

**The 2022 Economic Impact Study
of the California Wine Industry**

Methodology

Prepared for



The Wine Institute

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2022 Economic Impact of the California Wine Industry

Executive Summary

The *2022 Economic Impact of the California Wine Industry* estimates the economic contributions made by the California wine and wine grape industry (the Industry) to the U.S. economy in 2022. John Dunham & Associates (JDA) conducted this research, which was funded by The Wine Institute and the California Association of Winegrape Growers (CAWG). This work used standard econometric models first developed by the U.S. Forest Service, and now maintained by IMPLAN Inc. Data came from industry sources, government publications, and Data Axle.¹

The study defines the California wine industry as: Wine-grape growing, wine production, and wine-related tourism in the state of California, as well as the wholesaling and retailing of California wine in all fifty states plus the District of Columbia.

Wine-grape growing, and wine production comprise the first tier of the industry. Once wine is produced and bottled, it enters the second tier of the industry – the wholesaling tier. Wholesalers are involved in the transportation of wine from producers and the storage of products for a limited period of time.

The third tier of the industry is retailing, or directly selling products to the consumer. This can either be through on-premises sales (as in the case of a restaurant, bars, etc.), or sales for off-premises consumption (liquor stores, grocery stores, etc.)

Associations and organizations that help develop the California wine industry through education and research have also been included in this study, as are firms that serve the millions of tourists who visit California wineries and wine grape growing areas each year.

Industries are linked to each other when one industry buys from another to produce its own products. Each industry in turn makes purchases from a different mix of other industries, and so on. Employees in all industries extend the economic impact when they spend their earnings. Thus, economic activity started by the California wine and wine grape industry generates output (and jobs) in hundreds of other industries, often in sectors and states far removed from the original economic activity. The impact of supplier firms, and the “induced impact” of the re-spending by employees of industry and supplier firms, is calculated using an input/output model of the United States. The study calculates the impact on a national basis, by state, and by congressional district.

The study also estimates taxes paid by the Industry and its employees. Federal taxes include industry-specific excise and sales taxes, business and personal income taxes, FICA, and unemployment insurance. Direct retail taxes include state and local sales taxes, license fees, and applicable gross receipt taxes. The California wine and wine grape industry pays real estate and personal property taxes, business income taxes, and other business levies that vary in each state and municipality. All entities engaged in business activity generated by the Industry pay similar taxes. Federal and state excise taxes paid for the consumption of California wine in all fifty states and the District of Columbia are also included in this study.

¹ Data Axle is the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Data Axle gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Data-Axle verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

The California wine and wine grape industry is a dynamic part of the U.S. economy, accounting for about **\$170.5 billion in total economic output**, or roughly 0.79 percent of GDP.² Wine producers, wholesalers and retailers directly employed 497,123 Americans in 2022. These workers earned nearly \$2.1 billion in wages and benefits. In addition to this about 670 full-time equivalent workers help to promote and provide research on California wines and wine grapes, earning \$83.3 million in wages and benefits. An additional 75,831 jobs are created in firms serving the tourists visiting wineries throughout California’s 147 American Viticultural Areas.³

When supplier and induced impacts are taken into account, the California wine and wine grape industry is responsible for 1,135,797 jobs in the United States and \$59.9 billion in wages; as well as \$21.9 billion in direct federal, state and local taxes; not including local sales taxes imposed on California wine products.

Summary Results

The 2022 *Economic Impact of the California Wine Industry* measures the combined impact of the Industry on the United States, including California wine grape growing, wine production, wine promotion and research and wine-related tourism, as well as the wholesaling and retailing of California wine in all fifty states plus the District of Columbia.

The Industry contributes about \$170.5 billion in total to the U.S. Economy, or 0.79 percent of GDP and, through its production and distribution linkages, impacts firms in most of the 544 sectors of the US economy.⁴

Table 1 – Economic Contribution of the California Wine and Wine Grape Industry

	Direct	Supplier	Induced	Total
Jobs (FTE)	622,995	222,707	290,095	1,135,797
Wages	\$26,074,135,800	\$15,818,936,500	\$17,975,831,000	\$59,868,903,300
Economic Impact	\$70,307,035,600	\$46,080,760,200	\$54,105,946,100	\$170,493,741,900
Business Taxes				\$17,478,757,900
Federal Excise Tax				\$554,246,200
State Excise, Sales, and other Consumer Tax				\$3,861,338,200

The production process (as defined in this study) begins with the production of wine-grapes at vineyards in the state. California vineyards directly employ 49,372 in the process of growing 3.9 million tons of wine-grapes.⁵

Wineries in California either grow their own grapes at their own vineyards (estate vineyards), or purchase wine-grapes from other vineyards in the state. Wine-grapes are then turned into wine in the vinification process, which involves crushing, pressing, fermentation, blending, et cetera. After the vinification process, the wine is then bottled and ready to enter the wholesale and the retail tiers. All told, California wineries employ 43,286 people in the state.

² Based on 2022 3rd Quarter GDP of \$25.7 trillion. See: *Gross Domestic Product, Third Quarter 2022 (Advance Estimate)*, Bureau of Economic Analysis, October 27, 2022. Available at: <https://www.bea.gov/news/2022/gross-domestic-product-third-quarter-2022-advance-estimate>

³ See: *American Viticultural Areas of California*, Wine Institute based on Federal Register Information, September 14, 2022, at: https://wineinstitute.org/wp-content/uploads/2022/09/CA-AVAs_FINAL-FOR-WEBSITE_9.14.22.pdf

⁴ Economic sectors based on IMPLAN sectors.

⁵ *California Grape Crush, Preliminary Report 2021*, California Department of Food and Agriculture, February 10, 2022, at: https://www.nass.usda.gov/Statistics_by_State/California/Publications/Specialty_and_Other_Releases/Grapes/Crush/Prelim/2021/GrapeCrush_2021prelim.pdf

The 2022 *Economic Impact of the California Wine Industry* takes into account the fact that California wine is sold in all fifty states plus the District of Columbia, and therefore the retailing and wholesaling of California wine has an impact throughout the country.

Once California wine has been produced and bottled, it enters the second tier of the industry – the wholesaling tier. Wholesalers are involved in the transportation of wine from the producers, and the storage of products for a limited period of time. The Industry is directly responsible for over 27,663 jobs nationwide in the wholesaling sector.

The third tier of the industry directly sells products to the consumer. For this analysis, the retail tier is assumed to consist of firms in the following industries: Restaurants and taverns, wine and liquor stores, grocery stores, and, in states where sales are allowed, convenience stores and gas stations. The Industry is directly responsible for 426,174 jobs in the retailing sector.

The California wine and wine grape sectors are supported by as many as 142 associations, organizations and institutions that provide research, education, and advocacy. These supporting organizations provide an additional 669 FTE jobs.

Finally, the direct impact of the Industry also includes the economic impact of wine-related tourism in the state. All told, California wine tourism is directly responsible for 75,831 jobs in the state.

Other firms are related to the California wine and wine grape industry as suppliers. These firms produce and sell a broad range of items including machinery, tools, parts, chemicals, and other materials needed to produce wine-grapes and wine. In addition, supplier firms provide a broad range of services, including agricultural services, personnel services, financial services, advertising services, consulting services or transportation services. Finally, a number of people are employed in government enterprises responsible for the regulation of the Industry. All told, we estimate that the California wine and wine grape industry is responsible for 222,707 supplier jobs. Supplier firms generate about \$46.1 billion in economic activity.

An economic analysis of the Industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the supplier firms are part of the industry being analyzed,⁶ the spending by employees, and those of supplier firms whose jobs are directly dependent on the California wine and wine grape industry, should be included. This spending on everything from housing, to food, to educational services and medical care makes up what is traditionally called the “induced impact” or multiplier effect of the California wine and wine grape industry. In other words, this spending, and the jobs it creates are induced by the manufacturing and distribution of California wine products. The induced impact of the Industry generates 290,095 jobs and \$54.1 billion in economic impact, for a multiplier of 0.77.⁷

An important part of an impact analysis is the calculation of the contribution of the Industry to the public finances of the country. In the case of the California wine and wine grape industry, the traditional direct taxes paid by the firms and their employees provide \$17.5 billion in revenues to the federal, state, and local governments. Wine excise, sales and other taxes paid by consumers are estimated to be amount to \$4.4 billion. These figures do not include local sales taxes paid on California wine products.

⁶ These firms would more appropriately be considered as part of the supplier firm’s industries.

⁷ Often economic impact studies present results with very large multipliers – as high as 4 or 5. These studies invariably include the firms supplying the supplier industries as part of the induced impact. John Dunham & Associates believes that this is not an appropriate definition of the induced impact and as such limits this calculation to only the effect of spending by direct and supplier employees.

Table 1 on the prior page presents a summary of the total economic impact of the Industry in the United States. Summary tables for each state are included in the Output Model, which is discussed in the following section.

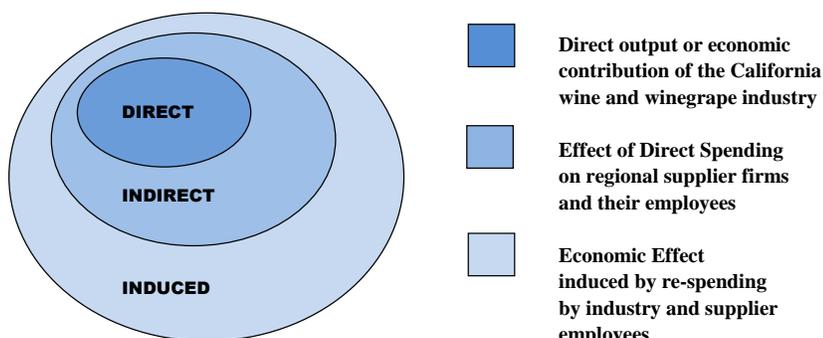
Output Model

John Dunham & Associates produced the *2022 Economic Impact Study of the California Wine Industry* for the Wine Institute and the California Association of Winegrape Growers. The analysis consists of a number of parts, each of which will be described in the following sections of this document. These include data, models, calculations, and outputs. These components were joined together into an interactive system that allows the Wine Institute and the California Association of Winegrape Growers to examine the links between the various parts of the industry and to produce detailed output documents on an as-needed basis. As such, there is no book – no thick report – outlining the impact of the industry, but a system of models and equations that can be continuously queried and updated.

Economic Impact Modeling – Summary

The study begins with an accounting of the direct employment California wine growing; wine grape production; wine research, promotion and advocacy, and wine-related tourism, as well as the wholesaling and retailing of California wine in all fifty states plus the District of Columbia. The data come from a variety of government and private sources.

It is sometimes mistakenly thought that initial spending accounts for all of the impact of an economic activity or a product. For example, at first glance it may appear that consumer expenditures for a product are the total of the impact on the local economy. However, one economic activity always leads to a ripple effect whereby other sectors and industries benefit from this initial spending. This inter-industry effect of an economic activity can be assessed using multipliers from regional input-output modeling.



The economic activities of events are linked to other industries in the state and national economies. The activities required to manufacture and sell California wine, in addition to research, promotion, advocacy and tourism activities, generate the direct effects on the economy. Regional (or indirect) impacts occur when these activities require

purchases of goods and services such as machinery or electricity from local or regional suppliers. Additional induced impacts occur when workers involved in direct and indirect activities spend their wages. The ratio between induced output and direct output is termed the multiplier.

This method of analysis allows the impact of local production activities to be quantified in terms of final demand, earnings, and employment in the states and across the entire country.

Once the direct impact of the Industry has been calculated, the input-output methodology discussed below is used to calculate the contribution of the supplier sector and of the re-spending in the economy by employees in the Industry and its suppliers. This induced impact is the most controversial part of economic impact studies and is often quite inflated. In the case of the *2022 Economic Impact Study of the California Wine Industry* model, only the most conservative estimate of the induced impact has been used.

Model Description and Data

This analysis is based on data provided by the state of California, the Wine Institute, the California Association of Winegrape Growers (CAWG), and Data Axle. The analysis utilizes the IMPLAN model to quantify the economic impact of the California wine and wine grape industry on the economy of the United States.⁸ The model adopts an accounting framework through which the relationships between different inputs and outputs across industries and sectors are computed. This model can show the impact of a given economic decision – such as opening a winery or growing wine grapes – on a pre-defined, geographic region. It is based on the national income accounts generated by the US Department of Commerce, Bureau of Economic Analysis (BEA).⁹

Vineyards

The vineyards that supply wine grapes to California’s wine industry are vital to the state’s economy. Viticulture has a long tradition in the state, dating back to the Spanish Jesuit missionaries who planted vineyards to produce wine for Mass.¹⁰ In order to estimate the economic impact of vineyards in the state of California, JDA first gathered data on all of the vineyards in the state of California.

Vineyard location, acreage and employment data is based on data collected from Wines & Vines and data gathered from Data Axle.¹¹ Data was entered into a database, and physically located in a geographic analysis system. Vineyards that were part of a winery operation (estate vineyards) were not included in the vineyard economic analysis to avoid double counting (these operations were included in the winery economic analysis).

Including both estate and non-estate vineyards, the California Association of Winegrape Growers (CAWG) estimates that there are 615,000 wine grape acres in estate and non-estate vineyards across the state of California.¹² This analysis found that California has non-estate wine grape vineyards in 39 of its 58 counties. Sonoma County leads the way with 274 non-estate vineyards. Napa County, with 123, is not far behind.

After wineries were excluded, JDA determined that there are 1,026 individual non-estate vineyard locations in the state, and these vineyards account for 89,882 wine grape acres, or about 15 percent of the total. These vineyards employed 49,272 full-time equivalent employees in the state, for an acreage-per-employee ratio of 1.82.

Jobs on farms are different than other occupations in that they are not the normal eight hours a day, 40 hours a week kind of activity. Even many farm owners only work part-time on agricultural activities, and the vast majority of the labor-intensive harvesting and planting activities are performed by teams of seasonal workers who move from place to place, often only working for a few days or weeks on any given farm.

Due to the seasonal nature of vineyard work, one full-time equivalent farm job is equal to the work performed by 2.2 actual farm workers, with an average farm worker performing about 832 hours of labor

⁸ The model uses 2020 input/output accounts.

⁹ The IMPLAN model is based on a series of national input-output accounts known as RIMS II. These data are developed and maintained by the U.S. Department of Commerce, Bureau of Economic Analysis as a policy and economic decision analysis tool.

¹⁰ *The History of California Wine*, The Wine Institute. Available at: http://www.discovercaliforniawines.com/wp-content/files_mf/ecawinehistory.pdf.

¹¹ Data was gathered from reports published by the individual counties of California, and aggregated by the California Association of Winegrape Growers, and provided to John Dunham & Associates.

¹² *California Grape Acreage Report, 2021 Summary*, California Department of Food and Agriculture, April 20, 2022, at: https://www.nass.usda.gov/Statistics_by_State/California/Publications/Specialty_and_Other_Releases/Grapes/Acreage/2022/grpacSU MMARY2021Crop.pdf

in the industry (compared with about 1,800 hours for a full-time worker in a non-agricultural occupation).¹³

To estimate employment and acreage, JDA first matched acreage data for individual vineyards from Wines & Vines with employment data gathered from Data Axle. For those establishments where a match could not be found, econometric techniques were used to estimate employment and acreage. JDA analyzed the median vineyard size in terms of both acreage and employment, and statewide vineyard employee-to-acreage ratios to construct estimates for records with missing data. Total acreage estimates were then reconciled to equal the total acreage estimates provided to JDA by CAWG, which were in turn based on USDA grape acreage data for the state of California.¹⁴

Wineries

With nearly 4,800 wineries in the state, the California wine industry is estimated to be responsible for close to sixty percent of all wine consumed in the United States. This makes California among the most important wine producing regions in the world. California's wine regions encompass nearly the entire state, or more exactly 50 out of its 58 counties. These wineries are an important part of California and the United States' economy for more reasons than being an important producer of wine for the entire country. Tourists from across the nation – as well as across the world – enjoy traveling to The Golden State not only for its beautiful landscape and vibrant urban life, but also to enjoy world-class wine.

To better identify the impact California's wineries, have on the economy, the study based its information from the following sources: California Department of Alcoholic Beverage Control License Reports, Data Axle, and data provided by the Wine Institute. The licensing data was structured to remove duplicates, inactive licenses, and any non-winery related records. Wineries are defined as: companies producing their own wines brands, companies contracted to produce wines for other companies, and companies marketing their own wine brand (but not producing the wine itself).

JDA estimates that there are about 4,795 facilities which are either wineries or facilities tied to wineries (such as tasting rooms or offices). The number of facilities identified as wineries differs from the Alcohol and Tobacco Tax and Trade Bureau (TTB) figure for bonded wine producers of 6,048 which includes wineries that may have closed, may not yet be open, or wine importers that have been classified in this model under wholesaling.¹⁵ The California Licensing data is then compared with data provided by the Wine Institute in order to generate a facility listing of wineries throughout the state. Where available, employment figures for each facility are obtained from Data Axle data. Facilities missing employment figures were replaced by medians. When possible, jobs relating to the actual manufacturing or branding of wine were separated from any other occupation occurring at the facility. An example of this separation includes the jobs relating to lodging and food because these jobs were already captured in the wine tourism segment. JDA estimates that there are about 43,286 jobs relating to the production or branding of wine in California.

Wholesale

The wholesaling tier is responsible for the transportation of California wine from wineries and for the storage of these products for a limited amount of time across the entire country. Data to identify these facilities include Alcohol Wholesaler Permit Lists from the US Department of the Treasury Alcohol and

¹³ US Department of Agriculture, 2017 Census, USDA, National Agriculture Statistics Service. Farm jobs statistics are measured differently than non-agricultural jobs as most workers are either seasonal or hourly. Many agricultural employees are seasonal workers who move from vineyard to vineyard over the planting and harvest period.

¹⁴ Op cit., *California Grape Acreage Report, 2021 Summary*

¹⁵ *Bonded Wine Producers by State: 1999 - September 30, 2022*, US Department of The Treasury, Alcohol and Tobacco Tax and Trade Bureau, October 6, 2022, at: <https://www.ttb.gov/foia/list-of-permittees>.

Tobacco Tax and Trade Bureau (TTB), Data Axle, and the Wine and Spirits Wholesalers of America (WSWA). The Alcohol Wholesaler Permit Lists from the TTB includes facilities which have been licensed to distribute alcohol beverages. The limitation of this list is that defunct facilities or facilities which have moved locations are not removed from the list as well as the lack of data regarding the alcohol beverage types being distributed at the facilities. JDA therefore cross-references the list against multiple sources including company websites, Google Maps, Data Axle, industry sources, and data provided by the WSWA. JDA estimates that there are about 4,276 facilities in the United States that are responsible for the wholesaling of beverage alcohol products, including wine.¹⁶ Data Axle records, when available, are then used to estimate total employment at these facilities. Medians are used to replace employment figures for facilities with missing employment data. Based on data provided by bw166 LLC,¹⁷ California wine consumption as a percent of total wine consumed is calculated. By applying this percent to the employment figures allocated to wine wholesaling at each of the 4,276 facilities that distribute alcohol in the United States, about 27,663 employees are estimated to be responsible for the wholesaling of California wine.

Retail

Retailing, the final tier of the three-tier system, can take place in either of two forms: On-premises or off-premises. On-premises retailers are locations which allow the consumption of alcohol beverage products on their property, such as restaurants, bars, and sporting venues. Off-premises retailers are locations which sell alcohol beverage products to take away and consume elsewhere, such as grocery stores, liquor stores, and warehouse clubs. Alcohol beverage retailing laws vary by state. Some states include dry counties which prohibit all sales of alcohol beverage products, while jurisdictions allow just on-premises sales or off-premises sales. The types of retail stores allowed to sell alcohol beverage products are also different across all states. These particular alcohol beverage retailing laws are accounted for when estimating the number of jobs relating to the sale of California wine across the United States.

Employment data were gathered at the zip code level from Data Axle, the Economic Census of Retail Trade by Product Line,¹⁸ and U.S. Department of Commerce – Bureau of Economic Analysis – Personal Consumption Expenditures by Type of Product.¹⁹ These data were used to determine the type of off-premise stores that sell wine as well as the percent of sales at each store type that is due to the sale of wine. IMPLAN Use data and U.S. Department of Commerce – Bureau of Economic Analysis – Personal Consumption Expenditures by Type of Product is used to determine the type of on-premises stores that sell wine as well as the percent of sales at each store type that is due to the sale of wine. These two methods are used to estimate the number of jobs in each state that are responsible for the sale of wine. Based on data provided by bw166 LLC,²⁰ California wine consumption as a percent of total wine consumed is calculated. The percent of California wine consumption is then used to estimate the number of jobs attributed to the sale of California wine in the fifty states and District of Columbia.

Associations

The wine associations sector is defined as trade associations which participate in the promotion of wine related industries such as wineries, wine grape vineyards, importers, and even suppliers. These

¹⁶ Most alcohol wholesalers carry at least a handful of wine brands.

¹⁷ Moramarco, Jon, *CA Wine by State*, bw166 LLC, September 4, 2022. Data for 2021.

¹⁸ *2017 Economic Census - Retail Trade: Subject Series - Product Lines: Product Lines Statistics by Industry for the U.S. and States: 2020*, United States Census Bureau.

¹⁹ *Table 2.4.5U Personal Consumption Expenditures by Type of Product*, U.S. Department of Commerce – Bureau of Economic Analysis.

²⁰ Op. cit. Moramarco, Jon.

associations serve to encourage growth and development of wine related industries in California through education and sound public policies.

Data for wine associations were provided by the Wine Institute, Wines & Vines,²¹ and Data-Axle. Employment data for each facility is gathered from the Data-Axle database. Any employment data that is missing is estimated using median job figures. JDA estimates that wine related trade associations employ about 406 people in California. These workers earn approximately \$43.7 million in wages and benefits while contributing an estimated \$92.6 million in economic activity to the U.S. economy.

Research and Education

The research and education sector is defined as organizations and institutions which are involved in applied research and educational programs that facilitate the development and advancement of knowledge that enable wineries, wine grape growers, and other wine-related industries to improve and protect the quality of their goods and services.

Data for wine research and educational organizations were provided by the Wine Institute, the California Association of Winegrape Growers, Wines & Vines, and Data-Axle. Employment data for each facility is gathered from the Data-Axle database. Any employment data that is missing is estimated using median job figures. JDA estimates that research and education specialists employ about 263 people in California. These workers earn approximately \$39.6 million in wages and benefits while contributing an estimated \$78.5 million in economic activity to the state's economy.

Wine Tourism

One of the important elements of the impact of wineries on the economy of California is their attractiveness to tourists. Every year, millions of people visit California in part to visit (or even stay at) wineries, learn about wine, and sample different wines from the thousands of producers located across the state. In order to estimate the economic impact of these visits it was first necessary to calculate the number of visitors to the state's nearly 4,800 winery facilities. This was done at the county level. Based on the data used in this model, California has wineries in 48 of its 58 counties, ranging from about 1,180 in Napa and 960 in Sonoma to a handful in other counties like Sutter and Yuba.

A function was developed that estimated the number of visits per winery based on the number of wineries in each of the 48 counties in the state that produce wine. This relies on the idea of economic clustering, which suggests that a larger grouping of wineries would attract more visitors to each winery than a smaller grouping. The tendency of locational clustering of similar types of firms has been documented by economists since at least the beginning of the twentieth century. British academic Stephen Brown described the rule of 'retail compatibility,' which explains how retail businesses, such as restaurants, know that two compatible firms in close proximity will show an increase in business volume directly proportionate to the incidence of consumer interchange between them.²² This concept was confirmed by a study by Andrei Rogers who found that the clustered spatial pattern exhibited by consumer goods retailers appears to contradict a common hypothesis that these stores tend to repel one another.²³

²¹ Wines & Vines Directory/Buyers Guide 2022, Wines & Vines Analytics, Sonoma CA, 2022

²² See: DeFranco, Laurence, William Lilley III, and John Dunham, *The Case of the Transient Taxpayer: How Tax-Driven Price Differentials for Commodity Goods Can Create Improbable Markets*, *Business Economics*, July 1998.

²³ See: Rogers, Andrei, *A Stochastic Analysis of the Spatial Clustering of Retail Establishments*, *Journal of the American Statistical Association*, December 1965.

While Rogers suggests that population densities have a lot to do with the clustering, there is significant economic theory that suggests that the tendency of activities to cluster is related more to competitive characteristics than to generalized demographic characteristics.²⁴

Using this model JDA calculates that a winery existing alone in a county would receive just under 2,050 visitors in a year, and that the number of annual visitors would rise linearly at a rate of about 9.5 additional visits per year for each additional winery in the county.²⁵ As such, a county with 10 wineries would see about 21,325 visits, while one with 1,000 wineries would report over 11.5 million.

Visitors were distributed across counties then aggregated by state. Adjustments were then made to account for the size of wineries in different counties. Other adjustments were made to account for both state population and the number of people per square mile since most people visiting wineries tend to come from the local area. The final results were compared with state-wide studies of wine tourism; however, these were so varied, and most did not contain detailed methodologies, so overall, these figures may not completely jibe with earlier tourist counts put out by individual counties.²⁶

Multiplying out the number of visits across all counties with wineries gives a total of over 25.2 million unique visits. Based on data from Napa, each person visits on average 3.29 wineries, so dividing visits by 3.29 gives an estimate of just under 7,659,100 actual wine related tourists across the state.²⁷

Once the number of visitors was calculated, spending propensities using data as broken into 24 industries based on percentages derived from the US Department of Commerce, Bureau of Economic Analysis.²⁸ These were in turn, combined into aggregate categories for processing with the IMPLAN model. As such, rather than basing the tourism impact on jobs (as with the rest of the study), it is based on estimated visitor spending on key tourism categories.

IMPLAN

The IMPLAN model is designed to run based on the input of specific direct economic factors. It uses a detailed methodology (see IMPLAN Methodology section) to generate estimates of the other direct impacts, tax impacts and supplier and induced impacts based on these entries. In the case of the Wine Institute model, direct employment in the California wine industry is a base starting point for the analysis. Direct employment is based on data provided to John Dunham & Associates by Data Axle as of July 2022, from Wines & Vines, and industry data provided by the Wine Institute and the California Association of Winegrape Growers. This data is gathered at the facility level; therefore, a company with a winery, corporate headquarters, and sales office would have three facilities, each with separate employment counts. Since the Data Axle data are adjusted on a continual basis, staff from John Dunham & Associates scanned the data for discrepancies.

Once the initial direct employment figures have been established, they are entered into a model linked to the IMPLAN database. The IMPLAN data are used to generate estimates of direct wages and output.

²⁴ See: Braid, Ralph, *Spatial Price Competition with Consumers on a Plane, at Intersections, and Along Main Roadways*, Journal of Regional Science, Vol 33, No. 2, 1993.

²⁵ The model had an R-squared statistic of 0.748 suggesting that a linear model was appropriate. The T-statistic on the coefficient was 2.982 meaning that the model was significant to the 10 percent level. This is a good level of significance considering the very low number of counties for which data were available.

²⁶ In addition, the COVID-19 pandemic has led to tremendous impact on the travel and tourism sector, which also effects this model.

²⁷ See: *2014 Napa Valley Visitor Profile: Report of Findings*, prepared by Destination Analysis for Visit Napa Valley, March 2015, at <http://sodacanyonroad.org/docs/Napa%20Valley%202014%20Visitor%20Profile%20Study%20-%20Final%20Report%20of%20Findings.pdf>. These were the only data available on visits per person.

²⁸ U.S. Travel and Tourism Satellite Accounts, US Department of Commerce, Bureau of Economic Analysis, at: http://www.bea.gov/industry/tourism_data.htm. Industries included are: Traveler accommodations, food and beverage services, domestic passenger air transportation services, passenger rail transportation services, intercity bus services, intercity charter bus services, scenic and sightseeing transportation services, other vehicle rental and leasing, parking, highway tolls, performing arts, all other recreation and entertainment, gasoline, and shopping.

Wages are derived from data from the U.S. Department of Labor’s ES-202 reports that are used by IMPLAN Inc. to provide annual average wage and salary establishment counts, employment counts and payrolls at the county level. Since this data only covers payroll employees, it is modified to add information on independent workers, agricultural employees, construction workers, and certain government employees. Data are then adjusted to account for counties where non-disclosure rules apply. Wage data include not only cash wages, but health and life insurance payments, retirement payments and other non-cash compensation. It includes all income paid to workers by employers.

Total output is the value of production by industry in a given state. It is estimated by IMPLAN Inc. from sources similar to those used by the BEA in its RIMS II series. Where no Census or government surveys are available, IMPLAN Inc. uses models such as the Bureau of Labor Statistics’ growth model to estimate the missing output.

The model also includes information on income received by the Federal, state, and local governments, and produces estimates for the following taxes at the Federal level: Corporate income; payroll, personal income, estate and gift, and excise taxes, customs duties; and fines, fees, etc. State and local tax revenues include estimates of: Corporate profits, property, sales, severance, estate and gift and personal income taxes; licenses and fees and certain payroll taxes.

While IMPLAN is used to calculate the state level impacts, Data Axle data provide the basis for political district level estimates. Publicly available data at the county and district level is limited by disclosure restrictions, especially for smaller sectors of the economy. Our model therefore uses actual physical location data provided by Data Axle in order to allocate jobs – and the resulting economic activity – by physical address or when that is not available, zip code. For zips entirely contained in a single congressional district, jobs are allocated based on the percentage of total sector jobs in each zip. For zips that are broken by districts, allocations are based on the percentage of total jobs physically located in each segment of the zip weighted by road density. Physical locations are based on either actual address of the facility, or the zip code of the facility, with facilities placed throughout the zip code area weighted by road density. All supplier and indirect jobs are allocated based on the percentage of a state’s employment in that sector in each of the districts. Again, these percentages are based on Infogroup data.

IMPLAN Methodology²⁹

Francoise Quesnay one of the fathers of modern economics, first developed the analytical concept of inter-industry relationships in 1758. The concept was actualized into input-output analysis by Wassily Leontief during the Second World War, an accomplishment for which he received the 1973 Nobel Prize in Economics.

Input-Output analysis is an econometric technique used to examine the relationships within an economy.

It captures all monetary market transactions for consumption in a given period and for a specific geography. The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios, or as estimates. The Minnesota IMPLAN group gathers this data, converts it into a consistent format, and estimates the missing components.

There are three different levels of data generally available in the United States: Federal, state and county.

Most of the detailed data are available at the county level, but there are many issues with disclosure – especially in the case of smaller industries. IMPLAN overcomes these disclosure problems by combining

²⁹ This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.

a large number of datasets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products, Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins.

The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of Economic Analysis (BEA) Benchmark I/O Study of the US Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade.

In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. As such, the margins for any good add to one. If, for example, 10 percent of the consumer price of wine is from the purchase of electricity, then the electricity margin would be 0.1.

Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The 224 sector BLS model is mapped to the 544 sectors of the IMPLAN model. Where data are missing, deflators from BEA's Survey of Current Businesses are used.

Finally, the Regional Purchase Coefficients (RPCs) – essential to the IMPLAN model – must be derived. IMPLAN is derived from a national model, which represents the “average” condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts, a cross-sectional database with consistent cross interstate trade flows developed in 1977. These data are updated and bridged to the 544 sector IMPLAN model.

Once the databases and matrices are created, they go through an extensive validation process. IMPLAN builds separate state and county models and evaluates them, checking to ensure that no ratios are outside of recognized bounds. The final datasets and matrices are not released before extensive testing takes place.

Differences Between This Study And 2022 Wine Industry Economic Impact Analysis Released by Wine America

A study of the US wine industry released by Wine America, a national wine industry association in 2022 was also conducted by John Dunham & Associates. Where possible, this analysis reflects the same data and methodology as the Wine America study. There are, however, four important differences.

- 1) As a national study, the Wine America analysis includes all wineries and wine importers in the country not just wineries located in the state of California. Even though California accounts for the lion's share of wine produced in the United States, there are also other important wine producing states. Sales of wine produced in states other than California are not included in the Wine Institute analysis.

- 2) This analysis does not include the wholesaling and retailing of imported wines from other countries. These products account for a significant share of the wine sold in the United States. Again, only wine and wine grapes produced by facilities located in the state of California are included in this analysis.
- 3) Calculations of certain consumer taxes such as excise and sales taxes may differ due to differing data on overall wine sales volumes. JDA's traditional source for volume sales at the state level is the US Department of Treasury Alcohol and Tobacco Tax and Trade Bureau. Unfortunately, the TTB decided not to make these data available to the public during the time that this model was under construction. This is due to a data audit going on in the Agency. The sales data used in this analysis comes from bw166 LLC.³⁰ These data differ from those used in the Wine America Analysis which came from the National Institute on Alcohol Abuse and Alcoholism.³¹ While JDA would not normally rely on data from this agency, it was the only Federal data available at the time of the analysis.

According to the NIAAA data, 930,820,000 gallons of wine were sold in the country in 2020. JDA modeled this to reflect 2022 volumes but maintained the same sales percentages across states. The final number used in the Wine America model was 1,142,880,540 gallons which was used to calculate taxes across the country. The data from bw166 LLC report that 417,427,893 9-liter cases of wine were sold across the country in 2021. This is equal to 992,455,050 gallons, slightly lower than what we used in the Wine America study.

To ensure that the two studies do not contradict each other, JDA used the gallonage calculated for Wine America and the percentages of California wine from the bw166 LLC data. This ensures that none of the excise tax numbers for any state in the Wine Institute study are either larger than, or fundamentally different from those calculated for Wine America.

- 4) While both studies calculate the economic impact of wine grape vineyard jobs on non-estate vineyards only. It is important that the two types of vineyards are separated in the analysis since it is difficult if not impossible to determine exactly how the staffing at an individual winery should be split between vineyard workers, production workers, tasting room workers etc. This is why economic impacts of non-estate vineyards are broken out separately in each analysis. Non-estate vineyards make up a small share of overall vineyard acreage (around 15 percent) and the Wine America study reports on the acreage of these vineyards since state-by-state data on wine grape vineyard acreage is no longer reported by the US Department of Agriculture. Since overall vineyard acreage data are available for California, these data are reported in the Wine Institute analysis.

The Effect of COVID-19 on the Model

While the data used in this model are derived from facilities and jobs as of July 2022, the impact figures are subject to the effects of the COVID-19 pandemic, since there are lags in all data, the employment figures included in the Data Axle database. Some facilities reported as closed in the Data Axle database may have subsequently opened and are yet to be updated.

³⁰ Op. cit. Moramarco, Jon.

³¹ Wine consumption in the U.S. in 2020, by state (in 1,000 gallons), National Institute on Alcohol Abuse and Alcoholism, April 2022, at: <https://pubs.niaaa.nih.gov/publications/surveillance119/surveillance-report119.pdf>. The more reliable data from the Alcohol and Tobacco Tax and Trade Bureau (TTB), are not presently available.

In addition, to certain data lags, the IMPLAN input/output tables used in this model are from 2020, the height of the COVID-19 recession. Supplier and Induced wages, output and jobs may be impacted to some extent by this; however, the main factor used to calculate these multiplier effects are the direct job numbers entered into the model.

Finally, the effects of COVID-19 and the Federal Government's reaction to the downturn do influence tax revenue calculations. Since taxes in all economic impact studies are calculated based on lagging data (2022 taxes will not be generally paid until 2023), the model includes the effects of the various stimulus packages passed by Congress in 2020 and 2021. Programs such as the Paycheck Protection Program and the stimulus payments to individuals are recorded in the model as negative taxes. While JDA has accounted for this in its own tax modeling, the baseline data will lead to some reductions in reported 2022 taxes simply because they are based on the 2020 tax year.

About John Dunham & Associates

John Dunham and Associates (JDA) is a leading economic consulting firm specializing in the economics of fast-moving issues. JDA is an expert at translating complex economic concepts into clear, easily understandable messages for a wide range of audiences. JDA's clients include a wide variety of businesses and organizations, including some of the largest Fortune 500 companies in America, such as:

- Altria
- Diageo
- Feld Entertainment
- Forbes Media
- MillerCoors
- Verizon
- Wegmans Stores

John Dunham is a professional economist with over 35 years of experience. He holds a Master of Arts degree in Economics from the New School for Social Research as well as a Master of Business Administration from Columbia University. He also has a professional certificate in Logistics from New York University. Mr. Dunham has worked as a manager and an analyst in both the public and private sectors. He has experience in conducting cost-benefit modeling, industry analysis, transportation analysis, economic research, and tax and fiscal analysis. As a senior economist for Philip Morris, he developed tax analysis programs, increased cost-center productivity, and created economic research operations. He has presented testimony on economic and technical issues in federal court and before federal and state agencies.

Prior to Phillip Morris John was an economist with the Port Authority of New York and New Jersey, the Philadelphia Regional Port Authority, and the City of New York's Department of Ports & Trade.