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Is Agricultural Productivity Research Productive?

Agricultural Productivity: Measurement and Explanation. *Edited by Susan M Capalbo and John M Antle, Washington, DC, Resources for the Future, 1988, 404 pages $30*

Reviewed by Roger K. Conway

Why has productivity growth followed a certain path? How does policy affect productivity, and can we project future growth rates based on policy? The research record in answering these questions sounds an uncertain trumpet and this volume echoes the refrain

This volume's strength it is a capable survey and a collection of papers on the state of knowledge of agricultural productivity and production accumulated during the 1970's and early 1980's Most of these papers were derived from a 1984 Resources for the Future workshop on agricultural productivity The opening section reviews new methodological developments in production theory and multifactor productivity measurement and summarizes the empirical evidence on agricultural productivity and production I would like to have seen a more searching critique of the literature For example, there are problems with econometric estimation procedures used to derive productivity measures A close conceptual relationship exists between index number measurement of multifactor productivity and econometric estimation of certain production functions However, an important difference separates the two Index number measurement is determinstic and the econometrics is statistical Harper and Gullickson (1986) cited the possibility of wide differences between the two because of the properties of the error term [1] Since the theory itself is developed deterministically, it is unclear whether the theoretical mathematical conditions are met in a stochastic framework

Events have muted Richard Shumway's generally on-the-mark critique of the current Laspeyres ERS productivity series ERS held a productivity conference in spring 1988 to unveil the new Tornqvist quality-adjusted indices developed by Ball (1985) as the forthcoming official ERS indices Ball's work addresses the recommendations suggested by Shumway as well as the 1980 AAEA task force report for improving the ERS productivity measures

While the Capalbo productivity data set (page 106) has been used a great deal recently for empirical research, it has serious limitations Capalbo fails to include inventories in the data, even though they are an important component of agricultural capital assets Gollop and Jorgenson are cited as the source of the labor data, yet that data set covered only the period 1948-78 How were the labor data extended to 1983? And, capital service prices are computed as the sum of opportunity costs plus depreciation and taxes Laurets Christensen (1971) defines opportunity cost as property income less capital gains Capalbo ignores the capital gains component Capalbo used crop year gross production and season average prices instead of calendar year marketing and cash receipts Ball's data set does not suffer from these limitations

New measurement techniques not discussed in this volume have great importance For example, failure to take account of variations in capacity utilization in agriculture can distort productivity measurement Preliminary work by Hauver, Yee, and Ball (1990), which adjusts for capacity utilization, is underway

Another new approach to solve the almost intractable aggregation measurement problem is to use hedonic procedures and to redefine the production function in characteristics space as suggested by Triplett (1985) A technological advance would then be indicated by the availability of different combinations of characteristics rather than input levels

The rest of the book explores empirical measures of productivity and seeks to isolate sources of growth Papers by Hazilla and Kopp and Huffman both stress the need for more disaggregate measures in order to improve investigations of sources of growth, farm behavior, and the distributional effects of farm policy Mundlak's paper is very useful because he adjusts for aggregation by constructing an aggregate production function with stochastic coefficients from micro-units His approach endogenizes technical change, offering an attractive alternative to the simple addition of a time trend in empirical work Antle, a gifted researcher, continues his important work of presenting the agricultural production process in a dynamic framework

These papers, however, are limited by their unquestioned adherence to neoclassical theory The assumption that farmers know all efficient input combinations, whether or not they have been tried, is somewhat unrealistic Neither is there any room for entrepreneurial innovation in the neoclassical production process Farmers are free to pick among all known technical possibilities to produce their output

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[1] Sources are listed in the References section at the end of this review

under profit-maximization and certainty We know that the farmer's response to risk permeates production decisions, yet we ignore this behavior in productivity measurement research Entrepreneurial rents are swept under the rug in accounting procedures by assuming perfect competition and complete information

Another important issue not directly addressed by this volume is that input decisions in agriculture must often be made with explicit consideration of flexibility versus efficiency trade-offs The expense of flexibility is usually a loss in economic efficiency relative to a best practice for a specific static operating environment Therefore, the farmer's calculation of the flexibility-efficiency margin is an important element in an evaluation of a farmer's technological possibilities and behavior So, the role of risk and/or uncertainty plays an important part in choosing durable inputs, since dynamic efficiency must be achieved in a context of flexible technologies For example, irrigation technology may be efficient *ex ante* but inefficient *ex post* if there is sufficient rain in a given year, so to maintain flexibility when the weather is dry, farmers may invest in irrigation equipment

The book recognizes that agricultural policies have considerable influence on productivity measurement and sources of growth, but little here is useful to the policymaker Perhaps understandably, none of the papers really deals with the measurement problems caused by farm policy Output and input market prices are not competitive because of farm policies The allocation of inputs is altered when farmers act on Government support prices rather than competitive prices Expectations of farm policy changes surely influence a farmer's input decisions and, consequently, productivity growth

Indeed, farmer expectations, in general, should be explicitly accounted for by distinguishing between *ex post* and *ex ante* measures of output and productivity *Ex post* measures of output and productivity represent what actually occurred and show the effects of unanticipated shocks to the agricultural production sector, such as weather and the influence of agricultural and macroeconomic policy *Ex ante* measures consider what the farmer anticipates the economic environment to be in the decisionmaking process *Ex post* and *ex ante* measures are likely to differ When they do, economists may mistake farm behavior and expectations for scale change and technical efficiencies

Monetary policy clearly plays an important role in determining agricultural productivity growth rates unacknowledged by this volume New technologies frequently require that increased purchases of nontraditional inputs and credit arrangements become important as a result Lee and Chambers (1986) found that relaxing expenditure constraints would lead to greater capital and labor usage, less land usage, and probably larger labor productivity increases

Promising new research may shortly address the farm policy issue A recent paper by Swamy, Lupo, and Sneed (1989) uses a stochastic coefficients regression approach that allows the elasticity of output with respect to each input to depend on a random variable and deterministic variables, such as farm policy levers, scale of operations, and research and development expenditures This procedure solves the Solow-Stigler controversy under certain conditions by allowing effects on changes in technology and economies of scale to be separated The approach also allows relaxation of competitive assumptions, estimation of total factor productivity directly from nontime trend regression coefficients, and forecasting outside the sample Farm and technology policy simulations on agricultural productivity would also be possible

Capalbo and Antle's compilation, then, is a bit of a curate's egg Readers new to the literature will find a cogent albeit uncritical, summary of production theory and measurement issues Others seeking the latest developments in the literature and desiring a strong linkage between productivity growth and policy must ferret out individual papers or await a future volume

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