa Isabel/Nieto y Senetiner*. Nevertheless, acquisitions continue to be far more common than "bootstrapping". Changes in ownership and concentration of boutique wineries in the hands of a few corporate players continued through the mid-'90s. They reflect the bargaining strength of those with access to finance over the relative powerlessness of cash-strapped traditional wineries to upgrade on their own. The best example is the Catena Group that has consolidated its presence beyond *Bodegas Esmeralda* and its table wine brands with the acquisition and modernization of several well known boutique wineries--*Bodegas Escorihuela*, *La Rural*, *Michel Torino*, and *Santa Gimena*. (In 1998 Catena also purchased its first Bordeaux winery, the famed Cos d'Estournel.) Each winery covers a different segment of the popular premium market.

The "Low Road" of Table Wine Restructuring

Starting from 1993 on a few of the mid-size Eastern Mendoza table wine producers that were integrated such as *Crotta*, *Berruti y Chini*, and the cooperative *FeCoVita* introduced some basic processing and refrigeration equipment to their facilities, and painted their cement tanks with epoxy. They also availed themselves of new *Tetra* bottling lines to replace the increasingly unfashionable demijohn. With very few exceptions, however, they did not make any changes in their operations: different varietals continued to be processed together, vineyard purity remained an elusive goal, and yields stayed high. Nevertheless, the results of these changes surprised everyone: table wine quality increased considerably. In subsequent years these wineries have gone a step further and begun to make small quantities of the intermediate quality wines.

The Commodity Grape Juice Exporters

Mendoza has always had a grape juice processing sector. Occasionally, grape juice was exported but most of it was either consumed in the domestic market or blended into table wine to sweeten it. Towards the end of the 1980s Mendoza's wine production well exceeded its domestic sales. The public sector had a blockade on most wine stocks to support wine prices. Producers with grape juice stocks were offered to have the blockade lifted if they could export them. Several firms like Berrutti y Chini made their first export sales at that time. When the country liberalized in the early 1990s and international grape juice prices began to rise because of a shortage in substitutes, about a dozen local producers decided to become dedicated exporters, among them *Gancia*, *Coarex*, *Rodriguez*, *Altarpec*, and *Santa Ana*. Mendoza's first big FDI from Chile was in fact a grape juice processor Jugos Chile who took over a local processing plant, *Jugos Lourdes*.

Those Left Out: The Chilean *Secano* and Eastern Mendoza's Bulk Producers

In both regions, small growers and processors that work with low quality varietals face the greatest obstacles to participation in the sectoral technological upgrading. While in Chile they are fewer than in Mendoza, they lack basic irrigation infrastructure that may be only available in the long term, if at all. This groups remains marginal in sectoral and policy making debates on how to improve the industry's competitiveness. In contrast, Eastern Mendoza's producers epitomize the opposite case: they are numerous, and also face structural difficulties such as the wrong endowments, old equipment, and lack of scale economies. Yet over the years, the region's producers have always remained very much in the center of public attention and policy making. In addition, some of the solutions to their problems may come through social mobilization.

At the Margin: The Forgotten Chilean Secano Growers

The breadth and depth of technological upgrading in Chile's wine supply chain is very substantial. The largest six integrated wineries alone control 14 percent of vineyards (almost 9,000 hectares; Table 2.21), all of them of the highest quality, a surface that will have almost doubled by the end of the century. In 1996 wine production from these vineyards alone represented roughly a third of the country's wine exports. Furthermore, when the fine grapes and semi-processed wines purchased from independent growers/processors and cooperatives are accounted, the six largest wineries controlled the final processing, bottling, and distribution of 50 percent of the export market and more than 75 percent of the domestic wine market. Since the late 1980s the upgrading has extended to another 50 medium and small integrated firms that are also investing in the same new stainless steel machinery and improving their grape growing and wine making techniques. All together, in 1996 these wine supply chains directly and indirectly controlled as much as 75 percent of vineyard surface and 89 percent of total wine production.

Table 2.21
APPROXIMATE SIZE OF EACH INDUSTRY SEGMENT; WINE SECTOR, CHILE 1996*

GRAPES/REGIONS PRODUCTION SEGMENT	Low Quality Grapes *Secano* (Non-Irrigated) VII/VIII Regions		Irrigated VII/VIII Regions	High & Medium Quality Grapes Irrigated IV-VII Regions	
VINEYARDS Total: 56,000 hectares	10,000-20,000 hectares 17-36% **Informal Sector** 5,000-15,000 hect. 9-27%	**Small Growers** 5,000-15,000 hect. 9-27%	8,000-12,000 hectares 14-21% **Small and Medium Independent Growers**	31,000 hectares 55% **6 Largest Integrated Wineries:** approx. 8,800 hectares 14% **50 Medium and Small Wineries** approx. 12,000 hectares 22% **Independent Growers** max. 10,200 hectares max. 18%	
			Table & Pisco Grape Processors (Regions IV-VII) 5,000 hectares		
PROCESSING Total: 388 million liters	**Informal Sector** 14-42 million liters 4-11%	**Small Processors, Cooperatives** 14-42 million liters 4-11%	**Small Processors, Coops** 64 million-92 million lts. 16-24%	**Domestic Mkt.** approx. 33 million 9%	**Export Mkt.** 184 million 47%
			Table & Pisco Grape Processors (Regions IV-VII) 51 million lts. 13%		
				6 Largest Integrated Wineries min. 62 million lts. 14% **48 Med. & Small Integr. Wineries** 82 million liters 22% **2 Cooperatives** 2 million liters 0.5% **approx. 100-150 Integrated Wineries & Independent Process.** 71 milllion liters 18%	
DISTRIBUTION Total: 388 million liters	**Informal Distribution** max. 42 million liters 11%	FORMAL EXPORT MARKET **6 Largest Integrated Wineries** 92 million liters 24% **87 Medium & Small Integrated Wineries** 90 million liters 24% **2 Cooperatives** 2 million liters 0.5% FORMAL DOMESTIC MARKET **5 Largest Integrated Wineries** 136 million liters. 35% **115-145 Medium & Small Integrated Wineries, & Coops.** 45 million liters 12%			
CONSUMPTION Export: 184 million liters Domestic: 204 million lts	**Informal Autoconsumption** max. 30 million liters 8% **Domestic Table Wine Consumption** approx. 124 million liters 32%			**Foreign Fine Wine Exports** 184 million liters; 47% **Domestic Fine Wine Consump.** approx. 50 million lts. 13%	

Source: Own preparation based on S.A.G., various tables; company reports; personal interviews. Many of the data are estimations.
*"Regions" refer to the political jurisdictions in which Chile is divided; they are twelve, Region I is in the north and Region XII at the southern tip of the continent.. The grape growing jurisdictions extend from Region IV through VIII. "Table grape" refers to grapes consumed fresh. "Pisco" refers to a distillate from various types of Moscatel and Pedro Gimenez grapes, located principally in the IV Region.

The remaining hectares and 15% of total wine production is the "forgotten" group, unlikely anytime in the near future to participate in the industry's upgrading. Mainly, it is the

output of a group of small growers and processors living in the *secano* (dry lands) in part of the VII Region and most of the VIII Region. In the southern areas of the wine country, they have grape varietals of poor enological quality, no access to water, and consequently very low yields and unpredictable crops. The *secano* consists of elevated areas in the rain-shadow of the coastal hills, where it only rains during the winter and there are no alternative sources of water during the hot summer months. The reasons are numerous and complex; the most often cited in sectoral and government reports is that in these areas there is no electric infrastructure to pump water, and in the few places where there is the water table is too deep to make extraction economical. To make matters worse, the varietals that these subsistence farmers grow are typically of the lowest quality--*País* and the somewhat better *Moscatel de Alejandría*. They are only ones that have adapted to the rigorous conditions of summer drought. Varietal change, or substitution with other crops is difficult if not impossible to carry out.

The absence of precise statistics on *secano* growers suggests the lack of attention they have received from the wine industry and government regulatory agencies associated with it. Their numbers are hard to determine, somewhere between 5,000 and 10,000. Their aggregate surface area lies anywhere between 10,000-20,000 hectares. Clearly, the high number of small, low quality vineyards suggests the magnitude of their disadvantages (Tables 2.22 and 2.23). Recent sectoral reports on the successful restructuring of Chilean wine supply chains either don't mention them at all or make a passing reference to them as in a totally separate category, because their problems are completely different. The claim is that these producers represent a "deep socioeconomic problem" that requires a separate integrated approach: their production infrastructure shortages and the high levels of alcoholism among this population are insurmountable for the regular market mechanisms or public programs to allow them to bootstrap themselves out of backwardness.

Table 2.22
TOTAL SURFACE AREA, NUMBER, AND AVERAGE VINEYARD SIZE: CHILE; 1995/96

	Total (hect.)	Number Vineyards	Avge. Size (ha)	0-1 ha	1-5 ha.	5-10 ha.	10-25 ha	25-50 ha	50+ ha
Total Vineyard Area	**106,438**	**14,969**	**7.1**						
Wine Grape Area	**56,003**	**11,037**	**5.1**	**48%**	**34%**	**8%**	**5%**	**4%**	**1%**
V Región	1,807	81	22.3	28%	17%	15%	9%	20%	11%
Metropolitan Region	5,904	176	33.5	10%	18%	18%	17%	21%	17%
VI Región	9,173	559	16.4	11%	25%	23%	20%	17%	6%
VII Region	26,010	3,941	6.6	37%	36%	12%	8%	5%	2%
VIII Region	13,000	6,270	2.1	60%	34%	4%	1%	1%	0%
Table Grape Area	**50,435**	**3,932**	**12.8**	**9%**	**34%**	**22%**	**20%**	**12%**	**3%**

Fuente: Based on S.A.G. 1996.

Table 2.23
PRODUCERS IN VII & VIII REGIONS; CHILE 1996

	VII Region	VIII Region
Total Surface Area (Hectares)	26,010	13,000
Total Vineyards	3,941	6,270
Average Vineyard Size (Hectares)	**6.6**	**2.1**
Number of Vineyards Size 0-1 Hectares	1,448	3,743
Number of Vineyards Size 1-5 Hectares	1,426	2,139
% Number of Vineyards 0-5 Hectares	**73%**	**94%**
País Hectares	9,116	5,728
Moscatel de Alejandría Hectares	201	5,703
% Low Quality Vineyards	**36%**	**88%**

Source: Own preparation based on S.A.G. 1996

Secano growers can't pull their weight with the wine industry, despite their large numbers and not insignificant aggregate surface area, principally because of their small contribution to sectoral output. Because of the absence of water, yields are very low, roughly 4,000 kg./hectare (about 40 percent of the average for low-yield fine varietals, and an even smaller fraction for high-yield varietals, anywhere between 15,000-50,000 kg/hectare). Low vineyard yields and high levels of informal Auto-consumption and distribution in local consumption chains, make their contribution to formal sectoral output very small. Only the output of some of the few large secano growers makes its way into the larger formal supply chains through a few channels, principally two of the three remaining cooperatives. As a result, *secano* growers have never wielded any significant impact on the price of domestic grapes, to call attention to themselves from the industry and government agencies, as have for example, producers in Eastern Mendoza.

The Margin as Mainstream: Eastern Mendoza's Bulk Table Wine Producers

Mendoza's upgrading is notable for an industry that had been retrenching for a decade: the investments made by 60-odd wineries in new machinery, the increasing production of fine varietal wines, and the rise in exports of intermediate quality varietals and grape juice concentrate are an awakening. The group of upgrading wineries accounts for close to 60 million liters of fine varietal wines and another 120 million of medium quality blends. A number of Mendozan growers are being swept up with them. Those with the best varietals--roughly 1,000 vineyards and 9,000 hectares (6 percent of total vineyards surface area)--are learning improved viticultural techniques to concentrate flavors and aromas in their grapes. Another 20,000-25,000 hectares (15 percent of total vineyards) mostly belonging to medium and large growers (15+ hectares), have also upgraded to become competitive suppliers of the grape juice export industry. They have benefited from the tutelage of experienced exporters to improve yields, concentration of sugars, and decrease the use of pesticides (Table 2.24).

Yet when all are counted, the vineyard surface and wine processing capacity undergoing rapid upgrading is roughly 20-24 percent of the total. The ten largest and most updated wineries in fine wine making distribute no more than 10 percent of provincial output, compared to over 25 percent by the 6 largest Chilean wineries. Prospects for much of the remaining 75 percent of the industry (involving 105,000-110,000 hectares) are less certain. Close to 400 wineries--or 87 percent--have incorporated little if any new processing technology. The average processor in these supply chains produces blended table wine exclusively for domestic consumption, sells it in a bulk market to oligopolistic bottlers/retailers, and/or serves niche regional markets in demijohns. It uses intermediate and poor quality but high-yield grapes from the less prestigious, hotter, growing subregions like Eastern Mendoza (there are approximately 250-300 of them alone.) The enologists that work at them have little training, most of them technical school graduates with an extended secondary education. Conditions and prospects for the average winery appear quite dismal--a shrinking market, poor quality grape endowments, little or no capital to reconvert, and no demand or supply-side assistance. Compared to the elite firms, wineries in this group are almost "driving

blind," knowing that they have to implement momentous changes to upgrade, but paralyzed by the uncertainty over how to proceed.

Mendoza has also been unable to match Chile's ability to increase its supply of fine grapes. In fact, the Argentine province reached its low point in fine quality grape loss only as recently as 1992 (Table 2.15). Between then and early 1996 the vineyard surface of best varietals had grown by less than 3,200 hectares, especially modest considering that Mendoza's wine industry is more than twice as large as Chile's. In addition to having only a few thousand hectares of the "big four" varietals,[29] it is hard to assess the market potential of the rest of the grape stock. For one, Mendoza has a tremendous diversity of varietals, over 120, several times as many as Chile, but almost half of them have little enological value. That leaves a similar amount of grapes of intermediate enological quality such as Malbeck and Sangiovese, but little known to most consumers worldwide. They might become the next "hot grape" once markets for the classic "fighting" varietals become saturated, but again they may not. A further complication is that Mendoza wineries are themselves not very knowledgeable on how to obtain the best flavors and aromas out of some grapes with intermediate potential, for example, the Italian Barbera, because until very recently they were processing it together with other poor grapes in the same batch. In sum, part of Mendoza's current grape supply has little value to wineries. The remainder suggests potential, but requires significant technological and marketing effort by wineries to materialize it.

[29] Chardonnay, Sauvignon Blanc, Cabernet Sauvignon, and Merlot.

Table 2.24

APPROXIMATE SIZE OF EACH INDUSTRY SEGMENT; WINE SECTOR, MENDOZA 1995/1996*

GRAPE/REGION / PRODUCTION SEGMENT	Low Quality High Yield Grape Juice & Table Wine		Medium Quality Medium Yield Blends	High Quality Low Yield Fine Wine
VINEYARDS	93,000 hectares		42,000 hectares	9,000 hectares
Total: 144,000 hectares	65%		29%	6%
% Share Total Vineyards	Grape Juice 20,000-25,000 hect. 14-17%	Table Wine 68,000-73,000 hect. 47-51%		
Eastern Mendoza 72,000 hectares	50,000 hectares 35%		18,000 hectares 13%	3,000 hectares 2%
Rest of Mendoza 72,000	43,000 hectares 30%		23,000 hectares 16%	6,000 hectares 4%
PROCESSING	Grape Juice	**Table Wine Domestic Mkt.**	**Table Wine Export Mkt.**	**Fine Wine Blends Domestic Mkt.**	**Varietal Wines Export Mkt.**
1,100 million liters	387 million liters 35%	450 million lts. 41%	105 million lts. 10%	150 million lts. 14%	29 million liters 3%
Eastern Mendoza	**approx. 100 Juice Makers** approx. 250 million liters 23%	**250-300 Medium Bulk Processors** (includes approx. 20 Cooperatives) approx. 250 million liters 23%		**approx. 5 Integrated Wineries** approx. 25 million liters 2%	
Rest of Mendoza	**approx 5 Juice Makers** approx. 137 million liters 12%	**approx. 150 Large & Medium Bulk Processors (includes approx. 20 Cooperatives)** approx. 305 million liters 28%		**approx. 40 Integrated Large, Medium & Small Wineries** 60 million liters varietal wine 5% **approx. 20 Integrated Large & Medium Wineries** approx. 114 million liters Fine Wine Blend 10%	
DISTRIBUTION 897 million liters	**approx. 10 Juice Makers** approx. 300 million liters 23%	**10 Largest Bottlers/Distributors & Integrated Wineries** 480 million liters 37% **Medium Bottlers/Distributors & Integrated Wineries** 206 million liters 16%		**10 Largest Integrated Wineries** 128 million liters 10% **50 Medium/Boutique Integrated Wineries** 101 million liters 8%	
CONSUMPTION Export: Wine 134 million Export Juice: million Domestic: 1,000 million lts.	**Juice Concentrate Exports** approx. 60,000 tons 23%	**Foreign Table Wine Exports** 105 million liters 8% **Domestic Table Wine Consumption** 664 million liters 51%		**Foreign Fine Wine Exports** 29 million liters 2% **Domestic Fine Wine Consumption** 336 million liters 26%	

Source: Own preparation based on I.N.V., various tables; Mendoza Stock Exchange, Gennari 1991.
*Vineyard surface is based on a December 1996 survey. Several of the statistics are estimations.

A group of 4,000 growers with roughly 30,000 hectares and associated with the province's cooperative system show uneven performances; most are holders of poor quality grapes. In addition, some cooperatives are far better managed than others. For almost everyone, small size is a serious problem: vineyards with 0-5 hectares account for 91,000 hectares, 63 percent of the provincial total (Table 2.25). Although the average vineyard size does not necessarily represent the size of the average grower's agribusinesses--many own vineyards in several separate locations, a

diversification strategy against damage from pests and especially from hail[30]--problems of size are still real for many. Also, the distance between each productive unit makes the use of mechanization less efficient. Those with high quality grapes and the least need to mechanize--their activity is more labor intensive--are relatively few.

Table 2.25
TOTAL SURFACE AREA, NUMBER, AND AVERAGE VINEYARD SIZE; MENDOZA 1995/96

	Total (Hect.)	Number Vineyards	Avge. Size (Hect.)	0-1 Hect.	1-5 Hect.	5-10 Hect.	10-25 Hect.	25-50 Hect.	50+ Hect.
Total Vineyard Area*	**144,173**	**19,058**	**7.6**	**15%**	**48%**	**19%**	**13%**	**3%**	**2%**
Dept.. Luján	8,745	829	10.5	16%	36%	22%	18%	6%	3%
Dept. San Martín	33,353	3,613	9.2	16%	41%	18%	18%	5%	3%
Dept. Tupungato	3,178	330	9.6	7%	40%	27%	17%	7%	2%

Fuente: Based on I.N.V. 1995 data.
* In Mendoza, viniferous grapes make up more than 98% of total vineyard surface area; table grape vineyards occupy no more than 0.5%.

In sum, those in the wine industry that are having the most difficulty adapting to the new competitive conditions are the growers with small vineyards and intermediate and low quality varietals, and the third-party table wine processors that work with them. The latter process the growers' grapes for a fee, and keep their wine in storage. Together they account for the output of approximately 65,000-85,000 hectares, or as much as 60 percent of provincial production. Because they sell their wine as a commodity in a bulk market both groups operate relatively disconnected from the final processing and commercial part of the business to even know what varietals to graft, what production changes to implement, or how best to have the grapes processed, even if they could find the capital to finance the changes. They don't have the requisite knowledge on how to upgrade their production facilities or improve their processing techniques. What they do know is that they have to change because profits in table wine processing are getting slimmer, but they are unsure how to proceed.

The upgrading effort is also unevenly distributed throughout the province: most of the "success" firms and a good portion of the best vineyards are located in the "First Zone," a micro-region to the south of the Mendoza River and the province's capital city, and stretching southwest

[30] Confirmed by an INTA extensionist in 1996 in a study of producers in the locality of Montecaseros, San Martín.

towards the Andes piedmont.[31] Less fortunate is the area of Eastern Mendoza, the hot plains to the east of the First Zone. At 600 meters above sea level, this subregion has remained relatively isolated from the fine wine export boom.[32] Eastern Mendoza holds half of the province's total grape production, yet 71 percent of it (51,000 hectares) is of high yield, low quality grape varieties, undesirable for wine making, and another 25 percent of intermediate quality varietal, used mainly for the domestic market to improve table wines and blend with fine varietals (Table 2.26). (See Appendix B for a history of Eastern Mendoza's low-quality high-volume production.)

In 1997 only a handful of Eastern Mendoza's 300-odd wineries--among them *Cooperativa Medrano*, *La Agrícola*, and *Fantelli*--had made the kind of stainless steel purchases and improvements in wine making techniques that would allow them to export quality varietals. A few others like *Berruti y Chini* and *Crotta* have recently become exporters of improved table wines and intermediate quality wines to less demanding niche markets in Latin American countries, including Paraguay, Bolivia, Colombia, and Mexico, and more recently, Chile.[33] But these are the exceptions rather than the rule: the majority of Eastern Mendoza's wineries do not even bottle the table wine they process. They supply almost half of a 600+ million liter provincial bulk market to a few major bottlers/distributors. Only when the price of bulk wine rises does any significant value added remain in the subregion.

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[31] At 850 meters above sea level, this subregion is endowed with the best soils, an ideal cool climate for fine grape growing, and abundant snow-melt water.

[32] Eastern Mendoza is not a political jurisdiction but rather a name commonly ascribed to 5 subprovincial administrative units or "departments" to the east of the capital city: Junín , La Paz, Rivadavia, San Martín, and Santa Rosa.

[33] In the last few years Eastern Mendoza has started to supply table wines to the Chilean market because the neighboring domestic industry is increasingly specializing in exports of fine varietals.

Table 2.26
INTERMEDIATE AND HIGH ENOLOGICAL QUALITY GRAPES IN EASTERN MENDOZA; 1996
(Hectares)

Department	Junín	La Paz	Rivadavia	San Martín	Santa Rosa	Total
High Quality			Whites			
Chardonnay	96	-	113	95	120	424
Sauvignon Blanc	30	-	79	50	26	185
Riesling	7	-	5	11	8	31
Subtotal	**133**	**0**	**197**	**156**	**154**	**640**
High Quality			Reds			
Cabernet Sauvignon	151	7	261	347	371	1137
Merlot	72	-	85	213	83	453
Pinot Noir	1	-	2	-	21	24
Syrah	68	-	129	172	142	511
Subtotal	**292**	**7**	**477**	**732**	**617**	**2,125**
Intermediate Quality			Whites			
Tocai Friulano	93	-	81	288	226	688
Torrontés Riojano	131	4	555	533	326	1549
Chenin	229	1	390	453	321	1394
Ugni Blanc	234	10	272	478	386	1380
Semillón	31	-	31	22	-	84
Subtotal	**718**	**15**	**1,329**	**1,774**	**1,259**	**5,095**
Intermediate Quality			Reds			
Malbeck	889	5	949	441	144	2428
Sangiovese	308	7	256	670	152	1393
Bonarda	588	40	1,120	2,094	953	5,795
Tempranilla	248	15	258	1,247	209	1,977
Gibi	81	-	247	528	272	1,128
Bequignol	41	2	27	535	182	787
Barbera	24	-	40	98	61	223
Subtotal	**2,179**	**69**	**2,897**	**5,613**	**1,973**	**12,731**
High Quality Grapes Eastern Mendoza	**425**	**7**	**674**	**888**	**771**	**2,765**
Intermed. Quality Grapes Eastern Mza.	**2,897**	**84**	**4226**	**7,387**	**3,232**	**17,826**
Low Quality Grapes Eastern Mendoza						**50,914**
High Quality Grapes Rest of Province						**5,970**
Intermed. Quality Grapes Rest of Province						**24,329**
Low Quality Grapes Mendoza Province						**42,165**

Source: I.N.V. December 1996.

If the plight of Eastern Mendoza's growers and processors appears somewhat similar to that of Chile's *secano* producers, in fact it is quite different. While the latter remain marginal to the industry and somewhat forgotten by public officials, with Eastern Mendoza's producers it is quite the opposite. Because of their large production volumes, if their yields are high prices per liter fall across the board. They may be the industry's "whipping boy," blamed for the poor quality of the province's wines, but it is precisely the high volumes they generate, their ability to affect prices and profits, and their political clout that keeps them in the mainstream of public debate. Eastern Mendoza producers have a strong sense of identity, born from being the targets of continuous criticism, especially from some of the First Zone wineries. The capital city's *Centro de Bodegueros*, the business association that groups the traditional elite boutique wineries and the largest integrated firms in the business has been an outspoken critic of Eastern Mendoza producers for many years. It has characterized them as typical rent-seekers: standard arguments are that they

don't do enough to upgrade their quality when the price of wine is up; they rely on their numbers and political activism to seek economic redress from provincial politicians in power when wine prices fall; they are a continuous drain on public resources. Eastern Mendoza producers retort that their accusers are hypocrites, profiting at their expense. They benefit from the status quo by buying their medium quality bulk wines at very low prices and fetch high retail prices by blending them with their finer wines.

Regardless of the degree of truth of claims and counterclaims, what is accurate is that Eastern Mendoza's producers are at a crossroads. The costs of upgrading low quality vineyards are high for the income streams they currently generate. Even grafting of finer varieties is relatively expensive, and eradication and replanting is inaccessible, given that two or more years are required for vines to start producing fruit, and another five years for them to reach their fullest potential. In addition, the lack of general guidance from wineries and technical experts on what varieties they should plant keeps many growers from planning significant investments. On the other hand they know that inaction will only cement their downslide to bankruptcy.

Conclusion

As a result of the industry restructuring of the last two decades most of Chile's wine supply chains, large and small, have converged towards an "international-style" fine wine making path (a small minority has been completely left behind). For a number of reasons, large firms played key roles in the restructuring. By contrast, Mendoza's growers and wineries have split into two groups: a few large firms and boutique wineries have followed roughly the same high value-added Chilean path, whereas the majority are on a low value-added road, competing more on the basis of price than quality increases.

These differences raise a set of important questions to pursue in the next chapters: Do market and public sector sources of tutelage adequately respond to the needs of both groups? Or does the fact that only a few are traveling the same tried-and-tested path to premium varietal

production suggest most of Mendoza's wineries are caught in a poverty trap? Is premium varietal production the only restructuring path? How do wineries and growers actually determine alternative upgrading possibilities, and the production standards they need to meet?

CHAPTER 3

The Breadth and Depth of Market Upgrading

Introduction: Opportunities and Limits to Market Tutelage

In this chapter I review the various forms of market tutelage that Chilean and Mendozan wine supply chains received from machinery suppliers, consultants, international wine buyers, from wineries themselves, and other market players. Those firms that wanted to move into the growing fine wine market had some sort of working model to follow. California's and France's big strides in fine wine making in the 1970s provided Chilean and Mendozan elite wineries a set of guidelines, what I call the "international-style" restructuring path. Also adopted in the late 1970s by Australia's wine industry, it involved the purchase of stainless steel technology, the borrowing of "modern" wine-making and grape-growing techniques, and the use of a handful of so-called "fighting" varietals that advanced-country consumers were familiar with.[34] This was the model the restructuring pioneers like *Concha y Toro*, *San Pedro*, and *Santa Rita* in Chile and *Trapiche* and *Esmeralda* in Mendoza adopted.

By contrast, as domestic consumption of table wine began its steady fall in the early 1980s, table wine producers did not have the upgrading opportunities and the market tutelage as neatly laid out for them; in fact they had no clear model to follow and instead faced several impediments. As processors of intermediate and poor quality high-yield grapes in suboptimal climates such as Eastern Mendoza, they faced a shrinking market and had the wrong varietals (grapes with far less acceptance in international markets). The tutelage opportunities that went with them were limited. In addition, they had little or no capital to incorporate new machinery nor to improve vineyards, and no specific wine-making and grape-growing techniques. Compared to the former group these

[34] See Footnote #14 for a definition of "fighting" varietals.

wineries were "driving blind," knowing that they had to implement momentous changes to upgrade, but paralyzed by the uncertainty over how to proceed.

Yet both types of supply chain ran into their own problems, with tutelage from machinery manufacturers, consultants, and wine buyers providing only partial help. In some ways fine wine supply chains faced far more significant learning demands than those confronting table wine producers; production of fine varietals forced them to benchmark their wines against international standards, practices, and prices (even if serving only the domestic market) in a relatively short period. Over time most of them completely restructured the way they organized their businesses and production itself. The fact that many were able to meet minimum international standards in relatively short time periods is a truly spectacular accomplishment, showing some of the inherent strengths of market tutelage. Yet at the same time, just as striking is the fact that fine wine supply chains have been relatively slow at moving up the learning ladder. The value added per liter of exports generated by wineries and growers has increased over the years, but still lags considerably behind that of leaders such as France and "New World" pioneers such as Australia. It suggests that the standard tutelage instruments have not performed as well in this respect. On the other hand, it is striking to observe that despite the lack of resources and a model to follow, and relatively less market tutelage, since the mid 1990s some intermediate and table wine producers are gradually making a series of improvements in their own wineries and vineyards. Their efforts are amounting to something that resembles the building blocks or rough outline of a model to replicate.

Immediate improvements for the sector as a whole have come through purchases of new hardware and borrowing of grape growing and wine-making techniques. Lower labor and land costs have provided them comparative advantage at the margin. What have remained the hardest to learn, yet remain the most valuable, are a set of work practices that allow wine supply chains to continuously improve their capabilities. The key organizing element of these continuous improvement practices involves incorporating in explicit ways much of the tacit knowledge from production and marketing experience. Tutelage from suppliers, buyers, consultants and joint ventures can complement but never replace these practices.

The chapter is organized in five parts. First, I describe in detail the kinds of learning challenges leading Californian and French wine supply chains faced in the 1970s to improve wine quality. Second, I provide some quantitative measures and benchmarks of the progress made by Southern Cone wine supply chains with respect to international competitors like Australia, California, Italy, and France. Third, I provide evidence on why low labor and land costs offer comparative advantage within limits; further progress requires more purposeful quality improvements. Next, I detail the various market mechanisms of tutelage that Southern Cone wine supply chains have used to date to upgrade their capabilities, to explain the current pattern of advances and bottlenecks in technological learning. Typical technology transfer has come through interactions with buyers and suppliers, hiring of consultants and joint ventures. The advances are uneven, and both fine wine and table wine supply chains face similar needs to make local tacit knowledge of grape growing and wine processing techniques more explicit, and better integrate conception and execution. I close with an example of a firm that has successfully implemented the continuous improvement systems to quickly move up the learning ladder.

The Foundation of Catch Up: Turning Tacit Knowledge into Learning

Californian and French Upgrading in the 1970s

In the 1960s French wine making was in a state of relative decline. Fertilizers and pesticides were used extensively in Bordeaux vineyards, and wines were brown-colored from worn-out cooperage. Back in the U.S., market demand for fine wines began to rise. With less respect for tradition than the French, enologists from the University of California at Davis began to experiment with stainless steel technology that allowed them detailed control of fermentation processes. They neutralized unwanted indigenous yeasts and enzymes and introduced those that enhanced the grape's best flavors, aromas, and color. With this technology they developed a set of winemaking practices that were a significant improvement over what had been handed down by tradition. The

French started to pay attention, and as they began building wineries in California and imitating them back home in France, they also taught Californians a few lessons:

> "Vineyards had to be located where the soil, climate, exposure and drainage were well suited to the grape variety, not where the owner's mansion would have a good view over the valley. Closely spaced vines with low yield produced the most flavorful grapes. Native yeasts could provide more complexity in a wine. Filtration often stripped more good things out of wine than bad. The traditional small oak barrel is the perfect vessel for fermenting Chardonnay and aging Cabernet. ...wine growers everywhere began to learn that they needed to treat their vineyards with fewer chemicals and more respect."[35]

But the real revolution initiated by California's enologists and enhanced by French viticulturists was only partly in the new machinery and wine-making techniques themselves, and most importantly in the **scientific process by which tacit production information was methodically made explicit and put to use**. Through experimentation in their laboratories and practical experience in vineyards and processing plants, wine-makers began to document systematically year after year the behavior of their grapes and wines. With the use of sampling methods and statistical techniques they created massive relational databases that traced the evolution of a particular grape through the production process until it was put into the bottle in the form of wine. Armed with these databases winemakers could trace the quality of each season's wine back to a particular location down to the acre, the amount of water administered to the vineyard, its canopy management, sun exposure, and harvest temperature, and the processing conditions--for example, yeasts, fermentation temperatures, maceration length--to which the grapes had been subjected in the winery. This allowed them to identify causality in certain independent variables,

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[35] Wine Spectator, April 30, 1996.

and to implement changes in viticultural and winemaking techniques that directly improved wine quality.

Those wine supply chains that took this revolution farthest completely redesigned the way they organized production activities. The traditional division of labor had enologists circumscribed to the winery and its labs, the agricultural engineers focused on the vineyards, and the marketing people in the firm's headquarters, often far away from the production facility. Yet the new view of winemaking encapsulated in the adage--"a good wine begins with a good grape"--suggested that these divisions were at best artificial, and at worst, seriously conspired against implementing work practices that could improve quality. For example, as irrigation data showed the risks of overwatering plants, enologists felt the need to get out of their labs and production facilities and walk the vineyards with the agricultural engineers, to find the right balance that would concentrate flavors and aromas and avoid herbal flavors from excessive vegetal growth while keeping the vines from drying.

As enologists began to relate wine quality with the hours of sunlight exposure the grapes had received during the growing season, they began detailed discussions and experiments with the agricultural engineers on how best to train vines, and on what percentage of leaves needed to be removed to better expose grapes to sunlight without harming the plant. Similar debates emerged with respect to grape yields. And as the best French viticulturists had hinted, with the help of their data enologists began to work closer with agricultural engineers to determine what varietals did best in which locations, and for what reasons. The information they collected from their experiments helped them rediscover their vineyards; what at first blush seemed like a homogenous green blanket, in fact was not. Even small changes in elevation, soil conditions, and wind exposure created distinct grape-growing microclimates, each one imposing a particular character to the wines that came from it. Greater predictability in vineyard performance allowed wineries to achieve better control over the consistency in wine quality and continuity in product taste over time.

Californian enologists and agricultural engineers also discovered the importance of jointly planning the harvest sequence, so that the majority of grapes could be picked at their ideal point of

maturity, when the concentration of tannins and sugars was at its peak. The data suggested that at all costs they wanted to avoid the harvest trucks' typical long waits at the winery gate; nothing was worse for quality than to have fresh-picked grapes oxidize and spoil under the hot summer sun, as they waited their turn at the destemmers, crushers, and presses. Even a couple of hours of wait, they learned from their data, took a high toll on quality. Nor did they want to process different grape varietals simultaneously and risk contaminating the yeasts from one grape with those of another. It was far better, they realized, to stagger their arrival at the processing plant as much as possible. Thus the explicit knowledge that was extracted from the systematic recording of tacit data forced enologists and agricultural engineers to work much closer than they used to when all varietals were processed together, most vineyard locations were viewed as roughly the same, and trucks waited at the winery gate as many as ten hours before it was their turn to unload their grapes.

By the same token, the enologists also realized they needed to work more closely with their marketing divisions. They needed to be directly involved in visits to brokers and distributors to learn what consumers in different markets demanded before they even sat down with the marketing divisions to determine the production program and marketing campaigns for the year. When the wineries went to trade shows seeking new clients, the enologists also needed to be there; the brokers that approached their stands preferred to talk to them before talking to the marketing staff. An enologist could provide them a better sense of a winery's ability to meet specific production standards and order sizes. And as certain enologists increased their reputations as skilled wine-makers their advertising cache increased proportionately. Wineries realized they needed to make them very visible at the industry trade shows and wine evaluation events, their names and reputations often as important as that of the wineries they represented.

A decade later Chilean and Mendozan wine supply chains faced similar challenges. They needed to improve their quality quickly if they wanted to stay in business. To restructure did not mean that everyone needed to move into fine wine production. Regardless of whether they competed in this or other market niches--table grapes, grape juice concentrate, quality table wine, or intermediate quality wine--more important was that they deliver high quality for value. For some,

initial improvements came quickly, yet over time they found out that movements up the learning ladder turned out to be more difficult than expected.

The Difficult Road to Southern Cone Progress: Catching Up to World Class Producers

Fine Wine Producers

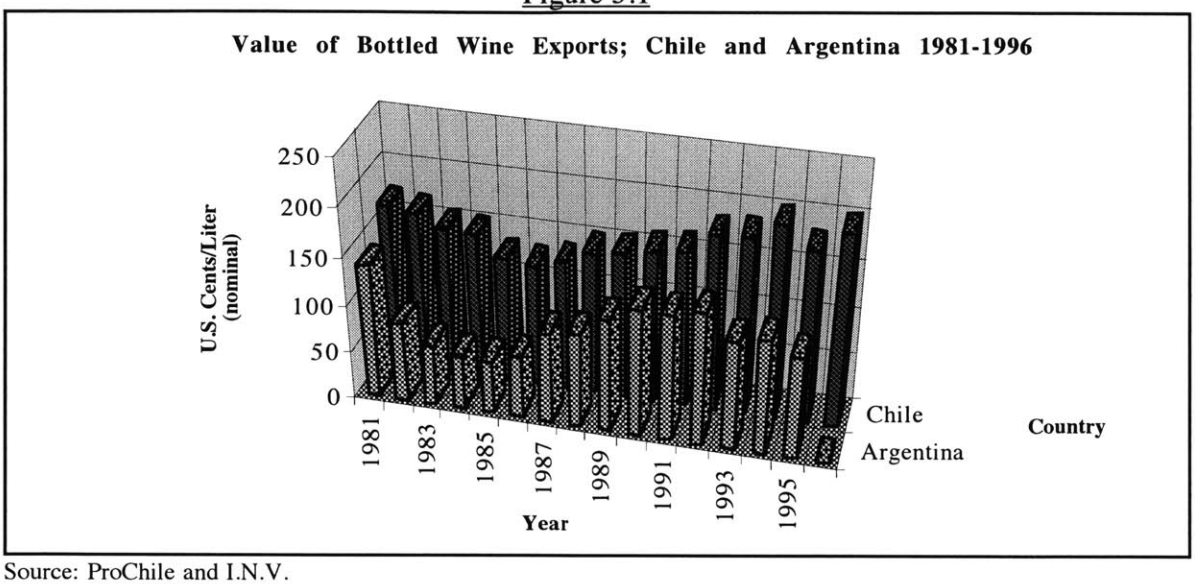
Since the mid 1980s value added and volumes of Southern Cone exports increased considerably (Table 3.1 and Figure 3.1). These are the result of wine supply chains' investments in hardware, their borrowing of wine-making and grape growing knowledge, and overall improvement in quality and production standards.

Table 3.1
VOLUME AND REVENUE SHARE OF BOTTLED WINE EXPORTS, CHILE AND MENDOZA; 1985-1995*

Year	CHILE			MENDOZA		
	Liters	Share in Total Volume Exported (Liters)	Share in Total Export Revenue (US$)	Liters	Share in Total Volume Exported (Liters)	Share in Total Export Revenue (US$)
1985	6,879,000	67.0%	86.0%	5,599,300	28.6%	62.3%
1987	11,163,500	78.4%	87.6%	4,836,100	37.7%	70.0%
1989	19,966,900	72.3%	88.2%	5,354,500	15.2%	66.9%
1990	27,900,300	64.8%	85.9%	5,802,100	7.1%	53.2%
1991	43,400,100	66.2%	83.4%	8,677,200	19.6%	67.9%
1992	56,401,800	76.2%	87.13%	11,171,900	42.5%	74.6%
1993	58,048,200	67.0%	84.0%	16,406,600	66.3%	80.5%
1994	58,860,000	59.2%	82.9%	15,764,000	70.4%	83.6%
1995	85,768,700	66.5%	84.9%	24,342,500	12.4%	43.6%

Sources: Based on data from Asociación de Exportadores y Embotelladores de Vino for Chile, and I.N.V. for Argentina. Although data representing Mendoza are national, the province is responsible for almost 100% of Argentina's wine exports.
*Data do not include sparkling wines.

Figure 3.1



Source: ProChile and I.N.V.

Yet at the same time the benchmark per liter value of Chilean and Mendozan exports, a proxy for industry value-added, remains low especially for Mendoza, and well behind a "New World" newcomer like Australia (Table 3.2). At least for Mendoza, a good part of the explanation lies in the growth of exports of cheap table wine to Chile and other Latin American countries. Bulk wine exports to Spain during a recent drought also account for the lion's share of Mendoza's high volumes for 1995. But even when cheap exports are factored out of the calculations, the evidence is still damning. For example, wine exports to the demanding U.S. market, most of which consist of the finer bottled wines, show Southern Cone wineries lagging far behind the leaders (Table 3.3). In other words, even the leading wineries and supply chains have substantial challenges of their own to increase the quality and retail value of their wine.

Table 3.2
FOB PRICES OF WINE EXPORTS OF "NEW WORLD" COUNTRIES.; 1987-1996
($/LITER)

Year	Argentina*	Chile	Australia
1987	0.53	1.21	
1990	0.34	1.19	2.38
1993	0.99	1.48	
1996	0.87	1.59	2.86

Source: From I.N.V., U.S.I.T.C. 1993, and I.W.A. 1998 (Fundación Chile February-March 1998).
*Prices are for bottled fine wine only.

Table 3.3
FOB PRICES OF WINE EXPORTS TO THE U.S.A.; 1985-1995
($/LITER)

Year	Argentina*	Chile	Australia	Italy	France
1985	1.04	1.59	2.38	1.22	3.58
1990	1.42	1.76	4.18	2.59	6.33
1992	1.96	1.90	3.77	2.98	7.13
1995	2.37	1.98	4.28	2.80	7.77

Source: From I.N.V. and I.W.A. 1998 (Fundación Chile, February-March 1998).
*Prices are for bottled fine wine only.

U.S. retail data for 1989/1990 (Table 3.4) provide a complementary picture beyond the averages; for that period, no Chilean wine bottle sold for more than $10. Meanwhile, Australia's best wines sold for more than $50 a bottle, and France's over $100 a bottle. This meant that despite the more than five years of accumulated production and export experience built since the early 1980s, Chile's leading wineries had been unable to come up with a single wine good enough to break through the $10/bottle retail ceiling. During the 1990s, prices rose gradually. By 1998 a handful of the best Chilean wines were retailing in the U.S. at over $20 a bottle, and two had reached the $50/bottle mark. But in a recent specialized review by a leading industry journal both of the latter wines had scored below the 90 points and were described as significantly overpriced.[36]

Table 3.4
RETAIL PRICES FOR VARIETAL 3/4 LITER WINE BOTTLES IN THE U.S.A.; 1989/90

Country	Chile			Australia			U.S.A.			Italy			France		
Varietal	Max	Min.	Av.	Max	Min.	Av.	Max	Min.	Av.	Max	Min.	Av.	Max	Mi.	Av.
Cabernet Sauv.	9.8	3.0	6.0	54.0	5.5	13.1	38.0	5.5	16.6	76.0	76.0	76.0	67.0	8.0	25.7
Chardonnay	7.8	4.0	6.0	20.0	7.0	11.4	24.0	7.0	15.0	45.0	5.0	15.8	135.0	11.8	n.d.
Merlot	6.0	4.5	5.0	8.0	8.0	8.0	20.0	7.0	14.2	n.d.	n.d.	n.d.	22.0	5.0	10.1

Source: The Wine Spectator, 1989 and 1990; in Fundación Chile, April 1992.
n.d.: no data

The growers involved with the grape juice processing industry have complications of their own. This market segment is extremely competitive; used as a natural sweetener and with several substitutes such as apple and pear juice, grape juice is a commodity. It is a low value-added product subject to intense price fluctuations (Figure 3.2). When, for example, international prices of grape

juice fall as they often do to $900/ton or less, it is only those growers with yields over 30,000 kg./hectare and with 30+ hectares, that can sell for ¢11/kg or less and can still turn a profit (Table 3.5). With the Mendozan provincial average yield fluctuating between 9,100-13,300 kg./hectare and the average vineyard size at 7.6 hectares, only a select few growers fall into the category of serious long-term contenders.

Figure 3.2

Source: I.N.V., Mendoza.

Table 3.5
SENSITIVITY OF THE DIRECT COST OF CONCENTRATED GRAPE JUICE TO THE PRICE OF RAW MATERIAL; MENDOZA 1997

Total Direct Cost To Make Concentrated Juice (U$S/ton)	$722	$771	$819	$868	$916	$965	$1,013	$1,062	$1,110	$1,159
Base Cost of Grape (U$S/kilo)	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17
Total Direct Cost of Grape Input (U$S/ton)^	$388	$437	$485	$534	$582	$631	$679	$728	$776	$825
Share of Direct Processing Costs	46%	43%	41%	39%	36%	35%	33%	31%	30%	29%
Share of Direct Cost of Grape Inputs	54%	57%	59%	61%	64%	65%	67%	69%	70%	71%

Source: Own preparation based on interviews of Mendoza juice processors.
^ One kilo of concentrated grape juice requires 4.85 kg. of grapes.

The point is that movements up the learning curve are not easy to make. Each wine supply chain faces different challenges depending in which market segment it competes. For example, superpremium wine producers need to learn grape growing techniques that better concentrate

[36] See Wine Spectator October 15, 1998.

flavors in grapes and wine making techniques that best extract them, as well as continuity in flavor and product quality from vintage to vintage to develop consumer brand allegiance. By the same token, intermediate quality wineries also seek continuity in flavor, but need to balance quality and quantity to deliver good value for a reasonable price. In turn, grape juice producers look for high yields and high sugar content. Despite the differences in the challenges each supply chain faces, two common threads run through them. The first is that low land and labor costs have provided Chile's and Mendoza's wine supply chains with a comparative advantage with respect to their competitors in other nations, but only within certain limits. The second is that steady improvement in wine quality requires adoption of mechanisms for continuous learning from production and market experience; purchases of new hardware and borrowing of wine-making techniques help but within limits.

Limits to Comparative Advantage

Lower labor and land costs are a source of advantage to Southern Cone wine supply chains' international competitiveness. In the mid 1990s, integrated Chilean wineries could produce Chardonnay grapes at an average direct cost per bottle of only 16 cents, whereas Napa Valley wineries had to pay 71 cents, over three times more (Table 3.6). Depending on how integrated the winery was the actual prices it paid could in fact be much higher. For example, Napa Valley's 1996 average (high quality) market grape price was $1,509/ton, meaning that wineries that did not own grapes spent approximately $1.89 per bottle.[37] Indirect costs also favored Southern Cone wineries; Napa Valley growers could pay as much as $120,000 for a hectare of vineyards, whereas Chileans spent under $50,000, and Mendoza growers somewhere between $12,000 and $25,000 depending on location.[38] These differences explain why in 1997 one of *Concha y Toro*'s popular premium wines retailed at $9 a bottle while a *Mondavi* of comparable quality sold for $14.[39]

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[37] Wine Spectator, June 15, 1997.
[38] For sources see Wine Spectator, Juri and Arjona (1996), Peters (1997).
[39] Wine Spectator, November 30, 1997.

Table 3.6
DIRECT COSTS PER TON OF CHARDONNAY GRAPES IN CALIFORNIA, CHILE, AND MENDOZA

Country Region	California Sonoma	Napa	Monterey	San Luis	North Interior	Chile	Mendoza,
Direct Costs	$2,600	$2,600	$2,200	$2,200	$1,900	$529	$738
Tons per Acre	5.2	4.6	4.0	4.3	9.2	4.0	4.0
Cost per Ton	$500	$565	$550	$512	$207	$132	$185
Cost per Bottle @ 800 Bottles/Ton	**$0.63**	**$0.71**	**$0.69**	**$0.64**	**$0.26**	**$0.16**	**$0.23**

Source: Based on Grape Intelligence 1994 for California data, and personal consultations with grape growers and wine processors in Mendoza and Chile in 1996.

Yet at the same time lower labor and land costs could only provide comparative advantage within certain limits. In fact, different strategies such as degree of vertical integration, vineyard quality and productivity, allowed California supply chains to compensate for a good part of their cost disadvantages. Table 3.7 provides a cost breakdown of what consumers pay for wine at different retail prices. It shows the maximum that wineries can afford to pay for grapes to remain within each market segment. A comparison of those prices with the direct costs of grape production (Table 3.6) shows that there is considerable room for strategy. It suggests, for example, that in the low priced varietal segment a Chardonnay from California's North Interior could easily compete on a cost basis with one from Mendoza or Chile--provided their quality was relatively similar--because the former vineyards are far more productive. By the same token, an integrated Sonoma winery could compete in the $15/bottle segment with a non-integrated winery in Chile, given that Chardonnay grapes from Chile's best valley, Casablanca, were being sold during the 1998 harvest at the market price of $1.25/bottle. In other words, local improvements in grape growing, in wine making techniques, and in general work practices could make up for significant comparative disadvantages.

Table 3.7
COST BREAKDOWN OF A WINE BOTTLE; CALIFORNIA 1994

	Relation	Low End Popular Premium	High End Popular Premium	Super Premium
(1) Retail Price: $		$5.00	$10.00	$15.00
(2) FOB Vineyard (50%)	(1)*0.50%	$2.50	$5.00	$7.50
(3) Share Production Costs (Marketing, administration, distribution, processing, dry costs, grape costs): %		60%	55%	50%
(4) Production Costs: $	(2)*(3)	$1.50	$2.75	$3.75
(5) Share Processing Costs (Processing, dry costs): %		61%	58%	53%
(6) Processing Costs: $	(4)*(5)	$0.92	$1.58	$2.00
(7) Maximum Available To Pay for Grapes	**(4)-(6)**	**$0.58**	**$1.17**	**$1.75**

Source: Grape Intelligence, Chardonnay: An Assessment of Supply and Demand. California, August 1994.

A further cost structure breakdown comparing grape production of different qualities in Chile and Argentina also shows that because fine varietal vineyards are proportionately less labor-intensive than medium-quality, higher-yield vineyards, the relative incidence of the cost of labor is not as high as one would presuppose (Table 3.8). As was noted, one of the ways of improving grape flavor and aroma concentration is lowering yields. Better quality vineyards are typically given less fertilizer to control vegetative growth. As a result, tasks such as pruning, fertilizing, canopy management, and manual harvesting are shorter and less labor-consuming. In addition, the costs of dry inputs--e.g., cork, bottle, labels, capsule, box--are higher than those intensive in labor (Table 3.9).[40]

Table 3.8
DIRECT COST STRUCTURE FOR 1 HECTARE OF HIGH AND MEDIUM QUALITY VINEYARDS; ARGENTINA AND CHILE (US$ 1996)

	Argentina				Chile			
Grape Yield (tons/hectare)	9 tons/hect.		15 tons/hect.		9 tons/hect.		15 tons/hect.	
Inputs	(High quality grape)		(Med. quality grape)		(High quality grape)		(Med. quality grape)	
Agrochemicals	$215	13%	$272	12%	$304	26%	$474	28%
Machinery	$266	16%	$268	12%	$183	16%	$202	12%
Labor (includes manual harvest)	$897	56%	$1432	64%	$456	39%	$791	46%
Other (energy, unexpected costs, etc.)	$246	15%	$275	12%	$221	19%	$247	14%
Direct Cost for 1 Hectare	**$1,624**	**100%**	**$2,247**	**100%**	**$1,164**	**100%**	**$1,714**	**100%**
Cost of Grape for 1 Bottle of Wine (750 cm3; 3/4 Liter)	**$0.23**		**$0.18**		**$0.16**		**$0.13**	

Source: Based on personal consultations with grape growers and wine processors in Mendoza and Chile.

[40] Relatively speaking, however, vineyards inherently require far more working capital than most crops. For example, one Argentine sectoral report noted that grape growing is unique among primary sector activities in that vineyards demand sixteen times more working capital (labor + inputs) than wheat and sunflower, ten times more than corn, almost three times more than cotton, and 55% more than sugar cane (AVA 1986).

Table 3.9
DRY COSTS OF A BOTTLE OF INTERMEDIATE QUALITY WINE; ARGENTINA AND CHILE*
(US$ 1996)

Inputs	Argentina	Chile
Cork 45 mm., intermediate quality	$0.19	$0.15
Bottle: Bordeaux style, 750 cm3	$0.21	$0.27
Neck Cápsule: PVC	$0.03	$0.03
Labels: Front and back	$0.07	$0.08
Subtotal Dry Costs	**$0.51**	**$0.53**

Source: Based on personal consultations with grape growers and wine processors in Mendoza and Chile and Juri and Tennerini (1992).
*Estimations based on popular premium bottle that retails at approx. $5-7/bottle. Final prices vary, depending on size of order.

In sum, wine supply chains could not rely on comparative advantage from low land and labor costs as a long term basis for competitiveness, even in the lower value-added activities. The second common thread to the challenges wine supply chains faced is that purchases of new hardware and borrowed wine-making techniques improved quality, but only within limits. Further movements up the learning ladder required systematic use of tacit local information.

Help from Machinery Suppliers

Fine Wine Supply Chains

During ISI and through the 1970s Chilean and Mendozan wineries were supplied by Mendoza's metalworking firms. Wine processing machinery manufacturers in Italy, France, Germany, and Switzerland were too busy upgrading European and California wineries to want to sell equipment to Latin American wineries. Evidence is that Uruguay's economy was open for most of the 1970s and Chile's for the second half of the decade, but it wasn't until the early 1980s that as advanced-country orders dwindled, European machinery-makers looked elsewhere for new markets.

The Italian firm *Velo* was the leader in Chile, signing up its first local dealer, Andrés Schloss in 1982, but only starting in Mendoza a decade later. It began supplying stainless steel technology to the largest integrated wineries, immediately displacing the Mendozan metalworking firms that

had failed to upgrade their products.[41] As new boutique wineries emerged in subsequent years the number of international machinery suppliers expanded to six or seven dealers. All of them sold more or less the same types of equipment, especially geared for fine wine-making. Most processing machinery and accessories for tanks were imported directly from Europe and the stainless steel tanks assembled in Chile. In Mendoza the arrival of international machinery makers was much slower than in Chile, delayed partly because of the relatively late liberalization (in 1991) but also because of the initial small size of the targeted market. After a decade of downsizing, only a few First Zone wineries had the financial capability to purchase significant quantities of stainless steel machinery.[42]

In less than two decades machinery suppliers sold Southern Cone wineries over 200 million liters of stainless steel storage capacity and processing equipment, including the most modern destemmers, presses, filters, refrigeration equipment, bottling machinery, and pumps. The contribution of European machinery retailers to Southern Cone upgrading was fourfold: first, before they sold the technology to the Chileans and Mendozans they had collectively spent more than a decade of product design, research, and user experience with the hardware, enological products, and techniques for the major varietals. In other words, the stainless steel technology was well tried and tested in the world's best wineries and ready for use. The hardware itself did not require significant adaptation to local conditions, and it came in multiple scales to fit different production volumes. While it was not scale-neutral, neither was it intensely scale-sensitive. In addition, some of it already came preprogrammed for use. Second, the interest rates at which it was offered were very accessible. Third, in the process of selling the technology they provided

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[41] *Velo* continues to dominate to date. It currently has about 50% of the Chilean market for tanks, filters, and presses, and 60% of the refrigeration market.

[42] With few exceptions, by 1996 the Europeans had all but taken over Mendoza's machinery market. Local metalworking shops like *Gasquet* ended up signing representational agreements with European machinery makers such as *Bucher* and *Pera*, and began to provide maintenance and repair services for them. Others closed down directly. Some of the service agreements did not last long, in part because local shops could not satisfy the quality requirements of the firms they represented. On the other hand, some Mendozan capital goods manufacturers downsized or closed down for reasons not always related to their lack of technological capabilities. Working capital shortages and high interest rates were two of the most common problems. Italian manufacturers were especially successful because of the low government-subsidized interest rates they were able to offer their customers. See Cuervo and Lessard (1997) and Walters and Scaraffia (1996).

extensive technical assistance on its use. Fourth, they invited their major clients' local technicians to visit European wineries and view first hand the results, thus providing them a holistic learning experience on how modern elite wineries operated. The leading Chilean and Mendozan supply chains relied heavily on this hardware to upgrade from production of traditional oxidized wines to fruity, clean-tasting varietals.

Tutelage from machinery suppliers, however, had its limits, and partly explains the slow rise in value added of the Southern Cone's wine exports. First, the investments in stainless steel machinery and refrigeration equipment turned out to be the "easy" part of catch-up. As was noted in Chapter 2, the hardware *per se* does not guarantee quality improvements beyond a certain minimum. A bottle of wine with a retail value of $50 is made with roughly the same technology as a varietal worth $6. The larger part of the price differential is attributable to the know-how required to make a complex wine. Second, despite the technical assistance machinery makers supplied, most wineries did not pick up immediately the full set of lessons on what fine wine making involved. The Chilean integrated wineries provide a good example; during the 1980s they built processing facilities almost like factories, and simultaneously planted thousands of hectares of fine varietal vineyards much like the early Californians had done. But they did not pay much attention to the suitability of the microclimate to the grape variety, nor did they implement the continuous improvement practices that were so critical to the success of the model (see also next section). Clearly, while the new technology was an improvement over the production infrastructure that existed before, and the general grape growing conditions were good, the wines turned out to fall in the low-priced "good value" category.

Some critics within the machinery supplier community attribute at least partial fault to themselves; they note that many colleagues' eagerness to sell equipment too often prevails over the clients' best interest. In other words, often their enthusiasm for selling the technology may distract them from ensuring that their clients know how to make best use of it. As an example, one commentator described the machinery purchases made by *Trapiche* in Mendoza in the early 1990s as "poetic". During a plant visit he was especially surprised at the lack of coherence in the

sequencing of the investments and the poor use that technicians were making of the hardware, at a great cost to the firm (it had built up a substantial debt). A few years later *Trapiche*'s precarious financial position had become *vox populi* in the province, and in 1998 its owners sold it and its parent company to an outside group of investors. In sum, the elite wineries have learned the hard way that machinery on its own was not in itself a mechanism of continuous upgrading. Neither have all suppliers shown to have the requisite skills to help fine wine and table wine supply chains upgrade.

Table Wine Supply Chains

In contrast to fine wine makers from the First Zone, Eastern Mendoza table wine producers had no clear model to follow to guide their restructuring efforts. Assistance for them first came in the late 1980s in the form of increased demand for high yield grapes for juice. But small growers and their bulk processors were on their own. Because of the bulk table wine industry's precarious situation, they were initially dismissed as potential customers by machinery makers (these focused on First Zone elite wineries). In fact relative to the elite wineries they were falling even further behind technologically, missing out on the intense learning that the interactions with machinery makers provided. Then in the mid 1990s as the price of wine recovered some wineries started with modest renewal plans. For example, they painted their cement tanks with epoxy, and a few even incorporated refrigeration units (to better control fermentation) and the first hyperoxigenator/ floating machines. The latter were stainless steel tanks designed to quickly remove solids in the grape juice by oxygenating the musts and skimming them off the top as they floated up. This equipment was supposed to improve the quality of table wines by better preserving their aromas. But when the first results came even the optimists were surprised with what they tasted: cheap grapes such as Cereza and Moscatel Rosado were producing some very good wines. This was the trigger that reopened a string of controversies regarding Eastern Mendoza's productive potential. To those who felt that the region had always been shortchanged and criticized unfairly for its poor quality and high volumes it only confirmed their worst suspicions. The fact that wineries from the

First Zone were going more and more often to the area to buy bulk intermediate wines for their finer blends while continuing to bad-mouth them seemed like evidence of a conspiracy to keep prices low at the growers' and bulk processors' expense. To those that were interested in tapping the region's productive potential it made it only more evident that much more information on local grapes, vine growing and winemaking techniques were required to uncover them. Unfortunately, no quick answers could be found at hand. Institutional research biases towards the First Zone and the lack of funds in Eastern Mendoza would delay this kind of information gathering effort for several years. The subregion would need to rely on other mechanisms to obtain the kind of localized knowledge that was required. This is a topic that I pick up in several sections that follow and again in Chapter 4.

Two other important contributions from machinery suppliers to Eastern Mendoza producers are worth noting. A lot of assistance has come from Piero Antoniazzi, who has been especially active in the area. He is an Italian dealer who visited Mendoza in 1989 and quickly realized that the East offered the biggest long-term potential market. (At the time, however, his opinion could hardly be considered widely shared.) He returned in 1993 to set up his shop *Tiainox* in San Martín, the main grape growing district in that subregion, and set new standards for the quality of service while still turning a profit. Antoniazzi is not a machinery manufacturer but an intermediator. He ascribes his success to the fact that he knows the wine business well (as opposed to only wine making) and is not tied to selling a particular kind of machinery. This gives him the freedom to recommend his clients what's best for them rather than needing to "get rid" of particular types of machinery (manufacturers regularly try to "dump" machines on their customers when they have overstocks that they are unlikely to sell). He helps bulk wineries create multi-year investment plans tied to their financial possibilities, prioritizing those that are most likely to have immediate impact on quality. For instance, he notes that white wine producers in the hot east are likely to benefit most from incorporating refrigeration equipment at an early stage. He also helps wineries obtain the financing to pay for the purchases.

A second very active machinery maker that is having a big impact in Eastern Mendoza is *Alfa Laval*, a manufacturer of carton container bottling technology, commonly known as the *Tetra.* This Swedish company operated in Argentina since the early 1980s under monopolistic conditions. At the time, *Tetra* became the container of choice for table wine, replacing glass liter bottles. It was cheaper than the glass bottle and more efficient to fill and transport. In addition it was well accepted by consumers. But it was leased exclusively to a handful of the biggest bottlers/ distributors, among them, *Peñaflor*, *Catena*, and *Cartellone*, effectively concentrating further a table wine market that already had oligopolistic tendencies. However, in 1990 International Paper (a U.S. company) began to sell a similar technology, first to orange juice processors and then to wine bottlers. A year and a half later *Alfa Laval* reversed its exclusive licensing policies and began to aggressively market its *Tetrapak* machines to several Eastern Mendoza wineries that it had previously stone-walled. The firm designed a convenient pricing scheme whereby it charged its users a unit price per container filled, rather than for the expensive packing machine itself. Several wineries such as *Berrutti y Chini* and *Crotta* seized the opportunity and incorporated their own *tetra* units at no fixed cost to them. They eliminated unwieldy demijohn bottling lines, a significant improvement given *Tetra*'s acceptability among consumers. *Alfa Laval* was also instrumental in 1996 in what turned into a novel Eastern Mendoza experiment: it organized three firms--*Fantelli*, *Palazzo*, and *Gomez*--into a consortium to share a single *tetra* bottling machine. In both examples *Alfa*'s assistance was crucial to put local wineries on a more equal footing with the big bottlers.

In sum, Eastern Mendoza has not yet received significant tutelage from machinery suppliers in terms of the volume of new pieces of equipment sold. Roughly only 25 percent of the 250-300 bulk wineries in the area have made any purchases at all. Yet for those in the industry who were paying attention, the few units of new technology sold have had an eye-opening effect. They have provided tentative new evidence that Eastern Mendoza has the capacity to produce good wines. In addition, a few of the traditional demijohn bottlers have also taken advantage of the new commercial opportunities of *Tetra.* As will be detailed later, these events have awakened a new confidence in some of the area's political and economic actors, and mobilized an unlikely set of technical

professionals. They are attempting to fill in what they perceive as a huge information gaps between the industry's perception of Eastern Mendoza and the region's productive possibilities.

Buyer-Assisted Technological Learning

Fine Wine Supply Chains

International wine buyers regularly offer their fine wine suppliers abundant advice on what wine consumers prefer and in what price categories. Winery technicians and marketing managers who want to travel overseas to get to know their customers better rely heavily on traders to organize wine tasting sessions and coordinate visits to restaurants and dealers. This is the fundamental information they need to prepare their marketing and production plans. Another common practice is for brokers to send wine samples to a winery and ask whether it is interested in replicating it. After several sample exchanges the broker may sign a purchase contract for a certain quantity. Many of the recent joint ventures between Mendoza wineries and international distributors operate this way.

As often, distributors send their own technical experts to work next to local staff. *Trapiche* in Mendoza is a good example. Every year since the 1970s the firm hosts a Japanese technician in Mendoza to supervise the preparation of the types of wines Japanese consumers are demanding that season. International traders and brokers may also induce wineries to make general plant improvements in hygiene and safety. To use again the example of *Trapiche*, in 1997 its English distributor, the Ehrmans Group, contracted a quality control firm to audit *Trapiche*'s operations. The auditor inspected everything, from vineyards to processing lines, including hygiene, labor practices, lighting, safety, and pest control, and made a list of improvements for the winery to implement. For instance, it asked *Trapiche* to cover and enclose its bottling line to keep out potential dust and insects from entering the bottles when they are lined up waiting to be filled.

But even after more than a decade of upgrading and working with international wine dealers most Southern Cone fine wine producers still have much to learn on what markets to target and at

what prices. To date most produce a wine first, and after determining its quality place it in a particular market niche. This was, for instance, how Concha y Toro developed its ultrapremium Don Melchor in the early 1990s. It wanted to make a very good Cabernet and then worried about what segment of the market would buy it (it currently retails for $25/bottle in the U.S.).[43] Only in 1997 did it change this strategy for the first time. The firm first...

> "...determined through market research that a lucrative niche existed, especially in the United States, for Chardonnays, Merlots and Cabernet Sauvignons priced at $8 to $10 a bottle. And only then did Concha y Toro go about developing the wines. 'Our market approach was also different...We wanted a distinctive bottle and an easy-to-remember name.' The bottle's flat-lipped, svelte shape, the marketing director candidly concedes, was copied from Mondavi. And 'Trio' was a lot easier to pronounce in English than Don Melchor, Marqúes de Casa Concha, and Casillero del Diablo--other, earlier upscale Concha y Toro wines."

In sum, tutelage from international wine traders and buyers has provided Chilean and Mendozan wineries key technical and market information on wine making techniques and consumer tastes, and induced numerous plant safety and hygiene improvements. However, the breadth of this tutelage has been modest even in Chile that has more of the varietals that international markets demand, and even narrower in Mendoza that has less of them.

Table Wine Supply Chains

The main beneficiaries of buyer assistance are fine wine supply chains. Intermediate and table wine producers get far less exposure, if at all, to this kind of tutelage. Foreign supermarkets have presented one of the few windows of opportunity for intermediate quality supply chains to export. Most other exports have been bulk sales without continuity, for example, to Spain during its 1995 drought. Intermediate quality wines typically retail for $3-$4.50 at the store, consisting of

[43] See *Wine Spectator*, November 30, 1997.

red and white blends. England's Sainsbury's has been one of the most active buyers in the Southern Cone. Several Chilean and Mendozan wineries have worked with the retailer. For example, the Chilean cooperative *Los Robles* became a Sainsbury supplier when it hired an experienced local consultant, Klaus Schroeder, to help it improve its wines. Schroeder already knew Sainsbury's wine buyer from his time at *Viña Santa Rita*. He helped *Los Robles* establish the contact and develop the wine that the English supermarket wanted. Sainsbury also sent its own enologist to guide production at the Chilean cooperative.

But tutelage from the English supermarket did not always reach producers directly. Eastern Mendoza's bulk wineries are an example: international buyers that purchase intermediate quality wines prefer to deal directly with the large integrated wineries. First Zone producers buy Eastern Mendoza's bulk wines and blend and improve them for export. Their competitive advantage over eastern wineries is that they offer traders quality guarantees and production experience that the latter cannot match. For instance, in Mendoza Sainsbury's has purchased intermediate quality wines through *Trapiche*'s parent company *Peñaflor*. The reason is that the winery already has a built reputation for predictable quality controls. Thus few traders that purchase intermediate quality wine have directly benefited Eastern Mendoza's bulk producers.

In sum, tutelage from buyers can be significant, helping firms map out different export market niches, quality standards, and production possibilities. However, for intermediate and low quality producers the benefits are far fewer, because of the fewer buyers that trade bottled wine of this type, and because elite wineries may also have advantages as suppliers for their better quality guarantees. However, the *Los Robles* example shows that buyers are willing to diversify their suppliers and work with newcomers as long as someone does provide the valued quality, product, and business guarantees. In the case of *Los Robles* that important role was played by a consultant enologist, the topic to which I turn next.

Demand-Driven Vineyard Upgrading

Fine Wine Supply Chains

The mixed upgrading record of even the best wineries looks good when compared to the general difficulties they have faced improving their supply of grapes. Table wine supply chains have been in disarray for a long time, and they are unlikely to improve quickly in the near future. But problems are not limited to poor quality grapes; growers of fine varietals, and even in-house planting efforts, have encountered serious problems of their own. Both Chilean and Mendozan firms have made poor locational choices for their vineyards, but it is more noticeable in the former because of the size of the investments. Chilean wineries were partly victims of their own success: as exports rose and grape prices increased they wanted to ensure some stability in the cost of their inputs. From the late '80s on most of the large firms began planting thousands of hectares of fine varietals without paying particularly close attention to the suitability of the soil, climate, exposure, and drainage to the grape variety.

Wineries' difficulties coming up with respectable white wines are illustrative of this point. Until the 1970s Chileans used to blend Sauvignon Blanc with Semillon and store it in oak casks until its fruity flavor disappeared. A good part of the problem was related to the use of the inferior Semillon varietal, but also related to the fact that most of the 20,000 hectares of white grape vineyards were located in the hotter Valle Central that runs north-south. This valley is well suited for Cabernet Sauvignon, but less than ideal for white grapes that need cooler climates. Miguel Torres was the first who attempted to improve Chilean whites when he introduced cold fermentation techniques from 1979 on. At that point winemakers realized that much of their Sauvignon Blanc was in fact an inferior clone, Sauvignonasse that produced wines with more vegetal flavors. Then in the early 1980s as a result of the wine crisis most of the country's Semillon vineyards were uprooted, and some of them replanted with Chardonnay. Surface area of this varietal rose quickly from no more than two hundred hectares to several thousand, a direct result of its high international demand. Unsurprisingly, Chile's whites remained poor. As one industry specialist noted, the

results while fruity and inexpensive were no better than cheap fighting varietals from Australia or California.[44]

Improvement in whites has come at its own pace. It began first through the *Concha y Toro* enologist and viticulturist Pablo Morandé who after visiting Sonoma County in California in the early 1980s found that its microclimate resembled very closely that of the Casablanca Valley back home. Different to the Valle Central, Casablanca opens west to the Pacific and is therefore cooled by the ocean fogs. Morandé planted his first few hectares of vineyards in Casablanca in 1982, and wine trials several years later proved him right. But Casablanca also has its problems:

> "During the growing season, from October through March, the region totals nearly 30 percent fewer degree days (a measure of heat summation) than the Maipo Valley; the harvest can be a month later. The risk of spring frost is much higher here, and the melting snow that runs off the Andes and irrigates the Central Valley vineyards is unavailable, so all the vines must be drip-irrigated."[45]

Still, after meticulous study, by the late '80s most of the big wineries--*Concha y Toro*, *Santa Carolina*, *Santa Rita*'s *Carmen*, Franciscan's *Veramonte*, *Errázuriz*, and others had started plantations in Casablanca. By 1995 over 2,000 hectares were in place.

Mendoza's fine wineries faced even greater difficulties. In addition to the locational challenges, in the early 1990s fine quality vineyards continued to be eradicated as a result of the industry downsizing of the 1980s. The sectoral loss of quality grapes presented itself as potentially disastrous for fine wine supply chains in the medium term--down to 5,000 hectares of the best varietals, most would be left with no inputs to process except their own. Moreover, few wineries had the capital to aim for self-sufficiency. Mendoza's wineries urgently needed to revert the vineyard eradication trend, and reach out to the deeply suspicious fine grape growers.

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[44] See Thomas Matthews, *Wine Spectator*, June 15, 1995.
[45] See Matthews, *op cit.*

Suspicion and quality problems went together. The suspicion was a direct result of the inflationary 1970s and 1980s with relations between grape processors and growers becoming very strained. Processors would habitually delay payments to growers. By the time the growers received the second or third of nine monthly installments inflation had completely eaten away its value. In addition, grape prices had dropped so low that in some years it did not even make economic sense to harvest. Not surprisingly during the 1980s Mendoza lost almost 100,000 hectares of vineyards including substantial surface area of the finest varietals. To defend themselves from abuse Mendoza's growers switched to "third party" processing: for a 5-10 percent fee, they had someone process the grapes and store the wine for them. They could then sell it at their convenience. During those years the grape market practically disappeared. But the change had consequences far beyond compensating growers more fairly. Wine quality dropped dramatically because of the increased segmentation of the supply chain. Quality wineries and growers no longer gave feedback to each other during the growing season and harvest that could improve the quality of grapes and the wines once they were processed. Wineries limited themselves to buying semiprocessed wine on the bulk market and finishing it (processing and filtering) before bottling. In sum, at the beginning of the 1990s the state of Mendoza's fine grape market had serious problems. Progress for Mendoza's independent fine grape growers has come very slowly because those who were supposed to be the leaders of the upgrading push were themselves unsure how to proceed. Here it is worth recounting the experience of one winery, *Chandon*, that has taken the lead.

The Chandon Experiment

The French multinational beverage giant, *Chandon*, opened its Mendoza operations in 1959 and targeted the domestic fine wine and champagne market segments. From the start *Chandon* operated as a mostly integrated winery, with its own marketing and distribution team, processing facilities, and vineyards. It only purchased some grapes for its less prestigious wines. For several decades fine wine consumption represented a very small portion of total domestic sales. The

winery was not especially large, with no more than 5 million liters of processing capacity. In a good year such as 1986 it sold 5 million bottles but then dropped as much as 20 percent during the hyperinflationary end of the decade. Things changed beginning in the early 1990s when fine wine consumption increased steadily and the economy stabilized. From then on the winery expanded quickly, investing $3-4 million a year to expand processing capacity to almost 20 million liters, and sold an average of 15 million bottles a year during 1996/1997.

Facing a rapidly rising need for fine grapes in the early 1990s even as fine quality vineyards continued to be eradicated, the winery found itself under significant pressure to make a strategic business decision. It could either expand its own supply of quality vineyards to become self-sufficient--and in doing so, have to sink significant financial resources into it--or it could continue as it had done in the past, producing its own grapes only for its best wines and champagnes, and purchasing the rest from growers. If it chose the latter path, it urgently needed to revert the vineyard eradication trend, to reach out to a growing number of grape suppliers, to overcome their suspicions and upgrade them to meet its minimum quality standards. It decided to take up the challenge.

In 1993 *Chandon* came up with an upgrading model that has become the industry benchmark and that few have been able to match. Its first golden rule was to build a reputation for prompt payment. The test came during the difficult *Tequila* crisis of 1995;[46] Chandon was one of the few Mendoza wineries that kept its word; growers took notice and increased their loyalty. Second, because most growers were cash strapped *Chandon* gave them a package of specific fertilizers and weed killers free of charge, with instructions on when and how to use them. Third, growers were guaranteed personalized technical assistance. They were given direct access to vineyard manager Martín Reboredo's cellular phone. Fourth, *Chandon* created a three-part point system by which vineyards and harvested grapes are graded. Growers are guaranteed a minimum market price for their grapes; good performance is rewarded on top of market price. One part of the grade, given by Reboredo, reflects the vineyard's general condition before the harvest; strong

[46] The "Tequila" effect refers to the Mexican devaluation of 1995 that triggered a financial crisis in several other Latin American countries. In a matter of days Argentina lost several billion dollars of foreign reserves as capital left

vegetative growth and high yields that dilute the aroma, tannin concentration, and provide herbal flavors are discouraged. The second part of the grade is given at the time of harvest. As freshly-cut grapes arrive at the processing plant in boxes, evaluators randomly select a few and objectively measure quantities of unwanted dirt, leaves and twigs attached to the grapes; the fewer the higher the score. The third part of the grade reflects the sanitary conditions of the grape; the score is lowered if there is rot or fungus such as mildew.

In the beginning the growers were unconvinced that these standards in any way improved wine quality. To persuade them, *Chandon* organized intense educational sessions at its production facility. They were shown technical films and asked to taste wines from grapes with and without leaves and twigs, with more and less concentration, etc. so they could check the differences for themselves. In Reboredo's own words, *Chandon* wanted to "make them accomplices of their objectives." As soon as the growers understood where the improvement was, they were asked to bring in their foremen and workers, so they would also experience first hand the difference the changes made. In this way those directly involved in executing the work had a clear understanding of the consequences of their actions.

Every year after the harvest the winery organizes a big barbecue for its grape suppliers, their families and staff, in all more than 500 people. The event is intentionally a "circus". The best growers--those scoring most points--are given prizes such as diplomas, engraved trays and cups (in addition to the higher prices paid for their grapes). The intent is to nurture in them a sense of pride in what they do. So far the strategy has paid off; the quality of grapes has improved every year. In the eyes of some industry observers, *Chandon* is in a highly vulnerable position; it produces only 10 percent of its grapes and relies on independent growers for the remaining 90 percent. Further vulnerability comes from the fact that it still signs no contracts and instead relies on an honor system. (In contrast, the large Chilean wineries regularly sign five-year contracts with their preferred growers). For the moment the evidence defies the skeptics; even as fine grapes are becoming scarce, prices have shot up, and elite wineries are stealing growers from each other,

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the country for safer havens, thus putting a strain on the banking and credit system. Many firms stopped paying

Chandon has had no trouble meeting its production targets; the winery has its stable core of suppliers. A few leave the system every year to sell elsewhere, but there are always new ones coming in to replace them.

Reboredo believes the model works because growers receive a personalized service from him--they can even call him at home if they need to. Whenever *Chandon* changes any of its policies all growers are called well in advance and the rationale for the new expectations, the benchmarks they are expected to meet, and the full set of rules on how they will be evaluated, rewarded and punished are carefully explained to them. Reboredo is always at hand when pay day comes around to intervene immediately if there is any discrepancy or mistake in someone's compensation. He often ends up taking sides with the growers against his employer. It is this socially responsible attitude and utmost respect for his suppliers that has earned the firm their loyalty.

Chandon's grower upgrading policies have had a significant impact in Mendoza in more than one way. In 1997 the winery worked directly with 203 growers and 300 vineyards. All of them have fine grapes, but are not necessarily large. In fact most have between 3-7 hectares.[47] These are the primary beneficiaries of the research and experimentation carried out in the Mendoza plant as well as what is transferred from the firm's main headquarters in France. In addition, there are several important secondary effects; first, other wineries have gradually begun to adopt the *Chandon* model. This is a major positive change from a business practice that was as antagonistic as it was generalized across the sector. Second, many growers who sell grapes elsewhere follow *Chandon*-style advice they learn from their neighbors who do work with the winery. Third, growers and wineries have begun to take notice where *Chandon* buys grapes. Because it is a major purchaser, in years of scarcity the winery's staff has traveled far and wide across the province looking for good vineyards in non-traditional areas. When *Chandon* buys from a particular

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their bills. Small firms were especially hurt.

[47] Among *Chandon*'s suppliers, there are 174 vineyards with sizes between 1-5 hectares, 96 vineyards with 6-10 hectares, 18 vineyards with 11-15 hectares, and 12 with 15+ hectares.

location previously unknown for its quality it sends out a signal to the rest of the sector. This may be one of the most consequential impacts, a topic discussed in the next chapter.

Unfortunately *Chandon*'s success is the exception to the rule. Currently no more than fifteen or twenty wineries follow its steps. In Eastern Mendoza only big grape juice processors like *Gancia* and *Jugos Lourdes* provide this kind of tutelage to a select group of high yield growers. Limited assistance to table wine grape growers has come through some cooperatives and public sector programs (for further discussion see Chapter 4).

Consultant-Assisted Technological Learning

Fine Wine Supply Chains

In the early 1980s the few Southern Cone wineries which could afford it borrowed much of the requisite knowledge on modern wine-making and grape-growing techniques from international consultants and through joint ventures. By the end of the decade, however, a critical mass of home-grown Chilean experts had developed considerable technical expertise and played a central part in the explosion of boutique wineries that started in the 1990s. Tentative evidence suggests a similar process is underway in Mendoza. Industry consultants not only brought with them technical experience but also had an invaluable supply of market information on consumer tastes and price categories.

Part of the early knowledge on international-style wine-making came from international consultants. Many of them visited both wine-making regions, and quite often their expenses were shared by several wineries. Enologists such as Jacques Boissenot (*Viña Santa Rita*, *Concha y Toro*), Jacques Lurton (*Viña San Pedro*), Michel Rolland (*Lapostolle*, *Trapiche*), Paul Hobbs (*Esmeralda*, *Valdivieso*), and ampelographers such as Boursiquot from France and Richard Smart from Australia have made multiple short trips to the two regions. These were the pioneers who guided managers in several big integrated wineries with their restructuring plans. Other consultants stayed for much longer. Especially Chile has received an influx of French experts since the 1990s.

Enologist Ives Pouzet started advising *Viña Los Vascos* in the 1980s and then in the 1990s moved on to work with a number of emerging boutique wineries such as *Chateau Los Boldos*, *Viña Porta*, and *Torreón de Paredes*. Gaetane Carron, trained in enology in France, Australia and Oregon, started at *Concha y Toro* in the early 1990s, charged with developing the firm's first superpremium. She did some of the earliest experimentations with prolonged macerations, hotter fermentations, and oak barrel aging, French techniques that had not been tried in Chile before. The wine was a Chilean first in beating the $20/bottle mark in U.S. retail stores. Recently Carron has moved to *Viña Veramonte* a Californian-owned winery in Chile. In Mendoza international consultants arrived later, the first one brought by Catena for *Bodegas Esmeralda* in 1988. Paul Hobbs had made his experience in Chardonnay and Cabernet Sauvignon with California's Mondavi on his Opus One project. Hobbs was instrumental in helping *Esmeralda* set up the experimentation systems to identify Mendoza's best grape growing microclimates and cultivation techniques. French ampelographers also provided invaluable help assisting growers purify their vineyards, weeding out plants that did not correspond to the varietal of choice. More recently Australian viticulturists have been consulted repeatedly on their pioneering vine training methods that achieve higher yields while preserving concentration of tastes and aromas (Table 3.10).

Table 3.10
SAMPLE OF FOREIGN ENOLOGISTS AND VITICULTURISTS; CHILE AND MENDOZA

Consultant	Specialty	Year Started	Wineries Worked/Consulted For
Ives Pouzet (France)	Enology	mid '80s+	William Fevre, Los Vascos, Los Boldos, Porta, Torreón
Jacques Boissenot (France)	Enology	mid '80s+	Santa Rita, Concha y Toro
Gilbert Rokvam (Lafite-France)	Enology	mid '80s+	Los Vascos, L.F. Edwards
Michel Rolland (Pomerol-Bordeaux-France)	Enology/Merlot	mid '80s+	Lapostolle, Trapiche, Bianchi, Lavaque
Paul Hobbs (Mondavi/Opus One-California)	Enology/Vitic.	late '80s+	Esmeralda, Valdivieso
Gaetane Carron (Australia, Oregon)	Enology	early '90s+	Concha y Toro, Veramonte/Franciscan Vineyards
Richard Smart (Australia)	Viticulture	early '90s+	ChileVid, Asociación Exportadores, AVA
Paul Monck (Australia)	Viticulture	early '90s+	ChileVid, Asociación Exportadores, AVA
J.M. Boursiquot (France)	Viticulture	early '90s+	Asociación Exportadores, Profo Vinos del Maule
Claude Vallat (France)	Viticulture	early '90s+	Asociación Exportadores, Fundación Chile
Brett Jackson (New Zealand)	Enology	1994+	San Pedro
Brian Bicknell (New Zealand)	Enology	93-'96	Errázuriz

Source: Own research, based on conversations with firm owners, enologists, sectoral specialists.

Towards the late 1880s an elite of local Chilean technicians had acquired enough experience of their own in the pioneer integrated wineries to begin offering their services as consultants for the emerging boutique wineries. All had tertiary training from one of the two main universities and

some had further postgraduate training from Bordeaux, Montpellier, and Davis. Increasingly, they were participating in harvests in France, California, New Zealand, and Australia during the off-season where they picked up additional know-how. They became the agents of change that spread the accumulated knowledge and commercial experience of the leading integrated wineries far and wide. The group that was most active had graduated around the 1970s. Among them was *San Pedro*'s Aurelio Montes who split to form his own winery with three associates in 1988. Over time he became consultant to approximately a dozen wineries, including *La Fortuna*, *Viu Manent*, *Santa Inés*, *Echeverría*, and *Bisquertt* to name a few. Felipe de Solminihac first worked for *Undurraga* and *Cousiño Macul* and then began his own winery *Aquitania* and simultaneously consulted for *L.F. Edwards* and *Doña Javiera*. Ignacio Recabarren has been one of the most prolific; he has worked for *Santa Rita*, *Santa Carolina* and its affiliate *Casablanca*, and consulted for *Caliterra*, *Errázuriz*, and *La Rosa*. He has also been involved as an associate in *Cono Sur* and *Porta*. He has his own winery *Quebrada de Macul* (Table 3.11).

Table 3.11
SAMPLE OF DOMESTIC TECHNICIANS: EDUCATION AND PROFESSIONAL EXPERIENCES; CHILE

Enologist	Domestic Education	Certificate Enology*	Other Major Education	Examples of Permanent Positions	Examples of Consultancies
Alejandro Hernandez	PUC	pre-1970	Post-grad. Bordeaux	Professor PUC; President OIV; San Pedro, Portal del Alto, Millahue	Balduzzi
Goetz von Gersdorff	Trained abroad	pre-1970		Concha y Toro	La Rosa, J.A. Bouchon
Alejandro Parot	PUC	pre-1970	Post-grad. Montpellier	Viñedos del Maule	J.A. Bouchon, Valle del Maule
Philippo Pszczólkowski	PUC	1971-1973	Post-grad. Spain, Montpellier	Professor PUC	Balduzzi, Santa Inés
Aurelio Montes	PUC	1971-1973		Undurraga, San Pedro, Discover	La Fortuna, Viu Manent, Santa Inés, Echeverría, Bisquertt
Mario Geisse	PUC	1971-1973		Manquehue, Moet-Chandon (Brasil)	Bisquertt, Casa Silva
Sergio Correa	PUC	1971-1973		Santa Carolina	Gracia, Cremaschi
Edmundo Bordeu	Uch	1971-1973	Post-grad. Bordeaux, doctorate UC Davis	Professor PUC	Balduzzi, Santa Eugenia
Fernando Ureta	PUC	1971-1973	Post-grad. Bordeaux	Cánepa	Segú Ollé, Carta Vieja
Klaus Schroeder	Trained Germany	1971-1973		Concha y Toro, Santa Rita	Los Robles, Doménico Correa
Ignacio Recabarren	PUC	1971-1973	Courses @ UC Davis, New Zealand	Santa Rita, Santa Carolina, Casablanca, Quebrada de Macul	Caliterra, Errázuriz, Porta, La Rosa, Cono Sur, Concha y Toro
Ernesto Juisán	PUC	1971-1973	Courses France	San Pedro, Errázuriz, Torreón de Paredes, Cánepa	Santa Laura
Pablo Morandé	Uch	1971-1973	Post-grad. PUC	Concha y Toro, Villard Fine Wines, Morandé	
María Elena Quezada	PUC	1971-1973		San Pedro, Santa Rita, Santa Carolina, Cánepa, Tarapacá	
Juan Pedro Sotomayor	Uch	1971-1973	Post-grad. Spain	Professor Concepción, Researcher INIA	
Fernando Torres	Uch	1974-1979		Concha y Toro, San Pedro, Viñedos del Maule	Astaburuaga
Rafael Sanchez	PUC	1974-1979		Los Robles	J.A. Bouchon, Balduzzi, Loncomilla
Pablo Vergara	PUC	1974-1979		Santa Emiliana	Tarapacá
Carlos Andrade	PUC	1980-1988		Cánepa, Itata, Francisco de Aguirre	
Andrés Ilabaca	PUC	1980-1988		Cánepa, Santa Rita	
Alvaro Espinoza	PUC	1989		Undurraga, Domaine Oriental, Carmen	

Source: Based on data from National Association of Agronomist-Enologists of Chile and own conversations with firm owners, enologists, and sectoral specialists.
*Enological certification requires a 5-year professional degree in Agronomy and standardized testing in basic enological knowledge and practices. The test is administered by the Chilean National Association of Agronomist-Enologists.

Yet the continued borrowing of knowledge through consultants is not an unambiguous sign of progress, and should be interpreted with caution. For one, consultancies can be expensive. The best charge over $1,000/day and run up substantial additional expenses for travel and accommodation. Few could afford tutelage at this cost. Second, because of grapes' sensitivity to local growing conditions, knowledge is only transferable to a certain extent. For instance, recognized Merlot expert Michel Rolland and Chardonnay specialist Paul Hobbs began working in Chile and Mendoza with limited knowledge on local conditions. They only learned about the regions' microclimates over time through their clients, *Trapiche* and *Catena*. Third, international

consultants have less expertise on varietals that are particular to some locations, as are for example, the Torrontés Riojano and Malbeck (this grape is native of Bordeaux but paradoxically produces far better wines in Mendoza). Thus they cannot be counted on to provide quality advice precisely in those varietals that may provide a particular region a comparative advantage.

Unfortunately, the low value added per liter of exports, and the fact that to date even the best Chilean and Mendozan wineries continue to rely heavily on foreign know-how and joint ventures to move up the learning curve, are signs of the difficulties most have to develop reliable in-house learning capabilities.[48]

Table Wine Supply Chains

Mendoza's viticultural diversity presents a serious challenge even for local technical experts because it has close to one hundred and twenty different varietals. Most have very specific growing needs and behave in distinct ways when processed. In contrast Chile has no more than twenty five different varietals; furthermore, 91 percent of the surface area consists of five major fine varietals and two low quality varietals. In addition, four of the five major varietals are the most studied by international enological laboratories, wineries and researchers across the world. Eastern Mendoza's table wine producers face further difficulties in that most viticultural and enological knowledge in the province resides with First Zone fine grapes. This is where most of the main wineries and the public sector research facilities are stationed.

Thus, while the learning demands put on local elite knowledge professionals in Chile and in Mendoza's First Zone have been many and their accomplishments quite spectacular, they also had it much easier than their less sophisticated colleagues in the majority of table wine producing firms in Eastern Mendoza. As was noted, until recently conditions and prospects for the latter firms seemed quite dismal--a shrinking market, poor quality grape endowments, little or no capital to

[48] Joint ventures are one of the most common forms of knowledge acquisition, such as the 1997 agreement between *Concha y Toro* and France's *Mouton-Rothschild* to develop a top Bordeaux-style Cabernet Sauvignon in the Maipo Valley. Their commitment to the project is between $5-6 million, to be shouldered 50-50 with their French partners. Another example is a joint venture between Robert Mondavi Winery of California and *Viña Errázuriz* of Chile.

reconvert, and no demand or supply-side assistance. Compared to the former group, these enologists and their wineries were "driving blind," knowing that they had to implement momentous changes to upgrade, but paralyzed by the uncertainty over how to proceed. Professional managers in elite wineries were assigned significant budgets for technological upgrading, whereas enologists in the other firms have found it far more difficult to persuade risk-averse owners to invest in new machinery, especially because they have little knowledge to what market they can sell the improved wine and recoup their investment. In addition many of them still have no working models to follow on how to upgrade their production practices. The enological laboratories have fewer tried-and-tested products for intermediate and poor quality varietals as they do for the fine varietals used by elite wineries that are the same across the world. The invaluable assistance that demand- and supply-side actors can provide enologists to help structure an upgrading process simply have not been available to them. They are unsure how to improve their wine, and they do not even know what new market segments they can target, what standards and benchmarks they need to set themselves, nor how to sequence a set of work practice improvements to progress from one step to the next.

To date some of the most basic microbiological questions important to Eastern Mendozan producers remain unresolved. For example, one of the problems wineries face is that three months after harvesting and processing, red wines from intermediate quality varietals such as Bequignol, Bonarda, and Tempranilla lose as much as 50 percent of their color, sometimes even more. Some of these wines could be turned into *Beaujolais* or *vin de pays* as in France and command good prices, but wineries on their own do not know how to enter these markets in such a knowledge vacuum. A serious organized discussion on the market, production, and microbiological possibilities of these grapes remains to be initiated.

An Example of Successful Upgrading: Viñedos y Bodega La Agrícola

One Eastern Mendoza firm epitomizes the best of the lessons that Californian and French producers established in the '70s. While its business model is not necessarily the one that most Chilean and Mendozan wine supply chains might be able to follow, it is the approach that they can aspire to imitate.

La Agrícola was established in Eastern Mendoza by Alberto Zuccardi in 1964, an engineer whose family owned a successful local construction firm. Zuccardi was one of the first to use the tax breaks offered by the federal government to firms that expanded into the eastern part of the province. *La Agrícola* started with some 380 hectares of vineyards in Santa Rosa, deep in the provincial east, and four years later set up its wine processing plant. This was the heyday of volume production when what mattered only were high vineyard yields, not quality. *La Agrícola* planted the most productive varieties such as *Criolla* and *Cereza* on *parrales*, the high-yield orthogonal vine training systems developed in the province not long before. Until 1980 the firm was a bulk producer of cheap table wines and sold them to the province's largest private bottler/ distributor, *Greco*. When domestic consumption peaked and began to fall in the late 1970s and with the bankruptcy of *Greco* in 1980, the province's wine industry boom finally came to a resounding end. Firms like *La Agrícola* that once were the archetypal Eastern Mendoza successes became the industry's whipping boys, blamed for all its failures and problems.

There was, however, a difference between *La Agrícola* and most of the other 250-300 table wine bulk producers in Eastern Mendoza that found themselves immersed in a crisis. The firm had a savvy business leadership and the resources to implement rapid changes. That leadership disbelieved that Eastern Mendoza was too hot for fine grape growing; in fact, the area of Santa Rosa had a microclimate that was somewhat different from the average for the region, with abundant winds that dryed and cooled the vines. Furthermore, the soils were also somewhat better than the average, less acidic, more sandy and loose, so that vine roots ventilated quickly. Instead of eradicating its vineyards and dismantling the by-now infamous *parral* training system as most of

the quality-peddling critics demanded they do, the firm decided to withhold judgment and began a methodical series of experiments on how to improve quality with what it had. Agronomists and enologists worked together to try different ways of improving grape quality on the *parral*. For example, in the past a large portion of grapes would grow clustered close to the main trunk of the vine, so much so that they often rot for being too close to each other. Technicians moved the buds away from the center of the trellis system, to better ventilate the grains and expose them to the elements. They experimented with various foliage removal techniques, varying them according to the varietal, and played around with the yields. They also changed their varietals, not only to fine quality grapes but included some of intermediate quality and medium yield such as Tempranilla, Sangiovese and Bonarda. In addition, they changed the width of the parral from 3 meters (10 feet) to 5 meters (16.7 feet) to allow mechanical harvesting. Each of these changes was painstakingly documented to allow them to compare what worked best and what didn't. As they fine-tuned the vineyard and processing improvements they began to obtain wines of very good quality with intermediate varietals at yields anywhere between 12,500-25,000 kilos/hectare. These yields were much higher than those recommended by the "experts" and consultants who advocated replacing the *parral* in favor of the curtain training system (*espaldera*), replanting vineyards with the best international varietals, and lowering yields to no more than 8,000-10,000 kilos/hectare. *La Agricola*'s wines turned out to be a great success in certain markets such as England. Because of the much higher yields, their prices were extremely competitive. *La Agrícola* also found that in fact the *parral* was far better suited than the curtain training system for growing white grapes in Eastern Mendoza, because the greater leaf growth created a shady canopy that protected them from the hot summer sun. In this way the whites grapes preserved all their aroma, ideal for making young fruity wines also preferred in British markets.

Rodolfo Montenegro, *La Agrícola*'s university-trained enologist and a key player in the firm's success is critical of the industry's leadership. His comments illustrate some of the larger ideological and practical struggles that are emerging in Mendoza, between those who more or less

adopt without question the "international" wine making model and those who would like to follow a more "indigenous" approach:

> "The policies that encouraged the eradication of *parral*-trained vineyards during the 1980s were disastrous. Instead of eradicating them one had to improve them. The domestic industry never had a global vision. *La Agrícola* is one of the few firms that is doing well because it takes its work seriously. Most of the others were so poorly handled that they were bought out by foreigners. ...Mendoza has yet to develop an Argentinean model. Catena's is the international model. What Catena (*Esmeralda*) makes Mondavi makes, and everyone makes; they are no different from each other. ...Most of the elite firms and their enologists in Mendoza are still focused too much on the First Zone, ignoring the productive potential of areas like Eastern Mendoza. There is still a lot of arrogance."

To date *La Agrícola* continues to overturn every conventional wisdom in provincial wine-making folklore. For one, the winery does not have one hectare of vineyards that is not *parral*-trained, despite the continuing demonizing rhetoric against it. Nor does it buy any grapes of other growers but relies exclusively on its own supply. It is one of the most aggressive firms in the domestic market, having recently introduced a line of wines in the thinly-served intermediate value category ($2-$4), the lowest end of the popular premium markets. In fact, a few of the leading wineries like *Norton*, *Lopez*, *Trapiche*, and *Escorihuela* are beginning to target this market segment and to set up their own *parral* vineyards. Montenegro also noted that the leading Chilean wineries that built a reputation for adopting international approaches and standards to wine-making also have *parrales* for their good value wines, even though they do not actively volunteer the information.

Second, La Agrícola continues supplying its demijohn market, even when most of the industry has dropped the container in favor of the compact, light, and attractive *Tetra* box or the traditional 3/4 liter wine bottle. La Agrícola justifies its decision on the fact that it has a core group of consumers faithful to the 5-liter demijohn. Rather than sell "inputs"--e.g., 6 bottles of wine, 6

corks, 6 labels--that added up are often more expensive than the wine itself, its philosophy is to save consumers their money and give them more value--one bottle, one cork, one label, and six times more wine.

Third, La Agrícola is just as successful in its exports to the good-value market segment, competing head to head with the best Chilean wineries in that niche. But what is even more striking is that the winery is by no means caught in an "intermediate-quality trap" unable to move beyond $4-5/bottle. Its top line of oaked varietals has been rated as one of Mendoza's best in the specialized magazines. Wine Enthusiast magazine's '98 "Top 100 Best Buys of the Year" list (defined as those with a U.S. retail value under $10/bottle) had La Agrícola's *Santa Julia 1996 Oak Reserve Chardonnay* for $9/bottle in fourth place (with 4 others) at 90 points, a truly outstanding score.[49] The next best Mendozan wine on the list was sixth-placed *Santa Julia 1996 Malbeck-Cabernet Sauvignon* (with 10 others) at $6/bottle and 88 points. The closest Mendozan competitor was *Trapiche 1994 Oak Cask Cabernet Sauvignon*, also sixth-ranked and valued at $9/bottle.[50] In all, *La Agrícola* had three out of the six Mendoza bottles that made it to the list.

Montenegro participates in all sectors of the firm's supply chain. For several years he has monitored carefully the behavior of each hectare of vineyards. His knowledge is good enough that he can now recognize the flavor of the wine each one produces, an advantage in helping him decide to which market he should send it. He continuously experiments with different fermentation techniques, and currently uses indigenous yeasts for his best reserve wines rather than the more standardized preselected yeasts sold by the enological labs. For several years now he has kept a database on his computer where he documents for each varietal the exact source of the grapes, the yeasts he used to process them, and the flavors and the aromas that resulted. This provides him clues as to what works best under what conditions. He recommends working without prejudices, through taste testing, and by avoiding copying models without ensuring they are an improvement

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[49] As a point of comparison, Concha y Toro's top of the line *Don Melchor Private Reserve 1994 Cabernet Sauvignon* sold in the U.S. for $25/bottle, and was also awarded 90 points in Wine Spectator's November 1997 ranking.

[50] Consider that *Trapiche* has more than 20 years of export experience, whereas *La Agrícola* only started to export in 1994.

over what existed. He does not think it is easy to copy *La Agrícola*'s business model, first, because the skepticism among many of the industry leaders is still so strong, and second, because to do so requires a very integrated implementation of mechanisms of continuous improvement that few firms are able to carry out.

Conclusion

In this chapter I provided evidence on the extent to which market tutelage--help from machinery suppliers, international buyers, wineries and consultants--induced, broad, deep, continuous upgrading in Chilean and Mendozan wine supply chains. The results are more even in Chile than in Mendoza, with those wineries following an "international-style" restructuring receiving most of the assistance. They were able to tap into more than a decade of accumulated experience of European and Californian wine making, in machinery use, enological product design, and grape growing and processing techniques. With the exception of an elite of commodity exporters and the growers that work with them, producers in wine subregions such as Eastern Mendoza where resource endowments are less well known internationally--and prejudices against them strong--were also less benefited by market sources of tutelage. These did not have the requisite knowledge, interest, or expertise to provide assistance tailored to Eastern Mendozan producers' particular needs.

Paradoxically, despite the advantage of fine wine producers over the table wine producers and the fact that many Chilean and Mendozan fine wine supply chains have made substantial progress since the early 1980s, even the most resourceful have found steady movements up the learning curve very laborious. In some ways both types of supply chains face a similar type of problem, that of implementing mechanisms for continuous improvement. Because grape growing and processing is especially sensitive to local conditions these mechanisms need to be based on the systematic use of tacit information from local production and market experience.

CHAPTER 4

Failures and Successes of State Tutelage and Beyond

Introduction: State Tutelage, Bootstrapping, and New Learning Institutions

In the first part of this chapter I review the role of the state as a source of tutelage for the wine sector, then in the second part I examine a pair of initiatives that somewhat inadvertently suggest how a patchwork of programs can come together with coherence, of the kind that advocates of integrated approaches fantasize. In the 1980s Chile's and Mendoza's public sectors had a significant impact on the course of the wine industry restructuring. In the former country different line agencies of the central government completely modified the industry's regulatory environment; in Mendoza, the interventions were at least as complex, involving multiple agencies and two levels of government, federal and provincial. On the other hand, the spirit of the reforms was very different in each region, *Laissez-Faire* until the mid '80s in Chile, highly interventionist in Mendoza. Yet despite the starkly different approaches, there was one key similarity to them. None of the policies provided explicit support for the kind of help local wine supply chains needed most: the formulation of a realistic set of achievable, incremental standards that could serve each different wine supply chain as a road map to eventual international competition, and that could be scaled up into a broad sectoral strategy.

In fact, for several years such a goal wasn't even a subject of debate. Things began to change first in Chile in the mid 1980s when the state shifted away from its *laissez faire* approach to the economy. Gradually, it introduced a series of programs designed to help wineries obtain new exports markets, solve technological bottlenecks, and carry out technical visits to competitor countries. Very recent export promotion programs in Argentina and Mendoza attempt similar goals; some provincial programs have also been introduced to facilitate technical catch up in certain primary and processing segments. Typically, these initiatives were designed independently of each

other, and were not the product of any coherent plan. In fact, lack of coherence and little learning about their effectiveness are often-heard criticisms leveled at these public programs.[51] Integrated policy approaches and program learning have remained elusive goals.

In the second half of the chapter I review a pair of initiatives that somewhat inadvertently suggest how a patchwork of programs can be given coherence, of the kind that designers of integrated policies fantasize with. The two examples of learning institutions to which I refer are not extensions of established organizations such as existing business associations or public sector development agencies, but a new combination of market and public sector elements. The key feature and strength common to both examples is that they are fora for the discussion of tacit and received knowledge that help formulate a sequence of targetable production standards. One is a consortium of wineries in Chile's VII Region that organized to export jointly. With public funds it first formed a quality evaluation panel to benchmark its members' wines and document what improvements each one needed to make. It hired a manager who tapped various sources of funding and private assistance to coordinate the group's upgrading activities. In this way it availed itself of a set of independent consulting services in a sequential and coherent way. One grafting technology generated for the group has already been copied extensively throughout the region. The other is a wine evaluation committee in Eastern Mendoza. Organized by a group of local enologists, enological labs, and bulk wine businessmen, they have organized a set of subregional events also centered on benchmarking of local wines and discussion on how they can be improved. Based on this knowledge, the committee is also availing itself of numerous funds and experts from the private and public sectors, and coordinating services they have identified in demand. In so doing they are also changing outsiders and employers' perceptions about themselves.

The fact that enologists have played an important hand in both these initiatives and that the institutions surfaced where they did, does not seem accidental. Enologists' key coordinating position in wine supply chains is privileged in that they can synthesize information on production and market experience better than anyone else. In addition, enologists' group activism and their

[51] See Dussel *et. al.* (1996) for Mexico.

identities with particular locations may have deep historical roots, the social product of long-postponed expectations for public recognition. These have combined to trigger their activism.

First Wave of Public Policies: Extreme Approaches and Big Mistakes

In both countries the first wave of public sector reforms consisted of very broad policies, better known for their failures than for their successes.

Chilean Laissez-Faire

Chile's wine sector restructuring began in the mid 1970s with a sequence of major policy failures. In what local analysts widely view as its darkest hour--at least with respect to the processing sector--the state's rapid and indiscriminate deregulation of the industry in the mid 1970s was blamed in large part for the grape and wine overproduction crisis that erupted in the early 1980s.[52] Among the major problems, first, was the timing of the deregulation plan: as in Europe, it coincided with rapid productivity improvements in vineyards precisely at a time when aggregate demand was falling and changing to better quality wines. This problem was exacerbated with a second one: in 1980 the state granted processors permission to use remainders of export-oriented table grapes to make table wine for local consumption, thus further increasing the supply of grapes--in years like 1992 by almost 50% (Table 4.1).[53]

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[52] The Chilean state began to deregulate the wine sector in 1974 by repealing caps on planting of new vineyards and on wine production, in place for the preceding four decades, and eliminating requirements on growers and producers to report their production volumes to the internal revenue service. In 1976 it also added an internal alcohol consumption tax thus raising incentives both for the expansion of exports as well as that of an internal black market. In 1979 it repealed the ban on the use of table grapes for wine. One of the most controversial policies was the 1979 repeal of the ban to plant hybrid varietals. This ban was subsequently reimposed in 1985 (Pszczólkowski 1991, 1997).

[53] Table grapes had been used illegally for wine making as early as the 1970s. Their use was legalized in 1980 but no official statistics were recorded until 1986.

Table 4.1
GRAPE SOURCE AND WINE PRODUCTION STATISTICS; CHILE 1986-1996

Year	Share Wine Grapes	Share Table Grapes	Share Pisco Grapes	Total Production (Million Liters)
1986	86%	14%		420.0
1988	84%	16%		463.0
1990	91%	7%		350.0
1992	67%	33%		316.6
1994	77%	23%		359.8
1996	87%	12%	1%	387.8

Source: Gross Consultores Asociados. December 1997. "Situación de la Vitivinicultura Chilena," mimeo. Chile, Ministry of Agriculture-ODEPA.

Third, it increased the domestic alcohol tax significantly, even above and beyond what other alcoholic beverages such as beer paid, so that wine competed unfairly with them. The high tax stimulated a black market in wine trading and various illegal production practices (such as diluting wine with water) that only served to decrease wine's popularity among consumers. Tax evasion grew at an alarming rate, jumping from 3% in 1978 to an estimated 69% in 1983 (Table 4.2).

Table 4.2
TAX EVASION IN CHILE'S WINE SECTOR; 1978-1986

Year	Production Estimates (Liters) Ministry of Agriculture (SAG/CORFO)	Production (Liters) Accounted for by Tax Bureau (SII)	Estimated Tax Evasion
1978	606,200,000	588,000,000	3.0%
1983	533,500,000	165,200,000	69.0%
1984	485,000,000	228,400,000	52.9%
1985	436,500,000	228,100,000	47.7%
1986	349,000,000	190,400,000	45.5%
1987	390,000,000	315,000,000	19.2%

Source: I.R.E.N. 1979, and Gemines. 1988.

As the crisis unfolded, the state stepped aside and made few if any attempts to reduce or redistribute the cost of restructuring.[54] For example, it provided some compensatory resources and technical assistance to wine cooperatives without any success--almost all of them eventually closed down.[55] The result was a decimated industry, with small firms being the group that suffered most firm deaths (Table 4.3).

[54] The *Gemines* (1988) study ordered by the Chilean government noted that the high taxes levied on wine consumption were regressive, inefficient, and were hindering the sector's development. It recommended repealing the tax and unifying it with those of other activities. The government chose to ignore the recommendations.
[55] For example, in the mid '80s a few cooperatives were involved in a project managed by *Fundación Chile*, to upgrade their wine processing technology. Some also were advised on improved viticultural techniques through the national agricultural research and extension agency *I.N.I.A.*

Table 4.3
NUMBER OF WINERIES, EMPLOYEES, AND AVERAGE FIRM SIZE IN CHILE; 1975-1995

Year	Number of Firms			Employees			Firm Size		
	Small	Medium+	Total	Small	Medium+	Total	Small	Medium+	Total
1975	20	35	**55**	437	3,359	**3,796**	22	96	**69**
1979	102	36	**138**	1,931	3,960	**5,891**	19	110	**43**
*Census '79	235	36	**271**	2,345	3,960	**6,305**	10	110	**23**
1985	43	23	**66**	866	2,733	**3,599**	20	119	**55**
1990	26	20	**46**	578	3,312	**3,890**	22	166	**85**
1995	22	21	**43**	503	4,073	**4,576**	23	194	**106**

Sources: I.N.E. Annual Manufacturing Survey of firms with more than 10 employees. Small firms are those with 10-49 employees; medium+ firms are medium and large enterprises with 50+ employees.
*The "1979 Census" is actually a very broad survey that also Includes microenterprises with 5-9 employees in the small firm category.

The Chilean state did far better in other respects, creating certain "wrong" prices, reminiscent of the government activism associated with late industrializing countries,[56] but allowing private sector agents to provide the market discipline. As did the European nations, it stepped in to restructure the primary sector providing subsidies to encourage growers to switch from vine grapes to various stone fruits and table grapes, exports that were extremely profitable and dynamic at the time. These initiatives were successful in large part due to the active role of fruit trading companies directly connected to the market, that coordinated much of the necessary technological effort.[57] During the '80s total vineyard surface with wine making varieties dropped from over 100,000 hectares to less than 60,000 hectares.

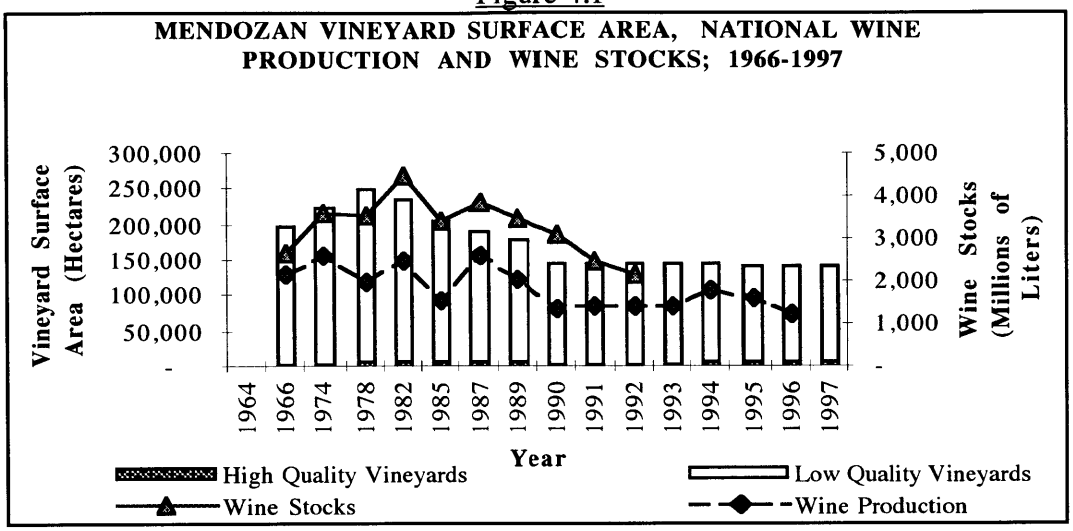
Mendozan Micro-Mismanagement

In Mendoza the public sector took a very different approach to Chile's. In attempting to appease several pressure groups, it wanted to restructure the industry through administrative fiat rather than market forces with the aim of distributing as widely as possible the downsizing costs. The federal government enlisted its sectoral regulatory agency, the *Instituto Nacional de Vitivinicultura* (*INV*) to come up with a restructuring plan. The *INV*'s first strategy was to use public development banks to finance the construction of new storage capacity. It was hoped that an

[56] See, for instance, Amsden (1989).
[57] See Jarvis (1992). Researchers formerly with public agencies recruited by the trading companies participated actively in this technological effort.

increase in stocks could buy the industry the needed time for consumption to recover or supply to fall by its own means (Figure 4.1).

Figure 4.1



Source: I.N.V.

When in 1982 wine stocks rose to over twice the national yearly production more drastic measures were implemented, principally a plethora of regulations on the market and the product itself to control the supply and price of wine at any time. Market controls were enforced through support prices, production controls (quotas), sales blockades (bottling restrictions), and date regulations (also to block the release of wine). Product controls were imposed by changing on a need basis the minimum alcoholic content definition of wine, the definitions of what constituted fine wine and table wine, and the closing date of the harvest.[58] Subsidies to eradicate vineyards followed, and a tight regulatory control was maintained over the remaining ones. Most subsidies were used by growers to switch to cash crops and fruit production for the local market; these initiatives did not have the success that they did in Chile because no commercial traders were involved to provide the market discipline.[59] Nevertheless, over the decade vineyard surface in Mendoza also fell spectacularly from 250,000 hectares to just over 140,000 hectares. In parallel, the provincial government attempted to use the large integrated firm *Bodegas y Viñedos Giol* it had owned since 1954 to guarantee growers' and cooperatives' minimum incomes with purchases at

[58] See Juri (1992) for an extensive description.

support prices. This winery's market power was considerable; for example, in the 1987/1988 harvest it processed 262 million liters, 15 percent of the province's production and equivalent to 67 percent of Chile's entire production for that year.[60]

The degree of success of these policies is questionable at best and the subject of deep controversy in Mendoza. For example, the *Giol* winery ran deficits for most of its existence as a government-owned firm, surviving only because it was covered by general revenue raised by provincial taxpayers. Between 1983 and 1989 its deficit never fell below the $19 million mark and reached $70 million in 1988. The winery was finally privatized in 1988/89. By the same token the *INV* gained a reputation for being a bloated and corrupt bureaucracy, used by politicians and various groups to pursue their personal interests. It employed 1,700 people and its budget was large by any means, coming directly from a 7% tax on national wine sales.[61] It was eventually reformed in 1991, its budget and responsibilities drastically reduced as part of a sweeping first wave of public sector downsizing.[62]

Second Wave of Public Policies: Activism Through Discrete Initiatives

After having toyed for almost a decade with an extreme form of liberalism in Chile, and an acute market control program in Mendoza, the public sector changed tracks in both countries. What triggered the change in Chile was the deep 1982 recession; conversely in Mendoza it was the federal government's move in 1991 to liberalize the economy and to downsize the public sector. Both comprehensive approaches--extreme liberalization and extreme market control--were shelved. What followed was a patchwork of discrete initiatives to provide particular forms of assistance to certain wineries and supply chains. For example, in Chile the largest producers were offered specific market assistance to encourage exports; another program targeted a number of medium-size wineries for a technology upgrading course on modern wine making techniques. In Mendoza,

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[59] Many of the varieties planted did not transport well, thus were unsuited for export (U.C.I.M. 1993).
[60] Juri and Mercau (1990).
[61] I.I.E.R.A.L. (1990).

the only "jewel" (albeit jaded) left in the public sector's crown was the state-owned *Giol* winery. Once the integrated winery was privatized and the *INV*'s controls were dismantled, the initiatives offered to the sector involved limited marketing assistance for export-oriented elite wineries, and agricultural research and extension support to certain wineries and medium-size growers.

Especially striking about these initiatives is that they were examples both of the improvement that careful targeting represented over the broad-brush approach of the past, as well as of its inherent limitation in terms of outreach. The initiatives were useful in that they filled in specific gaps in the 'road map' that wine supply chains needed to make the difficult transition from backward producers to quality exporters. But they were also limited in that they could not close all the knowledge gaps that existed. They provided real assistance for some economic agents, but could not reach out to all potential beneficiaries. This assistance was a real patchwork, gathering the greatest successes where the missing links and components in the road map could be filled in simultaneously by other means. Following I provide a few examples of these initiatives, describing in what ways they succeeded and how they failed.

Revised Chilean Neoliberalism

By the mid 1980s and recovering from a recession, the state moved decidedly away from its hands-off approach and began a period of earnest engagement with the private sector to promote exports, first with large wineries and in the early 1990s with their smaller counterparts.[63] The Chilean government first organized a sectoral consortium of the largest wineries, those already associated in the *Asociación de Embotelladores y Exportadores de Vino*, and began to work with them to develop Chile's international image as wine producer. This initiative came from one staffer at *ProChile*, the central government's export promotion agency. It began modestly with no more than half a dozen wineries and a work plan to organize advertisements around the theme "Wines of

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[62] Juri (1991).

[63] The state also stepped in to restructure the primary sector with subsidies to encourage growers to switch from vine grapes to various stone fruits and table grapes, exports that were extremely profitable and dynamic at the time. During the '80s total vineyard surface with wine making varieties dropped from over 100,000 hectares to less than 60,000 hectares.

Chile" in advanced country markets. *ProChile* created "wrong" (artificially low) prices with significant subsidies offered to firms that advertised in certain foreign markets.[64] In exchange, wineries had to comply with a set of advertisement design standards to provide the campaign with a unified façade. Until then, wineries had never marketed anything together; in fact, cooperation was rare. Yet the timing was propitious: in the early 1980s modest wine exports of the cheapest varietals to debt-burdened Latin American markets had all but collapsed and export managers were especially predisposed to try anything that might help them meet their sales quotas. Domestic tastes were changing away from table wine, and competition from beer, soft drinks and mineral water was intensifying. *ProChile* coordinated and cofinanced the publicity campaign as well as a series of trade shows and missions of trade specialists to Chile to sample first-hand the country's wines. Until then, Chile had been better known for its dictatorship than for its wine; *ProChile*'s efforts began to put the country on the wine map as a supplier of good value.

ProChile's work was invaluable in that it encouraged the large wineries to wean themselves away from the "easy" Latin American consumers, and accelerated their exposure to more demanding markets and standards. The wine export committee helped generate a debate among a producer elite on what market segments they could compete in, and helped them formulate a marketing strategy on how to get there. On the other hand *ProChile*'s effort was incomplete in two ways. First, in being a marketing program it was not designed to make explicit the particular technical standards that were required to compete in each market segment, and the technical solutions that would get them there. It was a forum for export managers; enologists were not present in these discussions. It was left to each winery to figure out on its own what the technical requirements might be. As was noted in Chapter 3 the 1980s were a time of experimentation through trial and error, where many mistakes were made planting vineyards in unsuitable microclimates. Second, in efficiently targeting the wine elite--those with the greatest financial and business resources to buy technology and pay consultants to acquire the knowledge, *ProChile* neglected the rest of the industry.

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[64] Wineries were reimbursed $1 for each case of wine exported per year or 50% of their advertisement costs in foreign

In the early 1990s *ProChile* opened up its assistance to a group of smaller wineries that had been pressuring for some time for access to its programs. The idea was initially resisted by the large firms and paradoxically, by some of the same staffers that had launched the program in the 1980s. Their concern was that small wineries would not meet minimum quality standards and might be tempted to free-ride on the quality image they had created through a lot of hard work. *ProChile* staffers that supported broadening the assistance finally prevailed. What broke the stalemate was the realization that small and large wineries did not compete in the same markets. This endorsement turned out to be key for the small wineries: *CORFO*, the central government's development agency provided them with seed capital to form a business association--*ChileVid*--and hire an export manager to promote their exports. To date, the association has had considerable success, facilitating the promotion and access of small wineries to export markets.

Fundación Chile's Technological Upgrading Efforts

A technology transfer non-profit organization established in 1976 with a $50 million endowment from ITT, in 1984 *Fundación Chile* (*FC*) launched a small technology upgrading project involving no more than twenty wineries from the central region. At the time the sector was in the midst of its overproduction crisis and the largest wineries were carrying out their first purchases of stainless steel equipment and experiments in international-style wine making. To broaden the spectrum of firms involved in this incipient restructuring effort *Fundación Chile* targeted a segment of medium sized wineries which did not have the financial resources to imitate the large ones but were nevertheless interested in upgrading. These included three cooperatives from Talca, Cauquenes and Quillón. Since none of these firms could afford to make heavy investments, *FC*'s proposal was to start with modest improvements in wine making techniques that did not involve big infrastructure expenditures. *FC* proposed to work with the wineries on two conditions. One was that they operate "cleanly", and eliminate the use of chemicals. For example, because many storage tanks were made of regular metal rather than stainless steel, oxidants blended

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media, whichever was lower.

into the wine. Enologists would typically remove the oxidants by adding chemicals to precipitate them. The precipitation was filtered out later. Instead, wineries were now directed to paint their storage tanks with epoxy to avoid oxidization and fungal growth. Second, they were also asked to set aside a section of their vineyards to experiment with different grape management techniques and harvesting dates. Rather than harvest when sugar levels were high as they usually did, they were encouraged to monitor tannin levels and harvest only when these reached a high level of concentration.

The program continued for a few years, and some of its participants improved their quality levels significantly. But the overall results were modest and the initiative was considered a failure. For instance, cooperative growers refused to lower their vineyard yields because the higher reward for better quality did not compensate adequately the loss of production. Wineries were also encouraged to introduce refrigeration units for white wine processing but few could afford them. In a sequel to the initiative several of the participant wineries banded together and hired a manager to sell wine for all of them. This effort also failed because the participants became immediately suspicious that the sales manager was working more for one than the other. On a more positive tone, several of the firms that participated in this program, among them *Santa Mónica*, *Portal del Alto*, and *La Fortuna*, banded together several years later. Once wine prices began to recover, they began to make hardware investments and became part of the boutique winery export association ChileVid.

Despite the poor results *FC* did not leave the wine sector. Its next major sectoral initiative was the purchase of a piece of land in the south of Chile's VII Region in 1989 to plant Chardonnay vineyards and build a state-of-the-art winery. Named *Itata*, this was a demonstration project to show the wine sector that the cooler southern part of the wine region was ideal for planting white grapes. Until then, most Chardonnay plantations had been mistakenly made further north in the Central Valley, and since the late 1980s in the cooler Casablanca Valley. The south had been ignored as a potential area for fine varietals because it was typically associated with the small subsistence farmers and low quality País grapes. The project was a substantial success; it produced

a varietal Chardonnay and a reserve that were recognized widely for their quality. By the mid 1990s the integrated wineries were purchasing grapes in the area and starting their own large-scale plantations. More recently, FC has sold off its vineyards and associated with another winery in the VII Region to produce an ultrapremium. In another landmark joint venture it is planning to produce intermediate quality varietal wines based on Moscatel de Alejandría for the domestic market. This is one of the grapes that impoverished secano growers of the VIII Region grow. *FC* is attempting to show the economic opportunities that this area holds and hopes to attract investment to the region.

The Giol Privatization

One of the Mendoza government's most successful actions in steering the industry's restructuring in productive directions may have been the privatization of *Giol*. Its bottling, distribution, and marketing division were sold to a federation of 37 provincial cooperatives, *FeCoVita*, set up as a 'second-order' marketing cooperative that buys bulk wine from its members and bottles it for them. In the early 1990s the province of Mendoza had approximately 4,800 growers affiliated in cooperatives, 80% of which were members of *FeCoVita*. If not in surface area or grape quality --it included some of the smallest, more impoverished growers, with the lowest quality grapes--this group represented 20 percent of the provincial total, and was more numerous than that participating in the fine varietal upgrading push. Given its size and organization, cooperative growers had historically been somewhat of a "thorn" in the side of the provincial government, vocally expressing discontent and seeking economic redress whenever the price of grapes and wine fell. Their economic welfare was of concern to the public sector.

Giol's main competitive asset was not its bottling facility--all of its plants were technologically outdated--but rather the established brand name of some of its wines. This asset was key to the cooperatives' needs because it solved one of their strategic weaknesses: marketing. Although the sale appears to have been less than perfectly 'transparent'--*FeCoVita* was the only bidder and was widely believed to have paid less than the full price--the provincial government's sale of the *Giol* business unit was strategic. Rather than continue to provide remedial assistance as

it did through the 1980s, it gave the cooperatives a valuable asset that complemented their own, and exposed them to the discipline of the market. Since its inception *FeCoVita* has been a commercial success; it currently holds roughly ten percent of the country's market share of table wine. The cooperative has also made significant investments in new machinery and has begun to export.

On the other hand *FeCoVita* and its affiliated growers still have a long way to go to catch up to modern wine-making times. In fact in some ways the federation has also become a sort of poverty trap for them. Even though *FeCoVita* is a commercial success in the domestic market, its grower members have neither seen a large share of the profits nor have they received assistance from it to upgrade their vineyards. The reasons are several and point simultaneously to the need for and the difficulty of implementing integrated upgrading strategies in complex organizations where interests are many and often not aligned with each other. An integrated approach suggests the need to assist *FeCoVita* both from the bottom up to improve the quality of grape inputs, and from the top down to improve wine-making techniques and marketing. Both types of programs exist in Mendoza, but their use by the cooperatives is modest. First, the leadership of most of the federated cooperatives has preferred to reinvest wine profits in processing and bottling facilities rather than return them to the growers. Second, the federation has done little to encourage grape quality improvement in its members in large part because the firm does not sell quality wines in the domestic market nor for export, so it has few incentives to reward its members with price differentials for better quality grapes. All its purchases from member coops, regardless of quality, are at the prevailing market price for table wine. If the wines need improvement they can always be reprocessed at the federated winery before bottling. In this way *FeCoVita*'s leadership captures a higher proportion of value added.

An integrated approach suggests the need to assist *FeCoVita* break into the domestic fine wine market or into varietal exports to better align members' interests with those of the leadership. In fact, *FeCoVita* did begin to export bulk wine to Spain during the 1995 European drought, giving hope that things would change. But change has been slow to arrive because the exports were opportunistic and did not require significant commitments to quality improvement from the seller.

In addition, *FeCoVita*'s agreement with its members' cooperatives is that it is not compelled to buy from them. This clause has been critical to the federation's success because it disciplines members to produce at a minimum market quality standard and price. But at the same time it reduces the stake *FeCoVita* has in upgrading its grower members. If it needs better quality wines it can always buy them on the local bulk market.

Attempts to correct this incentive misalignment have made modest progress. The very small minority of *FeCoVita* growers with better quality grapes has taken the 'exit' option of selling them outside the cooperative system. But the majority with low quality grapes have fewer alternatives, beyond exercising their less-than-perfect right to 'voice'. One of the few options available to them is to enlist *INTA*, the federal agricultural research and extension agency to help them upgrade. In fact *INTA* has an extension program, *Cambio Rural*, that in theory fits their needs very well, specifically designed to help groups of producers improve their production technology. But progress through this approach has also shown mixed results, in part because some cooperative leaderships are generally unwilling to have extension agents organize their members and challenge their authority. In addition, *INTA* and its program *Cambio Rural* have problems of their own, as will be seen next.

INTA's Achilles Heel

Founded in the late 1950s, *INTA* (*Instituto Nacional de Tecnología Agropecuaria*) spearheaded for many years the country's agricultural research effort and was responsible for many of the plant adaptation successes that made the Argentine pampas the nation's agricultural economic powerhouse. Through several decades the agency had remained relatively insulated from political turbulence, its engineers protected by the technocratic shroud of its mission, and its budget determined not by the Argentinean Congress but financed through a direct tax on agricultural exports. The agency's greater weaknesses were in the unevenness of its extension services--technicians typically prefer basic research in the clean lab than the "messier" extension work--and

a client bias in favor of big agribusiness with cutting edge techniques rather than small farmers with traditional technologies.

INTA's regional experimental station in Mendoza that specializes in viticulture and (to a lesser extent) enology was no different. During the 1980s the agency's technicians were involved in two projects critical to the province's long term pretension to launch its industry into the production of fine varietal wines. The two projects were actually quite basic, illustrative of the state of "backwardness" of the industry at the time. The first project, in the hands of the ampelographers was to map the region's 120 varietals and clarify the enduring confusion and misnaming of vines. For example, the fine Italian grape Barbera D'Asti was routinely confused with the Bonarda grape, of intermediate enological quality; Chardonnay and Chenin vines were usually misrepresented as Pinot Blanc, a varietal that didn't even exist in Mendoza. The same confusion reigned in wine making, where local wines labeled as "Chablis" had not a grain of Chardonnay, the mainstay of that French region; and Burgundy wines had not an ounce of Pinot Noir, the main red grape from the latter French locality.

The second project, equally important, was a mapping of which varietals did better in which microclimates. At *INTA*'s Center for Enological Studies (*CEE*) the agency's enologists began a systematic comparison across the nation. These studies confirmed scientifically what the more experienced enologists already knew about the best grape growing areas in the First Zone, but they also provided some big surprises. Somewhat predictable but still a challenge to conventional wisdom, Cabernet Sauvignon did quite well in Eastern Mendoza; so did Sangiovese and Syrah, all red grapes that are relatively good performers in hotter climates. But even white varietals such as Chenin and Tocai Friulano that prefer cooler temperatures did well. And some samples of Chardonnay and Sauvignon Blanc that typically do much better in the higher piedmont areas showed promise. These results were extremely valuable, published in an *INTA* report in 1987.[65] But the scope of the project was very small and the results had little diffusion in those areas like Eastern Mendoza where historical prejudice against it as a quality producer were strongest. For the

[65] See Catania and de del Monte.

effort to have any practical value it would have required far more detailed and extensive micro-regional experimentation to understand under what conditions fine varietals did well in these non-traditional areas. Furthermore, it would have required lengthy experimentation with grafting techniques, a technology more accessible to cash-strapped small growers than complete eradication and replanting, the preferred *modus operandi* in better financed projects. It would also have demanded intense grower involvement to raise their awareness of what varietals to graft in their own vineyards; and it would have required winery support to assist with the finance of the graft or to provide a sales outlet for the grapes. Unfortunately none of these conditions were in place; *INTA* had greater incentive to work in the preferred First Zone where most of the technological upgrading--and the financing--were located, and there were few if any wineries in Eastern Mendoza that had the hardware, know-how, and interest in fine wine production to be willing to work with the growers.

To wine supply chains located in the less propitious grape growing areas and competing in table wine and intermediate-quality market segments, *INTA*'s work was also of little help in that its typification experiments did not focus on the intermediate- and low-quality grapes they used, for example, Bonarda, Criolla, Cereza. These grapes were the work-horses of their business and were far more representative of the province's production than were the fine varietals. In sum, *INTA*'s research work was of greatest benefit to an elite of leading wine supply chains with the best varietals located in the prime grape growing areas.

Political operators in the presidential Secretariat for Agriculture, Livestock and Fishery were aware of *INTA*'s shortcomings. By then, the agency was already weakened by several years of reduced budgets, and was nowhere close to the cutting edge of viticultural and enological research. In fact, it had been unable to develop the cloning technology that became so popular with viticulturist in the 1990s and instead favored propagation by masal selection.[66] In 1991, under the mantle of public sector downsizing, *INTA* political operators moved to reorganize the agency and

[66] Refers to a multiplication approach that is distinct from cloning. The assumption is that one plant alone cannot hold all of the best features of a varietal. These are more likely to be obtained by multiplying and mixing a small group of plants each one likely to , several

design a program, *Cambio Rural*, to make up for its deficiencies. The program specifically targeted the technological upgrading of small and medium farmers.

The Cambio Rural Program

Cambio Rural (*CR*) was implemented in 1993, following three major blows leveled at *INTA* in 1991. First, the reformist political wing in the agency's top directive council won a power struggle against the career technocrats to alter its mission towards greater extension service provision. Second, the Minister of the Economy stripped it of its financial autarchy, reduced its budget, and changed its income source from a tax on exports to one on imports. Personnel was fired or retired and research posts were eliminated. In parallel, the office of the presidency created the *CR* program and offered it to *INTA* to be its service provider. This was the final blow in that *INTA* had no control over the purse strings and little control over program design. Nevertheless the *CR* program was accepted because it was the only way *INTA* could bring in extra funds to make up for the imposed budget cuts.

CR was inspired by the *CREA* groups (*Consorcios de Experimentación Agropecuaria*) that originated in the Argentine pampas. These were producers that periodically got together to share their experiences in technological upgrading (and the occasional costs of a consultant), to exchange tacit information on production experience that could help like-minded colleagues move up the learning curve faster. The *CREA* groups were a home-grown response to *INTA*'s weak extension services. If they had any shortcoming, it was that they were only a channel for information sharing; they were not known for fostering joint initiatives such as group purchases of inputs or marketing of their products. Several *CREA* viticultural groups existed in Mendoza, but in all they involved no more than 70 producers medium and large, mostly associated to the elite wineries. *CR* was designed to reach a different population, small and medium farmers that were technologically very backward and disconnected from the market. *CR* wanted to improve on the *CREA* group design by encouraging joint action beyond information exchange, whenever group members felt inclined to do so. The basic program design had producers spontaneously forming groups and approaching *CR*

for support from an extension agent. The extensionist's salary would be paid by the program in the first year, with group members gradually paying a greater share in the second year, and all of it after the third year. The extensionist would draw from *INTA*'s expertise, take the technology to the producer, and implement productivity-increasing changes in the groups' vineyards--better pruning, vine training, canopy management, weed management, varietal changes, etc. This would be carried out with monthly site meetings at one or more of the participants' vineyards to discuss changes and share information on the results. The expectation was that the extra income from the improvements would more than offset the costs of the extensionist. The initial program design also had a credit component to fund some of the technological improvements but this was dropped because of lack of financing.

The program was not difficult to implement in Mendoza. In the early 1990s the provincial government had provided some modest finance for a similar project targeted at small grape growers, involving *INTA*'s extensionists. Therefore the organizational structure was roughly in place to scale it up several steps. By 1996 Mendoza's *CR* had roughly 103 groups involving 1,250 farmers. Of these, 154 were grape growers, half of them with less than 15 hectares of vineyards. Another 192 producers had both vineyards and fruit orchards. In all, the program's outreach involved 344 grape growers, an improvement from previous efforts but still limited given the province's universe of 19,000 vineyards. *CR* was nevertheless successful in reaching out to an audience that was different to that of *CREA* and with some exceptions did not overlap with those involved with the elite wineries in the fine varietal upgrading push. Still, it was unable to involve the smallest producers, those with 1-5 hectares for the most part commercially nonviable, involving somewhere between 15-63 percent of vineyard owners. The average *CR* beneficiary had 25-30 hectares of vineyards.

Despite the lack of credit, with *CR* growers have improved their vineyard practices in many important ways. For example, at the start of the growing season a farmer would typically pass with his tractor and plow up and down each vineyard row four times to remove weeds and drop fertilizer. But in so doing he would often damage his vines' roots with the plow. *CR* has taught them to cut

down the number of passes to 1 or 2 by introducing them to a herbicide that requires no plowing. Growers have also learned to redesign their surface irrigation systems. Many of them used to take water from the canal from one corner of their property. But it would take six hours or more before it reached the other end of the vineyard, with considerable maldistribution of water and loss to evaporation and ground absorption. Those vines close to the source received far more water than the rest. Instead, *CR* technicians recommended carrying the source to the center of the vineyard and then distributing it up and down each row. This simple change made water use far more efficient. Pruning was a third area of improvement: in the past growers used to prune all their varietals in the same way, regardless whether the plants had different vigors or needs. With *CR* growers also began to improve these practices, becoming more familiar with the characteristics of each varietal.

Despite its limited outreach and the absence of a line of credit, *CR* has generally been well received among Mendoza's growers. The strengths of the program are clear and suggest ways in which it can be improved. The more obvious benefit is that it supplies an extensionist at a modest cost to a grower population that had never been serviced in the past. But more important, the program is based on the sharing of tacit knowledge from production experience among growers under the organized tutelage of a supervisor. They learn from each other's mistakes and successes on what works well and what does not. The same principle applies to the supervisors, who now have a block of time to themselves to exchange experiences learned from their individual groups. They are able to discuss and rework the information into explicit knowledge on which they can all agree. Unresolved technical questions that may have arisen in individual group meetings are aired and worked out at the supervisor gatherings or with *INTA* researchers back at the experimental station.

The strength of *CR* also suggests its weakness and how it can be reversed. The *CR* program does not seek explicitly to integrate growers with processors. In some instances growers already have a long-term relationship with a particular winery, as many do with Chandon (Chapter 2). However, if they do not, growers and the technicians themselves miss the valuable tacit knowledge-generating experience that the vertical interaction provides. This is also confirmed by

the preliminary evidence from an ongoing evaluation carried out by *CR* managers and evaluators.[67] Groups that have functioned best--where producers have actively upgraded their cultural activities in the vineyard, have planted fine varietals or grafted them on to their existing vines, and have begun to shoulder an increasing share of the extensionist's salary--are those (1.) where the disparities between growers are smallest, in terms of grape varietals, vineyard size, and capabilities; (2.) where the growers are most integrated with wineries, and (3.) where their buyers reward them for their quality improvement efforts with better prices. Growers are more willing to change if they know that the investments they make are the "right" ones, i.e., those that they could recoup in the not too distant future. Clearly, the direct involvement of an experienced winery improves the likelihood of this happening.

As important, the extensionists also perceived the *CR* program as better than the preceding services in that there was a budget and time to "train the trainers". Extensionists received weekly training sessions where they learned new technologies presented by *INTA* researchers, they discussed and critiqued each others' opinions on the more challenging cases they reviewed, and coordinated uniform policy approaches to certain standard problems. In the extensionists' opinion, the *CR* program had increased their credibility *vis a vis* the growers because they had literally brought the technology to the grower and reworked it to suit their needs. Because improvement depended on a social process--the ability of the extensionist to coordinate discussions among growers and among technicians--the evaluations all confirmed that the quality of the extensionist was key to group success. Among those most involved with their groups, some had gone into business with them. For instance, one technician who worked with 10 growers, members of the *Medrano* cooperative, had his salary paid directly by the winery.

In sum, in its strengths and weaknesses the *CR* program suggested what the conditions for successful learning might be: technological upgrading involved active discussion within communities of like-minded growers and professionals and between them, in ways that brought

[67] At the time that I carried out this research *CR* program directors were involved in a systematic evaluation study of their program. My comments reflect their early impressions, not published results. To double-check their opinions,

tacit information from production experience to bear on received knowledge, and reworked it to increase its usefulness to all, growers and wineries.

New Economic Development Institutions

In different degrees market tutelage and some forms of state support have facilitated technological innovation in Southern Cone wineries. But market tutelage has been uneven, especially for producers that are not following the international restructuring path. In turn, public sector support efforts to increase breadth and depth risk collapsing into a multiplicity of narrow programs difficult to coordinate, and whose effectiveness is hard to gauge.

But some initiatives that I observed during my fieldwork suggest how a patchwork of tutelage services might possibly be knit into a coherent whole without running into the coordination challenges of the integrated approach. Following, I provide two examples that resemble what might be called a "continuous learning institution". These are not extensions of established organizations such as existing business associations or public sector development agencies, but a new type combining market and public elements. The strength of both examples is that they are fora for the discussion of tacit and received knowledge. One is a consortium of wineries in Chile's VII Region that organized to export jointly. It first formed a quality evaluation panel to benchmark its members' wines and document what improvements each one needed to make. It hired a manager who tapped various sources of public funds and private assistance to coordinate the group's upgrading activities. In this way it availed itself of a set of independent consulting services in a sequential and coherent way. The other is a wine evaluation committee in Eastern Mendoza. Formed by a group of local enologists, enological labs, and bulk wine businessmen, it has organized a set of subregional events centered on benchmarking of local wines and discussion on how they can be improved. Based on this knowledge, the committee is also availing itself of numerous funds and experts from the private and public sectors, and coordinating services for

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I also interviewed some of the beneficiaries and talked to extensionists of the more successful groups and their

which it has identified a demand. In so doing it is also changing outsiders' perceptions about the subregions' wine quality and shifting the balance of power between technical professionals and their employers.

Proyecto de Fomendo (ProFo) Viñedos Valle del Maule[68]

The first example is a consortium of wineries interested in upgrading from low quality to fine varietals. The group sought the support of a *ProFo* to find new export markets under the umbrella of a common firm. The *ProFo* is an economic development program implemented in the early 1990s by the Corporación de Fomento de la Producción (CORFO), the Chilean central government's main economic development institution. The program was designed to support interfirm cooperation initiatives, to provide solutions to competitiveness problems and bottlenecks that individual firms could not resolve on their own. Since the program's inception and until 1997 CORFO had supported three wine sector group initiatives.[69] This associative initiative, Viñedos Valle del Maule, was the second one supported by CORFO in the wine sector. It involved eleven Chilean wine businessmen from the Talca area, in the south of Chile's wine producing region.

The experience is an excellent example of an indigenous form of bootstrapping because when the group got started it seemed an unlikely case to succeed. At the time of initiation the members represented the average table wine producer with no future in fine wine making. They mostly owned high-yield low quality *País* vineyards, enologically the worst quality; just a few had some hectares of fine varietals. Furthermore, only one of the eleven members of the association had the necessary processing technology to make quality wines. The group's technological backwardness was very significant, and they had no road-map showing them how to proceed, other

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supervisors.

[68] See CORFO, September 1997.

[69] Perhaps the most successful and best know is the first, ChileVid, an association which began with 12 small integrated wineries that got together to jointly promote exports. Each company handles its sales independently, but they cooperate in presenting a unified front at trade shows and expositions at home and abroad. Since ChileVid's inception in 1993 and until 1996 the association grew to 23 members and from $10 million to $39 million in exports. ChileVid wineries are small and medium *boutiques*, some foreign owned and others joint ventures, as well as recently integrated ex-bulk producers of fine wine (they used to sell to the large wineries) and wineries owned by

than an abstract understanding that it would require better varietals, stainless steel processing technology, new wine making techniques, and a market to which to sell. In addition, their goals were extremely ambitious in that to market and sell wine as a group each and every member had to achieve the same standards of excellence. It required only one laggard or free-rider to pull everyone down and derail the initiative.

With the financial support of the *ProFo*, Valle del Maule's first activity was to organize an internal wine tasting event to which the members invited three recognized Chilean enologists. They formed a wine tasting panel and completed it with two experienced enologists from their own firms, Alejandro Parot and Cristian Cremaschi. The panel did a rigorous tasting of wine samples from all 11 member firms. So as not to offend sensibilities and induce prejudice, the samples were anonymous and only identifiable by numbers. The panel failed more than 90% of them because they did not meet the minimal quality standards they knew were expected in international markets. Parallel to the wine tasting, the panel members visited the winery and vineyard of each member, evaluated their individual technological capabilities, diagnosed their deficiencies, and recommended ways in which these could be overcome. What the panel effectively did was to provide its members the first tangible roadmap, laying out a set of benchmarks, and indicated to each one where they stood and how to make progress. Furthermore, because some group members had greater ability than others to finance the changes they needed to implement, they agreed that each one would do them at his/her own pace, but following the same set of criteria. They appointed an internal enological commission to monitor each one's progress, especially the supply of export-quality wine they had to offer. This commission became the key mechanism for continuous improvement.

In addition, the technological upgrading plan worked out in the *ProFo* agreement earmarked funds to pay for a set of technical consultancies, cofinanced by Valle del Maule members. The French ampelographer J.M. Boursiquot from the famed University of Montpellier was flown down to visit each and every one's vineyard and winery. Boursiquot helped them understand which varietals they actually had in their vineyards. He identified varietal impurities that needed to be

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DBGs. Most came to the business with significant technological capabilities and resources, so that marketing was

removed, and suggested varietal changes through cheaper grafting techniques rather than the expensive standard eradication and replanting. All these services were invaluable additions to the "road map" because they provided incremental solutions, in this case technological alternatives for the more cash-strapped participants. Also notable was the involvement of the central government's agricultural research agency *INIA*, at that point called in to help develop a grafting technique of fine varietals onto País stems. The grafting experience was so successful that it was quickly spread to other vineyards outside the ProFo group.

To the public sector's credit the ProFo program provided the right incentives to "crowd in" investments and other demand-driven support such as INIA's. In four years of existence, the group has spent more than $4 million in processing machinery alone, including six pneumatic presses, four pneumatic filters and 5.5 million liters in stainless steel vats. For example, Cristian Cremaschi, head of Viña Cremaschi Barriga, noted that his firm overcame the fear of making investments in new processing technology after Valle del Maule's group manager came back from a commercial visit to Canada in 1994. He had met distributors interested in buying their wine in bulk, on condition they made the necessary machinery investments first to achieve certain standards. Without guarantees but with the expectation of achieving those standards and making the sales, Cremaschi purchased the machinery he needed. By 1997 he was exporting 50 percent of his production.

Valle del Maule was also successful in other more conventional ways. The group jointly purchased a mechanical harvester and shared export promotion costs. But it was this joint establishment of benchmarks, unprejudiced discussion of production experience, and laying out of a road map on how to achieve specific targets that actually provided the tools to induce this unlikely group of wineries to succeed.

Valle del Maule is much more than another example of a ProFo program. Other program beneficiaries have organized for different activities. The ProFo framework provides the private sector the flexibility to design institutions such as Valle del Maule, but it is the Maule participants

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their main focus of concern.

that take full credit for the specific character of their consortium. The key element of their initiative is the quality evaluation panel, around which public and private sector assistance has been organized.

Scaling Up: Mendoza's wine evaluation committees

Starting in 1989 three organizations--*CLEIF*, *CdeB* and *FEDB*--teamed up to organize Mendoza's first sectoral event to improve wine quality. The *CLEIF* (*Centro de Licenciados en Enología y Frutihorticultura*) is the organization that represents Mendoza's university-trained enologists (*licenciados*); the *CdeB* (*Centro de Bodegueros*) is the traditional business association that organizes the interests of the largest table wine producers and retailers, and the oldest boutique wineries; *FEDB* (*Facultad de Enología Don Bosco*) is the only institution providing university-level education in enology in the country. *EVICO* (*Evaluación de Vinos de Cosecha*), as the event was called, is a similar but larger scale version of what the Valle del Maule *ProFo* carried out in Chile: a panel of recognized wine experts blind-tastes and evaluates wines and provides constructive feedback on how to improve them. In this case the panel was composed of widely respected enologists from different organizations, including the elite wineries, the federal government's research and extension agency *INTA* and the industry's regulatory agency *INV*, enological laboratories, and the *FEDB*. The purpose of the event was not to award prizes but rather (1.) to benchmark the general quality of the harvest against preceding ones, and (2.) to suggest to the participants ways in which the wines could be improved during and after processing. The samples were numbered to ensure a blind tasting. Under these conditions of anonymity the event provided the conditions for a lively, unprejudiced discussion of production experience on different wines, opinions that were the product of a group debate and that the community of professionals respected. The audience was composed of the region's aspiring and top winemakers, thus it turned out to an invaluable source of learning and technical information on a variety of different wines.

The yearly *EVICO* evaluation events also had one big shortcoming: despite the anonymity of the submissions, they became events for the wine industry's elite, attended mostly by the top

wine makers and owners of the First Zone wineries. Those from Eastern Mendoza's bulk wineries, responsible for 50% of the province's production, didn't even want to be seen at these events because they felt uncomfortable in a crowd that had always criticized the East's poor quality production. Another important reason for their lack of interest was that the wines presented and discussed at *EVICO* were based on the finest varietals, not the kind of intermediate and low enological quality grapes that the Eastern Mendoza wine supply chains worked with. Therefore there was little useful knowledge to be learned at these events.

Things remained much the same until 1995, when fine grape prices began to rise and the frequency with which First Zone wineries purchased Eastern Mendoza's intermediate quality wines for blending increased significantly. A diverse group of knowledgeable local enologists, laboratory owners, and wine traders decided it was time to do something to revert the subregion's poor image, which they became convinced was increasingly unjustified. They created their own subregional version of *EVICO*, named *CODEVIN* (*Comisión de Evaluación de Vinos*). Their intent was to replicate the learning mechanisms of *EVICO*, but also to show that even with modest technological innovations, already some local wineries were producing much improved wines. Furthermore, their personal experiences told them that even though Eastern Mendoza was generally considered a very hot area, less than ideal for fine grape growing, there were some microclimates within this vast zone of 70,000 hectares that offered far better conditions. The problem was in that this knowledge was personal, and it needed to be disseminated widely. *CODEVIN* could serve as a tool to transform this tacit knowledge into a more explicit measurable format.

CODEVIN's popularity increased significantly since 1995. From a few dozen samples submitted in 1995 it expanded to more than 150 two years after. The event has become a great success in several ways. Panel tastings have shown wineries that even some of the most ignored varietals can produce outstanding wines if processed correctly, and they have discussed the technical processes involved in detail. Second, the events have been especially important in confirming to reticent winery owners that the work that their enologists are doing is valuable, and that their recommendations to improve facilities and work practices should be heeded. Third,

recognition of Eastern Mendoza as a producer of quality wines is not only important to boost insiders' egos but especially to show outsiders--i.e., elite wineries that come to buy grapes and bulk wines from Eastern Mendoza--that they are worth more than they have been paid so far. Fourth, the event has also helped rediscover the better microclimates within Eastern Mendoza. As *Bodegas y Viñedos La Agrícola* discovered several years ago, the subregion of 70,000 hectares was until recently perceived as one homogenous hot territory, unsuitable for fine grape growing. The evidence from the evaluation event suggests it is actually a "collage" of grape growing areas of different characteristics.

In sum, the collective initiative of enologists has begun to provide marginalized wineries with concrete advice and guidance on what works and what doesn't in their productive realities, and on the market segments, standards, benchmarks, and upgrading paths that are appropriate to each firm. Elite enologists started the practice of organizing small wine tasting discussions with their colleagues, visiting each other's wineries to sample and comment on their work. These discrete conversations were later broadened with the organization of yearly wine evaluation events. The subregional evaluations have become so popular that now there are several in Mendoza. But they are hardly separate conversations from each other; in fact, many enologists from elite wineries are often invited to be judges in the tasting panels, and are active supporters of these local initiatives. By the same token some technicians in the much criticized INV regulatory agency are invited to participate. Evaluation events try to improve or outdo themselves from one year to the next, thus stimulating a constructive institutional competition. In addition, these events have helped shift the focus of attention of former rent-seeking wine business associations, now far more involved in the discussion of quality and production issues.

In addition to mapping out the production standards that firms need to meet, EVICO and its various clones are a new breed of institutions in that its participants cut across boundaries of several organizations--firm owners, wine traders, technicians, researchers, and personnel from state regulatory agencies. EVICO brings together like-minded individuals who can temporarily suspend their institutional identities.

Professional Technicians' Activism

In both these initiatives and in many other ways, previously unrecognized local knowledge experts figure prominently, helping introduce innovations and build learning institutions that go far beyond their job descriptions, their professional environments, and the technologies available in their firms.

Literature debates on strategies for firm upgrading have typically been silent on the circumstances and conditions in which technical experts, responsible for the production of critical knowledge and standards, can influence the pace of local firm upgrading. In fact they typically portray a static view of production arrangements. This misrepresentation may obscure some of the strategic levers available for upgrading. One strand of the literature on professional expert agency is on technology sharing through workforce mobility. This is the traditional Marshallian external economy effect.[70] Well documented success cases include mobile engineers in Korea's chemical and steel industries, and trained labor movements in the Arab construction industry.[71] One study in Taiwan documents the movement of skilled labor from export processing zones to run-of-the-mill manufacturing exporters.[72] But there are also examples where labor mobility has not spread technical learning to local firms. One is reported from Mexico, where the movement of skilled labor has tended to be from one *maquiladora* to another and not to other domestic exporters.[73] But even in the cases of success the spillover effects are portrayed as incidental, with technical experts responding passively to opportunities to move elsewhere, and having no particular say or control

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[70] Refers to Alfred Marshall's (1929) notion of involuntary technological spillovers, one form of external economy that firms can benefit from when they cluster closely together in a same geographic region. It is based on the understanding that firms typically are unable to recover the full cost of the knowledge and on-the-job training their employees gain on the job when they move to other firms. Externalities are by definition market failures that in extreme formulations, can lead firms' to seriously undersupply on investments that have strong "leakage" effects.
[70] Categories of production, investment and innovation activities are drawn from the technology capability-building (TCB) literature. See, for example, Westphal *et al.* (1985).
[71] See Enos and Park (1987) for the movement of engineers in Korea's chemical and steel industries, Zahlan (1984) for trained labor movement in the Arab world.
[72] See Tchiang (1991).
[73] See Brannon *et al.* (1994).

over the pace of local firm upgrading. Part of the reason for this neglect may be that the technological capability-building (TCB) literature has the firm, not the expert, as the center of innovation.[74] And it is the various capabilities that firms need to build up, not the relative capacities of particular actors within the firm to execute the innovations, that receive attention. Even accounts that refer directly to the important contribution of skilled professionals such as engineers in Korea circumscribe their role to the confines of the modern industrial enterprises where they work.[75]

In the next sections I suggest why in Southern Cone wineries the increased role, autonomy, and collective action of knowledge experts are not accidental, to help think about ways of inducing similar processes elsewhere through policy design.

Origins of Southern Cone Enology

Before the 1980s, enological knowledge, education, and skills in Chile and Mendoza were modest. Major technological change had begun in Southern Cone wineries in the mid-1800s, after three centuries of colonial rule with few if any advances. Period accounts refer to the importation from Europe of the finest grape varietals, to the exchange of fine root stock among the two Andean wine regions, as well as to the presence of local and French enologists and viticulturists trained in the famous wine schools of Bordeaux and Montpellier. They migrated south in the latter part of the nineteenth century as a result of the *phylloxera* that progressively destroyed European vineyards and left them jobless. Yet as domestic consumption of cheap table wine rose steadily and the wine industry grew spectacularly in Mendoza through the two World Wars and until the 1970s, progress in wine-making knowledge stalled and the quality of inputs and outputs deteriorated drastically after

[74] See U.N.C.T.A.D. (1996) for a review.

[75] One of the few theories that directly refers to skilled professionals is Amsden's. The agent of expansion in all late-industrializing countries--Chandler's (1977) modern industrial enterprise--the argument goes, has had to catch up based on "learning", the improvement of borrowed technology on the shop floor: "Salaried engineers are a key figure in late industrialization because they are the gatekeepers of foreign technology transfer. The protagonist of industrialization has shifted from the entrepreneur in the late eighteenth century, to the corporate manager in the nineteenth, to the salaried engineer in the late twentieth." (Amsden 1989:9).

the first decades of the twentieth century.[76] The investments in new vineyards, processing plants, and storage facilities were designed mostly to increase volume rather than improve quality.

Enologists During Import Substitution Industrialization (ISI)

The post-war era in the Southern Cone was one of expanding tertiary education and professionalization of engineering activities in manufacturing. Yet in both Chile and Mendoza the French enologists were long gone, and those who replaced them were technical school graduates with an extended secondary education. Contrary to the dearth of vocational training programs typically ascribed to developing countries in the human resource literature, until the 1960s and 1970s in both Chile and Mendoza there was no lack of high schools churning out students with a "technical" degree. In fact, absent in Chile and Mendoza in the early import-substitution years was a tertiary-level educational program in enology; these would come later in the 1960s and 1970s.[77] Formal instruction gave enologists a general understanding of the operational activities of a wine processing plant, its mechanical components, and the sequence of processes involved in wine making, but little if any insight into organic chemistry.[78] Beyond a superficial knowledge of how sugars in grapes converted into alcohol, they were ignorant of the biochemical processes in winemaking, and were unable to manipulate in a scientific way the fundamental variables that affected its quality. With a very undemanding and thirsty market there was little or no need for skilled enological labor and few incentives to elevate the existing stock of human enological capital. The average enologist worked for a table wine producer in a processing plant of considerable size, and was not expected to do more than write standardized "prescriptions" in his lab for foremen to execute. His responsibility was limited to the production plant, disconnected from marketing or vineyards. Even though some of these technicians had years of empirical experience behind them it

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[76] See accounts by Foster (1995), Hernandez (1996), Marzo and Inchauspe (1967), Mathäss (1997).

[77] In Mendoza, where data are available, even agricultural engineers were scarce in the early 1950s. The census at the end of the decade showed that a province whose economy was basically agroindustrial, had only 255 agronomic engineers, whereas professors numbered 912, medical doctors 864, accountants and economists 560, lawyers 634, 444 civil engineers, 228 obstetricians, and 226 odontologists (Marzo and Inchauspe 1967).

[78] Several of the technical high schools in Mendoza were opened up by French-trained professionals who believed their graduates needed these operational skills to quickly enter the workforce.

was hard to transfer that accumulated knowledge from person to person in a scientifically rigorous way.

The first signs of serious professionalization of enological activities came from Chile in the early 1950s, when a group of French-trained local enologists organized an association, the *Asociación Nacional de Ingenieros Agrónomos Enólogos de Chile* (*A.N.I.A.E.*). They simultaneously redesigned the two existing professional degree programs in agricultural engineering, one at the *Pontificia Universidad Católica* (*P.U.C.*)--the university run by the Catholic Church, the other at the state-financed *Universidad de Chile* (*U.Ch.*), and introduced a specialization in enology.[79] To gain actual certification as enologists and join *ANIAE*, graduates from these agricultural engineering programs needed to take a further standardized test provided by the association. Between the mid-1950s and the early 1970s, these two programs produced a generation of agricultural engineers with a solid scientific background in basic enological knowledge and techniques, who would play a key role in the Chilean wine sector's turnaround in the mid-1980s and 1990s (Table 4.4).[80] In Mendoza tertiary enological education was initiated in 1965 at the *Universidad Juan Agustín Maza* belonging to the Catholic Church. The Technological Faculty of Enology and Industrial Fruticulture was known as the *Don Bosco* School located in one of Mendoza's suburbs. Graduates received their degrees as Licensed Enologists in five years. Most of the current enological leadership at Mendoza's best fine wineries graduated from *Don Bosco* (Table 4.5).[81]

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[79] Ruy Barbosa Popolisio was the founder of the U.Ch. program, as well as the A.N.I.A.E. in 1952, whereas Raul Durand Caubet did the same at P.U.C.

[80] Emilio de Solminihac, Alejandro Hernandez (later to become president of the Organisation Mondiale du Vin--O.I.V.), Jaime Ríos, Sergio Daneri, Alejandro Parot, Oscar Bustos, Phillippo Pszczólkowski, Aurelio Montes, Mario Geisse, Sergio Correa, Edmundo Bordeu, Ignacio Recabarren, Ernesto Juisán, Pablo Morandé, and Felipe de Solminihac, to name a few, would become household names in the late '80s and '90s. Understandably the profession lost much of its attraction during the recession of the 1980s but quickly recovered adherents in the 1990s.

[81] These include Rodolfo Montenegro from *La Agrícola*, Julio Montenegro from *Rodán*, Ricardo Gonzalez at *Lagarde*, Edgardo Ibarra at Balbi, Valentín Bianchi at *Bianchi*, Pablo Rodriguez from *Chandon*, Victor Marcantoni from *Etchart*, Juan Carlos Rodriguez at *Flichman*, Claudio Sosa and Daniel Fernandez at *Lavaque*, Susana Balbo at *Martins Domingos*, Alfredo Despous at *Navarro Correas*, and Walter Brescia at *Nieto & Senetiner*, and Angel Mendoza from *Trapiche*. The high number of graduates during the 1980s shows the delay in the wine sector's restructuring. The slump in the number of graduating enologists in the 1990s reflects the relatively slow pace of winery upgrading in Mendoza compared to Chile.

Table 4.4
AGRONOMIST-ENOLOGISTS; CHILE 1970-1997*

Period/Year	Graduated	Active^	Retired	Average/Year
-1970	129	19	28	
1971-1973	78	27	51	26
1974-1979	61	21	40	10
1980-1988	50	23		6
1989	1	1		1
1990	6	5		6
1991	8	6		8
1992	16	14		16
1993	9	6		9
1994	8	8		8
1995	9	9		9
1996	16	16		16
1997	25	25		25

Source: Based on data from National Association of Agronomist-Enologists of Chile and P. Pszczólkowski
*To become an agronomist-enologist requires a five-year professional degree in Agronomy and standardized testing in basic enological knowledge and practices.
^As of 1997.

Table 4.5
LICENSED ENOLOGISTS; MENDOZA 1971-1977*

Period/Year	Graduated	Average/ear
-1970	0	0
1971-1973	20	7
1974-1979	61	9
1980-1988	157	20
1989	5	5
1990	2	2
1991	3	3
1992	5	5
1993	6	6
1994	4	4
1995	3	3
1996	5	5
1997	1	1

Source: Based on data from Colegio Don Bosco, Rodeo de la Cruz, Mendoza.
*To become a licensed enologist requires five-years of tertiary specialized education in addition to a high school degree. A degree in Agronomy is not a prerequisite. Currently licensed enologists have no standardized testing in use.

Through the 1970s, however, the few enologists with university-level training played modest roles. They typically worked for wineries serving fine wine niches, but the rustic machinery available to them severely limited their ability to control wine quality. Despite continuously prodding their bosses to invest in new technology, professional enologists were basically ignored. Winery owners were risk-averse businessmen, partly due to macroeconomic turbulence associated with ISI, and partly because steady demand for relatively cheap wine dissuaded them from making big changes. Not surprisingly, enological jobs had nothing of the professional glamour often associated with French enologists working at elite *chateaux*. Instead, these professionals often self-

described as "trench" workers,[82] held positions with little recognition and power within firms and the industry. Curiously, while as a professional group licensed enologists remained marginal, they nevertheless nurtured a sense of entitlement bred out of the prestige their profession was accorded in other parts of the world. This sense of entitlement and desire to enhance their status would later be one of the drivers of their collective activism.

Spanning the Value Chain

As knowledge becomes more important to industrial competition in general, the individuals and groups that carry this knowledge also grow in importance. With wine technicians it is especially true and partly explains their increased role. As producers purchase new technology that allows better control of production processes the importance of knowledge-bearing professionals grows. But typically the complexity of production processes means that specialized knowledge is spread out over a large number of different knowledge-bearing groups, such as public administrators, scientists, engineers, and technically trained workers, and over different public agencies and private organizations. This puts a premium on their ability to combine different types of knowledge that together may lead to innovations (Ziegler 1997). But wine technicians appear to be strategically positioned in the value chain to induce innovations: the best of them carry knowledge that spans the whole range of wine-making activities, from vineyard management through processing and into marketing, including the knowledge on restaurant and wine store consumer tastes. Wine-making's particular knowledge demands rewards those that gain a strategic understanding of all these segments for the simple reason that product quality is so tied to the quality of inputs.

Thus, when from the late 1970s on Chilean and Argentine domestic consumption of cheap table wine began to fall quickly and that of fine wine rose, fine wine makers started paying attention to what their skilled enologists had been recommending for some time. Enologists immediately began to expand their knowledge base through the technology search activity, especially when they

[82] Noted by several practicing enologists during interviews in 1997 and 1998, especially in Mendoza.

were put in charge of the effort and invited to visit foreign wineries to see the new stainless steel machinery in operation. During these and other interactions with international wine specialists they learned that wine quality began in the vineyard. Increasingly they began to venture far beyond their production plants and laboratories, to engage the agricultural engineers in a conversation on how to improve wine. In learning about vineyard management they debated with them how best to concentrate aromas and flavors, and from there on became deeply involved in the supervision of grape production. This led them to implement work practices until then unheard of in Southern Cone wineries such as creating massive linked databases of the vineyards from which they harvested grapes, to trace the quality of each season's wine back to a particular vineyard locality down to the hectare, amount of watering administered, canopy management, sun exposure, harvest temperature, yeast utilized in fermentation, etc. They also switched to processing different varietals independent from each other (rather than all together as in the past), thus requiring careful scheduling so that yeasts used for one grape did not blend with those of another. By the same token they become involved in forward linkages, working closely with retailers and visiting restaurants abroad to understand the specific tastes of different types of consumers, and how to obtain them back in their vineyards and production plants. There strategic technical knowledge allowed them to identify changes they needed to implement all along the value chain to make their products more competitive. Thus university-trained enologists became leaders in the reconversion of elite wineries' production facilities and vineyards.

An Enabling Environment

Chilean and Mendozan enologists that have demonstrated most autonomy are typically those that started with strong practical training at some of the pioneer export-oriented wineries. There they not only acquired hands-on experience on how to make international-style wine but they also established numerous professional contacts with wine traders, and with international machinery suppliers and consultants. An increasing number of them are now availing themselves of these contacts to broaden their training in the off-season in northern hemisphere wineries and acquire

further expertise in fine wine making independent of their own firms' activities. Through their network of professional acquaintances they typically secure a seasonal job during the harvest at a foreign winery of repute. There they may specialize in a particular kind of grape, gain exposure to new varietals, or learn different wine making skills, and absorb practical knowledge from watching and working next to other experts. Chile's Ignacio Recabarren, for example, built a reputation as the country's premier Sauvignon Blanc and Chardonnay specialist after a stint working in new New Zealand with these white grapes. A stint in a foreign winery is currently becoming commonplace in Chile, even for new graduates with little practical experience. Mendoza's professionals are following suit if at a slower pace.

Exposure to foreign professionals and work practices is also reshaping Southern Cone technicians' self-conceptions of their role and status in wineries. As they acquired confidence and expertise they began to consult for upstart wineries that wanted to launch themselves into exports. Enologists provided not only the technical knowledge but also the contacts with European and American buyers. In some instances, their reputations became so well established among buyers that their name alone served as a certificate of quality for otherwise unknown new wineries. In these and many other ways, elite enologists have become the central coordinators of the Southern Cone wine-making revolution.

In each country they have participated in different ways in the sectoral catch-up effort. As was noted in Chapter 3, in Chile individual technicians have brought attention to themselves for their individual efforts. For example, Morandé identified the Casablanca Valley with especially good grape growing conditions; Recabarren advanced local knowledge on white wine making with his harvest experiences in New Zealand, France, and Australia. Several have also become successful entrepreneurs, heading new wineries alone or with associates. By contrast, Mendoza's enologists have been less visible for their individual efforts, but especially active as a professional groups, organizing collective activities as noted below.

Financial and Technical Support from Laboratories

Laboratories that sell enological inputs--enzymes, yeasts, filters, testing services, machinery, etc.--have been key sources of technical information and eager supporters of enologists' collective activities. Until the mid 1980s, both in Chile and in Mendoza enological laboratories used to sell very basic implements to the wine industry. For instance, Mendoza's Laboratorio Zeballos used to sell glass bottles, basic drugs, and other inputs that were commonly used in winery laboratories. Some of the enological laboratories also represented input suppliers such as Portuguese cork manufacturers. But for the most part they provided simple services and operated through a multitude of small salesmen, none of which had very specific technical expertise. All in all, the laboratories played modest roles as generators of innovations for the industry.

Things began to change first in Chile in the mid-1980s and towards the end of the decade in Mendoza. The first big step was when a number of local laboratories signed representational agreements with international yeast and enzyme manufacturers. Canadian giant Llalemand signed up Mendoza's Rodán and Chile's Raab-Rochette. Perdomini, one of Italy's main suppliers of nitrogen, chemical products, various other inputs, filters, and flotation devices, signed up Laboratorios Libertador in Mendoza. The sector gradually shook itself out with the strongest laboratories being those that had representation of specialty inputs and technical support from international manufacturers. As wineries purchased better technology the laboratories persuaded them to use selected yeasts and enzymes to better control their fermentation processes. Whereas in the late '80s hardly any wineries used specialized inputs--*Trapiche* was one of the pioneers in Mendoza--by the mid-1990s close to 90% of them did, and there is no longer any debate about their usefulness. Enzymes improve wine's color; they reduce the percentage of solids in the wine, making it easier to extract liquid from the grape must. Enzymes were accepted more quickly than yeasts because they could be used with older technology. Yeasts help preserve aromas. By contrast with enzymes, they have diffused more slowly because they require stainless steel or epoxy containers to ensure a controlled fermentation. They also require controlled temperature infrastructure so that grape musts can ferment between 16-22 degrees centigrade.

Currently enological laboratories are important sources of technical support for local enologists. Theirs is not a traditional customer-client relationship but rather a dynamic two-way interaction. On one hand, laboratories "indoctrinate" enologists on the benefits of their products to create a steady demand for them. On the other hand, every year laboratories like Rodán that are interested in testing the usefulness of new products provide enologists with free inputs to carry out industrial-scale experiments with them. Once the results are documented and evaluated in wine tastings, the laboratories make a decision if they will market the product widely or not. In fact, the laboratories replicate at a very small scale some of the mechanisms for discussing tacit knowledge mentioned earlier. They engage enologists in discrete conversations and experiments and then pull together the tacit learning from production experience to draw more general lessons. For the laboratories, the enologists are the key links to the wineries, both as clients to sell them their products and as sources of information on what works and what doesn't.

Thus it is not surprising that the laboratories go out of their way to support enologists in their activities. When Mendoza's First Zone enologists turned to them for funding for their elite wine evaluation committee EVICO, they did not hesitate to support them. When Eastern Mendoza's evaluation committee CODEVIN began to operate in 1995 they also did not hesitate to fund it even though the purchasing power of the subregion's wine producers is much lower. In sum, laboratories have provided enologists a financial inducement to do things collectively, with the view that these events help diffuse knowledge on new wine-making techniques and products.

In sum, enologists' increased role is partly to be expected; as knowledge becomes more important to industrial competition in general, individuals and groups that carry this knowledge grow in importance. With wine technicians it is especially true, since they carry knowledge that spans the full value chain of wine-making, from vineyard through processing and into marketing, reaching all the way to the consumer in the restaurant and the wine store. Second, enologists that demonstrate most autonomy generally started with a strong practical experience at pioneer export-oriented wineries, where they also established numerous professional contacts with traders and

international suppliers and consultants. An increasing number of them are now availing themselves of these contacts to broaden their training in the off-season in northern hemisphere wineries. The importance of this enabling environment to their autonomy cannot be overstated.

In turn, what seem to be important conditions for their collective activism are the financial and technical support for group activities they get from other industry participants, mainly enological laboratories. In addition, Southern Cone enologists' long history of unfulfilled professional expectations has also become a motivator for collective action that enhances their status. Even though until recently licensed enologists played marginal roles in wineries, their professional self-conceptions nurtured a sense of entitlement bred out of the prestige their profession was accorded in other parts of the world, especially France. Moreover, especially in Mendoza strong subregional identities are also motivators of collective activism.

Conclusion

State-supplied tutelage has not provided firms with the help it needs most, the formulation of realistic incremental standards that can serve as road maps for upgrading. Moreover, in the current constrained liberal policy environment where initiatives tend to be many but discrete--e.g., assistance to obtain new export markets, funding for technical visits to clients and competitors in foreign countries, credit for machinery--rather than integrated, it is difficult to make any sense from this patchwork of programs which initiatives work and which do not.

On the other hand, in Chile and Mendoza two spontaneous experiments involving firms, knowledge professionals, and the state suggest how "learning" institutions can be built and how they can overcome some of the typical shortcomings of current assistance programs. Both these institutions are unprejudiced fora for the discussion of received knowledge and the formulation of useful production standards firms can use to gradually increase their competitiveness. In both cases participants have coherently availed themselves of other sectoral resources and public sector programs, based on the recommendations and strategic plans of action proffered by the panels.

Knowledge professionals play an important hand in these organizations given that they carry strategic knowledge of the whole value chain.

CHAPTER 5

Conclusions:
Implications for Development

Introduction

This dissertation examined two decades of industrial adjustment in the Southern Cone wine sector to shed light on a set of linked questions. First, why are knowledge gaps between industrial and developing countries with opening economies are not closing as rapidly as they should with economic liberalization? Second, what can be done to close the gaps? Gerschenkron (1962) hypothesized that backward countries could leapfrog from backwardness to the technology frontier by drawing from best practice in other countries. Unfortunately, data on productivity and incomes have proved him right only with respect to a limited number of advanced economy countries.[83] Meanwhile, as the World Bank notes, the balance between knowledge and resources has shifted so much towards the former that it is fast becoming the single most important determinant of standards of living; more than land, labor, and machinery. The paradox is that since the collapse of the governance and economic development mechanisms associated with ISI in liberalizing developing countries and the disillusion with highly interventionist approaches, the current policy environment seems unable to produce the alternative mechanisms that firms need to induce a broad, deep, continuous catch up.

A Few Central Ideas in the History of Thinking on Technological Catch-Up

That knowledge gaps are hard to close is not new. In the 1940s and 1950s a number of development economists studying technological change within a political economy framework pointed to the problems of knowledge transfer. Technologies generated in mature industrial

[83] See Abramowitz (1986), Baumol (1986), DeLong (1988).

countries, the argument went, fit poorly with factor endowments, market sizes, and basic needs of third world markets.[84] International trade theory recognized the significant transfer of technology from advanced to developing countries, but the drivers of the transfer were postulated as residing in the economics of innovation of the product itself in the advanced countries, providing little comfort to its recipients.[85] Multinationals were viewed as the chief means of technology transfer and accused of overcharging for it, as well as bundling it with financial capital, managerial know-how and marketing capabilities, with contractual provisions that were disadvantageous to the purchaser.[86] Thus the research focus was on the imperfections of the technology transfer.

Starting in the early 1970s, a neoclassical reaction brought the attention back to fundamentals; upgrading was more likely to occur, the argument went, when public supply side policies such as trade, industrial, labor and financial regulations were kept to a minimum so that competitive forces in full could unleash an industry's static and dynamic efficiency. Competitive pressures typically came from three sources: from other producers in the domestic market (internal competition), from foreign producers selling in the domestic market (import competition) and from foreign exporters competing with domestic exporters in third world markets (export rivalry). All three competitive pressures induce firms to adopt new technologies, cut waste, realize scale economies, allocate resources more efficiently, and generally reduce costs. If domestic markets are small, exports can provide an opportunity to make full use of scale economies if they exist. Import competition can also keep oligopolistic structures from realizing excess profits. While these changes are marginal, competitive pressures can also induce more significant industrial restructuring such as when firms shed outdated operations, introduce new product lines, and search for new markets.[87]

By the 1970s, and early 1980s development economists' thinking on technology had also evolved, thanks in part to improvements in the understanding of how innovations take place at the

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[84] U.N.C.T.A.D. (1996:4-5) cites Furtado (1972) as one student of the imperfections of technology transfer.
[85] Vernon (1966).
[86] Baranson (1970) discusses the model of technology transfer through a wholly owned foreign subsidiary. See, also Radice (1975) on negative views of international firms. See Marton (1986) for a detailed discussion of the claims.
[87] See World Bank (1991:23-25).

firm level. The findings affirmed that developing country firms could innovate and improve borrowed technology with in-house know-how and resources. This research focused the attention on learning from production experience.[88] The research agenda on the choice of technology that had grown out of the appropriate technology debates gradually faded--increasingly, capital goods suppliers and consultants operate internationally, so that more countries are acquiring the same technologies--and what increased was an interest in what a firm does after securing it. The rise of East Asian exporters intensified the interest in understanding the innovative capabilities of technology "borrowers" or "late industrializers". The Latin American and East Asian experiences suggested that the flow of technology from abroad remained very important to developing countries, but that the domestic challenge was actually to build internal technological capabilities in firms. A broad research effort generically named the "technology capability-building literature" (or TCB) grew out of this interest, documenting how firms built internal technological capabilities in production, investment, and innovation. It used analytical categories such as learning ladders, intra-enterprise learning, and learning networks.[89]

At the same time these studies generated far more controversial debates on the extent to which the state needed to "subsidize" learning to move the private sector from simple to complex manufacturing. One hypothesis that might explain persistent productivity differences between advanced and developing countries and justify a more activist role for government is that poorer less developed countries may benefit to a relatively small degree from the public good properties of the innovations and investments of other more developed nations if their product mixes and educations are different:

> "A less developed country that produces no cars cannot benefit from the invention and adoption of a better car-producing robot in Japan...Lack of education

[88] Katz (1984, 1987) summarizes a set of case studies on Latin American firms in different sectors that adapted and improved imported technologies with in-house know-how and resources.
[89] See U.N.C.T.A.D. (1996) for a review.

and the associated skills prevent both the presence of high-tech industries and the effective imitation (adoption) of the Japanese innovation."[90]

The TCB literature has helped focus policy interest on the need to improve developing countries' supporting national research and development (R & D) institutions and infrastructure in which firms operate, to move them away from basic research only, and to make them more responsive to firms' needs. It has also sparked debate on the need to strengthen intellectual property rights in developing countries. On the other hand, the research on the East Asian experiences has unfortunately more often than not polarized debate between advocates of government intervention and those of free market policies rather than help shape a policy consensus on topics such as industrial policy, infant industry protection, and sectoral targeting. Thus, in today's more conservative policy environment, the policy tools that might have emerged from the TCB literature remain somewhat elusive. The repertoire of instruments available to liberalizing governments to provide assistance to firms are few and discrete, because the very idea that the state might play a hand guiding the economy remains under question.

The desire to move beyond the state versus markets debate, and the growing internationalization of trade, transportation, and communications in the last twenty years has refocused the attention of analysts on FDI, even when it remains a small component of total capital formation.[91] Now the interest is in the tutelage opportunities that global supply chains offer. One argument is that the global economy has created the context for the emergence of a new set of international manufacturers and retailers that operate in the form of global commodity chains (GCCs). Under certain conditions supply chains and subcontracting relationships provide useful market and technical information as well as product quality and delivery standards, that may flow upstream from buyer to supplier and facilitate upgrading.[92] Unfortunately the empirical evidence

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[90] Baumol (1986:1081-2).

[91] See ESCAP, 1990; as cited in Amsden (1992:64).

[92] One of the best examples is the case of the Singer Sewing Machine Company in Taiwan, required by the national government to set up a network of local subcontracting firms. Soon thereafter most parts were being manufactured locally, creating the conditions for the subsequent take off of domestic sewing machine exports (Schive 1990). See

shows that the development and upgrading prospects of late industrializing countries are hardly guaranteed, even when their firms do get connected to GCCs. They are conditioned in large part, the argument goes, by how transnational manufacturers and retailers incorporate them into their organization of production. This is determined by the way they administer their flows of investment capital, technology, goods, services and people to particular regions and countries, and the extent to which local capabilities are used and built up. These differences are reflected, for example, in a study of the Dominican Republic's export processing zones,

> "....East Asian projects were found to contribute more jobs, bigger investments, higher levels of local value added, and a greater utilization of skilled labor than the assembly oriented sewing operations by other foreign firms."[93]

Several other studies confirm that there is significant variability among multinational enterprises not only in the extent to which they subcontract locally, but especially in the degree to which these relationships serve local firms as learning ladders to more sophisticated manufacturing.[94] Similar mixed accounts exist in the literature on contract farming, suggesting its vulnerability as an instrument for upgrading.[95] Ultimately, demand-driven supply chains may provide learning ladders only for a minority of select firms. The relatively small share of FDI in developing country economies, and the uncertainty in the learning outcomes suggests that governments can hardly expect GCCs to provide lifesavers to the population of firms. Policy makers need to take further complementary action to induce a broader, economy-wide upgrading.

The recognition of broad, persistent knowledge gaps between advanced and developing economies in the 1990s has recently led the World Bank (1999), the mainstream voice in development thinking, to define the problem as one of "market failure". In a sweeping review it

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also Egan and Mody (1992) on how importers, wholesalers and manufacturers of bicycles and footwear provide substantial and varied information on market segmentation, trends, product specifications, delivery standards, etc.

[93] United States International Trade Commission (U.S.I.T.C.) (1989:5-6) reported in Gereffi (1995:50).

[94] For example, one study attributed the lack of skilled labor and financial capital for the dearth of backward linkages from Mexico's *maquiladoras* to local firms (Watanabe 1983). Another identified managerial/corporate office behaviors that discouraged local souring (Brannon *et al.* 1994). See also Gereffi (1996).

[95] See Glover (1984, 1987).

suggests that to close knowledge gaps not only must developing countries provide public goods such as universal basic education, lifelong learning, support for tertiary education, and basic telecommunication infrastructure, etc., to acquire, produce, absorb and communicate knowledge, but they also need to resolve a number of market failures. For one, because knowledge has public good characteristics--it is nonrival and nonexcludable--and therefore likely to be undersupplied, government may have to strengthen IPRs, provide monetary incentives, or be the provider itself. For another, information problems (or knowledge about "attributes") need to be overcome for certain markets to function properly. Especially important are those that involve the collection and dissemination of information that has to be generated on the spot and continuously refreshed (e.g., credit reports, product standards).

While few observers would quibble with the fact that most developing countries have imperfect educational systems, weak infrastructure, and absence of certain key information-processing institutions, the laundry list of solutions identified by the World Bank for closing knowledge gaps looks more like a set of outcomes than of preconditions for development. While the suggested improvements are necessary and are certain to help close knowledge gaps, it remains unclear how these policies might provide immediate assistance to firms and industries in the midst of a restructuring process. In addition, if one is willing to suspend the assumption behind the Bank's diagnoses and recommendations that all knowledge is explicit (and therefore it is the flow of information that needs to be improved), and consider that production and market experience are required to pick up the portion that is tacit, the mechanisms to bring about this kind of learning may be quite different.

Summary of Main Findings of this Dissertation

The research undertaken for this dissertation seeks to provide some useful insights to the general problems that restructuring firms in liberalizing economies face. First, it challenges the conventional views that market institutions and state tutelage automatically supply the kind of knowledge that firms need to achieve technological world standards. Assistance from market

agents is quite often incomplete, and on occasions very difficult to find. The public sector's ability and enthusiasm to provide help in an integrated way and "subsidize" learning--in a literal sense--by taking on a significant financial responsibility is constrained. Furthermore, firms cannot wait until all the structural preconditions of education, communication infrastructure and information-processing institutions are put in place. Moreover, a broad credit program to finance learning is improbable to be attractive either to suppliers or to its potential beneficiaries; there is unlikely to be an abundance of consultants with the requisite specific local skills waiting in the wings to be summoned.

The hypothesis advanced in this study is that what are required are alternative learning institutions that can generate a broad, unbiased discussion, reworking and improvement of received knowledge on the basis of collective tacit experience from production and marketing. Another part of my hypothesis is that the sectoral evaluation committees I have observed in Chile's and Mendoza's wine industries are precisely good examples of the requisite learning institutions, and of how to induce them. They "subsidize" learning in more than a literal sense by providing the conditions for groups of firms to proactively seek to solve common problems together. It is not only the subsidy obtained from the public sector that is of importance, but rather the nature of the interactions between the participant firm owners, managers, knowledge professionals and suppliers that generates the learning. The result is a knowledge creation effort where aggregate tacit experience is converted into explicit knowledge in the form of standards and benchmarks that firms can actually aspire to meet.

A final part of my hypothesis is that knowledge professionals are key players in these learning institutions. This is to be expected given that industrial production is becoming more knowledge intensive. The greater their knowledge of the full value chain, the more able they are to identify how required product changes at the end of the supply chain feed back into, and modify each stage of conception of production, and the more valuable is their contribution to an organized discussion with colleagues.

The evidence on the importance of knowledge professionals is robust. They have played important roles in two different countries and in several different value-added market segments in the same industry. To be sure, several preconditions needed to be in place to allow them to take on these important roles: foremost, the liberalization of input markets allowed the importation of specialized machinery and processing inputs. The knowledge base required to make use of these specialized inputs was much greater, thus creating a demand for knowledge professionals where before there was close to none. Another reason for the increased demand for knowledge professionals is domestic producers' interest in becoming internationally competitive. Especially in Chile, this was triggered by the collapse of internal demand, rather than a long-standing desire to enter export markets. By the same token, the availability of local tertiary-level trained professionals much before firms attempted to upgrade into international-quality production made the transfer of technology much easier.

The Findings in the Current Policy Context

My characterization of the two paths that the Southern Cone's restructuring wine industries are taking--leaning towards a high value-added road in Chile and a low value-added road in Mendoza--are crude simplifications of reality. For one, there are multiple alternative possibilities between the two extremes. For another, certain wineries and their supply chains compete in both high value-added and low value-added markets. In other words, firm owners and managers do not view their restructuring options as limited to one choice between two hard alternatives. Third, grape growing for low value-added products such as intermediate quality wine and grape juice is not that less knowledge-intensive than grape growing for high value-added products such as premium wines; the more important distinction is that it requires a <u>different</u> kind of knowledge.

But the bipolar characterization is nevertheless useful to set the findings on the wine industries in the context of current policy debates. For some time, there has been wide acceptance that developing countries' "easy export" phase based on low value-added natural resources is inevitably short-lived because of instability in volume and prices, and because world trade of these

products is growing at a slower rate than trade as a whole.[96] Rising real exchange rates and wages in both Chile and Argentina during the early 1990s has also taken away their competitive edge in sectors where productivity is low. But to raise productivity, the argument goes, investments must be made in human resources and the machinery that allows them to be more productive. One should therefore expect to see an increase in capital investment as well as in resources earmarked for training at the shop floor level. This is the thinking behind the public sector's and the multilateral lending agencies' (such as the Inter-American Development Bank) interest in directing their assistance to job training.

The paradox is that despite the attractiveness of these policy suggestions in the early 1990s several studies found that even when firms did buy new machinery, they invested surprisingly little in human resources.[97] What is inconsistent is that in both Chile and Mendoza managers complained in my conversations with them about the shortage of skilled labor. One possible explanation is that this is no paradox at all but a standard case of market failure. In fact the World Banks recommends that countries provide incentives to encourage firms not to underinvest in training.[98] But even more puzzling and reflective that this may be more than a case of market failure is the finding that most of the training that Chilean firms provided in the 1980s and early 1990s through a tax break--the kind of incentive the Bank recommends--was directed toward management rather than blue-collar workers, the latter group being the one that supposedly that needs it most.[99]

One hypothesis that could explain this puzzle is that not all machinery purchases require additional skills. For another, managers may be somewhat resistant to spend on workers for fear that it may uproot established firm hierarchies and reshape relations between them. Furthermore,

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[96] See, for instance, Rosales (1993), cited in Humphrey (1993).

[97] For instance, see Humphrey (1993:5) and Wormald (1995).

[98] In the Bank's view, the problem is one of market failure; firms may underinvest in job training when they cannot capture the greater part of their training dollars, for example, as when personnel with improved skills are lured to other firms with better salary offers. One solution is that the state provide incentives--such as tax breaks--to encourage firms to supply the right amount of job training. Alternatively, it can provide the training itself (WDR *op. cit.*).

investment in labor may generate pressure to raise wages.[100] But these hypotheses are not entirely convincing. For one, if the new machinery does not require additional skills then managers should not be concerned with skill shortages. For another, if new machinery does raise labor productivity (as it should), then wage increases should pay for themselves.

This study on the wine industry may provide a more persuasive explanation for the labor training paradox. It suggests that the increased focus on job training by policy makers and donors alike during the 1990s may need to be complemented with greater attention paid to assisting firms identify how they should rebuild. The reality is that quite often firms that want to upgrade face deep uncertainty. Even when managers know they need to change, it is far more difficult for them to identify their training needs if they are unsure what direction the firm should take. If restructuring requires not only machinery upgrades but also production experience, the policy implication that follows is that the public sector may do better by helping firms set up the learning institutions that facilitate the sharing and reworking of tacit into explicit knowledge.

Promoting the Knowledge Professionals or the Firms?

How can learning institutions be induced and reproduced? If local knowledge professionals are key to their functioning, to what extent should they or the firms for which they work be the direct targets of the promotion programs? Evidence from the two examples of learning institutions reviewed so far suggests that while knowledge professionals need not be the direct targets, their participation in promotion initiatives is likely to be important to their success.

In Chile, the state development agency CORFO has designed a broad economic development program--the *ProFo*--designed to support interfirm cooperation, to provide solutions to competitiveness problems and bottlenecks that individual firms cannot resolve on their own. The funding is to finance the salary of a manager for a period of one year, with co-payment by participant firms beginning in the second year until they can bear the full cost of the manager by the

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[99] Humphrey (*op. cit.*) cites studies by SENCE and CODELCO. Similar findings come out of the U.S with firms showing little interest in broad retraining programs for current employees or apprenticeships for their successors, especially puzzling since skill is viewed as a precondition of a "high-road strategy." See Sabel (1995).

end of the third year. CORFO has supported three different *ProFos* in the wine sector, the first of which is *ChileVid*, an export association formed by small and medium integrated wineries, and the third being an association of growers that want to integrate forward by jointly building a modern stainless steel wine processing plant. Yet among the three, it is only *Viñedos Valle del Maule* that initiated its upgrading strategy with the creation of an evaluation panel to benchmark its members, lay out the road map and standards all members needed to meet, and monitor their progress. Members of the *ChileVid ProFo* also occasionally engage in discussions among themselves on benchmarks and standards, and share tacit information, but they do not structure these conversations as systematically as does the *Viñedos Valle del Maule* group.

Further evidence that knowledge experts, rather than the particular development program, play an important role in these learning institutions comes from Mendoza. In fact in the Argentine province there is no specific program to finance the wine evaluation panels. Panel organizers obtain funding from a variety of sources, mainly the enological laboratories, and in small amounts from the *Fondo Vitivinícola*, a fund managed by the regulatory agency I.N.V. for general wine promotion purposes. The provincial government also provides sporadic assistance to some of the evaluation panels by allowing them to use public property free of rent for some of their gatherings and events. For example, CODEVIN organizes some of its wine tasting courses in a building that belongs to the provincial government. But it is the resourcefulness of the knowledge professionals, not the conditionality of the funding itself, that allows the evaluation committees to operate they way they do.

Additional evidence that knowledge professionals give a particular impetus to these learning institutions is the fact that in Eastern Mendoza the new investments in machinery that generate a demand for knowledge have come in very slowly. But knowledge professionals have not waited on the side lines, and instead gone ahead and organized their own subregional wine evaluation events in anticipation of the technology investments that are likely to be made in the area in the years to come.

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[100] See Wormald (1995:76).

In sum, programs that want to reproduce learning institutions of the type described in this research may not necessarily need to target knowledge professionals directly. As in Chile, they may be generic programs designed to promote interfirm collaboration. However, the key insight is that in some capacity they must include the knowledge professionals that have a strategic command of the value chain, and involve them in a systematic organized discussion of their experiences.

A Research Program on How to Rebuild Firms and on the Role of Knowledge Professionals

The final consideration is with the generalizability of the findings of this dissertation to other economic activities. Do knowledge experts play the same strategic roles in other sectors? What are the policy lessons for developing country sectors that do not have a homegrown supply of knowledge experts in a particular activity? What might a desirable research program look like based on the current findings from the wine sector?

Two brief comments are in order. First, there is tentative evidence from other sectors that suggests knowledge professionals play similar important roles elsewhere. For example, in a different agroprocessing activity, Chile's tomato paste industry, engineers in competing firms have somewhat similar if less structured mechanisms--"learning networks"--to discuss and share received and tacit knowledge from production experience. Professional ties between these experts are strong; many of them studied together in the same department at the University of Chile and worked in the same pioneer firms in tomato processing before being hired away by new firms entering the sector.[101] This may partly explain their willingness to interact and exchange information with each other. Learning networks are not uncommon in the development literature, suggesting there may be other examples where knowledge professionals have "scaled up" and systematized their interactions in the form of learning institutions described in this document.

Second, the point is not to prove the activism of a particular professional group but to understand the conditions that enable firms to map out alternative restructuring paths to rebuild themselves from situations of significant technological backwardness and become internationally

[101] See Perez-Aleman (1996).

competitive. In most developing countries the scarcity of tutelage opportunities through FDI and GCCs gives greater urgency to the search for alternative learning institutions. If the supply of local knowledge professionals is thin, it is likely to be far more difficult to generate the kind of homegrown bootstrapping effort identified in this research. Needless to say, that is a hypothesis that needs to be tested more broadly.

Appendix A

The Different Origins of Chilean and Mendozan Poor Quality Wines

Initial Differences in Endowments: Chile's Elite and Mendoza's Immigrants

The Chilean and Mendoza wine industries' developmental paths ran roughly parallel to each other for their first three centuries of existence until the mid-1850s. From then on the path and pace of technological progress--i.e., the gradual change from quantity- to quality-production--diverged. As we shall see, one factor in particular, differences in the mix of vines planted in each region, partly shaped the fortunes of the industries more than a century later.

Though period accounts are sketchy, Southern Cone wineries appear to have experienced little technological change in their first three centuries under the rule of Spain. Part of the explanation resides in that wine production on both sides of the Andes remained small in volume, mostly directed to local consumption because of trade restrictions imposed by the Spanish crown on its colonies.[102] By far the most consequential aspect of this humble start was the introduction by Spanish *conquistadores* of grape vines of poor enological quality from Spain into Central Chile and Mendoza. Prominent among the introduced varieties was the *"Criolla"* grape (as it was known in Mendoza, *"País"* in Chile), a vine that diffused widely because of its high yield per hectare. This varietal would prove to be the workhorse of the wine industry during ISI, contribute to its undoing during the 1980s, and paradoxically turn full circle to become the lifesaver of many Mendoza growers in the early 1990s.

The first significant technological change in Southern Cone wineries began from the mid-19th. century on, and it marked an initial separation of paths between Chile's and Mendoza's wine industries. It was first in Chile where progress was notable: the greater financial capacity of the actors involved, the better resources they tapped, and their better access to markets, explain why. Starting in the 1850s, the by-now independent country's aristocracy and businessmen saw winemaking as a source of status, and were willing to spend liberally to import French vines,

machinery, and even enologists, to start up fine wine production locally at an industrial scale.[103] By the 1880s the industry showed considerable size (Table A.1). One of the key decisions made by these elite pioneers was to import vines of the highest enological quality--Chardonnay, Sauvignon Blanc, Cabernet Sauvignon, and Merlot--considerably improving the country's grape stock. This turned out to be their most enduring contribution: more than a century later vineyards descended from these original high quality stocks provided Chile's leading wineries with the appropriate grape "launch pad" for varietal exports.[104]

Table A.1
SURFACE AREA WITH VINEYARDS; CHILE AND MENDOZA 1880-1940
(Hectares)

Year	1850	*1880	*1890	1900	1910	1920	1930	1940
Chile	n/d	10,000	20,000	40,000	n/d	n/d	80,000	102,000
Mendoza	400	2,000	9,000	21,000	45,000	72,000	98,000	84,000

*Data for Chile are estimates based on statistics in Hernandez (1996).
Source: SAG, Hernandez (1996) for Chile; I.N.V., Martín (1992), Marzo & Inchauspe (1967), for Mendoza, Argentina.

In contrast, in the 1850s Mendoza's wine industry didn't experience any auspicious technological take-off as it did in Chile; it took almost another 50 years for the sector to accelerate its growth, and it did so in a quite different direction. As noted, the distance to markets, the resources available, and the financial capacity of Mendoza's economic agents were quite different to those of their Chilean counterparts.

More than 600 miles west of Buenos Aires (the country's large population center) and separated from its neighbor by the Andes mountains, in the mid-19th. century Mendoza remained considerably isolated from the rest of Argentina. Its wine sector was small, producing mostly for local consumption because it was difficult or impossible to supply Buenos Aires, let alone

[102] To protect its domestic producers, in the late 18th. Century the Spanish crown prohibited wine trade among its colonies and restricted their production (Mathäss 1997, Peters 1997).
[103] Many among this elite had made their fortunes in mining (Hernandez Muñoz 1996, Mathäss *op. cit.*).
[104] When Europe's vineyards were devastated by a *phylloxera* attack in 1860, Chile's elite wine producers also benefited immediately by launching into a highly profitable export trade by ship along the Pacific coast. By 1900 Chilean vineyards occupied 40,000 hectares (Hernandez Muñoz *op. cit.*, Mathäss *op. cit.*).

export.[105] This was true even at a time when market conditions were extremely favorable for domestic wine producers given that wine imports became increasingly expensive.[106] Other limiting production conditions were Mendoza's natural resources, quite modest compared to the fertile and water-abundant *pampas*. In fact the province was mostly a desert, with settlements strung along a few snowmelt-fed rivers and canals. Even though Mendoza's landed elite had capital to purchase machinery and build storage facilities, and finer varietals also found their way into Mendoza from Europe and through Chile itself, their scale did not compare with the size and quality of the investments in the neighboring country (notice the time delay in the vineyard expansion as shown in Table A.1). In contrast to Chile's booming fine wine export trade, Mendoza's wine industry remained in relative obscurity through the late 1800s, its quality questionable, its ability to expand its vineyards constrained by the pace of parallel irrigation projects and by the growth of local demand--most wine consumption in Buenos Aires continued to be supplied from Europe.[107]

Conditions began to change in the 1880s in ways that accentuated the difference between Mendoza's and Chile's wine industries. Already from 1875 on, Mendoza's provincial authorities began aggressive but selective recruitment in Buenos Aires to entice people to migrate west. Those targeted were not the rich landed *pampas* elite but rather immigrants mostly from Spain and Italy. They were viticulturists and viniculturists in their home lands, willing to move to get away from the *phylloxera* attack that was devastating European vineyards. These colonists were selected because of their grape growing and wine making skills, knowledge that Mendoza's elite understood as crucial to the province's economic future once the proposed railway connection to Buenos Aires was completed. Predictably, as soon as the railway line opened in 1885 and transportation costs to

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[105] With a surface area of roughly 151,000 km^2, in 1880 the Mendoza province had a population of only 84,000 people. In 1863 wine imports represented 10.67% of all imports. Ten years later the value of Mendoza's wine production was still insignificant, 7.43% of the total of the nation's wine imports (Martín 1992:63).

[106] This was due to the action of the *phylloxera* aphid inadvertently introduced into France from the U.S. in 1862, gradually devastating Europe's vineyards, including close to a million hectares in France itself. The destruction was gradual at first but extended itself broadly from 1875 on, so that supply constraints increased wine prices.

[107] Wine imports fell only after the turn of the century, to 11% of total consumption in 1910, and 1% in 1918 (Martín 1992).

mass markets on the east coast began to fall, the local wine industry boomed.[108] Wine shipments from Mendoza to the east increased spectacularly, from 2 million liters in 1885 to 48 million liters by the end of the century, to 340 million liters by 1915, a magnitude almost equal to Chile's yearly production during the 1980s.

Who was behind the Mendoza wine industry's economic boom? While local land-owning elites had large wineries, much of the expansion reflects the emergence of a *petite bourgeoisie* of these Italian and Spanish immigrants that started small and gradually built up their firms.[109] Reflection of this bottom up growth is the fact that the number of wineries in the province jumped from 334 in 1884 to 433 in 1895 to 1,398 in 1914, about three times as many as there are today.[110] Undoubtedly these were a different breed of entrepreneurs from those that grew Chile's wine industry in the mid 19th. century. Despite the fact that the Italians and Spaniards arrived with grape growing and wine making skills, their knowledge of varietals and enological processes was more modest compared to those that Chilean entrepreneurs had been able to purchase with their investments in high quality vineyards and wine-processing equipment, and their hiring of the best French enologists of the time.[111] And as crucial to Mendoza's future technological growth-path, the immigrants brought with them a wide variety of vine cuttings from their countries of origin, most of them of far inferior enological quality to those imported into Chile by the local elite. Add to it a rising demand for wine from a growing Buenos Aires population, and a 40 percent tariff on wine imports imposed by the federal government in 1878, the conditions were created for the rise of a sector that produced extremely uneven if not decidedly poor quality wines. Despite the high profitability of the business the industry could not grow fast enough to satisfy demand, so that incentives to prioritize volume over quality were considerable, often leading to tampering, watering,

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[108] As noted in Table A.1, in response to the opening markets of Buenos Aires, between 1890 and 1910 vineyard surface area in Mendoza increased approximately 5 times.

[109] See Martín (1992:58).

[110] In 1914 86% of all wineries were very small, processing less than 500,000 liters and responsible for 33% of total production; wineries processing between 500,000 and 5 million liters represented another 13%, accounting for 45% of total output; only 10 wineries (1%) processed more than 5 million liters each, 22% of total volume. Average winery size has increased considerably over the years, from 300,000 liters in 1914 to 2.3 million in 1993 (average for the province's 451 wineries).

and falsification of wine. During the late 19th. century complaints about Mendoza's wine escalated to the point that provincial authorities had to intervene to enforce various dumping and quality control policies.[112]

In sum, the shortage of water for irrigation, the uneven grape growing and wine making skills, a grape supply varied in its quality, the scarce capital and machinery with which most entrepreneurs started in the business, and the incentives to prioritize volume over quality, set Mendoza's wine industry on a different trajectory to that of Chile's. In the latter country, the principal grape varieties turned out to be very few, with the best French varietals occupying a prominent position; in contrast, in Mendoza the diversity of grape vines introduced to the region was greater, including numerous Italian and Spanish strains of medium and low enological quality.[113] Furthermore, French enologists seem to have arrived later in Mendoza than in Chile, and in smaller numbers; while some historical accounts make general references to their presence in Mendoza in the immediate years after *phylloxera* first hit Europe (1862), other sources note that it was only at the end of the 19th. century that the Argentine federal government invited them to Mendoza to improve local enological knowledge.[114] The latter hypothesis seems more credible given the region's comparative isolation until the end the century.

Events in the 20th. century would contribute to narrow the technological gap between the two wine industries, unfortunately not because Mendoza's producers improved but because quality upgrading in Chile stalled, but the differences in grape endowments persisted through time.

Turbulence, Adjustment, and Quality Loss in the Early 20th. Century

Between the 1900s and 1940s, Chilean and Mendoza wine industries faced a series of similar overproduction crises, yet they resolved them differently. Chile's elite wineries struck a deal with government to limit production in exchange for a cap on new entrants to the industry.

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[111] The confusion among Mendoza growers with respect to the varieties they have in their vineyards continues to this day.

[112] See Martín (1992:65).

[113] Today Chile has no more than twenty varietals with 50+ hectares, whereas Mendoza has 55 varietals with 50+ hectares out of a total of 120 grape varieties.

Mendoza's wineries instead agreed to eradicate vineyards to limit supply. Both policies had flaws, and in the two regions led to the first stage of decline in the quality of wine production.

As noted above, at the turn of the century the wine industries in Chile and Mendoza were at quite different developmental stages: in the former country, elite wineries had modern and well-designed wine-processing and storage facilities with quality vineyards planted with the finest French grape varieties, and French technicians that supervised wine operations. In contrast, Mendoza's growers and wineries were more varied in size and endowments. Many of the earlier ones had started as backyard operations, for personal consumption. But as immigrants from European countries with strong wine drinking traditions flooded into Buenos Aires they created a significant demand for wine. From the late 1880s on Mendoza wineries linked themselves by railway to the eastern seaboard and began to serve those markets. Knowledge on improved cultural practices spread, and the sector began to grow and shake itself out with new larger scale operations taking over production, but with a more mixed-quality supply of French, Italian, and Spanish grapes than in Chile.

The first difficulties began on both sides of the Andes in the early decades of the 20th. Century with cycles of overproduction that became all too frequent. Detailed accounts from Mendoza, for example, note that crises occurred between 1900-03, 1911-12, 1929-31, and the longest between 1933-38; similar events took place in Chile between 1909 and 1931. During these periods, grape and wine prices fell well below their production costs.[115]

As it turned out, initiatives to reduce these grape and wine price fluctuations took very different paths in each country. Crucial to understand what happened in Chile, at the turn of the century there were negative signs that the industry was falling into disfavor in the eyes of the governments of the period. In fact, in 1902 Chile established its first "Alcohol Law" (#1515) that applied taxes on wine and distillates. In 1933 winery owners complained at their First National Wine Congress in Santiago of restrictive legislation and discriminatory taxes applied against the industry. Finally in 1938 Chile's wine sector struck a deal with a left-dominated national

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[114] Foster (1995: 10).

government that viewed wine as "poison" for the masses. In this second Alcohol Law wineries agreed to cap production at 60 liters/capita/year in exchange for a government ban on the expansion of vineyards (102,000 hectares at the time), hence limiting competition. In addition to a prohibition on new vineyard plantings, it was agreed that existing vineyard surface could only be transferred to poorer-quality agricultural land.[116] The elite thought it had struck a good deal , and it had, at least in two ways: first, for the next 43 years and until 1982 there were no more overproduction crises, except for one year, 1962, when supply outstripped demand. In fact, during certain years vineyard surface dropped below its 1940 levels (Table A.2). Second, wine-making became a highly profitable, non-competitive activity. Yet the agreement came at a tremendous cost to the industry's early quality edge: growers and wineries felt less of a need to improve their products because the domestic market was likely to absorb the sector's output, regardless of its quality. This became a perverse adverse selection mechanism: wineries could now meet the same production targets with lower-quality, higher-yielding vineyards.[117] It made more sense for the industry to supply itself from these high-yield vineyards in marginal land and leave the better agricultural areas to other profitable crops. Thus the balance of vineyards shifted from fine, lower-yielding varieties on better agricultural land to higher-yielding varieties in marginal agricultural areas. As one period account described the shift,

> "Winemaking as an elite activity run with a competitive spirit disappears, and transforms itself into a speculative business; money is made by purchasing wisely from producers; wholesale merchants emerge... developing a revolutionary marketing strategy, still current today. One at a time, traditional wineries lose ground, close, or change hands, no longer run by proud families. These maintain

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[115] Marzo and Inchauspe *op. cit*, Hernandez Muñoz *op. cit.*

[116] Hernandez Muñoz and Contreras (1993), Hernandez Muñoz *op. cit.*

[117] Higher yields are generally associated with poorer enological quality. Yields vary depending on the variety, but especially in relation to the amount of water provided to the plant during the growing season. Well-watered vineyards produce poor quality grapes because they dilute aromas, tannins, and colors, and enhance unwanted herbal flavor due to vine robustness. For best results in fine wine making, quality vineyards are provided very limited water, especially when close to the harvest date.

wine quality and focus on bottled wines, to leave the (larger) table wine market in big demijohns to wholesale merchants."[118]

Table A.2
SURFACE AREA WITH VINEYARDS; CHILE AND MENDOZA 1935-1998
(Hectares)

Year	1935	1940	1950	1960	1970	1980	1990	1998
Chile	†112,000	101,000	96,000	110,000	109,000	103,000	54,000	*63,000
Mendoza	101,000	84,000	121,000	173,000	211,000	232,000	146,000	143,000

† Datum corresponds to the year 1938
* Estimate based on unofficial reports from largest growers of recent plantings (International Wine Associates 1998).
Source: SAG for Chile; I.N.V., Marzo & Inchauspe (1967) for Mendoza, Argentina.

In the case of Mendoza, the relationship between wine industry actors and government was far more complex than that prevailing in Chile. For one, different levels of government had somewhat different interests with respect to the wine sector. Until the 1940s when the provincial economy began to diversify, wine making was Mendoza's principal driver of economic growth. For instance, in 1914 it accounted for 77 percent of its industrial output. Thus the provincial government's interests became closely aligned with the industry. For this reason the first provincial public policies attempted to defend prices for growers and processors alike. In contrast, the earliest national public policies were designed to control wine quality, especially to prevent its falsification. The federal government also had an interest in keeping the price of wine low, an important item in the average consumer's market basket.[119]

Participants in Mendoza's wine industry were also far more heterogeneous than in Chile. The largest wineries were in the hands of a small landed elite. But there was also a *petite bourgeoisie* in the making, composed of successful immigrants that had started out modestly with backyard operations and gradually grown their businesses with their own savings. Then there were also the merchants that led the sector's expansion once the market connection by rail with Buenos Aires was established. It did not take long for various splits to show when growth in wine consumption decelerated after 1914 as a result of the deceleration of new immigrant arrivals to the

[118] Hernandez Muñoz (1996:11).

country. As wine prices fell, the antagonism between processors on one side, and independent growers on the other became visible, mainly over the cost of grapes. These had become the most costly input. All in all, the wine sector's social composition may have been far more varied than in its neighboring country.[120]

In the early 1930s, after a continuous series of production crises, a provincial government-run Regulatory Wine Board implemented a vineyard eradication program in 1937 that eliminated approximately 17,000 hectares. In hindsight, this was evaluated as a serious mistake because wine demand picked up again soon after, and continued to increase for several more decades at astonishing rates. These events are crucial to understand the deterioration of wine quality in the 1950s and 1960s. As the industry literally scrambled to increase production, two factors in particular explain the quality drop: first, growers set up new vineyards with the most productive, low-quality varieties, including the *Criolla* grape introduced by the Spaniards in the early days of the colony.[121] Second, the national government in its attempt to keep the lid on the price of a mass consumption good, authorized the "hydratization" of wine. In plain language, it allowed the industry to water its wines. In the words of one commentator,

> " 'This gives origin to the darkest period shaping the wine industry's future orientation...Major transgressions took place...Wholesale bottlers made the most of the product scarcity. The public was forced to accept a low quality product, and the new grape plantations were a reflection of those (market) conditions. There was no need to select the better vines and varieties, nor was there any interest in the quality

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[119] A rising urban working class predominantly Mediterranean in its tastes had cheap table wine as an important item in its basket of family consumption goods. As this group grew quickly in the 1950s, wine regulatory activity also increased.

[120] The earliest statistics available to me, corresponding to the early 1960s, show a fairly mixed land distribution, and a variety of sizes of wineries. For example, 49% of grape growers had plots of land between 4-50 hectares owning more than 50% of total vineyard surface. Another 2.5% of growers (mostly integrated wineries) with properties larger than 50 hectares owned 35.3% of vineyard land. The remaining 48.6% with properties smaller than 4 hectares owned 8.6% of the vineyard land (Marzo and Inchauspe 1967:380). There were also 632 wineries with less than a million liters each in storage capacity, 580 wineries with 1-10 million liters, 2 wineries with 40-50 million liters, and the largest with 70 million liters (at the time, considered the largest in the world).

[121] In the early 1960s, Mendoza had 81,000 hectares of medium-quality red *Malbeck* grapes (introduced from France and through Chile), 51,600 hectares of *Barbera* grapes, and 8,900 hectares of *Verdot*. Among white grapes, there

of the wines produced; what mattered were the economic benefits that high grape yields could produce.' The future of the wine industry was structured with this mindset."[122]

During the 1950s, the Mendozan provincial government's interest shifted towards diversifying the regional economy into manufacturing. But the continued rise of wine demand led the provincial and national governments in the mid-1960s to further encourage winemaking activities. It was in this context that they designed a series of tax incentives to induce the private sector to develop Eastern Mendoza as the new agroindustrial frontier.

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were 12,600 hectares of *Pedro Gimenez* grapes of medium enological quality and 30,000 hectares of *Criolla Chica* of poor enological quality.

[122] Marzo and Inchauspe (1967:454).

Appendix B

Origin of Eastern Mendoza's Low-Quality High-Volume Production

Starting in the mid-1950s, and especially from the mid-1960s through the 1970s, provincial and federal promotion policies encouraged the expansion of agribusiness across the province, but especially into Eastern Mendoza. This policy coincided with the steady rise of domestic demand for cheap table wine and the introduction of an innovative vine training system, the *"parral cuyano,"* that increased yields significantly. Poor-quality high-yield varietals were preferred over less productive, more tasteful grapes. The land expansion, the new training system, and the vine choice, all combined to significantly change and deteriorate the industry's overall quality. The result is paradoxical given the magnitude of the growth and the investment: from 1950 and through the mid-1970s Mendoza's vineyards grew at a heady rate of almost 5,000 hectares per year, doubling surface from 120,000 hectares to 240,000 hectares (Table B.1). At current value, the investment in vineyards alone over a 25-year period was more than 1.25 billion dollars.[123] Similar progress was made with Mendoza's storage capacity: it doubled from the mid-1950s through the late 1970s, to reach 4,500 million liters. In a short period of time, Argentina had become the fourth largest wine producer in the world (after France, Italy, and Spain), with Mendoza its main contributor to that growth.

Table B.1
SURFACE AREA WITH VINEYARDS; MENDOZA 1938-1974
(Hectares)

Year	1952	1959	1964	1968	1974	Change 1952-1974
Great Mendoza	47,000	51,000	53,000	50,000	55,000	8,000
Eastern Subregion	44,000	50,000	57,000	66,000	77,000	33,000
Northeastern Subregion	14,000	14,000	18,000	20,000	25,000	11,000
Central-West Subregion	9,000	11,000	14,000	17,000	20,000	11,000
Southern Subregion	36,000	41,000	50,000	57,000	63,000	27,000
Total Mendoza	**150,000**	**167,000**	**192,000**	**209,000**	**240,000**	**90,000**

Source: Own compilation, based on I.N.V. data.

[123] Current investment costs are no less than $10,000/hectare, excluding the land acquisition costs. At 5,000 hectares/year the annual investment in vineyards is at least $50 million dollars. For a detailed cost analysis of vineyard investments in Mendoza see SPE (Secretaría de Programación Económica) (1996)

The financial impetus for growth during the 1950s, 1960s, and 1970s came from the public sector both at the national and provincial level to strengthen grape processing capability and vertically integrate grape growers. The cooperativist movement had had few successes in Mendoza except in rural electricity, and government agencies wanted to encourage the integration of the smallest producers and reduce their vulnerability to grape price manipulation by large processors. Cheap credit for cooperatives became readily available from several sources to build grape-processing and wine storage facilities: one of them was the *Instituto Nacional de Vitivinicultura* (*I.N.V.*), created in 1959 as the federal government's regulatory agency for the industry, charged also with its promotion. The *I.N.V.* had substantial resources, its annual budget roughly equivalent to the value of 100 million liters of wine.[124] Funding also came from the provincial government itself, already with a substantial experience in sectoral promotion.[125] It built wine-processing and storage facilities that it then handed over to cooperatives to manage. By 1965, Mendoza had 39 wine cooperatives in operation.[126]

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[124] The I.N.V. is a regulatory agency politically semi-independent from the national government, but completely independent in its financing. Located in Mendoza but with jurisdiction over the whole country, neither the Executive nor Congress determines its budget, which (until 1991) came from a 7% tax on wine sales. (In October 1991 the tax was reduced to 3%.) The agency is directed by a President named by the national government and a 12-member Directive Council, composed of 7 political appointees one for each producer province, and five sectoral representatives (supporting growers, labor, and wineries). Thus, despite its financial independence, the agency's leadership has always been widely viewed as more 'political' than 'technocratic' (Juri 1991, Novedades Económicas 1990).

[125] Mendoza's government was one of the first provinces in the nation to aggressively pursue industrial promotion strategies. Already in the early 1930s it had set out to diversify its economic base, at the time overly dependent on the wine industry's performance. For example, in 1932 Laws 932 and 938 provided support specifically to encourage the establishment of milk and cement industries respectively. Another more general law (1337) enacted in 1939 provided provincial and municipal tax exemptions to the first firms in each manufacturing sector that established themselves in the province. Other similar laws and decrees followed in subsequent decades. In 1959 Law 2626 encouraged private sector participation in hydroelectric projects. In turn, in 1964 Law 3110 promoted a petrochemical facility in the province. Yet even as the provincial economy diversified into cement, oil and chemical production, and several other agricultural and agroindustrial activities, the wine industry itself continued its expansion and forward-integration (Martín *op. cit*).

[126] In addition, in 1954 Mendoza's legislature signed Law 2301 authorizing the purchase of the province's largest winery, *Bodegas y Viñedos Giol, S.A. Industrial y Comercial*. Handling roughly 10% of Mendoza's wine production, it became the provincial government's key socioeconomic development tool to assist the sector's smallest growers and processors. For example, Giol used its extensive distribution network across the country to channel small growers' and processors' wine to markets, paying them better-than-market rates (Marzo and Inchauspe 1967: 456). (Small processors typically have little bargaining power *vis a vis* large bottlers/distributors.) Unfortunately, it did not take long for Giol to run a deficit, which the provincial government financed for several decades until it finally privatized the firm in the early '90s.

The final financial impetus, and the one with the greatest consequences for Eastern Mendoza came in 1965 from the national legislature: it made into law a project submitted by the Mendoza government to provide ten years of tax relief to firms that invested in new agroindustrial and manufacturing activities in the province. Different to the preceding initiatives, this program also attracted large firms with substantial capital. Especially encouraged were agroindustrial projects that incorporated modern irrigation systems and pumps to tap underground water reservoirs, to make more rational use of the scarce liquid than that achieved with the traditional surface-flooding system.[127] Eastern Mendoza was benefited with hundreds of new integrated wineries, processing facilities, and vineyard expansions. Until the late 1940s the area had seen its share of vineyard growth, but was generally viewed as agroecologically poor for fine grape growing. The subregion's elevation of 600 meters above sea-level was generally viewed as insufficient to provide the cooling effect that high quality grapes need during the hot summer growing season. However, the microclimate was ideal to grow high-yielding, sugar-producing varieties for grape juice, widely used as a natural sweetener in many beverages and in wine itself. With its large expanses of arable land, and the financial incentives in place to pay for underground wells and irrigation systems, Eastern Mendoza was a good choice even for winemaking, given that table wine demand kept growing and domestic consumers were accepting of a poor quality product. Within the subregion, the Department of San Martín grew fastest, its vineyard surface jumping from 12,000 hectares in 1947 to 40,000 in 1979, a full 18 percent of the province's total vineyards. By 1996 the share had increased to 23 percent. The growth was so spectacular, that between 1947 and 1980 the San Martín Department's rural population almost doubled, at a time that the nation as a whole was becoming highly urbanized (Table B.2).

[127] Among those participating in these programs were firms that would dominate the Mendoza economy and national economies in subsequent decades, for example, Greco, Sasetru, Recoaro, Peñaflor, Cartellone, Nieto y Senetiner, Inca, Campagnola, Canale, as well as successful mid-size firms such as Berrutti y Chini.

Table B.2
URBAN AND RURAL POPULATION IN THE PROVINCE OF MENDOZA; 1947-1980

Year	1947		1960		1970		1980	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Great Mendoza	232,921	103,823	371,978	111,153	482,767	107,401	616,084	131,470
Eastern Subregion	19,610	71,245	52,870	74,837	52,882	89,473	76,208	101,733
San Martín	**13,967**	**22,048**	**32,111**	**24,766**	**30,506**	**35,300**	**45,201**	**42,407**
West Subregion	2,437	35,389	21,053	29,380	16,440	42,240	23,602	43,701
Southern Subregion	41,607	81,199	81,520	81,245	88,832	93,040	112,654	90,776
Mendoza Province	**296,575**	**291,656**	**527,421**	**296,615**	**640,921**	**332,154**	**828,548**	**367,680**

Source: Own compilation, based on D.E.I.E. data.

In the urge to favor volume over quality and satisfy surging market demand, growers increased their net holdings of low-quality, high-yield varieties such as *Criolla*, *Cereza*, and *Moscatel Rosada*, with new plantings. Of Mendoza's net gain of 87,000 hectares of vineyards between 1964 and 1978, a full 77,000 hectares were of these low quality varieties. By 1978 they alone accounted for 43 percent of the grape supply. Growth also came at the expense of lower-yielding but higher-quality varieties, that were gradually eradicated. For example, from 1964 to 1978 the French Malbeck grape lost 14,000 hectares. (Table B.3).

Table B.3
VINEYARD SURFACE AREA OF SELECTED LOW AND MEDIUM QUALITY GRAPES; MENDOZA 1938-1974
(Hectares)

Year	1964	1968	1974	1978
Selected Medium-Quality Grapes	**85,000**	**90,000**	**100,000**	**99,000**
Chenin	5,000	5,000	5,000	5,000
Semillón	5,000	4,000	4,000	4,000
Pedro Jimenez	13,000	13,000	16,000	17,000
Barbera d'Asti	9,000	5,000	5,000	5,000
Malbeck	52,000	43,000	46,000	39,000
Tempranilla	-	11,000	11,000	12,000
Bonarda	2,000	9,000	13,000	17,000
Selected Low-Quality Grapes	**39,000**	**77,000**	**103,000**	**109,000**
Criolla Grande	26,000	52,000	66,000	70,000
Cereza	8,000	17,000	22,000	22.000
Moscatel Rosada	5,000	8,000	15,000	17,000
All Varieties in Mendoza	**192,000**	**210,000**	**240,000**	**253,000**
Share of Selected Low Quality Grapes	**20.3%**	**36.6%**	**42.9%**	**43.1%**

Source: Own compilation, based on I.N.V. data.

The 1960s were also the period of mass diffusion of a vine-training technique--the *parral cuyano*--that produced far higher yields than the industry standard at the time. Until the 1950s, the majority of grapevines tended to be trellis-trained, organized in low parallel rows no more than 4 feet high, and separated from each other by 4-8 feet. The vines grew as a vertical curtain, held by 2 or 3 vertically-aligned wires above the ground. This was called the *espaldera baja*. Yields were

typically around 5-8 tons per hectare. As the industry shifted its priority and began to privilege volume over quality, a higher version (6 feet tall, with as many as 5 wires) was introduced, the *espaldera alta*. It elevated yields to 10-15 tons/hectare. The *parral* was the innovation that followed. Wires were positioned to intersect at right angles to each other, allowing the vine to extend itself horizontally, forming a continuous canopy over the ground. Average yields jumped to 30 tons per hectare and could rise to as much as 50-60 tons/hectare. However, the structure did require more wiring and wood poles to set up, but cheap credit and tax breaks made it more attractive. Between the 1950s and 1980s, the *parral*'s share in the province jumped from 4 percent to 43 percent of total vineyard surface (Tables B.4, B.5). The combined growth of low-quality high-yielding cultivars on productivity-enhancing *parrales* dramatically shifted Mendoza's grape supply toward the low-quality end.

Table B.4
VINE TRAINING SYSTEMS USED IN MENDOZA'S VINEYARDS; 1950s-1980s
(Hectares)

Decade	Espaldera Baja (Low Trellis)		Espaldera Alta (High Trellis)		Parral Cuyano		Other	
	Hectares	% Share	Hectares	% Share	Hectares	% Share	Hectares	% Share
Average 1950s	144,000	86.3%	7,000	3.9%	16,000	9.5%	1,000	0.3%
Average 1960s	154,000	79.2%	10,000	5.1%	30,000	15.4%	-	0.3%
Average 1970s	132,000	53.4%	30,000	12.3%	81,000	32.9%	4,000	1.4%
Average 1980s	93,000	43.3%	28,000	13.2%	91,000	43.3%	1,000	0.3%

Source: Own calculations, based on I.N.V. data.

Table B.5
MENDOZA'S VINEYARD SURFACE AREA WITH HIGH-YIELD ORTHOGONAL TRELLIS SYSTEMS (PARRAL); 1950s-1980s

Mendoza Province	Decade 1950s	Decade 1960s	Decade 1970s	Decade 1980s	Decade 1990s
Provincial Average	10%	15%	33%	43%	56%
Eastern Mendoza	**1959**	**1969**	**1978**	**1990**	**1992**
Junín	11%	24%	37%	48%	56%
Rivadavia	10%	21%	35%	52%	59%
San Martín	16%	33%	47%	56%	65%
Lavalle	14%	32%	40%	46%	55%
Santa Rosa	14%	33%	50%	60%	68%

Source: Based on data from I.N.V., Mendoza

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