האוניברסיטה העברית בירושלים

The Hebrew University of Jerusalem

המחלקה לכלכלה חקלאית ומנהל

The Department of Agricultural Economics and Management

המרכז למחקר בכלכלה חקלאית

The Center for Agricultural Economic Research

Discussion Paper No. 6.14

Comments on the USDA/ERS Productivity accounts

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April 30, 2014

Comments on the USDA/ERS Productivity accounts[1]

The productivity accounts constitute a well-constructed series of output and inputs of the agricultural sector. The procedure is presented in a series of papers. This review leans on Ball et al 1997 and 1999. The papers outline the construction of the data, and provide numerical results of the TFP. The outcome is an insightful source for the study of agricultural growth, and information for further research. The ultimate objective of the exercise is the computation of TFP in agriculture. The following comments raise some points that deserve further discussions.

TFP –empirical results

Ball et al (1997) presents a series of inputs and output for American agriculture in the period 1948 - 2011. The data are used to compute TFP for the period as a whole and for sub periods. The paper concludes that "*[p]roductivity growth was the principle factor responsible for economic growth in agriculture."* Such an assertion is also often made for the total economy (e.g. Prescott 1998, Easterly & Levine 2001).

The paper, however, does not support the assertion. It implies that there is not even a correlation between changes in TFP and output. For instance, the years 1973-1979 were generally good for agriculture, output grew at a rate of 2.5 percent and TFP at a rate of 1.3 percent. On the other hand, the 1980s were difficult and the respective growth rates for output and TFP were 0.86 and 2.56 percent. Thus in the high growth period TFP accounted for about 50 percent of the output growth whereas in the low growth period TFP growth was almost three times higher than the output growth.(Mundlak 2005, p1011). This comparison suggests that TFP was sensitive to other variables and thus TFP was not the sole trigger of growth. More on this below

Taking a long run view Mundlak (2005) examines the components of growth of US agriculture over two centuries, 1800-1990. It shows almost zero TFP growth for the early sub period (1800-1840) when output and TF grew at a rate close to 4 percent while TFP grew only at rate of 0.19 percent. The output growth in the early years was accounted for by growth of land capital and labor. On the other end, the average output growth rate in the late sub period (1940 – 90) was 1.9 percent, quite close to the results reported by Ball et.al. (1997), and was exhausted by the TFP. The relative importance of TFP grew gradually over the years to the point where in the period 1940-1990 it exhausted the output growth.

Over the two centuries agriculture underwent major changes (sometimes referred to as revolutions): conversion of man power to animal power, followed by the introduction of mechanical power, and later on output growth was fostered by new chemical and biological inputs. Other important factors playing a role were the introduction of credit and changes in demand for agricultural output.

[1] The note has been written in response to a request by an external committee convened by the USDA/ERS to review the ERS productivity accounts

The relative importance of TFP varied not only over time but also across sectors, such as farms, states or countries. “There is much more volatility across states and among regions that can be inferred from TFP measures for the aggregate farm sector. At the same time, the evidence indicates that productivity growth in the U.S. farm sector is wholly a function of productivity trends in the individual states”, (Ball et al 1999).

Accounting for TFP

The assumption that TFP triggers output growth justifies the empirical effort aimed at getting it “right”. There are numerous results, differing by level of aggregation, (firms to global) countries, periods, and methods of calculation. The variance in the results raises two questions. First, what are the policy implications of the reported estimates of TFP? And second what are the implications for empirical analysis?

The TFP is an unobserved variable and its rate of change is the difference between the rates of change of output and of inputs. Thus, an explanation of the changes in TFP is associated with the explanation of the choice of outputs and inputs. The choice, in turn, depends on the economic environment which consists of incentives, technology and constraints to be referred to as state variables. Thus, variations in the economic environment generate variations in TFP. This explains the variability of estimates reported in empirical analysis. This view also paves the road for the empirical analysis.

The underlying premise is that firms face more than one technique of production. The collection of all possible techniques constitutes the available technology. The economic problem is to choose the technique to be employed along with the choice of inputs and output.[2] The collection of all available techniques represents the state of knowledge. Firms choose the implemented techniques subject to their constraints and the environment within which they operate. The empirical analysis reveals the implemented techniques.

This framework accounts for the variability of estimated TFP and provide a scope for policies such as augmentation of the available technology (say knowledge) and the removal of constraints. It is clear that one cannot state a typical value for TFP without providing more information on the sample. This approach puts the weight of the analysis on searching for state variables that account for the sample on hand.

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[2] Mundlak 1988, and Mundlak et al 2012

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