Peter Berck's Contributions to Forestry Economics

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Scott R. Templeton, Archibald W. Templeton, Peter Berck, and Mary Lou A. Niebling, at Scott's graduation from the PhD program at UC Berkeley, 1994.

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Peter Berck published numerous articles and book chapters related to the economics of forestry. His research covered, in approximate chronological order, four areas within forestry economics: (1) actual and optimal harvesting of timber, demand for timber, and, more generally, markets for wood products; (2) economic aspects of integrated management of forest pests; (3) old-growth redwoods as a nonrenewable resource, and (4) impacts of timber harvesting and other aspects of forestry on income and employment in nearby communities. Interwoven in much of the research are analyses of effects of policy on efficiency and on forest-dependent communities.

Most of Peter's earliest research in forestry economics addressed actual and dynamically efficient supply of timber, demand for it, and other markets for wood products. In his analysis of timber as a renewable resource (Berck, 1979), Peter focused on whether, in the western United States during 1950–1970, private landowners harvested Douglas fir sooner than was privately optimal and the US Forest Service harvested the firs later than was socially optimal. His nuanced answers were "no and "yes" (Berck, 1979, pp. 460). That is, private landowners with rational expectations implicitly discounted the future at a real rate of 5 percent, a rate of return lower than that available for other private investments and statistically lower than a real, pretax rate of 10 percent, which Peter used as the social discount rate (Berck, 1979, pp. 447–449, 460). Reasonable, evidence-based values for non-timber services were not sufficiently large to economically justify the Forest Service's waiting 25–50 years until the culmination of the mean annual increment of trees to harvest timber, that is, until the sustainable yield of timber would have been maximized (Berck, 1979, pp. 458–460).

The article about the economics of timber as a renewable resource (Berck, 1979) may be the most frequently cited among Peter's articles in forestry economics. In a subsequent, purely theoretical article (Berck, 1981), Peter analyzed dynamically efficient logging of trees when demand for timber is growing and trees as forests generate uncompensated non-timber services, called positive externalities. In subsequent articles, he analyzed the supply of Douglas fir and its potential for biomass utilization (Berck, 1980), scheduling of large-scale harvests of timber (Berck & Bible, 1984), and futures markets for wood products (Berck & Bible, 1985).

During the late 1970s and the first half of the 1980s, Peter participated in a multidisciplinary, multi-institutional teaching-research program on integrated pest management (IPM) of bark beetles in pine forests of North America. He cowrote two chapters in *Integrated Pest Management in Pine-Bark Beetle Ecosystems* (Waters et al., 1985), a product of the program. In their first chapter, Peter and William Leuschner described damages caused by bark beetles to timber harvests, other human uses, and ecosystem services of forests (Leuschner & Berck, 1985a). In their second chapter, the two coauthors described methods to estimate monetary values of the damages as part of benefit-cost analysis for forest IPM (Leuschner & Berck, 1985b). As an outgrowth of the program, Peter coauthored an article about impacts of western pine beetle (Liebhold et al., 1986). He and his coauthors simulated timber production with and without tree mortality caused by the beetle and then estimated net present values of the differences in timber production with and without the mortality (Liebhold et al., 1986).

In a sole-authored article (Berck, 1997) and a coauthored one (Berck & Bentley, 1997), Peter argued that old-growth redwoods were nonrenewable resources. Old-growth redwoods are hundreds to thousands of years old. They do not grow, on net, because decay or death of some trees in a stand offsets the growth of other trees in the stand (Berck, 1997, pp. 36–37; Berck & Bentley, 1997, p. 288). The stumpage value ($ per 1000 board feet) of old-growth redwoods is the price that a buyer pays to a landowner for the owner's standing timber, i.e., trees that are ready to be logged. As implicitly defined in Berck (1997, p. 37) and Berck and Bentley (1997, pp. 289 and 291), stumpage value equals the price of lumber minus the average costs of converting trees—logging, hauling, and processing felled trees—into lumber and other semi-processed wood products. As the rent for standing timber, stumpage value fits Hotelling's definition of the net price of a nonrenewable resource (Berck, 1997, p. 37; Berck & Bentley, 1997, p. 288). Thus, information about stumpage values of old-growth redwoods could be used to test predictions of Hotelling's model of wealth-maximizing extraction of a nonrenewable resource.

In Berck (1997, p. 37), Peter argued that stumpage values for parcels with large amounts of timber from old-growth redwoods should not differ from stumpage values for parcels with small amounts, according to the simplest version of the Hotelling Valuation Principle (Miller & Upton, 1985). However, estimated stumpage value did increase as stumpage volume increased from small amounts (Berck, 1997, pp. 48–49). The inconsistency with the simple valuation principle reflected, Peter surmised, scale economies that were caused by fixed costs of identifying willing buyers and sellers, contracting between the parties, and moving men and machines to the site of the sale but did not reflect the capital-market inefficiency (Berck, 1997, pp. 37–38 and 49).

In Berck and Bentley (1997), Peter and his coauthor added housing starts, expected interest rates, and remaining stumpage as explanatory variables to the "hedonic" model of stumpage values in Berck (1997). They also re-specified the model in Berck (1997) as a semi-translog one that, with inclusion of the additional variables, became a reduced form model of net price, as in Hotelling. Hotelling's theory implies two restrictions from the reduced form model of stumpage value and a structural model of demand for stumpage (Berck & Bentley, 1997, pp. 294–296). The first restriction depends on (1) the elasticity of initial stumpage value with respect to the initial stumpage—an elasticity that depends, in turn, on parameters from the reduced form model—and (2) the lumber-price elasticity of demand for stumpage, an elasticity that depends, in turn, on parameters from the structural model. The second restriction entails (1) the housing-starts elasticity of demand for stumpage in the initial period; (2) the elasticity of housing starts with respect to the initial stumpage value, evaluated at the largest value of starts; and (3) the elasticity of initial stumpage value with respect to initial stumpage. The two cross-equation restrictions statistically held, or were not violated (Berck & Bentley, 1997, pp. 295–296). The consistency of the two cross-equation restrictions with Hotelling's model led Peter and his coauthor to conclude that a version of the

Hotelling Valuation Principle held for sale of stumpage. Berck (1997) and Berck and Bentley (1997) were the second and third earliest peer-reviewed journal articles in which Hotelling's theory was tested with data on stumpage values of old-growth timber. Johnson and Libecap (1980) was the first article on the subject.

The livelihoods of people who work in the forest industry or who live in forest-dependent communities was Peter's fourth area of forest economic research (e.g., Berck & Hoffmann, 2003). Stability of employment in the forest industry and household incomes in forest-dependent communities was the focus of Berck et al. (1992). Communities that depend on the forest industry "suffer from considerably more variation in employment than do urban areas" (Berck et al., 1992, p. 336). Peter and his coauthors analyzed three possible explanations for this business-cycle variation. First, the forest industry "is not more plagued by economic fluctuations than are other sectors in the economy" (Berck et al., 1992, p. 325). In particular, the residual coefficient of variation in de-trended and de-seasonalized employment in the forest industry in Oregon during 1947–1987 was not different from the residual coefficients of variation in de-trended and de-seasonalized employment in manufacturing; in finance, insurance, and real estate; and in services in Oregon during the same period (Berck et al., 1992, pp. 323–325). Moreover, the residual coefficient of variation in de-trended and de-seasonalized employment in forest-dependent industries was less than the residual coefficients of variation in de-trended and de-seasonalized employment in agriculture and fisheries, mining, and construction (Berck et al., 1992, pp. 323–325). Second, employment in communities that rely on one industry does fluctuate more during a business cycle than employment in communities that rely on multiple, diverse industries (Berck et al., 1992, pp. 326–336). However, simulated diversification of industry beyond forest products in Humboldt County, California, to match the stability of the US gross national product would reduce the coefficient of variation in household income in Humboldt by only 16 percent (Berck et al., 1992, pp. 335–336). Third, the isolation, remoteness, and high transportation costs of businesses in Humboldt County and in most other timber-producing regions of the western United States lead to strong linkages between local businesses that keep the local economies relatively small, constrain diversification, and limit the extent to which stabilization of employment through diversification is possible (Berck et al., 1992, pp. 336–337).

The extent to which timber-related employment affects non-timber-related employment and poverty in forest-dependent areas of northern and eastern central California and the extent to which statewide economic conditions affect employment and poverty in the forest-dependent areas were the primary research subjects in Berck et al. (2003). Five-equation vector autoregressive models of local timber employment, local nontimber employment, state employment, local participation in a federal poverty-relief program, and statewide participation in the poverty-relief program in each of eleven timber counties or in each of three multicounty timber regions of California were estimated with monthly data for 1983–1993 (Berck et al., 2003, pp. 765–767). Timber employment is a basic industry in heavily forested areas of northern and central eastern California and is linked to non-timber employment. A one-time, unexpected increase of 100 jobs in the timber sector results 2 years later in an additional 86.5 jobs, most of which would be in the same sector (Berck et al., 2003, p. 773). An increase in timber employment is not, however, usually related in the short run or long run to a decrease in caseloads for Aid to Families with Dependent Children in timber-dependent areas (Berck et al., 2003, pp. 770–774). Statewide economic factors affect local poverty more than local timber employment does (Berck et al., 2003, pp. 763 and 774).

In short, Peter Berck's contributions to forest economics were original in breadth and depth.

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