

STONEBRIDGE

STRATEGIC SOLUTIONS FOR THE WINE INDUSTRY

The Economic Impact of Napa County's Wine and Grapes, 2016

Prepared for Napa Valley Vintners

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A STONEBRIDGE RESEARCH REPORT

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HIGHLIGHTS

FULL 2016 ECONOMIC IMPACT OF NAPA COUNTY WINE

\$9.4 billion in Napa County

\$17.3 billion Total California

\$33.5 billion Total US

	NAPA COUNTY	TOTAL CALIFORNIA	TOTAL US
Total Impact	\$ 9,413,941,283	\$ 17,279,358,445	\$33,537,820,04
Winery Revenue, 2016	\$ 2,997,395,360	\$ 3,801,721,026	N.A.
Winery Direct Sales, ††	\$ 1,136,793,229	N.A.	N.A.
Napa Appellation Wine Crushed, 2016 (Gallons)†	17,548,254	22,497,762	N.A.
Total Retail Sales Value of Napa Appellation Wine sold 3-Tier, 2016	\$ 30,736,471	\$ 1,296,312,393	\$6,955,254,578
Total Napa-Related-Wine Produced/ Crushed (Gallons), 2016†	44,024,080	48,973,587.2	N.A.
Total Retail Sales Value of all Napa County Related wine, sold 3-Tier, 2016	\$ 51,796,253	\$ 1,600,927,108	\$9,082,386,652
Total Retail Sales Value of all wine made in Napa County, sold 3-Tier, 2016	\$ 38,595,366	\$ 1,592,507,816	\$9,082,386,652
Number of Napa Vineyards	2081*	N.A.**	N.A.**
Napa Vineyard Acreage	43,449	N.A.**	N.A.**
Napa Grape Crop Size (Tons)	153,046	N.A.**	N.A.**
Value of Napa Grape Crop/Vineyard Revenue	\$ 729,507,300	N.A.**	N.A.**
Full-time Equivalent Jobs	43,979	75,127	188,552
Wages Generated Directly by Napa's Wineries	\$ 702,008,970	N.A.	N.A.
Wages Generated Indirectly by Napa's Wine Industry	\$ 1,592,094,758	N.A.	N.A.
Local Taxes Paid	\$ 106,342,390	N.A.	N.A.
State & Federal Taxes Paid	\$ 1,368,996,865	\$ 2,970,492,063	\$4,512,689,699
Charitable Contributions	\$ 63,000,000	N.A.	N.A.

Sources: Stonebridge Research, California NASS, US Bureau of Labor Statistics, Napa County Agricultural Commissioner, industry interviews. Destination Analysts, Inc. 2016 "Visitor Profile" prepared for Visit Napa Valley. *Total vineyard permits. Not all are commercial growers. Growers may own multiple sites. ** We did not attempt the estimate the number of non-Napa vineyards growing grapes for non-appellation wine processed in Napa. + TTB provided total of reporting wineries in 2016. † TTB and Industry ††We did not attempt to estimate the share of Napa-related DTC for non-Napa wineries.

TABLE 1: TOTAL ECONOMIC IMPACT OF NAPA COUNTY'S WINE AND GRAPES, 2016

	IN NAPA COUNTY	TOTAL CALIFORNIA	TOTAL US
REVENUE			
WINERY 3 TIER AND EXPORT REVENUE	\$ 2,950,386,916	\$ 3,754,712,539	\$ 3,754,712,539
WINERY DIRECT SALES	\$ 1,136,793,229	\$ 1,136,793,229	\$ 1,136,793,229
WINE GRAPE SALES	\$ 729,507,300	\$ 949,558,587	\$ 949,558,587
TOTAL DIRECT IMPACT	\$ 4,816,687,445	\$ 5,841,064,355	\$ 5,841,064,355
DISTRIBUTOR MARKUP (all Napa related wine)	\$ 6,245,980	\$ 181,332,368	\$ 1,044,624,910
RETAIL/RESTAURANT MARKUP (all napa related wine)	\$ 19,970,211	\$ 811,619,501	\$ 4,418,954,127
TOURISM	\$ 1,007,106,063	\$ 1,007,106,063	\$ 1,007,106,063
SUPPLIERS (including vineyard suppliers and development)	\$ 986,730,519	\$ 1,895,405,354	\$ 1,983,089,539
PROFESSIONAL SERVICES, EDUCATION & ASSOCIATIONS	\$ 4,242,655	\$ 591,592,783	\$ 808,342,066
CHARITABLE CONTRIBUTIONS (not paid out of Winery Revenue)	\$ 25,400,000	\$ 25,400,000	\$ 25,400,000
TAX REVENUES - STATE AND LOCAL (Not paid out of winery revenue)	\$ 78,214,524	\$ 78,214,524	\$ 78,214,524
TOTAL INDIRECT REVENUE	\$ 2,127,909,953	\$ 4,590,670,593	\$ 9,365,731,229
INDIRECT (IMPLAN)	\$ 1,222,056,350	\$ 3,615,170,182	\$ 8,220,782,180
INDUCED (IMPLAN)	\$ 1,247,287,534	\$ 3,232,453,315	\$ 10,110,242,279
TOTAL IMPACT	\$ 9,413,941,283	\$ 17,279,358,445	\$ 33,537,820,043

Source: IMPLAN, Stonebridge Research, US Bureau of Labor Statistics, California NASS, TTB, DtC Shipping Report and industry interviews

Executive Summary

Napa Valley's reputation as the home of many of America's most admired wines continues to grow, as do the sales of its wines. As one of the founding regions for California's fine wine, Napa Valley also continues to be home to much of California's wine sector — a role it has played for more than a century. Napa Valley's wine industry faces a variety of challenges which need to be resolved if it is to maintain its pre-eminent role in American wine.

This scale of wine activities in Napa County is reflected in its economic impact. Using a more rigorous measure of total economic impact, focused primarily on output ("revenue" in Table 1), Napa Valley's wine industry had, in 2016, **a total economic impact of more than \$9.4 billion on Napa County's economy, \$17.3 billion on the California economy and \$33.5 billion on the American economy, as detailed in Table 1 above.** We explain this improved metric below, and show how using this metric would have affected results in the previous study of the economic impact of Napa's wine and grapes, in 2012.

Napa's wine industry generates long-term, stable jobs, paying attractive salaries. The average compensation of workers employed in Napa's wineries in 2016 was **\$66,365**. The average compensation generated indirectly, by the many suppliers and service providers as well as other indirect and induced jobs in Napa, as shown in Tables 6 and 7 below, was **\$52,178** in 2016.

In 2016, all wine produced in Napa County, whether Napa County grown or grown elsewhere and processed in Napa County¹, represented 6.5²% of all the wines produced in California and 5.5% of all the wine produced in the United States, according to data provided by the Alcohol and Tobacco Tax and Trade Bureau of the US Treasury Department (TTB). The TTB defines wine as "gallons of fruit³ fermented," rather than cases of finished grape wine.

Sales of all wine produced in the county, regardless of where it was grown, accounted for **24% of the total retail value of all the California wine sold in 2016 and 7.8% of the volume of all California wine sold in 2016.**⁴ All *Napa County related wines* (including wine produced in Napa County, as defined above, plus wine made from grapes grown in Napa Valley but processed elsewhere) accounted for **30.8%** of the total retail value of all California wine sold in 2016 and **8.9%** of the volume of all California wines. By comparison, in 2012, Napa County wine accounted for 52% of the total retail value of all the California wine sold in the US, and 26.8% of the volume of all such wines. This decline is primarily attributable to three factors, one a statistical adjustment, one a long-term market trend and the third a possibly fundamental trend in winemaking practice:

¹ For this report, wine produced in Napa County includes wine grown, blended, bottled or removed from bond (bonded warehouses) within Napa County plus Napa Valley appellation wines produced in other parts of California.

² See Table 2, Page 11. When comparing 2016 wine production and 2016 wine sales, note that wine sold in 2016 included wine produced in 2012-2015.

³ Only an incidental amount of non-grape wine, if any, is produced in Napa County.

⁴ See Table 3 below for data related to this paragraph.

- The source for the estimate of total California wine production and sales is the annual release by the Wine Institute of data prepared for them by the Gomberg-Fredrikson firm. The new proprietors of the firm revised the “value” calculation for total California wine sales to better reflect the market value for California’s wine sold in all channels.
- Another factor underlying the decline in Napa Valley’s share of the value of California’s wine production is the continuing premiumization of wines across all regions and segments of California, driving improved quality and rising prices, as the low end of the market has been declining for years.
- The third factor underlying Napa Valley’s smaller share of the value of California’s total wine production raises more concerns, as it reflects the growing volume of Napa Valley grapes (as grapes or bulk juice) being moved out of the county to be made into wine in other California regions. While a small amount of such grapes have long left the County, it is now estimated that as much as 22%⁵ of Napa Valley grapes travel elsewhere. Several of the producers who helped built the reputation of Napa Valley’s wine have expanded elsewhere to accommodate their successful businesses. Other California fine wine regions have also increased their total wine production.

This third update of the economic impact of Napa County wine and grapes is distinguished from the previous studies by:

- Correcting the presentation of economic impact of the wine and grape industry from one that adds together revenue and wages to a more narrowly defined “total revenue,” plus some elements of tax and charitable contributions, as shown in Table 1.
- The inclusion of wine produced outside of Napa County from grapes grown in Napa County, an increasingly important element of Napa Valley’s wine activities, as noted above.
- Continued growth in the range and depth of the suppliers and service providers to the industry, as discussed below.
- Extensive customization of the IMPLAN model, which estimates the indirect and induced impacts, as explained below, to increase accuracy and ensure no inputs or impacts are double counted in this analysis.
- This study is consequently the most accurate and comprehensive economic impact study ever conducted of this industry.

⁵ A consensus estimate from interviews with leading grape and wine brokers and a variety of Napa Valley’s larger grape growers.

A Note on the Data and Analysis

IMPLAN is the acronym for “**IM** pact analysis for **PLAN**ing.” **IMPLAN** is a well established and widely used economic model that uses input-output analyses and tables for over 500 industries to estimate regional and industry-specific economic impacts of a specific industry.

Analytical Approach

The best way to understand how we approach this analysis is, to recall some principles of Economics 101. Essentially we build the economic production function for the Napa County related wine industry; in fact, we build five separate production models:

- Napa Valley appellation wine produced in Napa County;
- Napa Valley appellation wine produced outside Napa County;
- Non-Napa-Valley appellation wine produced in Napa County;
- Wine bottled in Napa County; and
- Wine Removed from Bond (wine sales delivered from bonded warehouses) in Napa County.

We then trace, to the extent possible, materials, employment and spending, for each element in the production and sale process and whether it was accrued in Napa County, in other parts of California or in other parts of the US.

These “direct impact” data are then fed into the IMPLAN model, described below, which then calculates the indirect and induced impacts of these economic activities.

A criticism offered of this approach is that the IMPLAN model already fully accounts for all such direct impacts and thus these data duplicate IMPLAN’s findings, suggesting that the only direct data that needed to be fed into IMPLAN are total either winery employment or total winery sales value.

However, discussion with IMPLAN, and review of its findings, as described below, indicate that IMPLAN does not fully account for the full operation of the industry, especially at the county level. The IMPLAN staff therefore recommended that analysts customize the model to reflect the specific industry being considered.

The wine and wine grape industry is a relatively small segment of the US economy. IMPLAN cannot be expected to fully investigate its economic production function, nor that of many other smaller sectors, particularly within each region. Moreover, to a degree often missed by observers of the wine industry, the economic structure of the wine and wine grape industry varies enormously among producing regions.

Among the many examples:

- Wine grape growing in Napa County uses primarily skilled manual labor, with labor rates ranging up \$22 per hour or more, with minimal mechanization, while areas in California’s Central Valley are predominantly mechanized, using vastly less labor, less skilled labor, with labor rates averaging \$14 per hour or less.

- Wine grape yields range from 2 to 4 tons per acre on average in Napa County compared with 6 to 7 tons per acre in the Lodi District and far higher yields further south in California's Central Valley.
- Wine grape prices per ton vary from an average of \$4,768 in Napa County to \$423 in Merced County. Cabernet grape prices in Napa County averaged \$6,830 in 2016, \$2,962 in Sonoma County and \$654 in the Lodi District.

The Customization Process

Stonebridge Research worked with the IMPLAN team to identify and resolve possible data issues, including double counting. To further ensure reliability and accuracy of the resulting analysis, Stonebridge and Napa Valley Vintners sought peer review of the analysis and methodology from the Economics and Country Risk Group of IHS-Markit, a leading source of economic advisory services, with decades of experience in economic impact studies and economic modeling. A short profile of IHS Markit, and its Economics and Country Risk group, is provided on page 27.

Reviewing IMPLAN's models with these advisors, Stonebridge identified several key issues and anomalies in IMPLAN's wine, grape and county-level data:

First, IMPLAN models draw their data from the US Bureau of Economic Analysis (B.E.A.) national input-output benchmarks.

- The more detailed level of such benchmarks — such as alcohol beverages within the 'agriculture benchmark' — were last updated in 2007. Local production practices since then have changed, given market, labor and input cost trends.
- IMPLAN then uses public information from B.E.A. and the 2012 National Agriculture Census to translate these national data to state-level data.
- We at first assumed that, having developed state level data from a fairly thorough examination of relevant data bases, IMPLAN further adjusted these data to estimate county level data. Unfortunately, as described below, we found that national averages (in broad product categories) were generally used in the county level data as well.

There are two key data structures underlying IMPLAN's models: "Study Area Data," which estimate the total value of local production and employment by sector for each region, and "Trade Flows" which estimate how much of each product is locally consumed (RPC, or Regional Production Coefficient) or sourced elsewhere.

Napa County Model

Examination of these data for Napa County found multiple inaccuracies, including:

- IMPLAN's Study Area Data estimated that the value of grapes produced within the county in 2016 totaled \$272 million, when the value of Napa Valley's grape harvest had not fallen below \$300 million since 2009. In fact, Napa Valley's 2016 grape harvest was valued at \$729 million in both the Napa County Crop Report and the California/NASS Grape Crush Report.
- IMPLAN's Trade Flows estimated that only 22% of these grapes were used within the County.

- The total value of wine produced in Napa was similarly divergent from best estimates from both Napa Valley’s reported grape values and the wine production volumes reported by TTB.
- IMPLAN’s data on key supplier industries, such as wood processing (important for barrel assembly and cork finishing), machinists and metal working, trucking and warehousing, among others) diverged widely from not only what was observable from local conditions but also from official state employment data, which we had previously assumed was source information for IMPLAN.

IMPLAN analysts were surprised to learn that grape values varied by region, as apparently most “agricultural commodities” are assumed to have a standard price across regions.

How then are IMPLAN’s Study Area Data and Trade Flow data actually constructed?

Study Area Data, for each economic sector or product, is a combination of 1) Number of Employees, 2) Total Value Produced and 3) Value Added per Employee⁶. If one variable changes, the others adjust, with value added per employee apparently the key exogenously derived value. “Value added per employee” is calculated from a formula that considers the share of the final product produced by the average employee, average labor compensation, taxes and the worker’s profit contribution.

The anomalies in the IMPLAN data for wine in Napa County thus become clear.

- The product used for these calculations in IMPLAN’s Study Area Data for wine is not wine or wine grapes but “fruit,” although wine grapes are the highest value fruit crop in the U.S., according to USDA data. And, within the wine sector, Napa Valley has the highest grape and wine values in the state and country.
- The IMPLAN model’s “average labor compensation” uses the *national* average compensation rate for workers in *fruit* production and even this is not the average compensation in Napa County or even in California, although both are available from both the California Employment Development Department (EDD) and the US Department of Labor’s Bureau of Labor Statistics (B.L.S.) — and Napa County’s average wage for vineyard workers is well above average.
- Thus, product values are underestimated for grapes and wine and the number of employees overestimated.
- National averages, or “adjusted national average,” is assumed for most sectors, creating similar problems.
- Several sectors which apparently had not developed sufficiently to be included in the BEA 2007 data for Napa and neighboring regions are simply omitted or discounted, such as fabrication and machinists.
- In parallel, apparently to fill the resulting shortfall in Total Regional Product, the values for other sectors, especially services, became inflated. For example, although Napa is home to a small number of

⁶ Total Product Value = Value Added per Worker x Number of Workers. If Value Added per Worker changes, the model initially assumes that Total Product Value changes, while the total number of workers remain constant, unless that is manually changed. Thus, if wages or product price is underestimated, total product value — in this case, total value of grapes produced — will be underestimated. If total product value is adjusted without changing Value Added per Worker, the number of workers will be over-estimated.

community banks, with relatively small branches of some national banks and other financial operations, Napa's banks are assumed to generate some \$800 million in credit each year.

To correct these inaccuracies, as recommended by the IMPLAN staff, we did the following:

- In Study Area Data, where we had actual, official data, or specific local data from producer interviews, from which the IMPLAN data widely diverged, we corrected the IMPLAN data.
- In Trade Flow data, based on advice from IMPLAN's staff, we "zeroed out" the Local Use Coefficient, and thus the IMPLAN model's indirect impact calculations, for the variables for which we had more accurate actual data, including wine, grapes and several key supplier categories, to ensure none of these variables would be double-counted. We then input the actual data for these categories as "Direct Impacts."
- After these adjustments we allowed the IMPLAN model to calculate the indirect and induced impacts, to complete the Napa County analysis.

California and U.S. Models

We discovered similar accuracy issues, primarily but not solely with respect to wine and grape values, in the IMPLAN data for the State of California. The problem seems to derive from IMPLAN's assumptions that

- California vineyard labor was paid the *national average farmworker wage*, although vineyard wages tend to be higher than for most other farm work.
- Wine grapes are priced in line with national average farm gate prices for *fruit*.
- Similar problems were found with a small number of other variables.

Rather than attempt to correct IMPLAN's Study Area Data for its California or US models, we "zero out" vineyard values and these other variables in the Trade Flows data for these models, so that we could input more accurate actual data. We then:

- Separately ran the IMPLAN model for "California," based on actual data for direct impacts in non-Napa-California.
 - We then added the non-Napa County-California IMPLAN results and the Napa County IMPLAN results together to produce the Total California Impact cited above.
 - We realize that this approach may undercount the broader state impacts of some Napa County spending but the alternative, running a 'total California' model would have converted Napa County's wages and prices to California average wages and prices, which would have been a significantly more inaccurate undercount.
- We calculated US Total impact in the same way: running the IMPLAN US model using non-California-US actual data and adding the result to the 'Total California' results, to avoid IMPLAN replacing California actual data with the problematic national averages built into the models.

Redefining Total Impact

The total Impact calculation that originated in MKF Research's first California Economic Impact study in 2000 for the Wine Institute and that was used in previous studies for Napa adds together the revenue and wages impacts of the industry.

This approach considered revenue and wages are concurrent 'economic flows' into the economy. While an argument can be made for this point of view, as IHS (the independent reviewers for this study) and many other economists have noted, wages are *paid out of revenue* and thus cannot be added to revenue. This is also true of some elements of taxes and charitable contributions, previously included.

Stonebridge maintained this original structure, to which the industry had grown comfortable, while presenting both totals so that readers with such questions could themselves judge the appropriate data to apply. For this report, we are correcting the presentation to the more accurate assumption, excluding from Total Impact the amounts paid out of revenue.

Total Economic Impact in each region is thus defined as the sum of:

- Total Wine Industry Revenue (Wholesale, Export and Direct to Consumer);
- Plus, the Indirect Impacts of wine and grape production, including
 - Actual winegrape, supplier and professional services revenues directly input into the IMPLAN model by Stonebridge, and
 - Other indirect impacts generated by the IMPLAN model;
- Plus, the induced Impacts generated by the IMPLAN model;
- Plus, selected charitable contributions (those not paid out of winery revenue);
- Plus, selected taxes, not paid out of winery revenue.

If the previous approach had been used, the total economic impact of Napa's wine and grape industry on Napa County's economy would have been nearly **\$13.9 billion**, **\$25 billion** on the California economy, and **\$49 billion** on the American economy. The additional components of this impact total are presented in Table 1. Each of these components are important to understanding the various ways Napa's wine and grape industry impacts the local, regional and national economy and each is discussed in detail in this report.

The Resulting Findings

Stonebridge is unique among those doing such studies in the wine industry in investing many hours over months in collecting detailed, sourced, actual data on production, labor, wages and prices in Napa's wine and grape industry. However, this work also produces uniquely accurate and comprehensive findings about the economic impact of this complex industry. As a result of such methodical work, we are confident that the resulting data and findings are the most reliable and accurate that are possible — which may be uniquely true for such research in this industry.

The Data

Each time we do these studies we need to stress that there is little public or standardized data on this complex industry. The State of California Department of Forestry and Agriculture (CDFA), through its division of the National Agricultural Statistics services (NASS), provides substantial and detailed data on grape production, acreage, and sales, down to the grape district level -- and fortunately Napa County is a single district. Wine sales *volumes* can be deduced from Federal and state excise tax data, although such data is not available for entities below the state level. National and state level wine production numbers and wine sales volume indicators (wine removed from bond) are published by the TTB and county level detail can be obtained on request. The number of wineries can be obtained from both state (California A.B.C.) and Federal sources (TTB) -- but these numbers seldom agree, due to timing differences in permit approvals and cancellations and different license categories at state and federal level.

No region can provide specific vineyard counts, as vineyards are often held in multiple parcels for private tax reasons. (The Napa County Agricultural Commissioner provided the vineyard count in the Highlights table from a special run of county data.) Employment and wage data by county is available for certain industry categories from the US Department of Labor Bureau of Labor Statistics. Fortunately, wineries and vineyards are specific categories for such data -- but most supplier industries and services (e.g. cooperages, bottles, closures, capsules, tanks for wine, wine laboratories) are buried in broader categories such as "glass containers" or "wood processing." These data sources exclude owner-operators but now includes contract labor. Revenue data is not available from any published source.

Thus, these studies depend on diligent primary research: multiple industry interviews combined with searches of multiple sources for pieces of information that can be assembled to substantiate an estimate. To provide a metric for the effort, we tracked employment, revenues and wages for approximately 84 industry activities for this study, with about 200 phone calls, emails, and meetings in addition to more conventional data and document searches.

An overview of the principles of economic impact analysis is provided on pages 25-26.

Reviewing the revised models, methodology and report, IHS provided the following assessment:

"IHS Markit has reviewed the methodology applied in, and the results presented in, the Economic Impact of Napa County's Wine and Grapes, 2016 study. We find that the methodology employed was defensible and based accepted economic principles and theory used to perform economic contribution studies. As a result, we conclude that the Study accurately estimates total economic impacts. The study was comprehensive as it considered both the economic contributions of grape cultivation and wine production in Napa County, and tourism activity that is directly attributable to the presence of the wine industry. The accuracy of the study was significantly improved by appropriately modifying the IMPLAN input/model to fully consider the large size and well developed supplier network that comprises the County's wine producing industry. The study properly notes that Napa County vineyards and companies that provide grapes, goods and services required by the wine industry also support wine producing activities across California, which increases its contribution in the County by bringing income back into it. Finally, we agree with the study's primary conclusion that the wine producing sector, including related tourism activity, accounts for between 45% and 50% of total economic activity in Napa County."

Research Findings

Wine Produced in Napa County

The passage of Napa County’s Winery Definition Ordinance (WDO) in 1990 required wines produced in wineries developed after that date to have at least 75% Napa grapes. Many of the wineries established in Napa County prior to the passage of the WDO, including some of the major wineries in the US, produced wine within the county from grapes grown in many regions, not just Napa. The WDO allowed these wineries to continue to produce wines from grapes grown outside the county. The WDO is considered a cornerstone protection of Napa County’s Agricultural Preserve and the agricultural character of the county.

The scale achieved by these major producers, along with the quality reputation of Napa Valley wines, attracted many suppliers and service providers to Napa County, including bottling, processing and storage facilities concentrated in the airport district in the southern part of Napa County. This cluster of industry expertise attracted still further vintners, winegrowers and service providers to the county, making Napa a key center of the California wine industry.

TTB provided the following data on total volume of wine produced (“total wine fermented”), bottled and removed from bond (removed from bonded warehouses for sale) in Napa County for 2012 through 2016. Tax-paid wine removed from bond is a reasonable indicator of wine sales by Napa producers (although it excludes exports, which are not subject to excise tax. Napa producers export a relatively small share of their production.)

Table 2: Estimated Total Napa County Wine Produced, Bottled and Sold, 2012-2016 (case equivalent)

	Napa County Wine					CA Total	US Total
	2012	2013	2014	2015	2016	2016	2016
Total Wine Fermented	19,040,068	21,442,952	22,493,833	16,722,096	18,575,561	286,244,998	339,516,394
Total Wine Bottled	51,510,149	48,698,766	50,199,729	43,846,511	33,861,763	248,673,666	299,099,491
Total Wine Removed from Bond	53,387,301	55,214,599	57,359,384	52,182,233	41,270,364	180,134,079	266,228,688

Source: TTB

For each year, significantly more wine is bottled in Napa than is produced, and a still larger amounts warehoused, resulting from Napa’s historic role as one of California’s wine centers and making a critical contribution to Napa’s leading position in American wine — most of these facilities are concentrated in South Napa, in the industrial area surrounding Napa Airport, outside of Napa’s Agricultural Preserve.

- Several of Napa’s larger, multi-brand producers, as well as some headquartered in adjacent counties, have centralized bottling of all their wines in facilities in the industrial area around Napa airport, in some cases to specifically reduce traffic in agricultural areas.
- Napa has long been one of the key consolidation/collection points by wholesalers for California wines being shipped across the US for the three-tier market. (Similarly, Lodi has been a main collection point for California wine consolidation/collection for wines traveling to market by rail.) Thus, a substantial volume of wine is shipped to bonded warehouses in Napa’s airport industrial area for sale to/consolidation for wholesalers.
- Although wine warehouse capacity grew significantly in the first part of this century, bottling and warehouse volumes are likely to decline significantly from 2017 as at least one major operation is moving to Sonoma and new warehouses are being developed in Solano County.

Based on these data, supplemented by information received from the industry, we have estimated that wines produced, bottled or warehoused in **Napa County account for nearly one in 5 bottles of wine produced in California and more than 1 out of every 6.5 bottles of wine produced in the U.S.**

California wine accounted for 60% of the volume and 57% of the value of the wine sold in the US⁷ in 2016, estimating total California wine sales volume at 211.9 million cases and the total value of sales of California wine at \$19.9 billion.

Table 3: Napa County Wine Bottled

	Cases (million)	% of US Wine	% of CA wine
Total US Wine Bottled, 2016	299,099,491	100.0%	
Total California Wine Bottled, 2016	238,507,781	79.7%	100.0%
Total Napa County Wine Bottled, 2016	33,861,763	11.3%	14.2%
Napa Valley Appellation Wine Bottled in Napa, 2016	8,802,442	2.9%	3.7%
Total Napa Valley Appellation Wine Bottled, 2016	11,843,929	4.0%	5.0%

Source: Stonebridge Research, industry interviews, TTB, California NASS. Wine Institute, Direct to Consumer Wine Shipping Report, published by Wines & Vines Analytics

The total retail value of all wine produced in Napa County, including sales through the three-tier system as well as direct-to-consumer and export sales, is estimated to have totaled \$8.4 billion in 2016. The retail value of Napa Valley appellation wines, including those produced outside Napa County, is estimated at \$7 billion, compared with \$5.4 billion in 2011. Napa appellation wines produced in Napa County represent 74% of the value of county’s wine sold while only 42% of the volume of the county’s wines.

⁷ Based on Wine Institute data.

California wine accounted for 60% of the volume⁸ and 57% of the value of the wine sold in the US in 2011, estimating total California wine sales volume at 238.1 million cases and the total value of sales of California wine at \$34.1 billion.

Table 4: Napa Wine's Share of US and California Wine Sales

		% of All Wine Sold in US	% of CA Wine Sold in US
Total Sales of Wine in US, Cases, 2016	399.2 million	100.0%	
Retail Value of Total Sales of Wine in US, 2016	\$59.5 billion	100.0%	
Total California Wine Sold in US, Cases, 2016	238.1 million	59.6%	100.0%
Retail Sales Value of Total California Wine Sold in US, 2016	\$34.1 billion	57.3%	100.0%
Total Napa Related Wine Sold in US, Cases, 2016	21.1 million	5.3%	8.9%
Retail Sales Value of Napa Related Wine Sold in US, \$, 2016	\$10.2 billion	17.0%	30.0%
Total Napa County Wine Sold in US, Cases, 2016	18.5 million	4.6%	7.8%
Retail Sales Value of Total Napa County Wine Sold in US, 2016	\$8.4 billion	14.1%	24.6%
Napa Valley Appellation Wine Sold in US, Cases, 2016	11.1 million	2.8%	4.7%
Retail Sales Value of Napa Valley Appellation Wine Sold in US, 2016	\$7 billion	11.7%	20.4%
All Napa Related Wine All Cases Sold in US, 2016	24.2 million	6.1%	10.1%
Retail Value of All Napa Related Wine Sold in US, 2016	\$10.5 billion	17.6%	30.8%

Source: Wine Institute, TTB, Stonebridge Research, NASS

The retail value of wine produced in Napa County accounts for **24.6%** of the *value* of all California wine sold in the US in 2016, from 8.9% of the volume of such wines. Napa Valley appellation wines produced in Napa County as well as other regions, and representing many of the highest value wines produced in California, alone represent more than **20%** of the total value of all California wine sold, from little more than 4% of such wine. All Napa County related wines, wherever produced, represent more than **30%** of the

⁸ Based on Wine Institute data.

value of all wine produced in California and **17%** of all wines produced in the US — **from less than 3% of the wine produced in the US.**

Consumer Direct Sales

The 2017 Annual Report on Direct-to-Consumer (DtC) Wine Sales by ShipCompliant, the leading shipment compliance firm, and *Wines & Vines Analytics*, reported that “Napa County continues to be the dominant engine in the DTC shipping channel,” representing nearly 50% of the DtC channel’s entire dollar value while accounting for 30% of its volume.

Table 5: Napa County Direct to Consumer Wine Sales

Volume (cases)	Growth in Volume	Value (\$)	Average Bottle Price	Growth in Bottle Price
1,534,840	11.7%	\$1,136,793,229	\$61.72	0.5%

Source: Direct to Consumer Wine Shipping Report, published by Wines & Vines Analytics

The report continues: “Napa County’s growth in volume of shipments and average price per bottle shipped all came in lower than the overall DtC shipping channel’s average for the first time in five years. In fact, **the volume of Napa Cabernet’s shipments increased by a meager 5 percent, far below Napa’s overall 11.7% and the overall DtC shipping channel’s 17.1 percent volume growth.** Napa County’s growth in volume of shipments, value of shipments and average price per bottle shipped all came in lower than the overall DtC shipping channels average for the first time in five years.” Thus, even as Napa County has added at least 20 wineries focused on the DtC channel in just the last year, the rate of growth of Napa’s DtC sales is slowing and Napa is losing market share to other regions.

Employment

Wineries employ full and part-time workers as labor for bottling, storage, maintenance and winemaking needs as well as hospitality, finance, sales and marketing functions. Some wineries also employ seasonal labor, for both harvesting and hospitality. Vineyard employment includes vineyard workers in integrated estate wineries, workers at independent vineyards, vineyard management companies and Farm Labor Contractors (FLCs). A very high proportion of Napa County’s vineyard labor is reported to be locally-based, full-time employees. However, as Napa County’s producers and vineyard management companies face a growing shortage of vineyard labor, it appears that both are increasingly looking to FLCs for support. Most of the FLCs used in Napa Valley vineyards are based in the county, but workers may be sourced from other regions.

Napa Valley grapes, Napa County wine and their allied industries, directly and indirectly, provided full-time equivalent jobs for nearly **44,000** individuals in Napa County, for more **75,000** individuals across the state of California and for nearly **189,000** workers across the US, as shown in **Table 6** below. The Napa wine and grape industry, with related activities, accounts for more than two-thirds of all the full time jobs reported in the county in May 2012.

Table 6: Employment Impact of Napa County Related Wine and Grapes

SECTOR	NAPA COUNTY (FTE)	TOTAL CALIFORNIA (FTE)	TOTAL US (FTE)
WINERIES	10,578	12,936	13,116
TOTAL DIRECT JOBS	10,578	12,936	13,116
WINE-RELATED TOURISM INCLUDING RESTAURANT & RETAIL	8,682	8,682	8,682
VINEYARD	4,226	6,468	6,468
DISTRIBUTORS	300	857	4,180
3-TIER (RESTAURANT & RETAIL)	130	12,900	76,981
SUPPLIERS	3,393	6,419	7,249
PROFESSIONAL SERVICES, EDUCATION & ASSOCIATION	661	2,249	3,398
OTHER INDIRECT (IMPLAN)	7,651	10,985	26,221
TOTAL INDIRECT	25,042	48,558	133,178
INDUCED (IMPLAN)	8,347	13,633	42,258
TOTAL	43,967	75,127	188,552

Source: Stonebridge Research, US Bureau of Labor Statistics and industry interviews. Note: California Totals include Napa; US totals includes all California.

Wages

In 2016 Napa’s wine and grape industry, directly and indirectly, generated **\$2.4 billion in wages in Napa County, \$4.8 billion in California and \$10.9 billion in the U.S.**, as shown in **Table 7** below.

Table 7: Wage Impact of Napa County Related Wine and Grapes

SECTOR	NAPA COUNTY	TOTAL CALIFORNIA	TOTAL U.S.
WINERIES	\$ 702,008,970	\$ 1,160,447,569	\$ 1,175,034,589
TOTAL DIRECT WAGES	\$ 702,008,970	\$ 1,160,447,569	\$ 1,175,034,589
DISTRIBUTORS	\$ 28,174,337	\$ 106,030,886	\$ 399,750,128
3 TIER RETAIL & RESTAURANT	\$ 8,402,040	\$ 412,852,849	\$ 1,728,265,026
VINEYARD	\$ 193,361,915	\$ 464,896,463	\$ 464,896,463

SECTOR	NAPA COUNTY	TOTAL CALIFORNIA	TOTAL U.S.
SUPPLIERS	\$ 167,125,150	\$ 314,763,847	\$ 327,113,755
PROFESSIONAL SERVICES, EDUCATION & ASSOCIATION	\$ 68,594,944	\$ 210,802,542	\$ 258,428,819
WINE-RELATED NAPA TOURISM	\$ 205,772,360	\$ 205,772,360	\$ 205,772,360
OTHER INDIRECT (IMPLAN)	\$ 493,010,076	\$ 718,292,749	\$ 2,682,316,183
TOTAL INDIRECT	\$ 1,164,440,823	\$ 2,433,411,694	\$ 6,066,542,734
INDUCED (IMPLAN)	\$ 427,653,935	\$ 700,455,775	\$ 3,157,900,629
TOTAL	\$ 2,294,103,728	\$ 4,294,315,039	\$ 10,399,477,952

Source: IMPLAN, Stonebridge Research, US Bureau of Labor Statistics, California NASS, TTB, DtC Shipping Report and industry interviews

Winery Direct Sales

We estimate, from the recently completed Napa Tourism Impact and Visitor Profile studies for Visit Napa Valley (Napa Valley’s Destination Marketing Organization), that visits to wineries totaled nearly 7.9⁹ million in 2016 by more than 2.6 visitors.

The data suggests that the total number of visitors to the county has increased from 3.1 million in 2012, or about 13%. However, wineries seek to attract visitors in order to sell wine, either directly in the tasting room, long-term wine club or allocation list members or at least as “brand ambassadors,” bringing new customers to the three-tier market. We are seeing an increasing number of wineries making efforts to limit the number of visitors they receive to more effectively reach, and ensure a more positive experience for, those most likely to actually purchase wine. Indications are that DtC wine sales growth is not keeping up with the growth in visitors, which is also reflected in the DtC Wine Shipping Report data.

The Visitor Profile report also allowed us to estimate the total Napa spending by winery visitors at more than \$1.3 billion (exclusive of wine purchases) and the related employment at 8,682 jobs.

Suppliers and Service Providers

Each iteration of this study allows more opportunities to deepen and expand the analysis of suppliers and service providers to the industry. Since the enterprises involved in the industry are either privately owned or services to the wine industry are just one of several lines of business for the enterprises, there is little if any public information available. Individual interviews with a combination of suppliers, vintners, growers and industry advisors were required to assemble the relevant data. Since the information collected is often

⁹ That study estimates that Napa received 3.5 million visitors in 2016, 72.3% of whom visited wineries, each visiting an average of 3.1 wineries during their stay.

proprietary, we have aggregated the data for presentation into “suppliers” and “professional services.” We are grateful for the cooperation and patience of so many of the respondents.

The research indicates some interesting trends among suppliers and service providers:

- Much of the equipment and capital inputs (barrels, corks, capsules, bottles) used in fine wine production is quite specialized and, in many cases, imported. Sales representatives, brokers and distributors for these imports have for decades been located in the Napa region, serving the rest of the US winemaking industry from Napa Valley. Similarly, the most respected wine laboratory in the US operates from a Napa Valley location.
- For many years these brokers, distributors and sales representatives, with their highly skilled professional staffs, were based in Napa County, usually in the South Napa business parks, but now many of these operations have moved out of the county, driving substantial new office/warehouse construction in neighboring counties, most recently Solano County.
- An increasing proportion of the finishing work for corks is conducted locally, primarily in Napa, although most of the raw materials are imported.
- After a brief trend to finish barrels after their arrival in the US, more imported barrels now arrive fully finished, where the makers can guarantee quality. (Most barrels are imported.) Barrels, ranging upward from \$400 for American oak, to as much as \$1200 or more for French oak, are among the most expensive inputs for winemaking (along with rising costs for grapes and labor and the always substantial capital investment for winemaking equipment, most of which is produced overseas.) French oak is still preferred by most Napa Valley wine producers. The different oaks lend quite different flavors to wine.
- Purchase of new oak barrels has declined considerably with increasingly sophisticated use of barrel alternatives and growth of stainless steel fermentation. Most sources report that most wines costing up to \$30 per 750mL, if they use oak, will use barrel alternatives, such as oak staves or chips in stainless steel tanks, one of several techniques for controlling costs as grape and labor costs rise.
- There has been considerable consolidation among glass bottle producers internationally. Glass bottles for Napa County’s wines are largely produced within California. We had previously assumed that much of this production occurred in various other regions of the US. Imports are however growing, with far more confidence now in the quality and consistency of Chinese-made bottles.
- Construction, custom metal work and similar activities for Napa County wineries are also more likely to originate in Napa County, but stainless steel tank construction has largely shifted to neighboring counties.
- There has been a notable shift of label production out of the immediate region, reflecting industry consolidation.
- From grape hauling, bulk wine and case goods shipment to bulk wine, barrel and case goods storage, highly specialized warehousing and freight services are major activities in the industry and in Napa County’s economy. Many of the freight companies in particular are small, local

entrepreneurial firms, although bulk wine shipping, requiring specialized equipment, tends to be provided by larger regional companies. This sector has only grown with the increased volume of grapes, bulk juice and wine traveling in and out of the county. The trend to outsource warehousing, especially case goods warehousing, but also increasingly bulk wine warehousing as well as direct sales fulfillment, with sophisticated material handling capabilities, continues. However, new warehouse construction in Napa County has been relatively limited, driving growth in lower cost Solano County or consolidation of facilities in neighboring Sonoma County.

- Among professional services, the growing challenges of the land use regulations has driven escalating demand for specialists among lawyers, consultants, engineers and environmental researchers. While the county expresses concern about attracting new and young entrepreneurs, the estimated cost of \$175,000 to begin consideration of any winery-related permit presents a formidable barrier. Alternative mechanisms for encouraging innovation in wine deserve exploration. Some are suggested in the closing comments on pages 22-24.

Public Revenues

From grape to consumer, the wine and wine grape industry generates significant tax dollars, benefiting federal, state and local governments. Tax dollars are raised through sales taxes, excise taxes, income taxes, estate and gift taxes, payroll taxes, property taxes and other business taxes and fees, including permits and licenses of various types.

Activities in Napa County related to wine produced in Napa County generated nearly **\$1.4 billion**¹⁰ in total public revenues in 2016, including **more than \$106 million in local taxes and other public revenues specific to Napa County** and more than \$700 million in Federal revenues, as shown in **Table 8 below**. Activities within California related to wine produced in Napa County generated nearly \$3 billion in public revenues at the local, state, and federal levels. Across the US, these activities generated more than \$4.5 billion in public revenues at all levels.

The Napa County Assessor estimates that: "the wine industry including vineyards, wineries, warehousing, corks and capsules, coopers, etc. represent approximately 12-18% of the county's 2016-2017 total assessed value of \$35,016 billion or between \$4.2 and \$6.30 billion in assessed value. That assessed value would generate between approximately \$45.8 and \$68.7 million in annual property taxes." We assume a midpoint in these amounts in the **Table 8**.

Those public revenues not paid out of winery revenues, such as sales taxes on winery direct sales, and planning fees and expenses for new winery and vineyard permits, are included in the Total Impact calculation, presented in **Table 1** above.

¹⁰ All the tax estimates in this table, except for the county specific estimates, excise and winery direct sales taxes, were produced by the IMPLAN model and the data collected by Stonebridge from industry interviews and California EDD data.

Table 8: Estimated Impact of All Wine Produced in Napa County on Government Revenues in 2016

	Generated by Napa County wine and grape related activities	Generated by all the activities in CA relating to Napa produced wine	Generated by all the US activities relating to Napa produced wine
TAXES & FEES RETAINED IN NAPA COUNTY			
PROPERTY TAX	\$57,250,000	\$57,250,000	\$57,250,000
GROWER ASSESSMENTS*	\$434,490	\$434,490	\$434,490
PLANNING FEES	\$4,322,964	\$4,322,964	\$4,322,964
WINERY DIRECT SALES TAX**	\$44,334,936	\$44,334,936	\$44,334,936
TOTAL NAPA SPECIFIC TAXES	\$106,342,390	\$106,342,390	\$106,342,390
OTHER STATE AND LOCAL TAXES			
WINERY DIRECT SALES TAX	\$29,556,624	\$29,556,624	\$29,556,624
EXCISE TAX	\$5,497,325	\$5,767,493	\$131,835,476
GROWER ASSESSMENTS	\$1,346,354	\$1,621,418	\$1,621,418
EMPLOYEE COMPENSATION	\$7,472,289	\$15,422,696	\$23,373,103
INDIRECT BUSINESS TAXES	\$391,698,139	\$1,142,799,497	\$1,329,580,991
HOUSEHOLD TAX	\$111,848,979	\$233,503,114	\$355,157,249
CORPORATE TAX	\$11,542,789	\$34,762,836	\$57,982,883
TOTAL	\$665,304,889	\$1,569,776,068	\$2,035,450,134
FEDERAL TAX			
EXCISE TAX	\$125,519,468	\$128,256,806	\$128,256,806
COMPENSATION RELATED	\$492,048,170	\$798,184,008	\$1,022,671,384
INDIRECT BUSINESS TAX	\$85,593,387	\$139,165,141	\$176,234,387
HOUSEHOLD (INCOME) TAX	\$384,902	\$262,402,632	\$821,334,727
CORPORATE TAX	\$146,050	\$72,707,408	\$328,742,261

	Generated by Napa County wine and grape related activities	Generated by all the activities in CA relating to Napa produced wine	Generated by all the US activities relating to Napa produced wine
TOTAL	\$703,691,976	\$1,400,715,995	\$2,477,239,565
TOTAL TAXES PAID	\$1,368,996,865	\$2,970,492,062	\$4,512,689,699

Source: Stonebridge Research, DISCUS, California Board of Equalization, the DTC Shipping Report and IMPLAN
 *Includes \$8 per acre for Napa Pest Control District, \$10 per acre for Farmworker Housing and \$1.25 per \$1,000 of wine grape revenue for Pierce's Disease and Glassy Winged Sharpshooter Eradication ** The county generally receives 1.5 percentage points of the California 7.75% sales tax.

Charitable Contributions

The wine industry is unique in its charitable support to the community. Based on discussions with the industry, charitable contributions in 2016 are estimated at **\$63 million** in-kind and in-cash, plus substantial donations, generally in-kind (wine for auctions and related travel) or sponsorships, for charities, particularly those based in Napa. Napa Valley Vintners itself directly donated \$16 million to community organizations and services in 2016, from the proceeds of its annual Auction Napa Valley and related reserve funds. A substantial additional amount is contributed personally by Napa Valley wine growers and vintners, nearly all family-owned, locally-based businesses.

Many wineries do not track such contributions or differentiate between family and company support. To estimate charitable contributions in 2016, we conducted industry interviews and winery surveys and concluded that the industry's contributions tended to average about 1.3% of winery revenues¹¹. We have not attempted to estimate the many charitable donations provided by Napa Valley's wine industry to activities outside the county.

Some of these contributions are paid out of net winery revenue, but large share of these contributions are not, including in-kind donations of wine simply written off by wineries, funds raised from third parties from auctions of winery generated auction lots. These latter group of contributions are included in **Table 1** above.

Napa's wine industry has long provided critical support to sustain Napa County's social safety net. Napa Valley's wine industry is particularly notable for the scale of support it provides to education, health and social services in the county, including the county's hospitals and hospice, as well as technology education and vocational and "maker" training. In 1999, long before neighboring counties even considered such programs, Napa Valley Vintners established the Napa Valley Vintners Community Health Center. The center houses Olé Health now in its 40th year, which serves low income and uninsured individuals. Additionally, the Napa Valley wine industry assesses itself to provide quality housing for farm workers. Napa's growers also support farmworker education and scholarships.

¹¹ Many allied industries continue to provide generous community support. Those amounts are not included in this estimate.

Observations: Key Issues Facing Napa County's Wine Industry

Napa County's wine and grape industry faces some key challenges to its continued success in a complex environment.

Rising Labor Costs/Tightening Labor Supply

Napa County has long relied on a stable core of largely resident, immigrant skilled workers for its vineyard labor force. Not only is this cohort aging, but the labor market in Mexico is improving, traveling across borders more challenging and demand for labor — from construction, cannabis and other industries — is growing. These forces not only drive up costs — although Napa County growers have long paid well above market for labor — but make it difficult to find essential labor in critical periods.

Consequently, Napa County's growers are carefully exploring both technology and mechanization in Napa County's vineyards, in which mechanization has been rare. Experiments are being undertaken with mechanized pre-pruning and harvesting but the industry consensus is that existing mechanization equipment is still unsatisfactory for final pruning, can only selectively be used for harvesting and is still challenging for hillsides. Some growers are replanting with the vertical trellises needed for mechanized harvesting for some grapes in vineyards in the valley's flat lands and additional such replanting is likely.

Rising Grape Prices

Napa County's grape prices are escalating well beyond the possible increases in wine prices, even in Napa County's luxury wine sector, placing vintners producing wine accessible to most US fine wine consumers, even at the high end, under increasing pressure. While the price of grapes in 2016 averaged \$6400 per ton, it is not unusual to find grape pricing not only above \$10,000 per ton but above \$20,000 per ton for some Napa County regions. With the usual and still-accepted rule of thumb for wine prices — the “rule of 100” (if the price of a ton of grapes is \$10,000) — then the retail price of wine it produces would be \$100 per 750mL.

To put this in perspective, it is estimated that only about 7% of American consumers buy wine costing more than \$25 per bottle. (Some argue that \$25 is closer to \$15 for parts of the market.) A minuscule share of those consumers buy wine costing more than \$100 per bottle. If one applies that math to grapes costing \$20,000 per ton, the implications are obvious. Even Napa County's most celebrated “cult” wine producers know they can only expect to sell, and then very selectively, with elaborate long term marketing and intense customer service, a few thousand cases of such wines.

The problem was clearly identified nearly twenty years ago, in a paper¹² by Joel Podolny, a distinguished economics professor at both Stanford and Harvard who now the Chief Economist for Google. In his words, “We find evidence that owners with strong non-financial motivations choose higher prices for their wines, controlling for quality; owners with strong profit-maximizing motives choose lower prices for their wines, controlling for quality.” To translate the economic-speak into conventional English, producers with non-

¹²“Love or Money? The Effects of Owner Motivation in the California Wine Industry”, Joel Podolny with Fiona M. Scott Morton: NBER Working Papers w6743, October 1998.

economic motives drive up the prices of grapes and therefore wine because they do not make economic-based, or market-based, decisions. In the process, they make it increasingly difficult for producers actually trying to make wine consumers can buy to succeed.

As we can see in the DtC shipping report, Napa's wine prices are escalating well above any other wine region and winery direct sales, the outlet all such non-economic wineries are pursuing, is slowing and Napa is losing market share.

We understand that tourism generated taxes are increasingly important to Napa County and enabling new small wineries is seen as part of building the tourism industry. However, Napa may be substituting low paid hospitality labor for middle class-skilled labor — labor who can afford to live in Napa County, rather than commute to Napa County— in the wine industry and its more sophisticated suppliers. This trade-off needs thoughtful consideration, within a long term vision for the future of the region and the industry.

Napa's Opportunities

Amid these challenges are some very attractive opportunities for the Napa community and Napa's wine industry.

Research, Technology and Mechanization

In developing this report, we looked carefully at viticulture and enology research in the region and the industry — and learned that, as one expert phrased it, everyone doing research in wine wants to include Napa in that research because Napa's quality adds credibility to their work. But relatively few of such researchers are based in Napa.

We also found a burgeoning industry in new technology for the vineyard and winery, from elaborate vine sensing systems to fermentation monitoring. The rapidly changing economics of making wine in Napa is driving the industry to explore new technologies and cost and labor saving techniques in both the vineyard and the winery. Adapting such technologies to high value fine wine and grape production presents some unique challenges. Yet few of these high value, high growth businesses are based in Napa. Napa should be able to develop these products, not just buy them.

Napa's small, entrepreneurial manufacturing and fabricating companies have invented much of the new or modified equipment that allows fine wine producers to both automate and improve quality in winemaking. Demand for their work is growing, but they have to train their staff from scratch, with little local training provided for skilled machinists. Even operating today's mechanized farming equipment requires advanced mechanical and computer skills, training for which is still scarce in Napa.

Vintners report that their long-term immigrant vineyard and cellar workers want their children to do higher paid work, to not work in the fields but in professions and skilled trades. It is possible to put together these dual trends to grow a strong, skilled, well-paid labor force for Napa.

“Maker” Training

Napa Valley institutions, including Napa Valley Vintners and Napa Valley College, have developed multiple quality training programs in winemaking and viticulture.

Making wine means also “making” a wide variety of other things. Napa Valley College does have Associate Degree in Science programs in Machine Tool Technology and Welding. Another example is the Digital

Innovator Program, a collaboration between Napa County Office of Education and the nonprofit NapaLearns. The program's Maker Educator workshops provide teachers with the opportunity to understand how engineering and design can inspire creativity, critical thinking, and collaboration in their classrooms. NapaLearns is also expanding inquiry-based math in elementary schools and Math + Coding + Robotics in middle and high schools. Expanding the variety of such training, including on-the-job training, apprenticeships, unstructured workshops and other approaches would benefit the county. The compensation levels for professions in these fields can help Napa retain its next generation labor force and grow and diversify Napa's economy.

In conclusion, Napa has for many decades been a key center of the American wine industry. There are many opportunities now for Napa to further prosper by building on those opportunities.

Economic Impact Methodology: Overview

The best way to understand an economic impact analysis is to see it as the answer to the question: what would we lose if this industry disappeared tomorrow? Intuitively, we all know that the answer to that question is far more than the industry's immediate sales. It includes all the jobs and the tax revenues lost; the business for the restaurant where the workers eat lunch and the car dealers who sell them cars; the office supply stores where the companies buy printers and papers, and the sales and business and other taxes paid by all those businesses. An economic impact study is essentially a way to put numbers to those losses.

To produce this assessment, Stonebridge Research Group LLC explored and developed metrics for the multiple components of this very complex industry: from wine grape growing and winemaking to the many allied industries involved in wine production and consumption, grape cultivation and allied industries - distribution, tourism, equipment, and suppliers. Other economic benefits, including tax revenues, financing, charitable contributions and other indirect and induced benefits generated by the wine industry are also summarized.

This report is an update of the 2011 study and is based primarily on 2016 data.

In some areas, data sources available to us have changed or been somewhat revised. *In certain other areas, we have been able to improve substantially the accuracy of the analysis, such as the supplier impact calculations.* Expanding the scope of wine production to include all wine produced in Napa County, not solely Napa Valley appellation wine, and wine produced out of county from Napa-grown grapes, makes it difficult to fully compare this report with the previous reports so that readers may assess the progress of the industry. However, this expansion also makes the study far more accurate and relevant; we had been including all winery employment but not capturing all of their output since the many employees may be involved with production of wine from both appellation and non-appellation grapes, depending on their role and had been including all Napa-produced grapes without recognizing the wine produced outside of Napa from Napa grapes.

Direct, Indirect and Induced Effects (IMPLAN)

Much like dropping a rock into a pond, the wine industry has ripple effects on the Napa County, California and US economies. Economic impact studies estimate the impact of an industry in a defined geographical area by identifying and measuring specific concrete economic "events." The events tracked in this report are jobs by industry code.

IMPLAN is the acronym for "IMpact analysis for **PLAN**ing." **IMPLAN** is a well established and widely used economic model that uses input-output analyses and tables for over 500 industries to estimate regional and industry-specific economic impacts of a specific industry. For this study, we have, as explained in pages 6-11 above, we worked with the IMPLAN staff and IHS-Markit to adapt the model to more accurately reflect Napa's wine industry.

Thus, the full economic impact of wine produced in Napa County wine, as shown in Table 1, combines actual, current data on the Napa County wine industry's direct and indirect impacts with indirect and induced economic impacts as measured by the application of the customized IMPLAN model.

Given this customization, the expanded scope of the report and the annual updates to the IMPLAN model and its structure to reflect changes in the US economy, in wages, in productivity assumptions, and in regional economic structures. readers should not try to directly compare the IMPLAN results from the previous reports with the results of this update.

The definitions in the IMPLAN model and methodology of Direct Effects, Indirect Effects, and Induced Effects are explained below.

Direct Effects

Direct effects are economic changes in industries **directly** associated with the product's final demand. Thus, direct effects in this case consider the direct employment and spending of wineries, vineyards, distributors, and immediately allied industries, data on which Stonebridge Research Group LLC collected through primary research.

Indirect Effects

Indirect effects are economic changes - income created through job creation - in industries that supply goods and services to the directly affected industries noted above. Examples of industry effects are purchases of electricity and gasoline by wineries or of janitorial services by wine bottle manufacturers. These may also be defined as "secondary economic exchanges."

Induced Effects

Induced effects are the effects of these new workers spending their new incomes, creating a still further flow of income in their communities and a flow of new jobs and services.

Examples are spending in grocery and retail stores, medical offices, insurance companies, internet providers, and other non-wine related industries by workers in industries allied to the wine industry - such as the spending by the janitor working under contract to the wine industry supplier. These tertiary exchanges induce more jobs and incomes throughout the state and the nation, based on the original economic flows from the Napa County wine industry.

Taxes

The IMPLAN model estimates all non-industry-specific taxes generated at federal, state, and local levels by the jobs produced by the industry in the respective geographical area. Stonebridge added to these estimates industry specific taxes including federal and state alcohol excise taxes, consumer direct sales taxes, property taxes paid by wineries and vineyards, planning fees and expenses and assessments paid by the industry, because these items are not included in the IMPLAN results.

Measuring the Full Economic Impact of Napa County Related Wine and Grape Production

Napa County's wine industry has a "multiplier" effect, extending across a broad network of economic benefits. The revenue derived by the wine industry becomes income for other workers and firms, in Napa County, in California, and across the US, who spend more money on other goods and services.

About Stonebridge Research

Stonebridge Research Group LLC is a leading and authoritative source of research, data and insight into the business of wine and the key trends and forces driving the industry. Stonebridge Research's services include market entry strategy, market and consumer research, industry research, litigation research, financial and operational benchmarking, economic impact studies and business and strategic planning for all segments of the wine industry.

Stonebridge Research Group LLC has conducted major economic, market and consumer studies for the Wine Institute, Wines of Chile, Wines from Spain, French Trade Ministry/UBIFRANCE, Bodegas de Argentina, Napa Valley Vintners, the Office of Champagne, multiple U.S. states and regional wine organizations, major producers, industry investors and suppliers in the U.S., Europe and Latin America, among others. Stonebridge also produced the Food Marketing Institute national study of the economics of Wine in Food Stores along with the Tennessee study that contributed to the opening of Tennessee's market for the sale of wine in food stores by local option.

Barbara Insel, Stonebridge's President and CEO, has an MBA from Stanford University, an MA in Economics from Brown University and a BA from Barnard College of Columbia University. Prior to creating Stonebridge Research LLC in 2008 with a group of industry investors, Ms. Insel was the Managing Director for MKF Research LLC for four years, leading all research and advisory activities for this leading wine business consulting firm, including the first study of the national impact of wine and grapes on the US economy and managing the Wine Institute's first market research project in twenty years, which culminated in its California First promotion strategy.

About IHS-Markit: Economics & Country Risk Group

IHS Markit is a leading source of information, insight and advisory services in economics, financial markets, energy, chemicals, technology, logistics and transportation, healthcare, geopolitical risk, sustainability and supply chain management. IHS Markit has more than 50,000 key business and government customers, including 80% of the Fortune Global 500 and the world's leading financial institutions.

Its Economics and Country Risk Group, operating under IHS Global Inc., an independent US headquartered subsidiary, provides economic analysis, forecasting and consulting services across the entire group. It is the market leader in economic, country risk and cross-industry analysis and forecasts, employing more than 300 economists, analysts and consultants.

IHS was founded in 1959 and became a publicly traded company on the New York Stock Exchange in 2005. Through predecessor companies such as Global insight, DRI and WEFA, IHS founded the modern economic forecasting industry over 50 years ago. Global Insight was formed in March 2001 from the merger of WEFA (formerly Wharton Econometric Forecasting Associates, founded by the Wharton School of the University of Pennsylvania and led by Nobel Prize economist Lawrence Klein) and DRI (formerly Data Resources Inc, the largest non-governmental distributor of economic data in the world), together with Primark Decision Economics (later called Decision Economics, Inc.), and the French company DAFSA. It since acquired several other companies, including PlanEcon, CIEMEX, Reebie Associates, and London-based World Markets Research Centre. IHS, proprietor of Cambridge Energy Research Associates, Jane's Information Group, and IHS Herold, acquired Global Insight in 2008.