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Review of Agricultural Research and Productivity

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Review

Reviewed Work(s): *Agricultural Research and Productivity*. by Robert E. Evenson and Yoav Kislev

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analysis proceeds within the framework of the permanent-income hypothesis of Friedman.

Although I very much agree with Smith that the demand for automobiles must be approached in terms of ownership, replacement, and purchase, on the whole I find the study disappointing. Specifically: (1) I am disappointed that Smith does not look beyond population, income, and time trends in explaining ownership. While the model utilized by Smith explains the historical record very well, it is of little relevance to analyzing the forces currently having a marked impact on the automobile market, namely, sharp increases in the price of gasoline and almost equally sharp increases in the price of cars occasioned by general inflation and the cost of pollution control equipment; and (2) while I completely agree with Smith that the market for new cars and the market for used cars are distinct in terms of ownership, they are nevertheless highly interdependent. Smith, in my opinion, makes too light of this interdependence and, in particular, ignores the key equilibrating force across the wide range of ownership markets, namely, used-car prices. At the beginning of chapter 4, Smith notes the theoretical importance of used-car prices in connecting replacement demand with the decision to scrap, but concludes, in essence, that the transmission mechanism is too complicated to model. I disagree that this is the case, and until used-car prices are dealt with explicitly, no study of automobile demand can, in my view, lay any claim to being definitive.

Despite these misgivings, there is much in the study that is interesting and useful, and I strongly recommend it to anyone interested in the demand for automobiles.

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Agricultural Research and Productivity. By ROBERT E. EVENSON and YOAV KISLEV. New Haven, Conn.: Yale University Press, 1975. Pp. xi+204. \$12.50 (cloth); \$3.95 (paper).

The book summarizes the authors' extensive research on the economics of international agricultural research and productivity change. Although much of the substantive content of the book has been published elsewhere, the authors have performed a service to the reader by bringing their work together in a single volume. Also, the book presents some new and previously unpublished findings and provides better documentation and more detail than is permitted in professional journal publications.

The basic hypothesis is that discovery and diffusion of agricultural technology is subject to economic analysis. The economic analysis is primarily empirical—measurement and estimation or statistical analysis—and this is what the authors do best in the book. They have performed the laborious task of collecting extensive international data on various measures of agricultural research and extension. These data are key inputs into the authors' attempts to explain various aspects of knowledge production and agricultural productivity change.

The stage for the analysis is set in chapter 1 by summarizing trends in world food production (aggregate and per capita) by continent (1953–71) and summarizing past research on U.S. agricultural productivity change, especially the pioneering work by Griliches. Chapter 2, which is one of the most interesting and important in the book, summarizes the comprehensive compilation of international data on agricultural research and extension and contains estimates of the productivity of agricultural research systems.¹ These data show: “The world total expenditure on research in 1965 was \$1.1 billion annually, with close to 60,000 scientists engaged in research activity. There were more than 160,000 extension officers with budgets reaching \$700 million. As these figures indicate, the agricultural knowledge-producing and dissemination industry is of substantial size (and growing), but the economic resources engaged in these activities are much smaller than those devoted to many other public sectors” (p. 16). Furthermore, in 1965 the developing countries employed twice as many extension workers per \$10 million dollars of agricultural production as developed countries, but only half as many researchers.

As a proxy measure of knowledge creation, the authors use the number of scientific publications in a particular agricultural science. These data show that the world share of publications from the developed countries rose slightly over the period 1962–68 and that the ratio of publication rate to value of agricultural production has remained roughly constant for developed regions and has generally risen for developing regions. Also, the mix of research has shifted toward crops and away from livestock.

Estimates of the productivity of agricultural research systems are inferred from regression estimates of a knowledge (publications) production function. The average rate of agricultural science publication is positively and significantly related to the input of researchers’ time and to the rate of publication of related and supporting scientific knowledge.

An aggregate analysis of agricultural productivity for 36 countries in chapter 5 shows a positive and significant contribution of research (publications) to explaining aggregate output. The calculated marginal benefit–cost ratio is two. Also, the production function results imply that agricultural productivity is higher and increasing faster in rich countries than in poorer ones.

Chapters 4 and 6 contain an empirical analysis of the contribution of indigenously created and borrowed research (from similar agro-climatic regions) to agricultural productivity. In chapter 4,² national average wheat and maize yields (in 64 and 49 countries, respectively) are shown to vary positively and significantly with both indigenously created and borrowed knowledge. However, no borrowing occurs in the absence of indigenous research. In chapter 6, measurement and analysis of aggregate agricultural productivity for the states of India (1953–71) and of research productivity show a growing disparity of agri-

¹ The essence of this chapter is reported in Robert Evenson and Yoav Kislev, “Investment in Agricultural Research and Extension: A Survey of International Data,” *Economic Development and Cultural Change* 23 (April 1975): 507–22.

² The essence of this chapter is reported in Robert Evenson and Yoav Kislev, “Research and Productivity in Wheat and Maize,” *Journal of Political Economy* 81 (November/December 1973): 1309–29.

cultural productivity change, a growing importance of modern agricultural inputs relative to conventional inputs, and a gradual shift in research publications away from commercial crops (sugar and cotton) toward food grains. In the statistical analysis, measured agricultural productivity is shown to be positively and significantly related to both indigenous and borrowed research. Furthermore, the interaction effect between research and extension is negative and significant. Income streams created by expenditures on research are shown to be larger than from expenditures on extension.

In an attempt to identify factors that have contributed to the international transmission of crop-biological technology, the authors examine in chapter 3 the experience of sugarcane varietal transfers between countries. International transfer of sugarcane varieties is an early example of international technology transfer, and the authors conclude that during the early stages of varietal development the transmission of technology was by transfer of varieties directly. During the later stages, when plants were developed that were relatively more sensitive to the local environment, the transfer of varietal technology took place via the international exchange of research findings and information rather than by transfer of varieties directly. A statistical analysis of adoption rates for cane varieties in seven countries shows that the average rate of adoption was positively related to the intensity of experiment-station research per unit of aggregate output. A statistical analysis of cane yield increases for three countries shows that yield increases are positively related to the rate of varietal change. A combination of information from the two sets of results shows a large rate of return to experiment-station research from increasing the rate of adoption of cane varieties.

In chapters 7 and 8, of all places, the authors present conceptual models. The first is of the adoption, diffusion, and adjustment by farm firms to new technology, and the second is of the agro-biological scientific research process. These chapters add meagerly to the accumulated empirical evidence of the previous chapters, and they detract from the book's consistency of purpose. They should have been saved for a later book.

In the final chapter, the authors conclude that expenditures on agricultural research have been a good investment; however, developing countries have generally underinvested in agricultural research and overinvested in extension.

Reading the book is a must for persons who are interested in pragmatic issues of knowledge production and of international agricultural productivity change.

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An Investigation of Brand Choice Processes. By B. WIERENGA.
Rotterdam: University of Rotterdam, Netherlands, 1974. Pp. xi+256.

The researcher with an interest in brand choice modeling will certainly find it useful to read this book. A selective reading would seem appropriate, however, since some chapters describe already known results. The empirical work is based