

Who Pays for Sudden Oak Death? An Econometric Investigation of the Impact of an Emerging Pathogen on California Nurseries¹

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Abstract

While there is a great deal of scientific uncertainty about the nature and control of *Phytophthora ramorum*, there is growing concern that its economic costs will be significant. Indeed the repercussions at the nursery level of a positive test for the presence of *P. ramorum* may include severely impacted current and future cash flows. Given this possibility, nurseries that are susceptible to *P. ramorum* infestation may reassess their production strategy. Firms may choose to increase expenditures to prevent *P. ramorum* infestation, or they may choose to reduce production of *P. ramorum* host plants, thus limiting exposure to infestation risk. Optimal production strategies may reduce the expected cost of *P. ramorum* by affecting either the probability of infestation or the magnitude of the loss incurred in the event that infestation occurs.

In this paper, we use a unique data set to identify the characteristics of firms that are impacted by *P. ramorum* (e.g., their location, size, and target market). We also estimate econometrically the partial equilibrium relationship between realized costs of *P. ramorum* control and nurseries' crop mix. We motivate the empirical work with a simple model of firm behavior in the presence of regulatory inspection and uncertainty. The model is related to previous work on efficient resource management to control pests short of eradication and the pollution abatement decision when regulatory compliance may be imperfect.

The data employed in this research was collected via survey during a three-month period in 2004. This confidential and timely data contain qualitative and quantitative information about many nursery characteristics not reported by the California Agricultural Census surveys. The sample of firms represented covers a wide geographic area and includes both large and small firms with varying production mixes. All California nurseries that (i) were considered a

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candidate for producing at least one type of *P. ramorum* host plant and (ii) operate their growing facility on at least five acres of land were contacted and asked to participate in the survey. In order to account for the non-random sampling nature of our data, we use Heckman two-step estimation to correct for sample selection bias.

In the empirical section of the paper we develop two separate regression equations: we predict changes in (either fixed or marginal) cost as a function of firm characteristics, and we predict *P. ramorum* /Non- *P. ramorum* host product mix as a function of changes in costs and firm characteristics. The explanatory variables in both regressions include grower characteristics such as size, location, and sales destinations. Changes in the cost of production arise largely as a result of changes in water treatment and irrigation practices, fungicide programs, labor practices, and inventory management.

We discuss the bias resulting from the endogeneity of the production mix and cost and present possible bias-correcting techniques including instrumental variables. Our results allow us to identify firm characteristics that may predict the relative impact of *P. ramorum* on profitability, and describe nurseries' behavioral responses to a possible extension outward of the zones of infestation boundaries. These findings can assist regulators in identifying which firms and regions may benefit most from technical assistance.