Estimating the Supply of California's Winegrapes

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Econometric supply estimation is the key to obtaining supply elasticities, which in turn are essential to welfare analyses. This study is the first of its kind to econometrically estimate the supply of California's major winegrapes for the purpose of retrieving reliable elasticities with respect to grower returns. Our approach takes into account the heterogeneity of California's major winegrapes and growing regions as well as potential substitutability in production among certain grape varieties. The results also serve to identify the major determinants of winegrape output in California. We use a time series beginning in 1976 and ending in 2006.

The supply estimation is broken down according to growing regions and grape varieties. The growing regions are 1) North Coast, which lies north of San Francisco and includes Napa and Sonoma, 2) Central Coast, which stretches from Ventura county in the south to San Mateo county in the north, 3) Central Valley which includes the Sacramento and San Joaquin Valleys, and 4) Southern Valley which includes California's Inland Empire and points south to the Mexican border. These growing region definitions are a slight modification of those used by Sumner, et al., 2001. The grape varieties include four reds: Cabernet Sauvignon, Merlot, Zinfandel, and Pinot Noir, and four whites: Chardonnay, Sauvignon Blanc, French Columbard, and Chenin Blanc.

We employed a systems approach to the supply estimation of California winegrapes. Ignoring any potential substitutability between red grapes and white grapes, we estimated a system for red grapes and a system for white grapes for each region. For each grape variety, output measured as tons crushed and bearing acreage were treated endogenously. Therefore the supply of each variety was measured using two equations, resulting in eight equations per system. We used growers' expected, rather than contemporaneous, returns, which were treated exogenously. A seemingly unrelated regression (SUR) approach allows for efficient estimation given that there may be long-run substitution in production of like-colored grapes.

A number of weather variables, measuring precipitation and temperature at various points throughout the growing and harvesting seasons, were incorporated into the estimation. We also included variables measuring the costs facing growers, including the wages paid to laborers and land prices.

The results indicate that in many cases California winegrape production is relatively inelastic with respect to grower returns. Indeed, weather and technology change as measured by a time trend are responsible for the majority of the variation in production for many regions and varieties. Not surprisingly, we find the strongest evidence for grower return responsiveness for the cases in which returns have either grown or shrank considerably throughout the time series. Examples include Cabernet Sauvignon and Pinot Noir in the North Coast and Zinfandel throughout nearly the entire state.