



Estimating the Supply of California Wine Grapes using Regional Systems of Equations

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This study is the first of its kind to econometrically estimate the supply of California wine grapes. Despite the clear economic importance of wine grapes to the state, nation, and world, up until now we have not obtained elasticity estimates for the industry. These elasticities are vital for forecasting the future of wine grape production and conducting welfare analyses. We conduct our analysis on four red grape varieties—Cabernet Sauvignon, Merlot, Zinfandel, and Pinot Noir, as well as four white varieties—Chardonnay, Sauvignon Blanc, French Colombard, and Chenin Blanc for the years 1976-2006.

Given that there are significant differences throughout California in terms of growing conditions, grape variety specialization, and prices received by producers, we divide the state into four major growing regions. These regions are: 1) North Coast, which is home to Napa and Sonoma Valleys, 2) Central Coast, which extends from San Mateo County to Santa Barbara County, 3) Central Valley, which includes the Sacramento and San Joaquin Valleys, and 4) Southern Valley which includes San Bernardino and Kern Counties and all points south. In order to avoid aggregation bias, our supply estimations are specific to region/variety pairings.

We estimate systems of simultaneous output and acreage equations, each covering a growing region and a grape color. Thus for example one system pertains to red wine grapes of the North Coast. Given the right-hand side endogeneity of our equations and the potential for long-term substitution among like-colored wine grapes, we estimate our systems using three-stage least squares (3SLS). We account for weather factors using bloom- and harvest-specific weather variables while labor wages and land prices capture the costs facing wine grape producers.

Our results indicate that California wine grape production is inelastic with respect to prices received by growers. Weather and technological change account for a large degree of the variation in output. Out of the 31 region/variety pairings we estimate, only 15 produce statistically significant supply elasticities. The Central Coast and the Southern Valley in particular show very little price responsiveness. In the former region, output has increased very slowly over the 30-year span while in the latter production is largely determined by contractual arrangements with large wine distributors. Among grape varieties, Zinfandel and Chardonnay show strong price responsiveness throughout the entire state. The estimated supply elasticity for Zinfandel grown in the North Coast is 0.89 while the supply elasticity for Chardonnay in the Central Valley is 0.85. There is little evidence for significant price-output relationships among the white grapes that have seen decreasing or stagnant production in California over the last couple of decades.

Our results provide crucial insight into the key determinants of wine grape production in California as well as the building blocks for formal welfare analyses on an industry of major economic importance to both the state and the entire country.