

An Economic Survey of the Wine and Winegrape Industry in the United States and Canada

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Revised draft December 2, 2001

The wine industry in the United States and Canada is new by Old World standards but old by New World standards. The industry has had several rebirths, so specifying its age may depend on the purpose of the investigation. In the colonial and post-colonial period up through the middle of the 19th Century, it was a relatively tiny industry with imports accounting for almost all of the still meager consumption of quality wine in the region (Winkler, et al.). There was gradual development in the latter half of the 19th century, but wine production in the United States and Canada only began to develop significantly with the expansion of the California industry early in the 20th century (Carosso; Hutchinson). Then the industry needed to be recreated after the prohibition era from 1920 to 1932. More recently, in a sense, the industry was reborn again thirty or so years ago with an aggressive movement towards higher quality.

The geography of the industry is relatively simple. Despite some wine and winegrape production in Canada and most states in the United States, California is the location of more than 90 percent of grape crush and about 85 percent of the wine production in North America (Wine Institute). Therefore, most of the discussion of grape and wine production in this chapter focuses on California. The discussion of demand and policy issues, of course, covers all of the United States and Canada.

This chapter begins with a very brief outline of the history of wine production and consumption in the United States up through roughly 1990. The expansion of the industry up to the prohibition era and the climb back after prohibition are the main parts of this story. We then turn to the demand side to consider recent data on wine markets, including information on demand by quality, and the domestic and import sources of wine consumed in the United States and Canada. Only relatively thin evidence is available on the response of quantity or

quality demanded to changes in prices and consumer income, and this seems to be an area where much more research could be warranted. Wine marketing regulations are complex and also an important influence on the pattern of demand, given state-by-state and province-by-province rules on wine retailing and wholesaling.

Section 3 reviews recent data on grape and wine production in the United States and Canada with specific attention to grape acreage and production by variety and region in California. We also examine grape prices by region and variety. The consequences of the spread of grape pests such as phylloxera and Pierce's disease are also considered in this section. Section 3 also includes analysis of recent wine production and patterns and the industrial organization of the wine industry, including vertical integration from grape production through wine production, and a brief discussion of exports. Finally, in section 4, we review the most important economic and policy issues now facing the winegrape and wine industries in the United States and Canada and discuss how the industry is likely to evolve in the near future and over the longer term.

1. History

The wine industry and market in North America began as soon as there were sufficient European immigrants to drink, buy, and produce wine. The abundance of native grapes suggested that wine could be produced successfully in North America. However, the expansion from nascent beginnings was slow. In the 16th Century wine was produced in both Spanish and French colonies of North America successfully enough that the home-country industries blocked further development. These restraints furthered effort to establish wine production in the English colonies (Mishkin). In the 17th Century attempts to establish *vitis vinifera* in what later became the eastern United States failed, and grapes grown there even now are based on early native species (Winkler, et al.).

During the 17th and early 18th Centuries vines and wine spread throughout what is now Mexico and the southwest of the United States with Spanish soldiers and missionaries. Like much else in the history of the State, the wine industry in California was created by the establishment and spread of the missions (Conaway). Beginning in 1790 in San Diego, over

the next four decades, Spanish missions moved up the Coast bringing vines and winemaking abilities with them. The local grapes were of no use for wine making, but a European-based variety known as “Mission” did well, and became the basis of California wine production for many years (Hutchinson, Winkler, et al.). The mission vineyards and winemaking facilities fell into disuse and disarray when the Spanish were forced out after Mexico (which included California) became independent in the 1830s (Winkler).

California joined the United States as a part of the settlement of the war between the United States and Mexico in the 1840s. The California Gold Rush, beginning in 1849, hurried California to statehood in 1850. Then the wine industry expanded rapidly in a State that was experiencing a population and economic boom. In 1850, only about 9,462 hl of wine were produced in the United States. By 1860, U.S. production had jumped to 56,775 hl, with California joining the major production states (Hutchinson). Of course, most of this wine was very low quality produced for consumption locally by miners; however, the production of quality wine also had its beginnings during this decade. In 1857, Colonel Haraszthy, the founder of Buena Vista winery in Sonoma, began propagating important European varieties in California.

The well-known phylloxera story from the 19th Century also shows the interdependence between the American and European industries (Unwin). Grape phylloxera, which are root destroying insects, are native to the Americas, where native *Vitis* species are rarely damaged by its feeding. European-based rootstock proved to be extremely susceptible to phylloxera during various attempts to develop quality wine production in North America, from Jamestown onward. Phylloxera were identified in California in 1873 and this hampered the development of high-quality wine production in California in the 19th Century. Also, the phylloxera were unintentionally imported to Europe in the mid-1800s and about 75 percent of the vines of France were destroyed within 30 years of the introduction (Winkler). Eventually it was discovered that root systems of American species could be grafted with *Vitis Vinifera* scion cultivars to produce phylloxera-resistant plants that yield European varietal grapes (Granett).

From about 1875 to 1915, the wine industry in the United States and Canada developed rapidly in both quantity and quality. After depressions in the 1870s, and the battle

with phylloxera, the industry gradually began replacing Mission grapes with higher-quality varieties (Gregory). By the 1904 to 1908 period, annual U.S. wine production was about 1.55 million hl with about 85 percent produced in California. Annual production peaked in the 1909 to 1913 period at 2.01 million hl before declining back to about 1.55 million hl again from 1914 to 1918 as the movement towards prohibition began (Selden, Hutchinson, and U.S. Tariff Commission). The influx of about six million immigrants from wine-producing regions of Europe during the early part of the 20th Century contributed to both more demand and better-quality wine production. This immigration was halted by World War I and was not allowed to resume. Then prohibition shifted industry progress into reverse.

The 18th Amendment to the U.S. Constitution, which implemented prohibition, had been ratified by thirty-six states in January of 1919. This prohibition against beverage alcohol other than for medicinal or sacramental purposes was law from January 1920 until 1933. The operative Section 1 read simply: “After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited.”

The law allowed the production of wine for use in the home of the winemaker and there was also widespread illegal consumption of wine. Therefore, grape acreage did not fall and some estimates suggest overall wine consumption expanded during the 1920s (Clark, Hutchinson). California grape production was reported as about 0.71 million metric tons in 1910, with about 57 percent crushed commercially. In 1920, production was 1.15 million metric tons, but only 13 percent of these were crushed commercially. Then after 10 years of prohibition, in 1930 production had risen to 1.87 million metric tons, but only 4 percent of these were commercially crushed in that year. Grape production remained relatively stagnant during the 1930s with total output rising only about 10 percent, to 2.04 million metric tons in 1940, but by then about 44 percent of the California grapes were commercially crushed (California Crop and Livestock Reporting Service, various years). Most observers assume that much of the grape crop was home-crushed and turned into wine during prohibition, but that wine production took place in home wineries. In addition, the California table grape and raisin industries developed rapidly in the first half of the 20th Century, and the expansion of

these other markets for grapes would likely have reduced the share of grapes used for wine during the 1910 to 1940 period even without prohibition. Further assessment of the production and demand effects of prohibition demands additional empirical analysis, which is beyond the scope of this chapter.

There is little question that the impact of prohibition on the commercial wine industry was dramatic. Almost all of the 700 commercial wineries that operated in California in 1920 were closed over the subsequent 12 years. This implied a major loss in capital investment and in human capital for the industry. Further, the development of the market for high-quality commercial wines was reversed (Tillit, King). Lapsley discusses three explanations for why, in the first years that followed repeal of prohibition, most wine was of poor quality. First, 80% of California wine production was shipped as bulk to out-of-state bottlers who had their own labels. This reduced incentives for California wine producers to build a reputation for quality with consumers. Second, winemakers in the post-depression years were untrained and were producing wine in unsanitary conditions. Third, demand for grapes had been high all over the continent so that grape prices rose and during prohibition growers planted high-yielding, low-quality, thick-skinned grape varieties that could withstand transportation.

The role of prohibition in the development of demand for wine quality is not fully understood, but one apparent consequence was an emphasis during prohibition on production of sweet dessert wines that persisted after repeal (Lapsley). For example, in 1950, only about 26 percent of U.S. consumption was table wine, most of the rest was sweet, high-alcohol dessert wine (Wine Institute). Lapsley points out that during prohibition, most wine drinkers were looking for high-alcohol rather than traditional wine flavor. Moreover, he notes that the market for quality commercial table wine remained low, in part because some immigrant Americans continued to produce wine at home (from California grapes), thereby escaping high excise taxes. Finally, we should recognize that prohibition itself was the consequence of an anti-alcohol sentiment that would have had significant effects even without the 18th Amendment.

By 1950, annual U.S. production of wine had tripled pre-prohibition quantities, with about 90 percent of total of 51.86 million hl produced in California. Consumption stood at

about 3.52 liters per capita. Of this consumption, less than 5 percent was imported and three-quarters of imports were from France and Italy (Table 1).

Several factors contributed to overall demand growth in the second half of the 20th Century. From 1950 to 1980, per capita wine consumption in the United States more than doubled from about 3.5 liters per capita to a little over 8 liters per capita. Although 8 liters per capita remains small by European standards, the growth in per capita consumption actually stopped and went into reverse in the 1980s. Population growth continued to contribute steadily to total demand. From 1950 to 1980, imports grew from less than 5 percent to more than 20 percent of consumption by 1980 (Table 1), and California continued to supply about 90 percent of domestic production. In total, table wine consumption rose from about 1.36 million hl to about 15.1 million hl. Quality improved as well. From 1950 to 1980, the share of table wine (that is, still wine having less than 14 percent alcohol by volume) in total wine consumption grew from about one-quarter to about three-quarters.

The gradual upgrading of the quality of California wine is usually dated from the late 1960s or early 1970s. The coastal industry began expanding and the area planted to higher-quality varieties grew. The basis for this change was an expansion of wine awareness and consumption in the United States. However, a wine consumption boom in the late 1960s and early 1970s (per capita consumption jumped by 50 percent from 1967 to 1971) gave way to sluggish demand growth in the mid-1970s. And, when anticipated demand growth did not materialize, prices declined and a number of vineyards were removed.

After the plateau of the middle 1970s, U.S. wine consumption and production picked up again in the late 1970s and 1980s. But, that growth too was not sustained, and consumption peaked in the middle 1980s at almost 9.20 liters per capita, then declined gradually for a decade before moving back up again. Per capita consumption had only reached 7.7 liters per capita again by the end of the 20th Century (Figure 1 and Table 2).

2. Current Wine Consumption Patterns and Issues in North America

In this section, first we review the recent patterns surrounding wine consumption in the United States and Canada as a whole. Then we discuss data and issues related to the United States and Canada separately.

Table 2 shows some key wine consumption facts for the United States and Canada for the period 1990 to 1999. Total consumption continued its decline from the peak in 1988, until 1996 when per capita wine consumption jumped to 7.6 liters per capita, fully 1.1 liters per capita above the quantity in 1995, when it was the lowest in two decades. Since then, consumption per capita held steady while total consumption grew slightly with population.

The changes in per capita consumption partly reflect shifts in the age distribution of the population. The huge baby-boom generation came of age in the 1970s and 1980s. The baby bust that followed meant that the share of the population entering maturity dropped during the late 1980s and early 1990s. However, much more than demographics drove the changes in U.S. and Canadian consumption of wine from 1970 to 2000. The share of wine in the consumption of alcohol also dropped rapidly after 1986 and hit a 15-year low in 1995 before rebounding strongly (Table 2).

Economists would expect price and income to play significant roles in wine consumption, as with other goods. Available estimates of the own-price demand elasticity for wine in the United States are based on data from the 1970s and 1980s. Leung and Phelps review two studies that report own-price elasticities for wine that range from - 1.86 to - 0.88, both based on aggregate cross section data. Heien and Pompelli found an own-price elasticity of demand for wine of - 0.55 using a household sample from the United States. These estimates all suggest substantial negative demand response to an increase in the relative price of wine. The econometric evidence on income elasticities is less well developed, in part because of confounding of income changes with demographic shifts and in part because of quality movements that are correlated with income. (Of course, these factors also affect estimates of price elasticities.)

To date, separate elasticities have not been reported for high-quality versus low-quality wine, for red versus white wine, or for imports versus domestic wines. Clearly there is room for significant empirical analysis to obtain better estimates of demand parameters in the wine market.

2.1 United States Consumption Patterns and Issues

As Figure 2 shows, there is wide variation in the price of wine purchased in food stores. In 2000, only 20 percent of the wine volume sold for more than \$7 per 750 ml bottle. This “premium” wine, however, accounts for 43 percent of the value of wine sold and has been a rapidly growing segment of the market. From 1999 to 2000, the volume of wine in the \$7 and greater range jumped 22 percent while the volume of wine sold for less than \$7 per bottle declined by 1 percent (Wine Institute based on Nielson data). In Figure 3, we adjust the nominal price categories used in available sales distributions for 1980 by the 1999 CPI to remove the effects of the general movement of prices. In 1980, only 7 percent of the wine sold for more than \$6.68 per 750 ml in 1999 dollars. In 1999, 23 percent of the wine sold for more than \$7.00 per 750 ml (again in 1999 dollars). In 1980, only 5 percent of the volume of California table wine shipments were in the \$6.68 to \$15.59 range and 2 percent were in the more than \$15.59 category. In Figure 2, which uses a somewhat different sample (table wine bought in U.S. supermarkets) in 2000 the share in the \$7 to \$14 range was 18 percent. These data are suggestive of a quality (or at least price) upgrading, but without further detailed data analysis, it is not possible to fully apportion these changes among the sources. (However, see Fredrikson for more discussion.)

Dessert wine is now less than 7 percent of wine consumption in the United States, with sparkling wine accounting for another 7 percent. Of the table wine, red and white each comprise almost equal shares of about 40 percent, and blush wine accounts for about 20 percent of volume. For wine sold in food stores by grape variety, Chardonnay has a 19 percent share and is easily the dominant white. White Zinfandel is the sole “blush” varietal wine commanding more than a one percent of sales, and itself has 13 percent of volume. Merlot at 11 percent and Cabernet Sauvignon at 9 percent are the dominant reds (Wine Institute, Key Facts).

Wine consumption in the United States totaled about 21 million hl in 1999. California was the source of about 72 percent of that. About 20 percent was imported and about 8 percent of consumption was wine produced in the United States outside California. Of the imports, about three-quarters came from Europe, with almost three-quarters of that from Italy and France. At about 500,000 hl each, the growing sources of imports, Chile and Australia

together now contribute about as much as France to U.S. consumption (Wine Institute, Key Facts, based on U.S. government data).

Important issues affecting the development of wine demand in the United States and Canada over the years ahead will include (a) quantity and quality response to wine prices, (b) response to aggregate income changes with a recession underway, and (c) adjustments in state, provincial and local wine marketing regulations that discourage consumption by reducing consumer options and convenience of purchase. We have already discussed price and income elasticities, let us turn briefly to marketing regulations.

Alcoholic beverages are unique in the degree to which individual states have the authority to regulate marketing in the United States. For a typical product the interstate commerce clause of the U.S. Constitution says, in effect, that states may not limit commerce between states unless they can establish compelling local reasons. (Conversely, the federal government may not regulate purely within-state commerce.) However, the 21st Amendment that reversed prohibition is usually interpreted as allowing states more leeway in regulating alcohol. Section 2 reads as follows: “The transportation or importation into any state, territory, or possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited.”

In fact, individual states exercise substantial control over the marketing of alcoholic beverages including sales through state-owned and operated stores. State authorities in states such as Pennsylvania and Utah are the sole importer, wholesaler, and retailer of alcoholic beverages in their boundaries. In general, many states have imposed regulations that make establishing national distribution systems more difficult, and severely restrict direct winery-to-customer shipments. Many of these restrictions favor local wine producers or favor local wholesalers and retailers to the detriment of the wine production industry elsewhere. Political attempts to reduce these restraints of trade face problems at the national level because of the interpretation of the 21st Amendment. And, efforts to have regulations changed in state legislatures face the problem that politically powerful within-state interests often benefit from trade restrictions. Wine consumers have not yet become organized or effective enough to effect reform.

2.2 Canada

Canadian wine consumption is a little over one-tenth of the U.S. total, with per capita consumption averaging about 7.5 liters over the past four years, roughly equal to that in the United States. The Canadian table wine market is now split evenly between red wines and white wines after several years of rapid growth in the red wine share. Since almost all of the red wine is imported this shift has affected the import share as well (Statistics Canada, website).

Imports rose from about 55 percent of consumption in the late 1980s to about 90 percent of consumption in 1997 before slipping back to about 84 percent of wine consumption in Canada in 1999. However, even with this relatively small market share for domestic wine, a significant part of the domestic wine production in Canada relies on imported grapes or must, primarily from the United States. Wine imports into Canada derive from a variety of countries. France accounts for about 30 percent, the United States accounts for about 20 percent, and Italy and Chile about 15 percent each. Australia, Germany, and Spain each supply between three and five percent of imports (USDA, FAS). Import unit values average about US\$2.50 per liter in Canada compared with about US\$4.30 per liter import unit value and about US\$2.00 export unit value for the United States (Anderson and Norman).

Regulation of wine sales is largely a provincial authority in Canada. “The Importation of Intoxicating Liquors Act requires that liquor imported into Canada be brought in through a provincial or territorial liquor board. The provincial and territorial governments are also responsible for regulating and controlling traffic in intoxicating liquor for sale and consumption within their respective jurisdictions” (Treidlinger, see also AAFC, Food Bureau). The control of the sale of domestic and imported wines by the provincial government has tended to benefit wines produced in that province and to limit the selection available to customers. Provincial governments control the mark-up on wines and have tended apply lower mark-ups on local wines. In response to NAFTA, they raised the mark-up on local or provincial wines rather than lower the mark-up on imported wines. All of these factors reduced the rate of growth of imports in Canada, which has nonetheless been rapid. The control over which brands are on offer may also make marketing particularly difficult for new suppliers. This may account for the still relatively small market shares for U.S. and other New World suppliers in Canada (Heien and Sims). Anderson emphasizes that trends in

imports from the U.S. into Canada were consistent with trends in imports into Canada from other New World suppliers such as Australia, Chile and New Zealand.

3. Grape and Wine Production in the United States and Canada

3.1 Grapes

The United States is a major producer of grapes used for fresh table consumption, dried consumption (raisins), and fresh or frozen grape juice, as well as wine. These multiple uses for grapes complicate the production picture, particularly because all four uses of grapes are important in some important regions, and for the most commonly grown variety, Thompson Seedless. Of course, the most famous wine varieties and regions are dedicated solely to wine.

Grapevine area in the United States and Canada grew by about 25 percent from 1990 to 1999. The 1999 total of about 380 thousand hectares (Anderson and Norman; USDA, NASS) still comprises a tiny 0.2 percent share of the total cropland in the region (Anderson and Norman). As grape area has expanded, so has total grape production (Figure 4). Of course, production from year to year has been more variable with a large crop yield per bearing area in 1997 followed by two years of relatively low yield. In 2000, yields were up again and the grape crop was more than 10 percent above that of 1999. In 2001, the crop was down because yields fell. One reason why overall grape yield per hectare has declined may be that the expansion in area has comprised lower-yielding wine varieties. Also, when yield is measured as the ratio of production to total area, as in Anderson and Norman, yield is “biased” down wherever the ratio of non-bearing to bearing acreage is unusually high.

The latest numbers for grape production in the United States show an industry that is continuing to grow and to shift from other varieties of grapes toward wine varieties. Total U.S. grape bearing area was 382,833 hectares in 2000, up 10 percent from 1998 (USDA, NASS). Of this, California accounted for 87 percent of the total area or 334,521 hectares of bearing grape land. About 4.5 percent of the national grape area was in Washington and about 3 percent in New York. Furthermore, the California share has been growing and almost all of this growth is in wine varieties. Bearing area of California wine-type grapes has grown

by about 19 percent in two years and now comprises 48 percent of all the grapes grown in the United States. This under-estimates the total wine use of grapes, however, mainly because a significant share of Thompson Seedless grapes (classified as a raisin variety) are used for crush and some of that for wine.

Grape yields in the United States vary widely with the highest yields obtained from California raisin-type grapes. Average raisin grape yield in 2000 was 25.45 metric tons per hectare while overall average yield was 20 metric tons per hectare. California has the highest grape yields, but as we discuss below there is wide variation within the state and the high-yielding San Joaquin Valley dominates total production and average yields.

Total grape production in the United States was 7.0 million metric tons in 2000. This quantity exceeded the 1999 production by 22 percent. About 92 percent of grape production is in California. A drop in total grape production in 2001 was caused, in part, by supply control measures introduced by the raisin industry in response to extremely low prices. However, most of the drop was caused by extremely low yields in California.

Figure 5 shows the distribution of the grape crush in California by region of the state. This regional breakdown is crucial to understanding the wine industry in the United States and Canada. California is divided into 17 crush districts and much of the data on grapes crushed are available for those districts. These crush districts range in grape price from the highest, Napa County on the North Coast, down to two large districts that comprise much of the Southern San Joaquin Valley. While there is heterogeneity within districts, there are also distinct differences across districts.

The San Joaquin Valley produces about 60 percent of the crush. About 25 percent of the grapes crushed in the San Joaquin Valley are table grape and raisin grape varieties (CASS, crush report), whereas almost all of the grapes crushed in other districts are wine varieties. Further, about one-third of the total crush in the San Joaquin Valley is estimated to be used for grape juice concentrate. Some of that concentrate may be used for wine, for example, blended in other states or Canada, or blended to make wine-like products, but most is used as juice.

Not only do varieties, yields, and uses of grapes differ by region, grape prices differ by region, even for the same variety. Over the decade from 1991 to 2000, the price of all grapes

used for crush in Napa County (the highest-price crush district in California) averaged about 8 times the price of grapes in the Southern San Joaquin Valley. Other districts range between these two. Lee and Sumner show that about 70 percent of the variation in California grape prices can be explained by a set of fixed effects for crush district. On average they show that, even holding constant fixed effects for variety, the price of grapes in the Southern San Joaquin Valley averaged about \$1,212 dollars per metric ton lower than the average price in Napa County. Figure 6 shows the distribution of average prices of grapes in 2000 across regions. Notice that not only are coastal prices far above those in the other regions, grape prices continued to rise in 2000 in the North Coast while they fell in other regions.

Variety is another quality factor affecting grape prices. From 1991 to 2000, the average price of Pinot Noir grapes was about seven times higher, and the average price for the more-widely planted Cabernet Sauvignon grapes was about six times higher, than the price of Thompson Seedless grapes used for crush. Lee and Sumner show that variety alone accounts for more than 50 percent of the variation in prices of grapes used for crush in California. But, given the correlation between crush district and variety, adding variety to a statistical model that already controls for district, adds only about seven percent to the explanatory power. While the popular wine-grape varieties such as Chardonnay or Merlot are grown everywhere, the low-priced varieties are only grown in significant quantities in the San Joaquin Valley districts. On average, in 2000, the prices of wine varieties were far lower in the San Joaquin Valley than on the coast. For example, the average price of Chardonnay grapes was \$2,151 per ton in Sonoma but only \$361 per ton in the Southern San Joaquin Valley. For Merlot, the average price was \$2,321 per ton in Sonoma and \$374 per ton in the Southern San Joaquin Valley (CASS, Crush Report).

Of course, there are also large variations within districts. For example, relatively small quantities of Cabernet Sauvignon in Napa sold for double the district-wide average in 2000. More surprising, prices also vary substantially in the Southern San Joaquin Valley, where most observers say the product is more homogeneous. The coefficients of variation of price in Napa and the Southern San Joaquin Valley are both about 0.45 (Lee and Sumner). Some of this price variation is likely to be explained by the timing of contracting on prices (Goodhue, Heien, Lee, and Sumner).

Figure 7 shows the growth in wine-variety grape area in California (CASS, acreage report). The story in the figure is one of remarkable growth. Area of wine grapes has doubled in the past decade. But, the regional breakdown of this growth in area of wine varieties is equally important. Figure 8, from Lee and Sumner, shows that from 1991 to 2000, the share of crush volume (for the 15 varieties that account for 90 percent of the crush) produced in the coastal districts stayed constant at about 17 percent. However, the variety distribution was anything but constant over this period. The share of crush volume comprised of the four high-priced varieties (Cabernet Sauvignon, Chardonnay, Merlot and Pinot Noir) grew from about 16 percent to about 35 percent.

The remarkable growth in the production of wine grapes seems set to continue for at least a few more years, especially in the coastal districts of California. The California Agricultural Statistics Service collects data each year on bearing and non-bearing grape area by variety and district. Notwithstanding the well-known undercount of non-bearing area, the implied growth rates in bearing area projected for the next few years are impressive. The reported non-bearing area of six major wine varieties (Cabernet Sauvignon, Chardonnay, Merlot, Pinot Noir, Sauvignon Blanc, and Zinfandel) grown in the coastal districts, was about 12,944 hectares in 1997. In 2000, non-bearing area of those varieties was 50 percent higher. In 2000, the non-bearing area was fully 30 percent of the bearing area. This suggests that the rate of growth in bearing area is likely to accelerate in the near future. In the coastal districts, growers are unlikely to pull young vineyards unless a price collapse is projected to continue, given that the stock of vines is already quite young, and investment cost of vineyard establishment is a high share of total costs. The bearing area is, therefore, expected to grow by about one-quarter over the next three years simply as a result of the maturation of existing non-bearing acreage. Furthermore, there has been more planting of reds than white wine varieties in the coastal districts. Therefore potential growth is even larger for the red varieties. For example, in 2000, the reported non-bearing area of Pinot Noir in the coastal districts was about 84 percent of bearing area. Thus, even if planting slowed to just replacement percentages, the area of Pinot Noir in the coastal districts is set to increase by about three-quarters in just a two or three-year period (CASS, Grape Acreage Report).

Unlike the coastal districts, reported non-bearing area in the Southern San Joaquin Valley declined considerably from 1997 to 2000. In 2000, reported non-bearing area was about 9 percent of bearing area. Furthermore, in the San Joaquin Valley some vineyards are being pulled. One reason for the small amounts of non-bearing area is that growers anticipated that the high-prices of the 1990s could not last. This suggests that projections of the price collapse that occurred in 2000 were evident in planting behavior a few years in advance.

The expansion in acreage in coastal districts is understandable looking at estimates of costs and returns being used in the industry. According to widely circulated budgets published by the University of California Cooperative Extension Service, the cost to establish a Chardonnay vineyard in Sonoma County in 1999 was about \$32,000 per hectare. The major categories of cost are for trellising, planting and purchase of vines. Other costs include cultural practices and overhead costs in the first two years before marketable crops are harvested. Operating costs, including such items as irrigation, pruning, fertilizer, and harvest costs, were about \$7,500 per hectare. The assumed raw land value in this example, \$35,000 per acre, is important because it affects taxes, insurance and capital recovery. The overhead including capital recovery for this vineyard is estimated to be about \$15,500 per hectare for a total production cost of \$23,000 per hectare. Returns are estimated in 1999 as 16 metric tons per hectare at \$1,900 per ton for total revenue of \$30,000 per hectare (Smith, Klonsky and Livingston). Thus, data circulated by the University of California suggested net revenue of about \$7,000 per acre above a normal return on capital and management.

Another supply variable has been disease. Since 1980 there have been two major pest insects to the California winegrape industry. In the 1980s the popular AxR1 rootstock began to succumb to attack by phylloxera. The infestation was found mainly in the North Coast, and the San Joaquin Valley. About 60 to 70 percent of the vineyard area in Napa and Sonoma was to be replanted because of phylloxera (Sullivan). In the 1990s, a second major pest threat entered. Pierce's Disease has been in California for many years without causing widespread concern. Pierce's Disease can kill a vine in two years, but, until recently, infestations were relatively minor and the spread was slow. Nowadays, however, a new insect vector, the glassy-winged sharpshooter is spreading the disease much more rapidly than before. Pierce's

Disease has spread widely in Southern California, but has so far affected less than one percent of the state's winegrape acres. The response has been to institute massive eradication and control measures to keep the pest contained and to fund substantial new research on an emergency basis to find an effective biological control to eliminate the insect. So far, there are several promising leads but no effective solution has been found.

3.2 Wine Production and Sales

Wine flows from grapes and transport costs for grapes or must are high. Therefore, most of the wine production in the United States and Canada occurs in California where the grape are grown. Although almost every state in the United States now boasts of local wineries, these are generally relatively few and with one or two exceptions invariably tiny, with a focus on direct retail sales to local tourists. The main exceptions are in Washington, Oregon, and New York. There are about 2,000 wineries in the United States with about 850 in California. The numbers outside California have grown remarkably. There are now 122 wineries in Oregon, 153 in New York, and more than 170 in Washington compared with just 19 in Washington 20 years ago. Despite many wineries in other states and in Canada, about 90 percent of the wine produced in the United States and Canada is produced in California and that share has been gradually growing.

Wine production tends to follow broad movements in production of grapes although this is complicated by the multiple uses of the lower-priced grapes. Wine production in the United States and Canada grew rapidly since the early 1990s after falling from 1986 to 1994. Wine production grew from 16.3 million hl in 1990 to 21.1 million hl in 1999—a 20 percent increase. The peak in wine production in the 1990s was the large harvest year of 1997.

Total wine production in the United States expanded with the large grape harvest of 2000 (Figure 9). Canada's production was 371,000 hl in 1999 (the last year available) well down from the peak of about 542,000 hl in 1988 (Anderson and Norman).

The California wine industry is comprised of a handful of relatively large firms, another couple of dozen firms that produce and market widely in the domestic and international markets and several hundred wineries that produce mainly for the local market or for small national or international clientele. About 25 firms produce about 90 percent of the wine. About one-half of the wineries in California are in Napa and Sonoma counties, with

most of the rest scattered throughout the coastal counties. The Central Valley, which produces most of the grapes, has some very large wineries, but comparatively few small wineries. Some larger firms produce and market under several winery-label names and may produce wines in several organizations managed somewhat separately from the corporate parent firm. Thus, there are more wine labels in the market than actual wineries

Gallo is by far the largest winery in the United States or Canada, producing about 6.3 million hectoliters of wine, about one third of the total wine volume in California. Gallo produces and markets under many different label names and across the whole range of prices and qualities. The firm, headquartered in Modesto and with a long tradition in so-called jug wines, is established as the dominant player in the San Joaquin Valley. It is also a major producer of mid-priced varietal wines from grapes produced in coastal districts, and Gallo of Sonoma, the high-end label, has established itself as a significant producer of high-priced wines that sell for \$25 per 750 ml bottle, and more.

Most wine producers in the United States and Canada also grow grapes, but the typical large winery buys most of the grapes it uses. The converse is also not uncommon. Some large grape growers operate a small winery, but sell most of their grapes. The typical situation is for a winery to establish a contract with growers each year with the understanding that, subject to some quality rules, the winery will accept all of the grapes produced on the designated farm and the farmer will deliver all of their grapes to the winery (Goodhue, Heien, Lee and Sumner).

In recent years exports have become important. As discussed above, both Canada and the United States are net importers of wine from the rest of the world, especially Europe. However, from 1990 to 2000 there has been a rapid expansion of exports of wine from California to Canada, but also from the United States to the rest of the world. Wine export value has grown each year for the past decade and in 2000 totaled about \$560 million dollars (U.S. Dept of Commerce, National Trade Data Bank). The major destinations are Canada, Japan, and the United Kingdom, but significant shipments are also made to the Netherlands, Switzerland, Germany, and Belgium.

One important characteristic of the export situation is the low export unit value of wine exports relative to the unit value of imports. In 2000, the average U.S. wine export unit

value was only \$1.87 per liter. We do not have good data on comparable wholesale-level prices for wine sold domestically. If the wholesale price is generally about half the retail price, then using the data in Figure 2, the implied wholesale price in 2000 was about \$4.50. One way to account for this difference is if the exports are of wine with fewer marketing services applied, so that the domestic wholesale price is simply not the right comparison – for example, if a significant share of wine exports is of bulk wine prior even to bottling and labeling. If the stage in the marketing chain is comparable between wholesale and export port values, however, the low export unit value suggests that export trade is heavily weighted to lower-priced wines relative to domestic consumption.

4. Projections

The winegrape and wine industry in the United States and Canada faces a number of current issues that will determine its evolution in the near future. We will explore these briefly.

There was a massive increase in area of grapes available for crush in the 1990s. Most of that increase was in high-end wine varieties (such as Chardonnay, Merlot and Cabernet Sauvignon) planted in the San Joaquin Valley. These grapes and the wines they produce do not receive high prices relative to the same varieties grown on the coast (or in premium areas of Oregon or Washington State). However, they have received substantially higher prices than Thompson Seedless grapes that are also grown for crush in the same region. Vineyards that were planted early enough in the 1990s were able to capitalize on the relatively high prices in the latter part of the decade and probably already recouped the cost of vineyard establishment. More recent vineyard plantings will almost surely have a difficult time showing much return on the sizable capital investment in vineyard establishment (even though these costs are much lower and yields much higher in the San Joaquin Valley than in the Sonoma County example provided above). Low yields per hectare in 1998 and 1999 shielded the industry from the full implications of this area increase, but the large crop in 2000 caused grape prices in the San Joaquin Valley to decline by more than 50 percent from 1999 to 2000. Beginning wine inventories going into the 2001 season added to available supply and although yields were down in 2001, prices reported were lower yet in 2001 than in

2000 and, in some cases, vineyards were left unharvested. This collapse was at least partially anticipated, and so the net increase in wine grape area in the San Joaquin Valley stopped a few years ago.

There has also been a rapid expansion of wine grape planting in the coastal districts. Average yields are lower and establishment and production costs are higher in coastal districts, but grape prices have been much higher. For the 2001 harvest, prices in the medium-quality or medium-reputation regions in coastal districts were lower than in recent years. This is especially true for Chardonnay, the most important variety in the Central Coast and the most important white wine grape in the state. This price decline occurred despite the fact that yields were down in coastal districts in 2001. Planting of Chardonnay slowed in the later 1990s and much of the new coastal wine grape area is in red grapes, but that generalization is less true in the Central Coast counties (Monterey, San Luis Obispo, and Santa Barbara, for example) that have developed a reputation for quality Chardonnay grapes. And, given the large amount of non-bearing vineyard area in coastal districts, further price declines seem likely, at least outside the extreme high-price regions of Napa and Sonoma Counties. The result is serious income pressure on some vineyards. The data are not yet available to see how large are the land price effects of the grape price decline.

The wine grape area in Napa and Sonoma counties also has expanded rapidly and, based on the high proportion of non-bearing area, the expansion of production will accelerate in the next few years. Of course, this expansion is not in the core high-quality areas. For example in specific American Viticultural Areas such as Howell Mountain, Spring Mountain and some on the floor of Napa Valley there is no room for expansion. Rather, the expansion has been on steeper slopes and in outlying areas of the Napa and Sonoma counties, where costs may be higher and reputations for quality are not yet established. Yield per hectare has also increased as new vines are being planted at closer spacing and with newer trellising systems that economize on expensive vineyard land. Prices of wine grapes in the premium-price region have so-far remained immune to the glut facing the rest of the industry. For this to continue requires that the market for premium wine grapes be distinct from that for the lower-priced grapes and that demand for the premium grapes will continue to expand rapidly (discussed below). Industry practice and recent price movements suggest that wine demand

does seem to be segmented by quality, which is associated mainly with where the grapes are produced. Under this hypothesis, there is relatively little substitution between wine grapes grown in different geographically-based quality segments of the market.

For 2001, crop yields were down significantly in the North Coast, so production may be down from 2000, despite an increase in bearing area. Our expectation is that prices for premium grapes have avoided the collapse experienced by the other parts of the industry, but that rapid price increases of the recent past may have ended. Further, given forward pricing provisions in contracts, it may take a couple of years before the most recent supply and demand conditions are fully reflected in average prices.

Against these forces for expansion of production are concerns about Pierce's Disease. The newly arrived glassy winged sharpshooter is a much more effective vector for the disease than the native sharpshooter and knowledgeable specialists are taking the threat to productivity of the grape industry very seriously. If this infestation were to carry forward unabated for the next few years in its move northward, the total size of the wine grape harvest could be seriously affected. This would raise prices, but that would come at the cost of substantial capital losses for many growers. Growers also face many other costs that have been rising, notably higher wage rates, as hired farm labor supply tightens, and additional regulations on pesticide use.

The outlook for the demand side of the wine industry is equally complex. At the low-price end of the spectrum, grape juice that might be used for wine competes with apple juice and other sources of liquid sweeteners. These uses include drinks with and without alcohol content. This market for grapes as a food and beverage ingredient is huge, but only at very low prices that may not be much more than the cost of harvest. This market for grape juice concentrate is international, so supply conditions in Argentina, Brazil and other countries also affect prices in the United States. The grape-juice concentrate market provides no relevant demand support for higher-quality wine grape varieties (Chardonnay, Merlot etc.) even with the high yields and relatively low costs in the Southern San Joaquin Valley. If yields are normal, this part of the industry now faces a painful adjustment while demand growth catches up with the planting that occurred in the 1990s.

A recession began in the United States in March 2001. Increases in per capita consumption continue to be tiny and the quality upgrading that accompanies a maturing consumption base or income growth is hard to sustain, especially at relatively high wine prices. Further, consumption of high-end wine relies on the upper tail of the income and wealth distribution. This group did quite well relative to median incomes for two decades and was a major beneficiary of the stock market boom in the 1990s. Stock market growth has reversed and certain sectors with high average salaries (e.g. high tech) have contracted recently. Thus, the short-term demand prospects are not strong even at the upper end of the quality spectrum. Terrorist attacks on September 11, 2001 were a particular shock to the wine industry, which is income-sensitive and relies on consumption away from home, including travel and tourism. Of course, data are limited, but early reports indicate a sizable downward shift in consumption, at least in the short-run.

The other demand variables that are important in the United States and Canada relate to the regional and ethnic distribution of wine consumption. Wine consumers tend to be more urban or suburban, more from European immigrant populations, and more in the West Coast and North East than in the South or the Central regions of the country. Therefore, wine demand growth depends in part on growth in the upper tail of the distribution of incomes and wealth in the wine consuming regions and populations. The rapid growth in Asian and Latin American immigrant populations has not contributed much to wine consumption.

Of course, the relatively low per capita consumption of wine in the United States and Canada may also be seen as a great opportunity for potential demand expansion. It is certainly possible that favorable health news or some other demand shock could increase the demand for wine dramatically. The wine industry still spends relatively little on promotion compared with beer or soft drinks, and it is possible that some promotional effort that has not yet been tried could pay large dividends.

Import competition is another important demand factor. Canada continues to import most of its wine consumption from outside North America and thus there is potential for U.S. exports to grow by successfully displacing European wine in Canada. However, New World imports, especially from Chile and Australia are a growing force in the market for wine in the

United States and Canada. The strong U.S. dollar has recently tended to make U.S. wine expensive relative to wines from elsewhere.

Export market growth, which has been important for a decade, also slowed in 2000. Part of export growth has relied on non-traditional wine markets such as in Asia, but the Asian financial crisis and lack of income growth in Japan have added to the difficulty of marketing there. The ability to expand by competing directly with European wines in their established markets such as Great Britain has also been important. The difficulty with that in the near future is compounded by a strong U.S. dollar and competition from the other New World wines.

The wine industry itself is also evolving with a continued presence of hundreds of small and medium-sized wineries and thousands of grape growers along with a handful of large wineries. Winery tourism is a major contributor for smaller wineries, especially those located in scenic areas or convenient to population centers. Corporate ownership of larger wineries shifts occasionally, with international connections across the industry coming and going. The constant in the California industry in the important role of Gallo as by far the largest player, one that continues to be important in all segments and quality categories. The corporate ownership of other large firms shifts from time to time, and the relative fortunes of wineries adjust. None of this has been a major force for change in the past decade and there seem to be no major shifts on the horizon.

The wine and winegrape industry in the United States and Canada seem to be facing a challenging period over the next few years. Supply growth will continue while demand growth will be harder to sustain. The industry is differentiated, so some growers and wineries may do quite well, but it is hard to see an easy road in the near term for the whole sector. Over a longer horizon, there is no question that there is a large amount of land, capital and human capital in the United States and Canada that is well suited to the production of both high-quality, high-priced wine in some places (such as the coastal districts of California or Oregon and Washington) and lower-priced, everyday wine in other places (such as the Central Valley of California). The industry is well positioned to compete in the long-term; both in the domestic market and in a growing export market.

Table 1. Wine Consumption in the United States, by Type and Source, 1950-1999

Year	U.S. Consumption			From the U.S.		From California	
	Liter / capita	'000 hl	% Table Wine	'000 hl	%	'000 hl	%
1950	3.52	5,299	26	5,148	97	4,542	85
1960	3.44	6,170	36	5,791	93	4,883	79
1970	4.96	10,106	50	8,970	87	7,343	73
1980	7.99	18,168	75	14,156	78	12,490	69
1990	7.76	19,266	83	15,935	83	14,270	74
1999	7.60	20,859	88	16,697	80	15,017	72

Source: Hutchinson, 1969 (Wine Institute, *Annual Wine Industry Statistical Surveys*. Annual Issues); Wine Institute website, *Key Facts*, 7/31/01; *US Wine Market Impact Databank Review and Forecast* 1990 and 1998 Editions; USDA (ERS); and [Anderson and Norman](#).

Table 2. Wine Consumption in the United States and Canada, 1988-1999

Year	Consumption (‘000 hl)	Per Capita Consumption (liters)	Wine’s Share of alcohol Consumption %
1988	23,326	8.6	14.0
1989	22,222	8.1	13.5
1990	21,630	7.8	13.0
1991	20,008	7.1	12.6
1992	20,288	7.2	12.7
1993	19,039	6.6	12.2
1994	19,341	6.7	12.4
1995	19,038	6.5	12.3
1996	22,479	7.6	14.1
1997	22,399	7.5	14.0
1998	23,103	7.7	14.3
1999	23,405	7.7	14.3

Source: Anderson and Norman.

Table 3. Non-Bearing Area as a Percentage of Bearing Area for Grape Crush in California 1997 and 2000

(By variety, by region)

Region	Year	All Varieties	All Wine	White Wine	Chardonnay	Red Wine	Cabernet Sauvignon
- percentages -							
California	2000	12.0	19.2	11.1	15.9	25.9	44.3
	1997	14.3	23.8	17.4	36.1	30.1	32.4
South San Joaquin ¹	2000	4.7	9.3	2.4	15.3	16.7	23.6
	1997	5.7	14.9	8.2	165.6	22.8	462.8
North Valley ²	2000	17.6	18.4	14.0	12.6	20.6	40.0
	1997	37.1	41.3	35.1	54.0	43.3	52.5
Central Coast ³	2000	31.1	31.2	18.1	17.7	48.3	46.6
	1997	28.9	29.0	22.8	28.5	38.6	18.3
North Coast ⁴	2000	29.6	29.6	19.4	19.1	35.0	43.0
	1997	23.6	23.6	17.7	16.6	27.8	21.5

Source: CASS, grape acreage reports 2000 and 1997

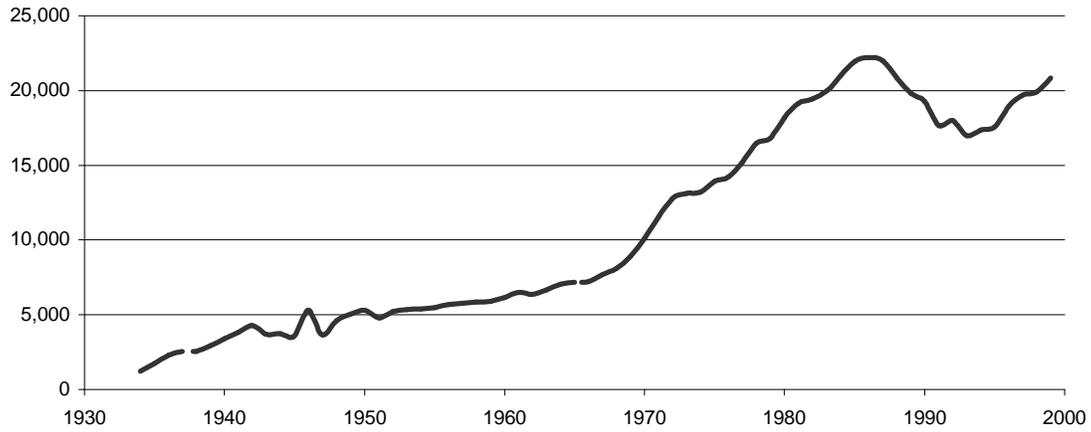
1/ corresponds to district 13

2/ corresponds to district 11

3/ corresponds to districts 6, 7 and 8

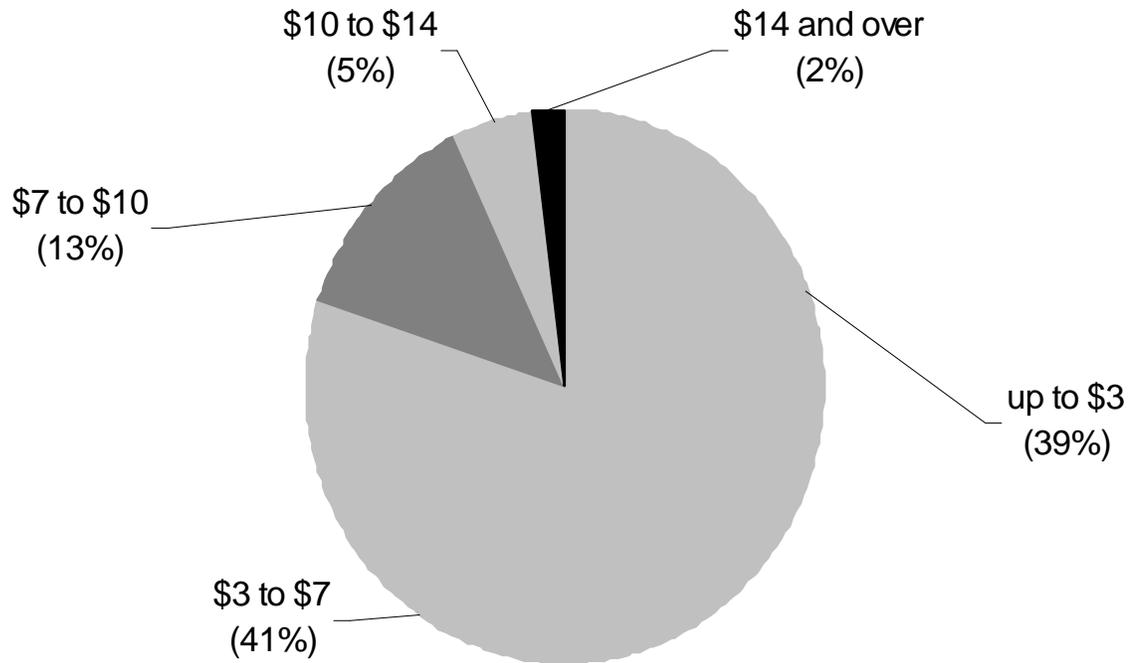
4/ corresponds to districts 3 and 4

Figure 1. Wine Consumption in the United States, 1934-1999
(Thousands of Hectoliters)



Source: Wine Institute, Key Facts (website)

Figure 2. U.S. Consumer Purchases of Table Wine in Food Stores in 2000
(Volume shares)

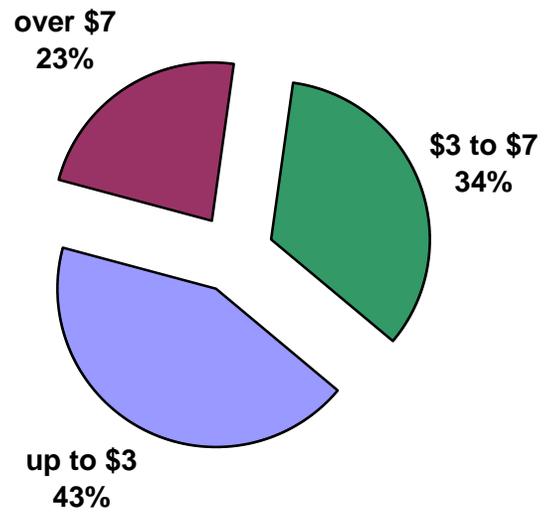
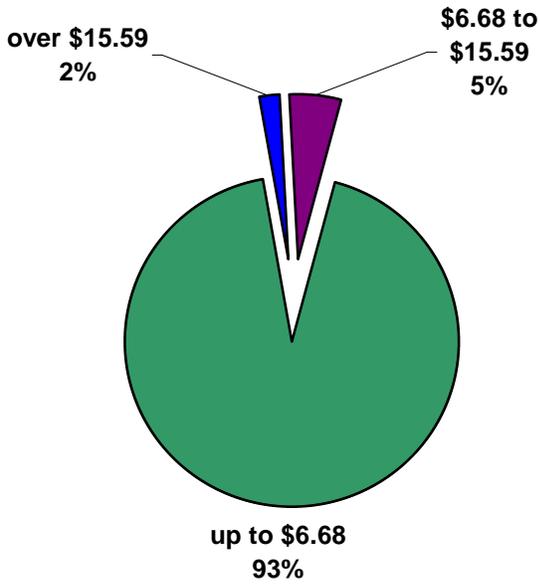


Source: Wine Institute, Key Facts (based on ACNielsen/Adams 2000 survey).

Figure 3. California Table Wine Shipments by Price Category¹
(Volume shares)

In 1980

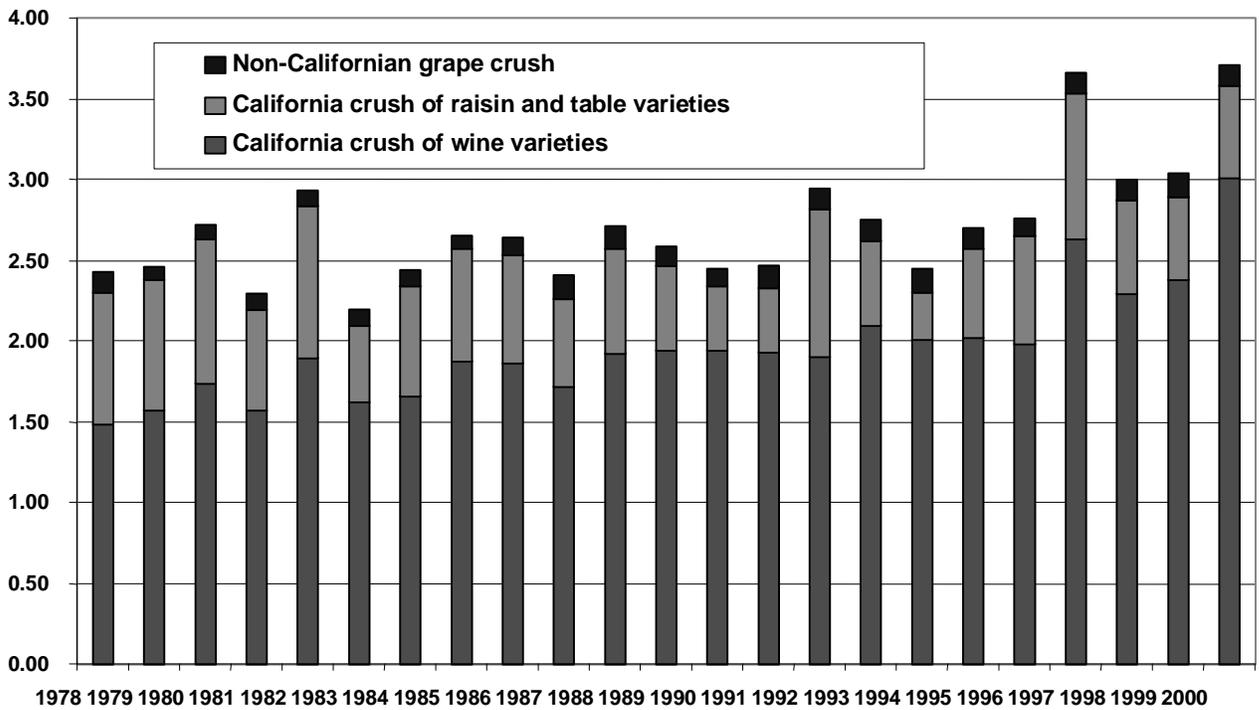
In 1999



Source: Gomberg (volume shares) and Bureau of Census (CPI).

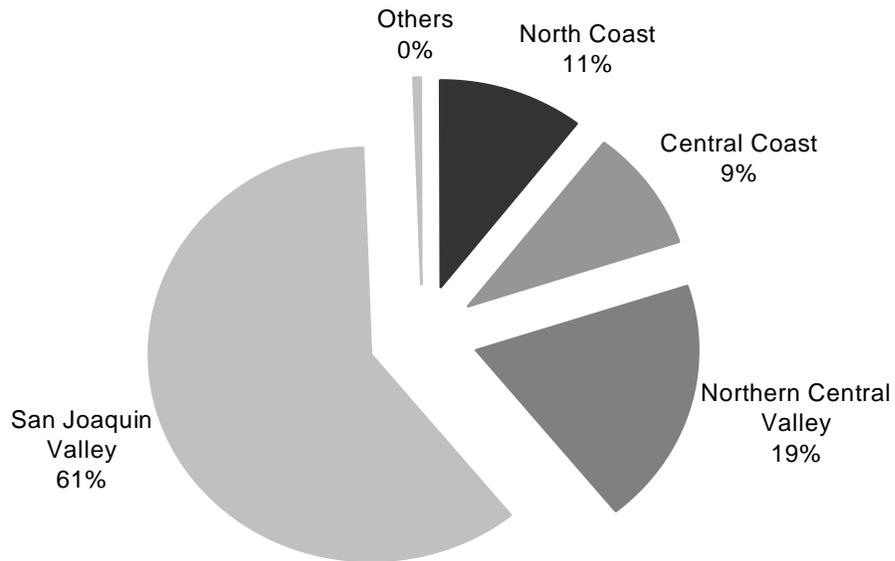
1. The price categories are deflated by the Consumer Price Index (CPI) based on 1999 U.S. dollars.

Figure 4. U.S. and California Grape Crush, 1977-2000
 (Millions of metric tons)



Source: Wine Institute and CDFA.

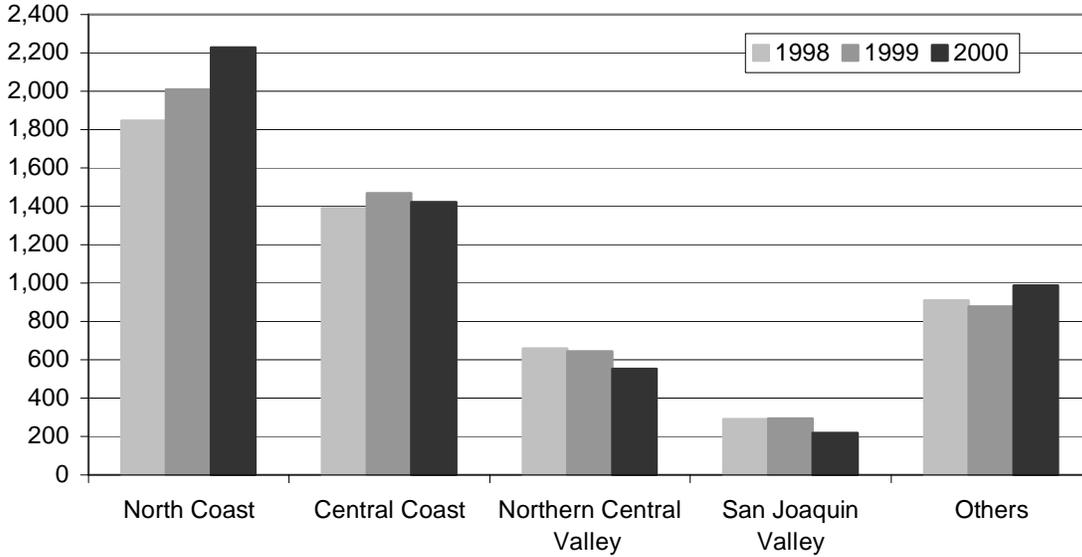
Figure 5. Regional Distribution of Grape Crush within California in 2000¹



Source: CDFA/CASS, Grape Crush Report, 2001

1. The districts 12, 13 and 14 define the region San Joaquin Valley. The districts 1, 2, 3, 4 and 5 define the region North Coast. The districts 6, 7 and 8 define the region Central Coast. The districts 9, 10, 11 and 17 define the region Northern Central Valley. “Others” is the region defined by the districts 15 and 16. Total = 2,900,000 metric tons.

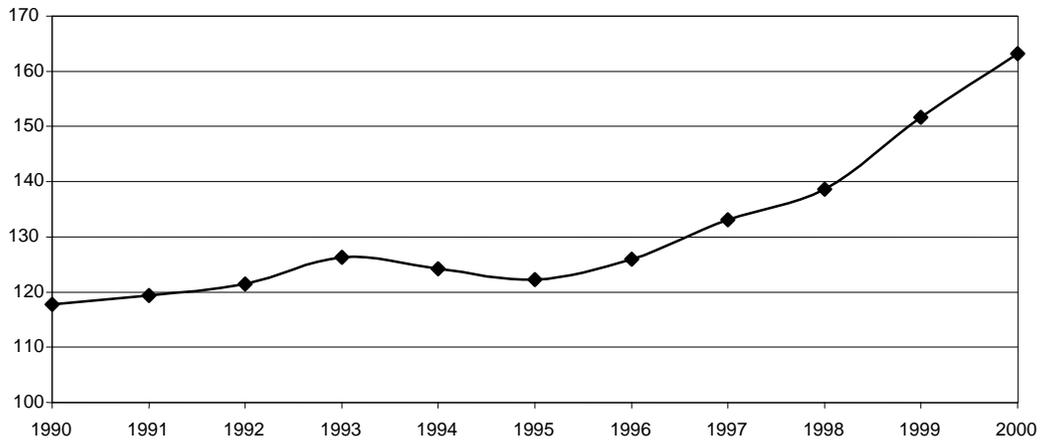
Figure 6. Average Price of Crushed Grapes in California by Region, 1998-2000¹
(Dollars per Ton)



Source: CDFA/CASS, Grape Crush Report, 2001.

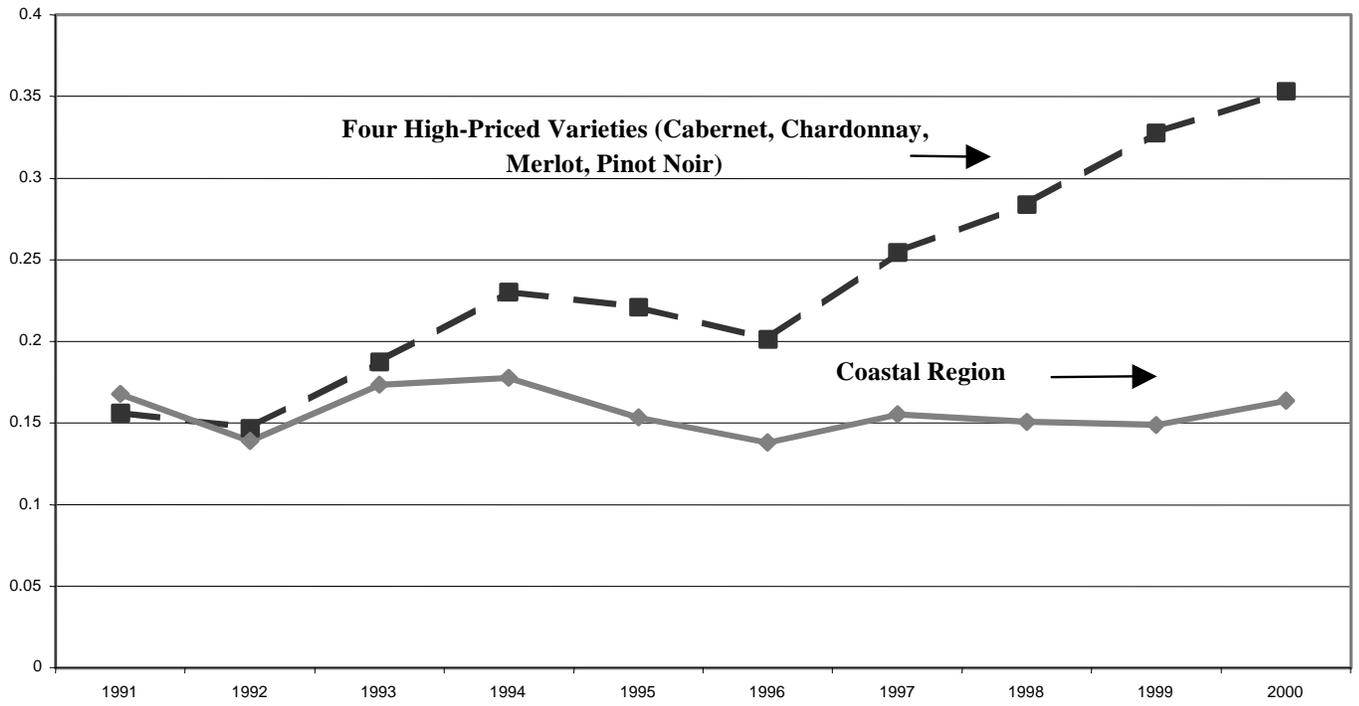
¹ The districts 12, 13 and 14 define the region San Joaquin Valley. The districts 1, 2, 3, 4 and 5 define the region North Coast. The districts 6, 7 and 8 define the region Central Coast. The districts 9, 10, 11 and 17 define the region Northern Central Valley. "Others" is the region defined by the districts 15 and 16.

Figure 7. California Bearing Area of Wine-type Grapes, 1990 - 2000
(Thousand hectares)



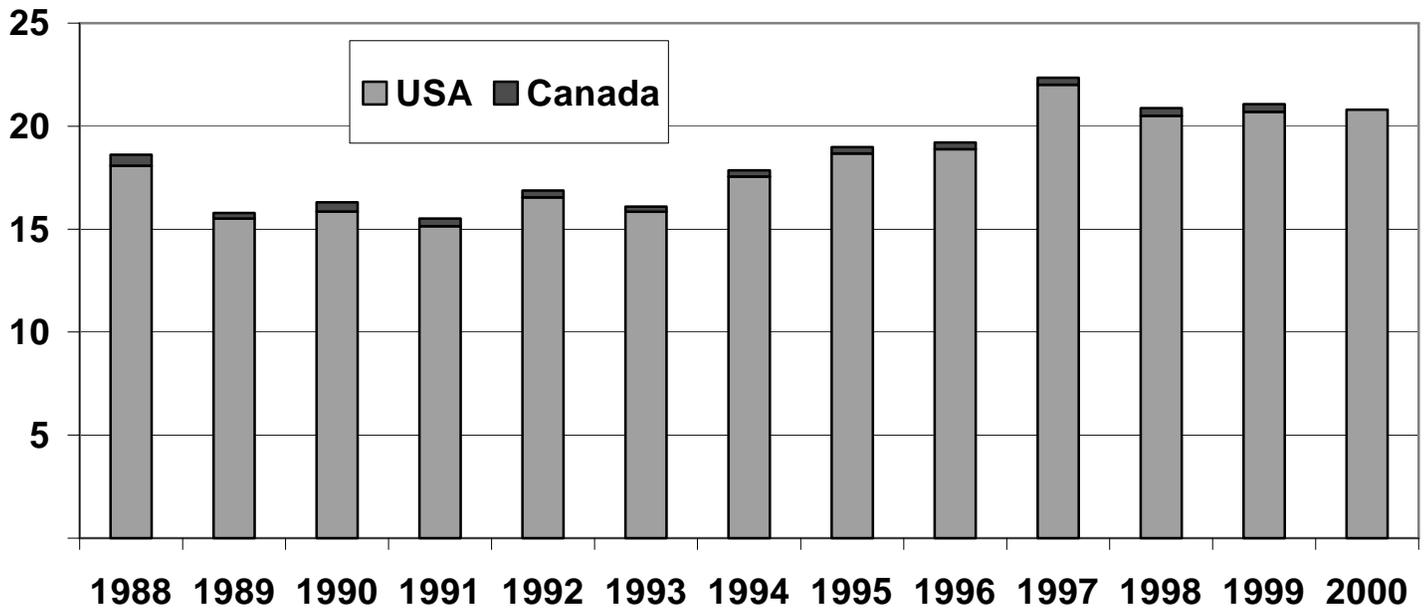
Source: Wine Institute (CDFA/CASS Grape Acreage Report, various years)

Figure 8. Volume Shares: High-Priced Varieties and Coastal Region



Source: Lee and Sumner, from CDFR, CASS Grape Crush Report, various years

Figure 9. Wine Production in the United States and Canada, 1988 –2000
(Thousands of Hectoliters)



Note: Data for Canada are not available for 2000.

Source: Anderson and Norman.

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