The Economics of Pierce’s Disease in the California Winegrape Industry

Abstract

Pierce’s Disease, a vector-borne bacterial disease of grapes, costs over $100 million per year (Tumber et al. 2012) in losses and prevention efforts and threatens an industry worth over $3 billion per year (California Department of Food and Agriculture 2011). The introduction of the Glassy-Winged Sharpshooter, a relatively new and threatening vector, has increased the incentive to study the disease and efforts to find a cure. Spurred by concern over this new vector’s ability to spread PD, the Pierce’s Disease Control Program (PDCP) was created by various government agencies. The PDCP is an extensive program that includes funding for research, area-wide controls, and inspections undertaken aiming both to limit the spread of the GWSS and eventually to find an effective pest control or a preventive measure, cure for the disease, or some combination thereof.

This dissertation explores the economic effects of Pierce’s Disease and the current and potential policies that have been put in place to curb its impacts. The tools used for the analysis include dynamic optimization applied to a representative grower at the level of the vineyard; econometric estimation of a system of demand equations for winegrapes to be used to parameterize a market equilibrium model; and numerical simulation
methods applied both in the vineyard model and in a dynamic regional model of the supply and demand for California winegrapes that allows for alternative scenarios of pest and disease prevalence, policy, and technology.

Chapters 1 and 2 provide introduction to and history of the economics of Pierce’s Disease. Farm-level analysis in Chapter 3 suggests that, across a wide-range of scenarios, growers can gain substantial economic benefits from cooperating in controlling for the disease, and they can incur potentially large costs from being adjacent to an area that does not control for the disease. Additionally, results suggest that some factors treated as parameters in this analysis, such as vine replacement cost and crush price, have more impact on grower profitability than others.

Chapter 4 presents demand elasticities estimated using both econometric and synthetic methods, each of which provides a check on the other, with some examination of the implications of using alternative modeling approaches in the econometric approach and alternative choices of fundamental parameters in the synthetic approach. Specifically, the uncompensated own-price elasticities of demand for three different price categories of winegrapes range from $-2$ to $-9$ when estimated using “synthetic” methods, $-3$ to $-9$ using econometric results, and $-3$ to $-10$ using “mixed” techniques, all suggesting that demand for winegrapes is fairly elastic.

Chapter 5 builds a model of the market for winegrapes in California, taking account of supply-side complications specific to perennial crops, such as bearing versus non-bearing acreage, and vineyard age structure. Chapter 6 presents and discusses results of applying the model developed in Chapter 5 for various scenarios and over ranges of estimates of PD incidence and winegrape production developed from a combination of
responses to questionnaires and careful guesswork. These results suggest that the Pierce’s Disease Control Program has yielded substantial net economic benefits to winegrape growers and the State as a whole. These results suggest that the program yields benefits of over $250 million per year, compared with a scenario in which the program ends immediately. Taking into account its roughly $50 million cost, the program yields a very substantial net benefit—over $200 million per year—and has a benefit-cost ratio is in excess of 5:1.

The sum of this work shows that the Pierce’s Disease imposes substantial current and potential costs on the California winegrape industry. More importantly, this work suggests that the Pierce’s Disease Control Program has been cost-effective in preventing potentially very large losses, despite itself imposing a substantial cost on the economy.