

Laudatio*

by Franco Peracchi

Tor Vergata, June 5, 2007

Angus Deaton was born in Edinburgh in 1945, obtained a Ph.D. in Economics from Cambridge University in 1974, taught at Cambridge University and the University of Bristol, and was appointed Professor of Economics at Princeton University in 1982, where he is now a Dwight D. Eisenhower Professor of International Affairs and Professor of Economics and International Affairs in the Woodrow Wilson School of Public and International Affairs and the Department of Economics.

He has been Vice-President of the American Economic Association, President of Section F (Economics) of the British Association for the Advancement of Science, and is a fellow of the American Academy of Arts and Science, the British Academy and the Econometric Society. Among his many honors and awards, in 1978 he was the first recipient of the Frisch Medal presented by the Econometric Society for the best applied paper in *Econometrica* in the previous five years (“The analysis of consumer demand in the United Kingdom, 1900-1970”).

His scientific contributions span several fields of economics (especially demand analysis, consumption and saving, health economics and development economics), econometrics and statistics. He has been deeply influential in all these fields, making lasting contributions and pioneering new research ideas and methods. He has been the author of many articles published in the most important scientific journals in the fields of economics, econometrics and statistics. His three books *Economics and Consumer Behavior* (1980, with John Muellbauer), *Understanding Consumption* (1992) and *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy* (1997) have been extremely influential and are now classics of economic literature.

Professor Deaton’s research deals with fundamental concepts: consumption, health and well-being. Consumption is one of man’s main activities, it requires both judgment and resources, has a forward looking dimension, and produces individual well-being as its output. Health is one of the fundamental aspects of well-being. At the same time, health (along with income) is a pre-condition for consumption. Poor health and low income limit our consumption activities and the amount of well-being that we derive from them. Economic theory may help us understand some of these relationships. But simple theorizing is of limited use if it does not provide observable predictions. This raises the question of how to combine the data with appropriate econometric and statistical methods in order to test the prediction of a theory. In this approach, economic theory, econometrics and statistical methods all play a role. There are not very many people that can master all three. Angus Deaton is definitely one of them.

* I thank Luigi Guiso and Amelia Perea for helpful comments.

In the remainder of my talk, I will briefly review some of the work by Professor Deaton that I found especially inspiring. Of course, this is not a comprehensive review and it reflects both my own tastes and my ignorance. I apologize to Professor Deaton if important papers have been neglected or not adequately appreciated.

Demand analysis

Ever since Richard Stone (the 1984 Nobel laureate) first estimated a system of demand equations derived explicitly from consumer theory (the Linear Expenditure System), there has been a continuing search for flexible specifications and functional forms for demand analysis.

One of Angus Deaton's pioneering contributions is the use of duality theory to derive systems of demand equations that satisfy the basic axioms of choice. Good examples are his 1980 and 1981 papers with John Muellbauer and his 1985 paper with Martin Browning and Margareth Irish. In all these papers, the emphasis is on the conditions under which data on market demand may be represented as if they were the outcome of decisions by a rational representative consumer. This may not be the way we now think about aggregate data but, at that time, it was essential in order to give a meaningful interpretation of the available statistical evidence, largely based on (single or repeated) cross-sections or time series data.

His 1980 paper with John Muellbauer is especially famous for the derivation of a flexible system of demand equations known as the Almost Ideal Demand System (AIDS). The name comes from the fact that this system of demand equations gives an arbitrary first-order approximation to any demand system, satisfies the axioms of choice exactly, aggregates perfectly over consumers, is simple to estimate using ordinary least squares, and can be used to test the theoretical restrictions of homogeneity and symmetry through linear restrictions on the model parameters.

In addition to functional form problems, empirical demand analysis is complicated by a number of issues, such as the zero expenditure problem, the problem of how to incorporate household composition effects, the construction of equivalence scales, the problem of how to measure the cost of children, and the problems of quality effects and spatial variation in prices. Angus Deaton has given fundamental contributions on all these issues. It is enough to mention his 1985 paper with Margareth Irish on zero expenditures, his 1986 paper with John Muellbauer on the theoretical basis for measuring child costs in poor countries, his 1988 paper in the AER on the effect of quality differences and spatial variation in prices, and the discussion of demographic separability and its relationship with the problem of measuring the cost of children in his 1988 paper with Javier Ruiz-Castillo and Duncan Thomas.

Consumption and saving

A distinguishing feature of Deaton's research has been the "interplay between the micro and the macro, between the studies of cross-sections and panels, on the one hand, and aggregate time-series on the other" (Deaton 1992). Nothing illustrates this better than his work on aggregate consumption and saving.

This work is rooted in the life-cycle hypothesis of Franco Modigliani and Richard Brumberg (reviewed by Deaton in his 2005 paper) and the permanent income hypothesis of Milton Friedman,

rejuvenated in the early 1980's by the contributions by Robert Hall and Marjorie Flavin. If permanent income is defined as the annuity value of lifetime resources, then the two theories are in fact very close, although their emphasis is somewhat different. In a number of important papers (most notably Campbell and Deaton 1989, Deaton 1991, and Deaton and Paxson 1994 and 2000) he has made important contributions to the methodology, the evidence, and the substance of the issues. His book *Understanding Consumption* has shaped the mind of cohorts of young economists working on savings and households decisions. Three main messages emerge from his research.

First, “representative agent models applied to aggregate data . . . are of limited value, and . . . what we have learned from them is more methodological than substantive. Representative agents have two great failings: they know too much, and they live too long. An aggregate of individuals with finite lives and with limited and heterogeneous information is not likely to behave like the single individual of the textbook”.

Second, “the accumulating microeconomic evidence casts increasing doubt on the life-cycle hypothesis, or at least from the insights that come from the ‘stripped-down’ version, that saving is largely hump-shaped for retirement, that consumption is based on lifetime resources, that aggregate wealth is accountable for by life-cycle saving, and that saving responds positively to productivity and population growth”.

Third, “future progress is most likely to come when aggregation is taken seriously, and when macroeconomic questions are addressed in a way that uses the increasingly plentiful and informative microeconomic data”.

Inequality in income and health

The reasons for looking at health (broadly defined to include nutrition and longevity), in addition to consumption and income, are spelled out clearly in Deaton's 2001 paper in the conference volume edited by Finis Welch: “In much of applied welfare economics, income—real income, consumption, or consumption per equivalent—serves as our measure of individual welfare. But the goods and services provided by income are not all that there is to well-being. Health is not only instrumental in enabling people to earn a living, and to enjoy the fruits of their labors, but is an important element of well-being in its own right. Health status is correlated with income, both for individuals within nations, and across nations in aggregate. But the correlation is far from perfect so that looking at health leads to different assessments of well-being from those that come from looking only at income”. Because health status is such an important determinant of well-being, a general interest in the distribution of well-being leads naturally to an interest in health inequality and, more generally, in the joint distribution of income and health status.

The measurement of health inequality raises two important issues. One is the difficulty of identifying a measure of health status that is useful over the complete life cycle. The other is how to measure inequality in health status. Because of these problems, the approaches typically adopted for income inequality cannot be simply transferred to health inequality.

Another issue is whether income inequality is a health hazard in the sense that individuals are less healthy in places where income is more unequally distributed (the so-called Wilkinson hypothesis).

Deaton's 2003 paper in the JEL lays out some of the possible mechanisms through which income inequality may affect health, but also provides negative evidence on the existence of a direct link. This does not mean that policies affecting the distribution of income would not affect health. Quoting from Deaton (2003): "If income has a nonlinear effect on health, and even if there is no direct effect of income inequality on health, redistribution of income toward the poor will improve their average health by more than the loss of health among the rich. People who are income-poor are also health-poor, so that seeing well-being as dependent on both income and health reveals wider disparities between rich and poor than are recognized by standard, income-based approaches".

Health, poverty and development

As Deaton argues in his 2006 paper with David Cutler and Adriana Lleras-Muney, "the decline in mortality over time, differences in mortality across countries and differences in mortality across groups within countries are phenomena worthy of serious attention by economists and other". If we think of mortality as the "ultimate" indicator of health status, this holds for health more generally.

Making progress on this research agenda is not easy for a number of methodological and substantive problems. First, health is a multi-dimensional concept, whose components do not correlate perfectly with one another, let alone with income-based measures. Second, as illustrated by Case and Deaton (2005), it is difficult to make international comparisons of subjective measures of health and living standards, such as those typically collected in household surveys.

More importantly, it is not clear how to interpret the observed positive correlation between income and health status, both within and between countries. The "wealthier is healthier" hypothesis asserts that income is the main determinant of health. In fact, causation may go the other way round, or it may go both ways.

Understanding the nature of the causal relationships between socioeconomic status (income and wealth) and health is especially important for its policy implications. The debate about the role of nutrition in poor countries provides a good example. One view assumes that nutrition is determined by income, and the main object of research is then the estimation of the Engel curve for calories. The basic idea is that economic growth and increases in income will lead to substantial improvements in nutrient intake. The other view is that productivity (hence labor earnings) depends positively but nonlinearly on nutrition. Those who do not get enough to eat remain unemployed because, at the going wages, it is not profitable for employers to hire them. Angus Deaton offers important insights into this issue in his 1996 paper with Shankar Subramanian, which looks at nutrition and expenditure in rural Maharashtra in India. They estimate that the elasticity of calorie consumption is positive but small, and declines only slowly with income. Even the poorest do not seem to be as hungry for additional calories as one might expect. Furthermore, the calories necessary for a day's activity cost less than 5 percent of the daily wage. This makes it quite implausible that malnutrition is the explanation for poverty, as opposed to its consequence. "If nutrition is a trap, it is one from which there is a ready escape".

Finally, do income and wealth represent the bulk of the story? In his 2004 paper with Abhijit Banerjee and Esther Duflo, he asks whether access to health care may also have an effect on health and well-being of villagers in rural Rajasthan, one of the poorest regions of India. They paint a fairly bleak picture: "villagers' health is poor; the quality of the public service is abysmal; and private

providers who are unregulated and, for the most part, unqualified provide the bulk of health care in the area. Having low-quality public facilities is correlated with some direct health measures. Lung capacity and BMI are lower where the facilities are worse, after controlling for household per capita monthly expenditure, distance from the road, age, and gender”. And yet, “villagers not only do not perceive their health as particularly bad, but they seem fairly content with what they are getting Self-reported health and well-being measures, as well as the number of symptoms reported in the last month, appear to be uncorrelated with the quality of the public facilities. The quality of the health services may impact health but does not seem to impact people’s perception of their own health or of the health-care system”.

If one looks at trends over time, it is natural to ask another crucial question addressed by Angus Deaton in his work. To what extent does economic growth help reduce poverty? Answering this questions involves, once again, a host of delicate but often ignored statistical issues.

In his 2005 paper in the *Review of Economics and Statistics*, Deaton focuses on one of them, namely the fact that consumption measured from household surveys, which is used to measure poverty, grows less rapidly than consumption measured in national accounts, in the world as a whole and in large countries, particularly India, China, and the United States. In consequence, measured poverty has fallen less rapidly than appears warranted by measured growth in poor countries. One story is that richer households are less likely to participate in surveys. But growth in the national accounts is also upward biased, and consumption in the national accounts contain large and rapidly growing items that are not consumed by the poor and not included in surveys. So it is possible for consumption of the poor to grow less rapidly than national consumption, without any increase in measured inequality. Current statistical procedures in poor countries understate the rate of global poverty reduction, and overstate growth in the world.

To complicate things, there is often an interplay between statistics and politics. This problem is at the core of his 2005 paper with Valerie Kozel. What happened to poverty in India in the 1990s has been fiercely debated. This debate provides an excellent example of how politics and statistics interact. Although there is no consensus on what happened to poverty in India in the 1990s, there is good evidence both that poverty fell and that the official estimates of poverty reduction are too optimistic, particularly for rural India.

Despite all the current uncertainty surrounding theory and methodology, I think that the notes of optimism in the final chapter of *Understanding Consumption* may help here as well. Comparing the state of consumption theory in the early 1990s with the situation twenty years earlier he says: “The certainties have gone There is much less consensus now than there was then, and much more disagreement about what the evidence shows. Nevertheless, there is no doubt that we have learned a great deal, about theory, about methodology, and even about substance. If we are less confident, it is because we know more, not because we know less”.

Econometrics and statistics

In his 1978 paper with Hashem Pesaran, Deaton pioneered the use of methods for testing non-nested hypotheses, namely cases where the null hypothesis cannot be obtained by imposing a set of constraints on the parameters that define the alternative. Non-nested hypotheses may arise for

several reasons. For example, competing economic theories may lead to alternative sets of covariates in a regression model. Or, even when there is agreement on the set of covariates, there may be disagreement on the form of the regression model (Aneurn-Evans and Deaton 1979).

Another important contribution has been the study of methods for repeated cross-sections, that is, successive cross-sections of identical or at least very similar design and sample size. Many countries have no panel data but they do have repeated cross-sections. Even when panel data are available, their quality may be inferior to available cross-section data, for example because of the smaller sample size, the severity of attrition, the high rate of nonresponse to specific questions, etc. Deaton (1985) showed that, in cases when repeated cross-sections are available, grouping the data makes it possible to construct pseudo-panels of group averages that may be used to estimate linear relationships.

Angus Deaton has also been a pioneer in the application of nonparametric statistical methods in order to free empirical analyses from strong parametric assumptions. His 1989 paper in the *EJ* examines the effects of rice prices on the distribution of real incomes across different households. Instead of relying on cross-tabulations and on linear regressions as means of summarising the data (“the former are not very flexible and do not transmit information clearly, while the latter tend to oversummarise, rarely doing justice to the amount of information available”) he uses kernel regression methods to “provide easily comprehended graphical descriptions of the data that are directly informative about the problem at hand”. Other important applications of nonparametric methods include his 1996 paper with Shankar Subramanian, his 1998 papers with Serena Ng in *JASA*, and his 1998 paper with Christina Paxson in the *JPE*.

In my opinion, however, his most important and enduring contribution to the theory and practice of econometrics has been in the field of household surveys, especially his role in the development of the Living Standard Measurement Study (LSMS) of the World Bank. His 1997 book on *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy* contains a wealth of useful information about how household surveys are done, and on how to use them. Much of this is based on the experience gained with the LSMS project. Although it focuses on developing countries, most of the issues also apply to the analysis of household surveys in wealthy countries.

References to Professor Deaton's work

- "The analysis of consumer demand in the United Kingdom, 1900-1970", *Econometrica*, 1974.
- "Testing non-nested non-linear regression models", with Hashem Pesaran, *Econometrica*, 1978.
- "Testing linear versus logarithmic regression models", with G.B. Aneuryn-Evans, *Review of Economic Studies*, 1979.
- "An almost ideal demand system", with John Muellbauer, *American Economic Review*, 1980.
- Economics and Consumer Behavior*, with John Muellbauer, Cambridge University Press, 1980.
- "Functional forms for labour supply and commodity demands with and without quantity restrictions", with John Muellbauer, *Econometrica*, 1981.
- "Statistical models for zero expenditures in household budgets", with Margareth Irish, *Journal of Public Economics*, 1984.
- "Panel data from time series of cross-sections", *Journal of Econometrics*, 1985.
- "A profitable approach to labor supply and commodity demands Over the life cycle", with Martin Browning and Margareth Irish, *Econometrica*, 1985.
- "On measuring child costs in poor countries", with J. Muellbauer, *Journal of Political Economy*, 1986.
- "Quality, quantity and spatial variation in price", *American Economic Review*, 1988.
- "Rice prices and income distribution in Thailand: A non-parametric analysis", *Economic Journal*, 1989.
- "Why is consumption so smooth?", with John Campbell, *Review of Economic Studies*, 1989.
- "The influence of household composition on household expenditure patterns: Theory and Spanish evidence", with Javier Ruiz-Castillo and Duncan Thomas, *Journal of Political Economy*, 1989.
- "Saving and liquidity constraints", *Econometrica*, 1991.
- Understanding Consumption*, Oxford University Press, 1992.
- "Intertemporal choice and inequality", with Christina Paxson, *Journal of Political Economy*, 1994.
- "The demand for food and calories", with Shankar Subramanian, *Journal of Political Economy*, 1994.
- The Analysis of Household Surveys: A Microeconomic Approach to Development Policy*, The World Bank, 1997.
- "Parametric and non-parametric approaches to price and tax reform", with Serena Ng, *Journal of the American Statistical Association*, 1998.
- "Economies of scale, household size, and the demand for food", with Christina Paxson, *Journal of Political Economy*, 1998.
- "Growth and Saving Among Individuals and Households", with Christina Paxson, *Review of Economics and Statistics*, 2000.
- "Inequalities in income and inequalities in health", in Finis Welch (ed.), *The Causes and Consequences of Increasing Inequality*, The University of Chicago Press, 2001.
- "Health, inequality, and economic development", *Journal of Economic Literature*, 2003.
- "Wealth, health and health services in rural Rajasthan", with Abhijit Banerjee and Esther Duflo, *American Economic Review, Papers & Proceedings*, 2004.

- “Measuring poverty in a growing world (or measuring growth in a poor world)”, *Review of Economics and Statistics*, 2005.
- “Franco Modigliani and the life-cycle theory of consumption”, *Banca Nazionale del Lavoro Quarterly Review*, 2005.
- “Health and wealth among the poor: India and South Africa compared”, with Anne Case, *American Economic Review, Papers & Proceedings*, 2005.
- “Data and dogma: The great India poverty debate”, with Valerie Kozel, *World Bank Research Observer*, 2005.
- “The determinants of mortality”, with David Cutler and Adriana Lleras-Muney, *Journal of Economic Perspectives*, 2006.