

Statistics and Policy Making in Support of Agriculture and Rural Development

The Benefits from Good Data

Hans P. Binswanger-Mkhize

ICAS V

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Introduction

- The costs of poor data are well known to you
 - Most of you can give very good examples
 - For most of your lives these costs have motivated you to do better
 - The costs are the reason for the new strategy for agricultural statistics discussed at ICASE V

The basic agricultural and food statistics

- Despite data quality problems, development economists have learned a lot from these data
- They have been using them
 - to track trends in production, consumption, prices, etc.
 - in econometric studies of the dynamics of agricultural output and investment with respect to prices and government investments
 - in regional, national and global planning and projection models
 - and for many other uses

Consequences of poor agricultural statistics

- Inability to assess trends and shocks
- Inability to compare across regions and countries
- Inadequate diagnosis for development planning
- Poor basis for model building
- Poor basis for public storage and trade decisions:
e.g. Malawi
- Inaccurate food balance sheets and poor emergency assistance decisions
- Difficulty in private decision making on marketing, investment
- etc. etc. etc....

Integrated household surveys go beyond the basic agricultural statistics

- They have become powerful tools for poverty tracking and policy analysis
- When collected as panel data, they have allowed estimation of structural behavioral relationships, and impact analysis of policies and programs
- Very detailed long term household panels have vastly expanded our understanding of human and farmer behavior

This speech illustrates these developments over the last 40 years

- It is not about trends, planning or projections
- But instead about the fundamental behavioral assumptions that go into all these analyses
- It has been a personal journey, as I will be using research studies and results of my friends and myself

Time series and panels of regional and national data

They combine data from many different sources

They have been widely used for econometric and policy analysis

Here are some of the important results

Individual commodity supply functions

- Are used for analysis of individual policies, and/or incorporated into national and global models
- There are thousands of individual product supply studies
- They generally show
 - an elastic supply of most commodities *in the long run*,
 - *less elastic in the short run*
- and backward bending short run supply for livestock,
 - because breeding animals are retained
- **Since 1960, these analyses helped dispel the notions of irrational peasants**

Agricultural output as a whole:

”Aggregate supply functions”

- In contrast to individual supply, Johnson (1950) first showed
 - That aggregate supply is very inelastic in the short run
 - because of fixity of land, capital, and labor force
 - This finding is robust across the developed and developing World
- Mundlak and collaborators have also shown
 - that aggregate supply is very elastic in the long run
 - because of strong investment responses by farmers
- *Keep this in mind when evaluating*
 - *how long the current higher international food prices will last*

Aggregate output, farm investment, and the role of public investment

- Since 1985, supply and investment function analyses across countries, in China, and in India, have shown that
 - Returns to agricultural research are exceptionally high
 - Returns to roads in the next best public investment, followed by education, health, and electrification
 - Canal irrigation has not been a powerful driver of production growth...

- Farm investment is responsive to the same price factors and public investments as aggregate agricultural supply
- Rural banks enhance private investment in agriculture
- In many countries these findings have been used in recommendations on how to allocate public investment for agriculture and rural development
- They have also helped to underline and define the critical role of the public investment in achieving agricultural growth

Factor demand functions, and biased technological change

- In 1974 I first used duality theory to estimate a full system of factor demand functions for US agriculture
 - using four sets of cross sections for the census years from 1952 to 1964
- The factor demand curves showed labor saving and machinery using technical change between 1952 and 1964
- I then used the function to estimate biases of TC since 1912,
 - and showed that the biases responded to factor prices
 - this was the first rigorous test of the Induced Innovation Hypothesis of Hayami and Ruttan
 - that has influenced agricultural development policy until

Is a slowdown of technical change partly responsible for the food crisis?

- Fuglie (2008) using basic FAO data from 1960 to 2006
- Decomposes sources of output growth into aggregate input and total factor productivity (TFP) components
 - For most countries, all regions, and the world as a whole
- He finds no evidence of a slowdown agricultural TFP
- Instead, the growth rate in TFP accelerated in recent decades.

- However, the results do show a slowdown in the growth of agricultural investment
- Accelerating TFP growth was largely offset by decelerating input growth
- Between 1960-2006 these offsetting trends have kept global real agricultural output growth at about 2%

These findings are contested by scholars who collected/included data on more inputs and their quality than available in FAO data

The debate continues

Integrated household surveys

Their benefits

- They try to collect as much as possible from individual households
 - Contrary to classic teaching on data collection
- This enables them to relate production, consumption, assets, health, education household characteristics, local factors, etc.
- Are being conducted with increasingly large national samples
- Provide critical information for social accounting matrixes
 - that differentiate between poor and well off economic groups

- and that are the basis for general equilibrium policy

The consumption data are used to measure consumption poverty

- They quickly showed the far greater prevalence of poverty and hunger in rural than in urban areas
- Over time they showed
 - The dramatic decline in poverty in East and SE Asia
 - The slower progress in South Asia and Latin America
 - The minimal poverty reduction in Africa
 - That economic growth is often not enough

The importance of agriculture in growth and poverty reduction

- Ravallion and Datt, 1994, used a long term panel of sequential NSS Surveys for NSS regions in India to show that
- *Urban* growth reduced *urban* poverty
- ... but had adverse distributional effect *within the urban sector*
- ...therefore there was no positive spillover of *urban growth* on *rural* poverty

- *Rural* growth was distributionally neutral in the *rural* sector
- It sizably reduced *rural* poverty
- *Rural* growth also had pro-poor distributional effects on *urban* poverty
- This reinforced the importance of *rural* growth for *national* poverty reduction
- Support the theory of Johnston and Mellor (1961) on the role of agriculture in economic development

Poverty trends in China: 1980-2001

- *The incidence of extreme poverty fell dramatically*
- *Rural areas accounted for the bulk of the gains to the poor*
- *Rural economic growth was far more important to national poverty reduction than urban economic growth*
 - *Although rural-urban migration helped*
- *Agriculture played a far more important role than the secondary or tertiary sectors*
- *Rising inequality within the rural sector greatly slowed poverty reduction*
- *Taxation of farmers and inflation hurt the poor*
- *External trade had little short-term impact on poverty*

Weaknesses of cross-section data and sequences of cross-section data

- Household decisions and performance are influenced by unobserved or unobservable factors, such as ability
- It is therefore difficult to attribute cause and effect, and estimate structural relationships
 - Between education, health, fertility and productivity
 - Between credit use and farm production
 - Between land rights, credit and farm output
 - And many other important policy questions

~~Because of rich-out variable~~

bias, cross-section data cannot answer

- Why people are poor or rich
- How long they stay poor
- Whether and how they climb out of poverty
- And many other important policy questions

The movement to panel data

- For structural estimation of causal effects
- For the study of poverty dynamics
- For impact analysis of policies, programs and projects
 - Analyses without a baseline and/or a quasi-experimental or experimental design are no longer publishable
- This is the reason for the household panel studies with strong agricultural modules sponsored by the GATES foundation in 6

African countries that we will discuss at this

Some policy questions answered by
household panel data

Do land markets have negative economic and social impacts in Uganda?

Deininger and Mpunga (2003) used panel data from the rounds of 1992/93 and 1999/2000 Uganda National Household surveys to show that

- Agricultural land markets are very active, and rental markets activity has increased significantly
- *Land rental markets* transfer land to more efficient and relatively poorer producers
 - they provide an opportunity for the landless to access land
- There is no evidence that *land sales markets* transfer land to more efficient producers
 - or that they lead to land concentration
- Similar studies have become available in India, China, and Ethiopia

Impact of adult mortality on Agriculture in Kenya

Yamano and Jayne, using rural panel data 1997 and 2000

- Death of male head of household (HoH) was associated with 69 % reduction in value of crop production
- It greatly affected cash crop area, and off-farm income
- Death of female HoH greatly reduces area under cereals
- Death of other prime age adults was partially compensated by an inflow of other adults into the household
- The impacts of HoH death persisted over the three years

Very detailed long term panel data

- India, ICRISAT village data since 1975, NCAER REDS data since 1968
- Detailed data include
 - Production, input use, soil characteristics on plot and season basis
 - All labor inputs
 - including family labor, by gender, plot, livestock and postharvest activities
 - Ability to measure farm profits at household and plot level
 - All economic transactions, more recently with their precise partner information: who does what with whom?
 - Public programs and amenities at village level
 - Daily rainfall data, weather, health, and other shocks
 - ICRISAT data: ability to measure individual farmer's risk
 - Combined with experimental data on risk and time

Farmer investment behavior in India

- Despite high profit risks, larger farmers have profit maximizing investment portfolios
 - They self insure via diversification, social relations, and own wealth
 - They are unlikely to have demand for agricultural insurance
- Small farmers do not have profit maximizing portfolios
 - They have to invest in risk reducing assets with lower returns
 - They do not have ability to self insure via wealth or social relations
 - They would benefit from agricultural insurance
 - But they are credit-constrained, and therefore cannot buy it

Diffusion of agricultural risk

- In ICRISAT villages, farmers use investments into draft animals to diffuse agricultural risks
 - Periodic liquidation of draft animals leads to persistent underinvestment in draft animals
(Rosenzweig and Wolpin, 1989)
- The village households form marriage alliances to smooth consumption risks
 - The higher the riskyness of agricultural production, the farther away they go in search for brides
(Rosenzweig and Stark, 1989)

Economies of scale in India

- Per-acre profits are higher on larger plots and farms compared with smaller plots and farms
 - Because of economies of scale of machines
 - Even though rental markets for machines reduces these a lot
 - Because of credit market constraints
- There is underinvestment by small farmers into machines, fertilizers and other inputs
- Ownership of land helps overcome credit constraints
- The marginal returns to capital and to fertilizer decline with owned landholdings

Implications of economies of scale

- Most farms in India are too small to exploit the productivity and cost-savings from mechanization.
- (But in the absence of other opportunities, even very small ownership holdings improve livelihoods!)
- There are too many farms and too many people engaged in agriculture
 - Employment growth in industry may not only augment economic growth but also raise agricultural productivity
 - But only to the extent that those exiting sell their land

Conclusions

- Analysis of official agricultural data, as well as of integrated household surveys has answered increasingly complex policy questions
- The economics profession has made enormous progress in differentiating correlations from causal relationships
- Integrated household surveys and panels have been critical
- Increasingly more detailed and comprehensive data allow analysis of more and more subtle behaviors, policy and program impacts

- Statistical systems for agriculture, food and natural resources have to improve along with the increasing capacity to analyze the data for meaningful policy analysis
- Analysts and agricultural statisticians have to work closely together to meet these rising demands
- The proposed agricultural statistics strategy recognizes these needs, and proposes many solutions to further improve relevance and quality of the data
- You will have plenty of opportunity to debate these, and their costs and benefits