

Too Much of a Good Thing? Causes and Consequences of Increases in Sugar Content of California Wine Grapes

Julian M. Alston, Kate B. Fuller, James T. Lapsley, and George Soleas

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The sugar content of California wine grapes has increased significantly over the past 10-20 years, and this implies a corresponding increase in the alcohol content of wine made with those grapes. Our preliminary analysis indicates that the sugar content of California wine grapes at harvest increased from 21.8 degrees Brix in 1990 (average across all wines and all districts) to 23.3 degrees Brix in 2008. Since sugar converts essentially directly into alcohol, a 9 percent increase in the average sugar content of wine grapes implies a corresponding 9 percent increase in the average alcohol content of wine.

These changes might have resulted from changes in climate, cultural changes in the vineyard either in response to perceived demand for more-intense or riper-flavored wines or to mitigate the effects of climate change, or some combination of the two. In this paper we seek to develop a detailed, quantitative economic understanding of these recent changes in the sugar content of wine grapes in California. In pursuing this aim, we document the increases in the sugar content of wine grapes and the corresponding implications for the alcohol content of wine in California. Additionally, we evaluate the roles of exogenous changes in climate versus human responses (both in the vineyard and the winery) to climate change and other influences in determining the changing sugar content of wine grapes.

The paper begins with a brief introduction, followed by an overview of the main production patterns in terms of varieties grown, and variation in quality and price by location of production, as well as the basic trends in sugar content of winegrapes. We also provide an overview of changing technologies, market trends, government regulations, and recent changes in climate that may have had some influence on the phenomena we are studying. Next, we develop a conceptual model of winegrape production and quality, including sugar content and other characteristics as choice variables along with yield. Using this model we derive hypotheses about alternative theoretical explanations for the phenomenon of rising sugar content of grapes, including effects of changes in climate and responses to changes in consumer demand. The remainder of the paper consists of three separate but connected pieces of empirical analysis, drawing on this conceptual model.

First, we have assembled (from annual crush reports and various other sources) and begun to analyze a very detailed data set that includes (a) annual data by variety of grapes and crush district on the average sugar content of wine grapes at crush, extending from 1980 through 2008, and (b) other data on yield, acreage, and production of wine grapes by variety and county. We use these data to estimate a statistical model and test hypotheses regarding the causes of higher alcohol content.

Second, we quantify efforts to remove alcohol from wine in wineries. Vignerons have some scope to manage the balance between sugar content and other characteristics of

winegrapes. Likewise, winemakers have access to technologies that may be used (at a cost) to remove alcohol from wine but not without affecting other quality characteristics of the wine, and they can blend wines to balance characteristics. We discuss these technologies and present data on the extent of the adoption and use of the “spinning cone” technology to reduce the alcohol content of wine in California. This analysis provides some evidence of the extent to which excess alcohol has become a nuisance by-product from production of wine.

Third, we examine data on the alcohol content of wine. Detailed data on the alcohol content of California wines are not available. While every wine bottle reports a figure for alcohol content on the label, the tolerances are wide and the information content is therefore limited. The Liquor Control Board of Ontario (LCBO), which has a monopoly on the importation of wine for sale in the province of Ontario, Canada, tests every wine it imports and records a number of characteristics including both the declared and actual alcohol content. We have obtained access to these records and in final main section of the paper we present an initial analysis of the changes over time in the alcohol content of California wines, the relationship of actual alcohol content to label claims, and the relationship of alcohol content of wine to sugar content of wine grapes.

* Julian Alston is a professor in the Department of Agricultural and Resource Economics and Director of the Robert Mondavi Institute Center for Wine Economics at the University of California, Davis, and a member of the Giannini Foundation of Agricultural Economics. Kate Fuller is a PhD candidate in the Department of Agricultural and Resource Economics at the University of California, Davis. Jim Lapsley is Adjunct Associate Professor in the Department of Viticulture & Enology at the University of California, Davis and Academic Researcher at the UC Agricultural Issues Center. George Soleas is Senior Vice President, Logistics/Quality Assurance, Liquor Control Board of Ontario. Authorship is alphabetical.