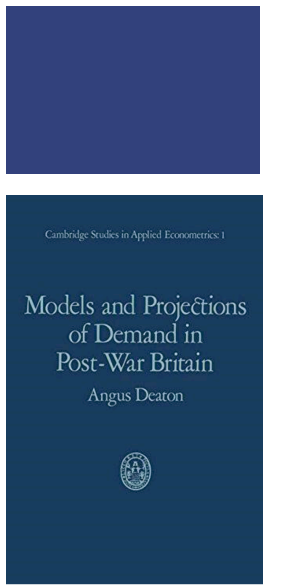
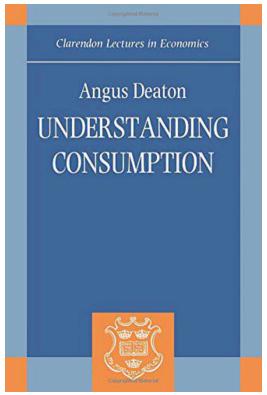
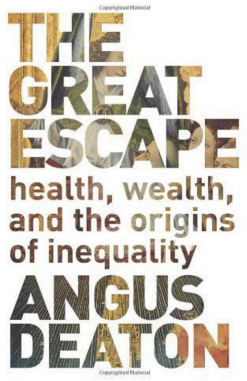
Angus Deaton: Consumption, Poverty and Welfare

The Almost Ideal Demand System (AIDS)







Angus Deaton

Curriculum Vitae

CURRICULUM VITAE

Name: Sir Angus Stewart Deaton

Date and Place of Birth: 19th October 1945 in Edinburgh, U.K.

Nationality: British

Children: 2 children, born 1970, 1971.

Degrees: B.A. 1967, M.A. 1971, Ph.D. 1974 (Cambridge)

Present Positions:

Senior Scholar, Woodrow Wilson School, Princeton University
Dwight D Eisenhower Professor of Economics and International Affairs, Emeritus
Presidential Professor of Economics, University of Southern California
Senior Scientist, Gallup Organization
Research Associate, National Bureau of Economic Research

E-mail: deaton@princeton.edu

Chronology of Education and Appointments

1959-64	Foundation Scholar, Fettes College, Edinburgh.
1964	Exhibition in Mathematics, Fitzwilliam College, Cambridge.
1964-67	Fitzwilliam College, Cambridge, Mathematics, Parts 1a and 1b, and Economics, Part 2.
1967-68	Economic Intelligence Department, Bank of England.
1969	Junior Research Officer, Department of Applied Economics, Cambridge.
1972	Fellow and Director of Studies in Economics, Fitzwilliam College and Research Officer, Department of Applied Economics.
1976-83	Professor of Econometrics, University of Bristol.
1979-80	Visiting Professor, Princeton University.
1983-2016	Dwight D. Eisenhower Professor of International Affairs, and Professor of Economics and International Affairs, Woodrow Wilson School and Department of Economics
1990-91	Overseas Fellow, Churchill College, Cambridge.

Honors and Awards, Invited Lectures, most recent first

2017 Franklin Founder Award, joint with Anne Case
2016 Cozzarelli Prize, Proceedings of National Academy of Sciences, joint with Anne Case

Source: Deaton's Homepage [Link]

Professor Sir Angus Deaton

Senior Scholar, Woodrow Wilson School

Contact

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RESEARCH AREAS

- Poverty in the World and in India
- Health Status and Economics
- Household Surveys

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Research Areas

My current research focuses on the determinants of health in rich and poor countries, as well as on the measurement of poverty in India and around the world. I also maintain a long-standing interest in the analysis of household surveys. To view information about my research on India and world poverty, health, or household surveys, click each corresponding link.

Source: Deaton's Homepage [Link]

Angus Deaton

Knighting Ceremony

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Curriculum Vitae

Sir Angus Deaton receives knighthood in ceremony at Buckingham Palace December 6, 2016

Source: Deaton's Homepage [Link]

Courses

Links

Contact

Angus Deaton

Honors and Awards, Invited Lectures

2017 Franklin Founder Award, joint with Anne Case
2016 Cozzarelli Prize, Proceedings of National Academy of Sciences, joint with Anne Case
2016 Royal Medal of the Royal Society of Edinburgh
2016 Honorary Fellow of the Royal Society of Edinburgh
2016 Doctor of Humane Letters, Brown University
2016 Knight Bachelor, Queen's Birthday Honours List
2016 Honorary Fellowship, Bristol University
2015 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel
Member, National Academy of Sciences, 2015
Member, American Philosophical Society, 2014
Lionel Robbins Memorial Lecturer, LSE, 2014
Leontief Prize for Advancing the Frontiers of Economic Thought, 2014

Content

Review – Demand, Consumption and Poverty

Demand Analysis – the Almost Ideal Demand System

Consumption Analysis – Aggregation of Cross-time Consumption

Review

- **Demand** - Analysis of demand across commodities at a given point in time; Almost Ideal Demand System (AIDS).

- **Consumption** - Aggregate consumption across time; the use of individual (or household-level) data; careful handling of the aggregation problem.

- **Poverty** - Welfare measurement in developing countries; measurement and analysis of the poor's living standards.

Review – Demand Analysis

Background

- Three implications of consumption theory:
  a. Homogeneity of degree zero in nominal variables
  b. Symmetry
  c. Negative semi-definiteness
- Minimum restrictions on preferences under which one can interpret aggregate consumer behavior as the result of the behavior of a single representative consumer.
- PIGLOG (Price-Independent Generalized Logarithmic)：

$$w_{jh} = a_j(p) + b_j(p) \log\left(\frac{c_h}{k_h}\right).$$

Review – Demand Analysis

Advantages of the AID System

a. It allows expenditure $p_j q_j$ to be non-linear in c.

b. It can be used to test for rationality; homogeneity, symmetry and negative semi-definiteness

c. The AID system aggregates over consumers under weaker assumptions about preferences than did earlier models.

d. The average budget share w_j for good j can be regarded as the demand by a representative consumer with expenditure

$$c_r = \exp\left(\frac{\sum_h c_h \log\left(\frac{c_h}{k_h}\right)}{\sum_h c_h}\right)$$

- The AID System:

$$w_j = \alpha_j + \sum_{\mathrm{k}} \gamma_{jk} log p_k + \beta_j \log\left(\frac{c_r}{p}\right)$$

Review – Consumption over Time

Background

- Theory and evidence on consumption over time:
  - PIH (Permanent Income Hypothesis) by Milton Friedman
  - LC (Life-Cycle Model) by Franco Modigliani

- The marginal utility of consumption is equated to the marginal utility of wealth at the optimum.
- The Euler equation is a necessary condition for optimality, when individuals maximize a discounted sum of per period utility.
- The Euler equation states:

$$u'(c_t) = \beta E_t[u'(c_{t+1})(1 + r_{t+1}^a)].$$

Review – Consumption over Time

Background

- Three disadvantages of PIH and LC:
  - Consumers may not be rational.
  - Working with aggregate data and the notion of a representative consumer is problematic; individuals may be rational, but the conditions for aggregation are not satisfied in reality.
  - Rational individuals may be confronted with many constraints not accounted for in the models

Review – Consumption over Time

Pseudo Panels

- Deaton (1985) showed how to construct a "**pseudo panel**" made up of cross-sectional individual data for cohorts of individuals or households of the same age.

- With enough data, successive surveys would generate successive random samples of individuals from each cohort and a time series from which one can infer behavioral relationships for the cohort as a whole, just as if panel data were available.

- In this way, he played a fundamental role in shifting the macroeconomic literature on consumption and savings towards micro-based empirical models.

Review – Poverty and Welfare

Background

- Today the subject is dominated by micro econometric research based on high-quality household data (and other micro data).

- Deaton's work on development spans a wide spectrum of methodological and substantial contributions: from details on how to measure poverty – in specific countries and globally – to pioneering empirical analyses of micro data from household surveys.

Review – Poverty and Welfare

Empirical Analysis of Household Survey Data

- **LSMS** – The Living Standards Measurement Study
- **Consumption instead of income**. Consumption is often easier to measure and provides a more accurate measure of material welfare when income varies seasonally throughout the year.
- **Income and calories** – Deaton uses traditional Engel-curve analysis to investigate the relationship between income and nutritional status, as measured by calories consumed.
- **Within-family discrimination** – An ingenious way to indirectly estimate whether girls are given less resources than boys. Can't find any systematic differences under normal circumstances.

Review – Poverty and Welfare

Measuring Poverty

– How to compare individuals in households of different sizes and compositions?

– To create the number of adult equivalents:

Child costs are about 30-40 percent of per capita adult expenditures.

– How to treat goods with different prices and qualities?

– Substantial spatial price variation in many developing countries.

Practical poverty measurement: India.

Review – Poverty and Welfare

Welfare Comparisons across Time and across Countries

- Growth, poverty and welfare
  - A fact: Aggregate consumption measured **in household surveys** grows less rapidly than aggregate consumption measured **in national accounts**.

- World poverty
  - Deaton constructs purchasing power parity (PPPs) exchange rates for the poor (PPPPs) from household surveys in 62 developing countries

  - Deaton championed the use of household survey data in developing countries to measure living standards and poverty.

Review – Poverty and Welfare

Others and Comments

- Related contributions
  - Consumption
  - Health
  - Subjective wellbeing

- Comments
  - Consumption demand systems
  - The fluctuations of consumption over time
  - The measurement of consumption and poverty in the developing world
  - How individual and aggregate outcomes come toghther

The AID System

Construction

- Marshall demand function and Hicksian demand function.
- Function c(u, p) – PIGLOG (Price-Independent Generalized Logarithmic) by Muellbauer (1975, 1976):

$$\log[c(u,p)] = (1-u)\cdot\log[a(p)] + u\cdot\log[b(p)] \quad (1)$$

- where

$$\log a(\mathrm{p}) = a_0 + \sum_k \alpha_\mathrm{k}\cdot logp_k + \frac{1}{2}\sum_k\sum_j r^*_{kj} logp_k logp_j \quad (2)$$

$$\log b(\mathrm{p}) = \log a(\mathrm{p}) + \beta_0 \prod_k p_k^{\beta_k} \quad (3)$$

- which satisfies homogeneity:

$$\sum_k \alpha_k = 1 \sum_j r^*_{kj} = \sum_k r^*_{kj} = \sum_k \beta_\mathrm{k} = 0 \quad (4)$$

The AID System

Construction

- and symmetry condition:

$$r_{ij}^{*} = r_{ji}^{*} \tag{5}$$

- From (2)~(5) comes AIDS expenditure function:

$$logc(c,p) = (1-u)loga(p) + uloga(p) + \beta_0 \prod_k p_k^{\beta_k} = loga(p) + \beta_0 \prod_k p_k^{\beta_k} \tag{6}$$

- Shepherd's Lemma:
  - Hicksian demand:

$$q_i = \frac{\partial c(u,p)}{\partial p_i} \tag{7}$$

  - (7) times $\frac{p_i}{c(u,p)}$:

$$\frac{\partial logc(u,p)}{\partial logp_i} = \frac{p_i q_i}{c(u,p)} = w_i \tag{8}$$

The AID System

Construction

- From (8) comes:

$$w_i = \alpha_i + \sum_j r_{ij} logp_j + \beta_i u \cdot \beta_0 \prod_k p_k^{\beta_k} \tag{9}$$

- where

$$r_{ij} = \frac{1}{2} \cdot (r_{ij}^* + r_{ji}^*) \tag{10}$$

- Define price index:

$$\log p = \alpha_0 + \sum_k \alpha_k logp_k + \frac{1}{2} \sum_k \sum_j r_{kj}^* logp_k logp_j \tag{11}$$

- where

$$\sum_{i=1}^{n} \alpha_i = 1, \sum_{i=1}^{n} r_{ij} = 0, \sum_{i=1}^{n} \beta_i = 0, \sum_j r_{ij} = 0, r_{ij}^* = r_{ji}^* \tag{12}$$

The AID System

Construction

- When cost equals to expenditure (c = x), from (6) comes:

$$logc = logx = logp + u \cdot \beta_0 \prod_k p_k^{\beta_k} \tag{13}$$

- Put (13) into (9):

$$w_i = \alpha_i + \sum_j r_{ij} logp_j + \beta_i \cdot log \frac{x}{p} \tag{14}$$

- The whole society:

$$w_{ih} = \alpha_i + \sum_j r_{ij} logp_j + \beta_i \cdot log \frac{x_h}{k_h p} \tag{15}$$

- Meanwhile:

$$\sum_h p_i q_{ih} \Big/ \sum_h x_h = \sum_h x_h w_{ih} \Big/ \sum_h x_h = \overline{w_i} \tag{16}$$

The AID System

Construction

- Put (15) into (16):

$$\overline{w_i} = \alpha_i + \sum_j r_{ij} log p_j - \beta_i log p + \beta_i \sum_h x_h \log \frac{x_h}{k_h} \Big/ \sum_h x_h \tag{17}$$

- Define $\bar{x}$ as the average total consumption:

$$log \frac{\bar{x}}{k} \equiv \sum_h x_h log \frac{x_h}{k_h} \Big/ \sum_h x_h \tag{18}$$

- Rewrite (17) as:

$$\overline{w_i} = \alpha_i + \sum_j r_{ij} log p_j + \beta_i log \frac{\bar{x}}{kp} \tag{19}$$

Aggregation of Cross-time Consumption

Construction

- 动态规划方程:

$$\mathrm{V}_t(A_t)=\max\{v_t(y_t+A_t-\sum N_i)+E_tV_{t+1}[\sum(1+r_{it+1})N_i]\} \quad (1)$$

- FOC:

$$v_t'(c_t)=E_t[(1+r_{it+1})\mathrm{V}_{t+1}'(A_{t+1})] \quad (2)$$

- 由包络定理得：

$$V_t'(A_t)=v_t'(c_t) \quad (3)$$

- 回代，得：

$$v_t'(c_t)=E_t[(1+r_{it+1})v_{t+1}'(c_{t+1})] \quad (4)$$

- 令$\lambda_t(c_t)=v_t'(c_t)$，$E_t[(1+r_{it+1})v_{t+1}'(c_{t+1})]=(1+r_{it+1})v_{t+1}'(c_{t+1})$-$u_{it+1}$，则有：

$$(1+r_{it+1})\lambda_{t+1}(c_{t+1})=\lambda_t(c_t)+u_{it+1} \quad (5)$$

Aggregation of Cross-time Consumption

Construction

- 加总（找到一个代表性的消费水平，而且满足上式（理性假定））的两个问题：信息异质性（保险市场）、时间问题（用假设解决）
- 定义（假定各消费主体（家庭）边际效用函数相同，可放松）：

$$\tilde{c}_t = \lambda_t^{-1}[\frac{1}{H}\sum \lambda_t(c_t^h)]$$

- 满足上式。
- （当λ是凹性的，$\tilde{c}_t > \bar{c}_t$,反之$\tilde{c}_t < \bar{c}_t$ ，当是线性的， $\tilde{c}_t = \bar{c}_t$ ，只有在极短期才是线性的）
- （当各主体消费水平相等时， $\tilde{c}_t = \bar{c}_t$ ，所以可以将$\frac{\tilde{c}_t}{\bar{c}_t}$看作横截面消费水平不平等的度量，当不平等程度保持稳定， $\bar{c}_t$ 与$\tilde{c}_t$ 平行移动）