60 YEARS OF RETURNS TO EDUCATION

What have we learned?

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IDEA at CERGE-EI, Nov 4, 2014

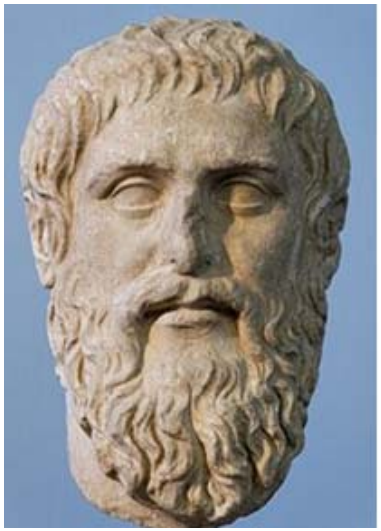
Today's Wall Street Journal

Road map

- History
- Theory
- Methodology
- Review of the evidence
- Controversies
- Policy applications

Aristotle

circa 300 BC



“If a man neglects education, he walks lame to the end of his life”

Confucius

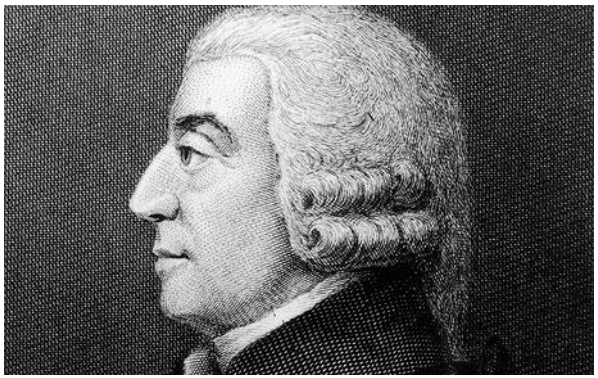
circa 500 AD

Give a man a fish and he will eat for a day.

Teach a man to fish and he will eat for a lifetime.

Adam Smith

1776



"A man educated at the expense of much labor …. to ….. employments which require ……skill, may be compared to …. expensive machines.

The work which he learns to perform …. over and above the usual wages of common labor, will replace to him the whole expense of his education".

Strumilin

1924

Costs and benefits of training Leningrad workers

Others

- **Alfred Marshall** (1890) referred to industrial training as a national investment
- **Walsh** (1935) estimated the stock of human capital in the United States
- **Friedman and Kuznets** (1946) used the discounted value of future earnings to explain the incomes of doctors and dentists.

The residual puzzle

"Coefficient of our ignorance"

1950s

- National income grows faster than capital, labor and land
- Solow's technological change inadequate explanation

T.W. Schultz

1961

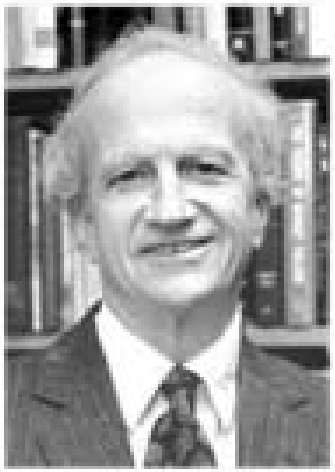
Investment in education explains the residual puzzle

Economics of education

Interdisciplinary approach integrating not only education and economics, but also:

- **Sociology**
- **Psychology**
- **Medicine**
- **Criminology**
- **Political science**

Nobels

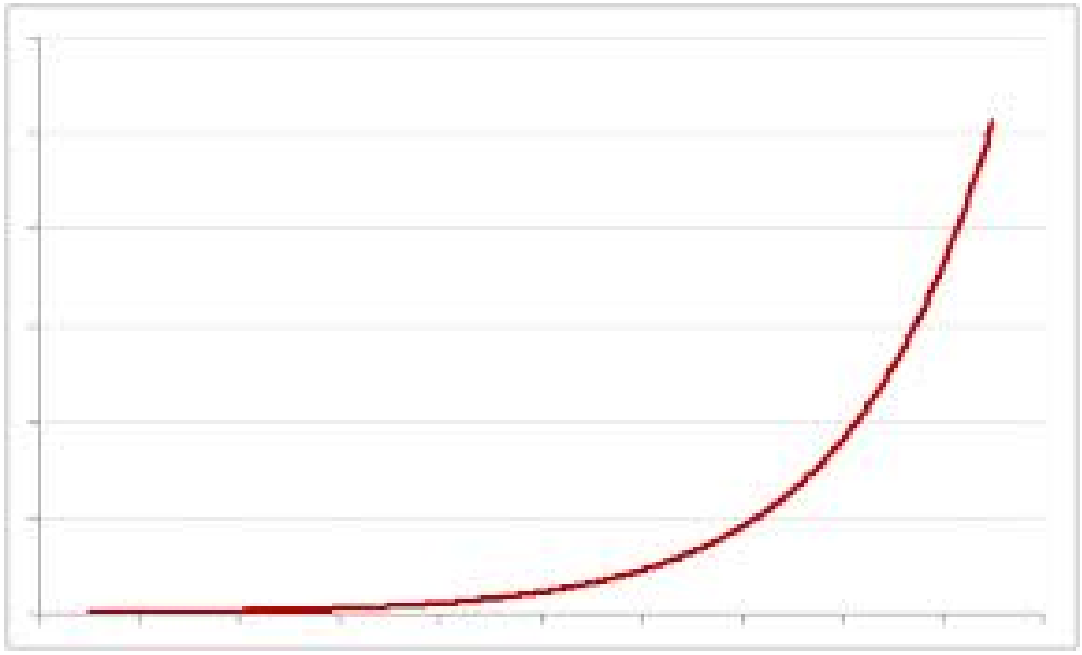


Rigor

- A relatively new field in economics that revolutionized the way we formulate and apply education policies

- Brought analytical rigor to the field by documenting the many effects of education on socioeconomic development

Literature growth

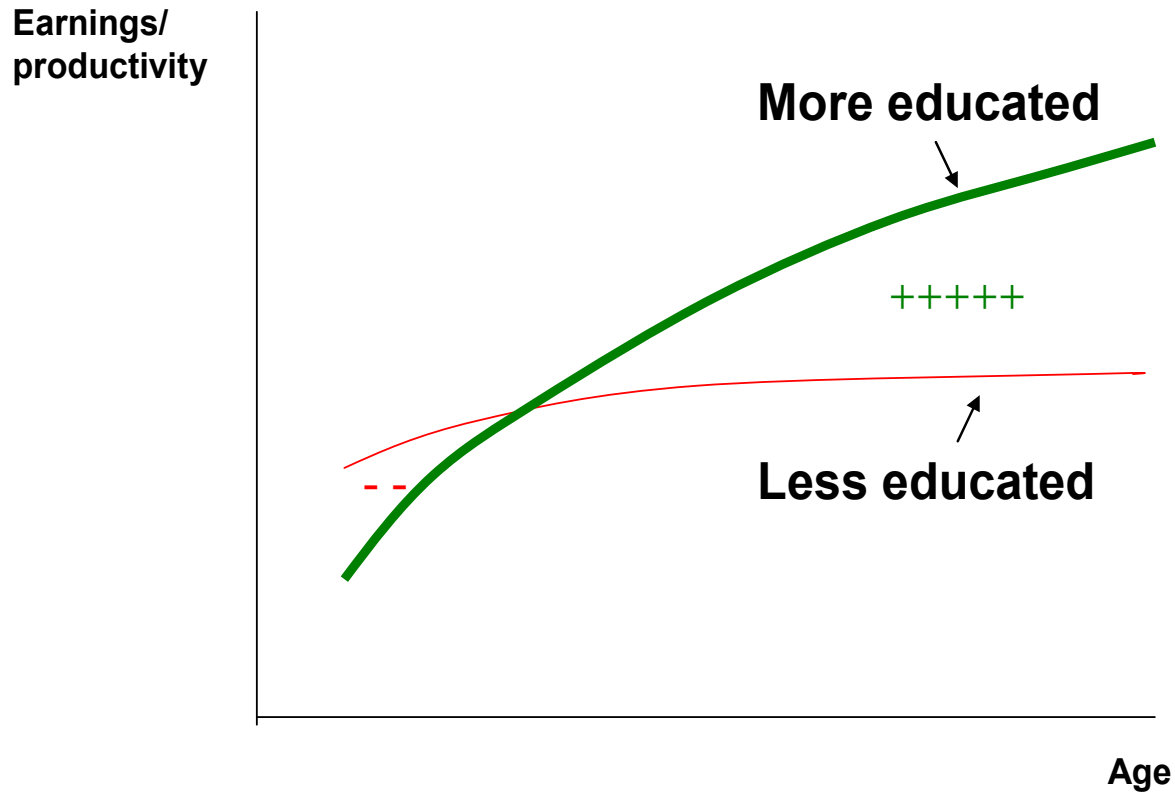


1960 2013

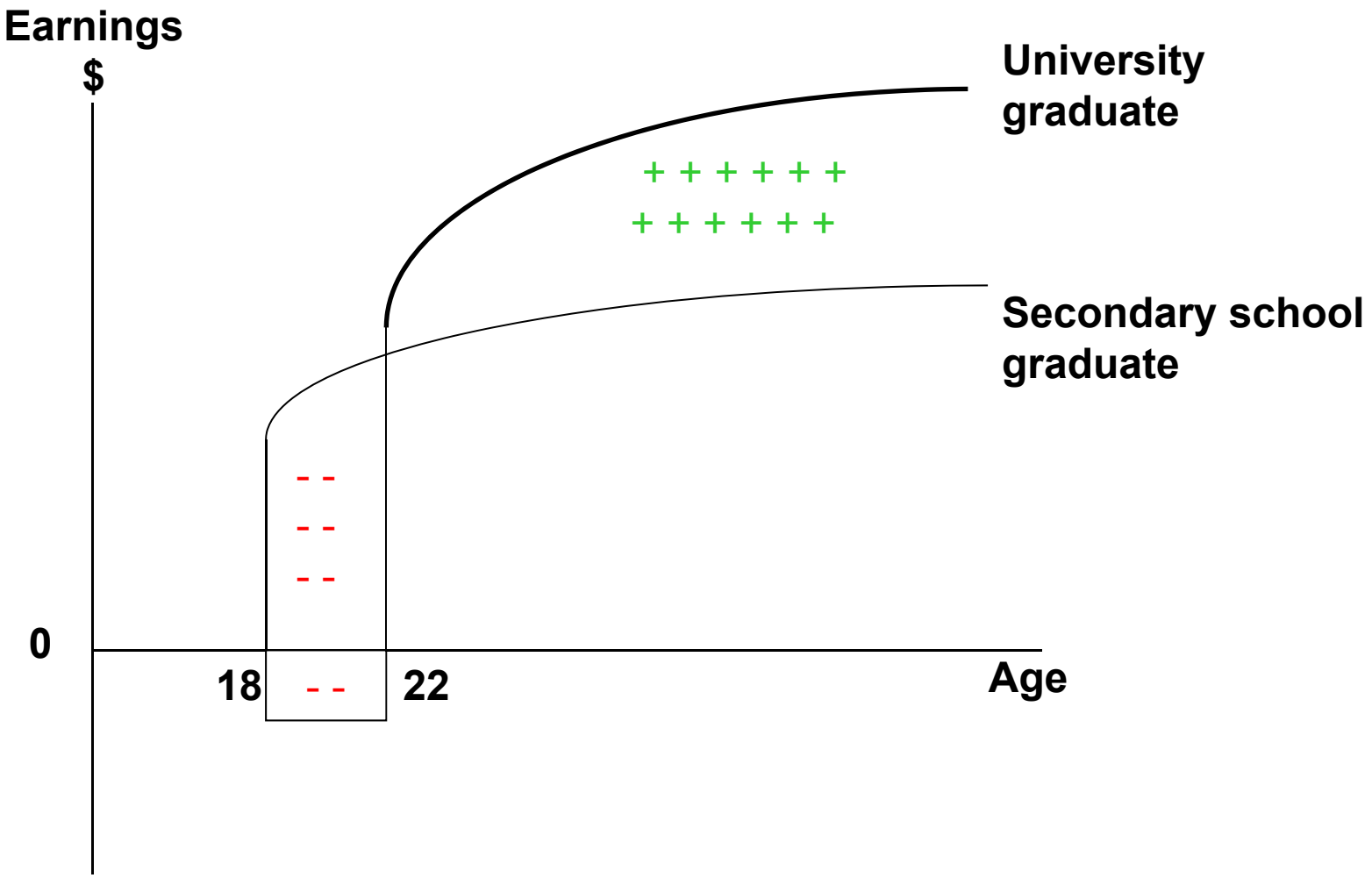
Economics of Education Landmarks

Date	Concept	Exponent
1960s	Human capital theory	Schultz, Becker, Mincer
1970s	Signaling and screening	Arrow, Stiglitz, Spence
1980s	Endogenous growth	Lucas, Romer
1990s +	Externalities, non-market	Venniker

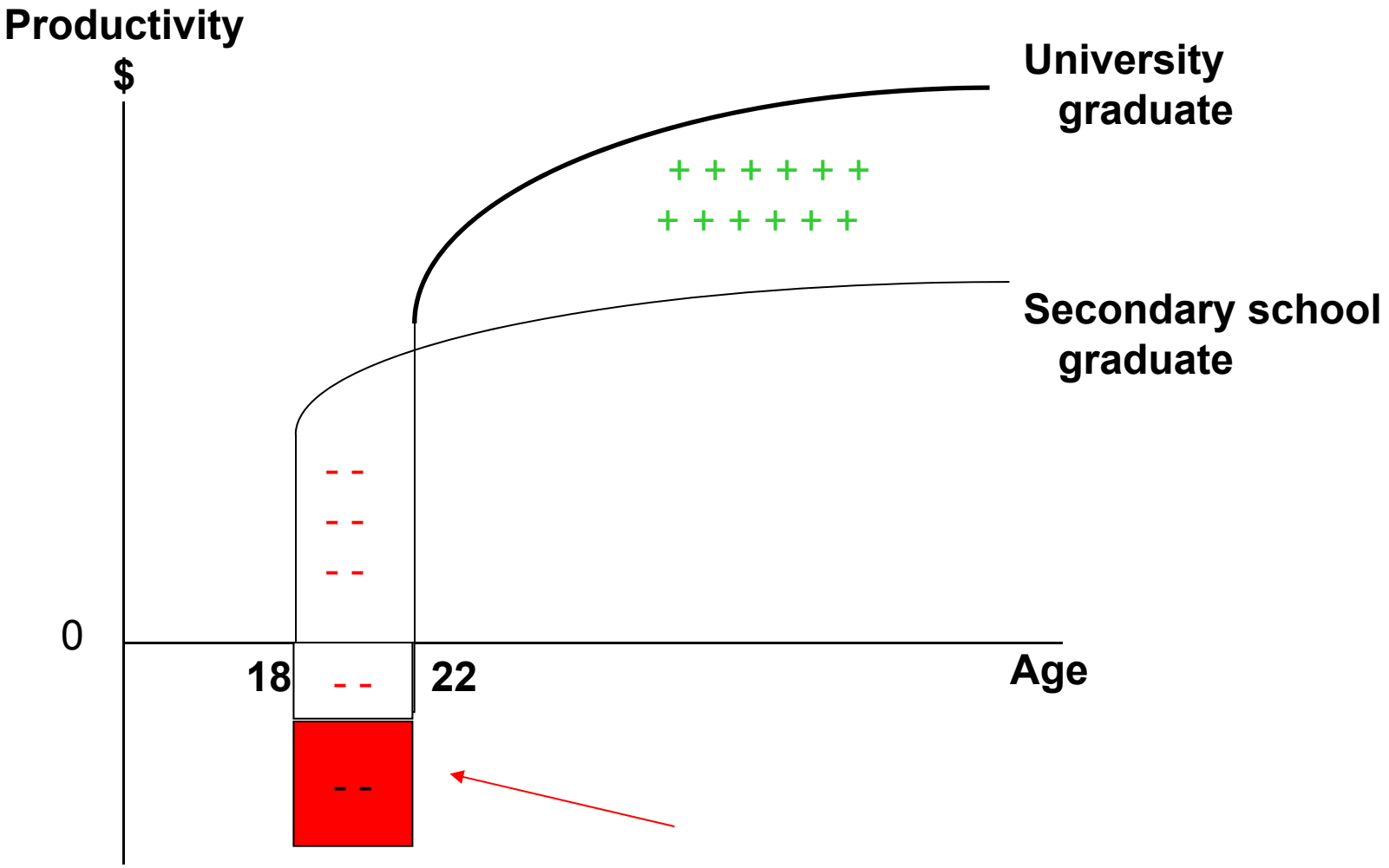
Human Capital Theory



Evidence fits theory



Enter the full resource cost



C-B analysis standard in business

- Education is not free lunch
- Resources are used
- Someone has to pay
- Is it worth paying?

Bank interest example

$$\text{Interest rate or return} = \frac{\$5 \text{ annual interest}}{\$100 \text{ capital stock}} = 5\%$$

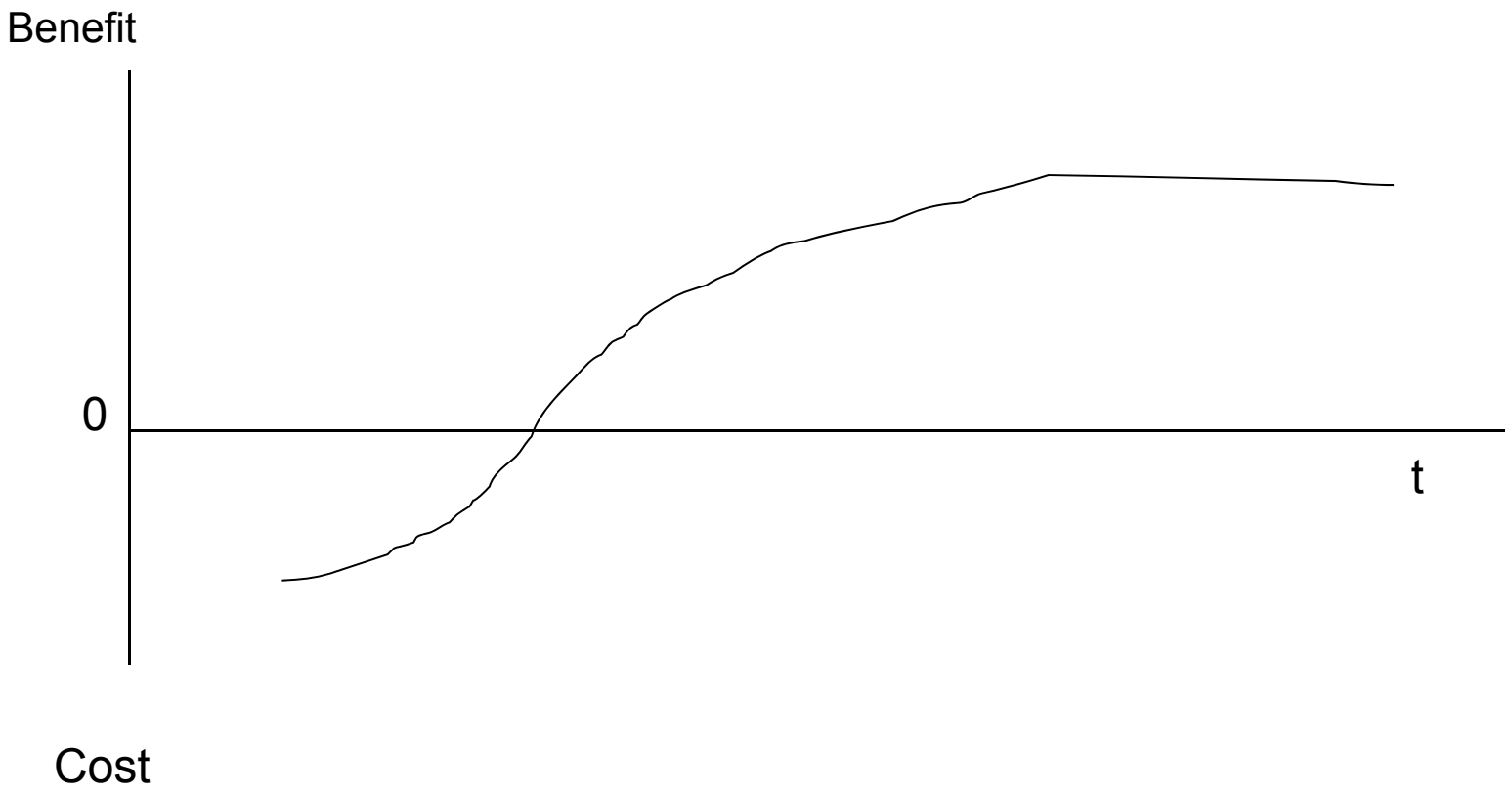
Flows and stocks

- Capital stock = Σ_t (Annual investments)
- Benefits flow = (Annual benefits)$_t$

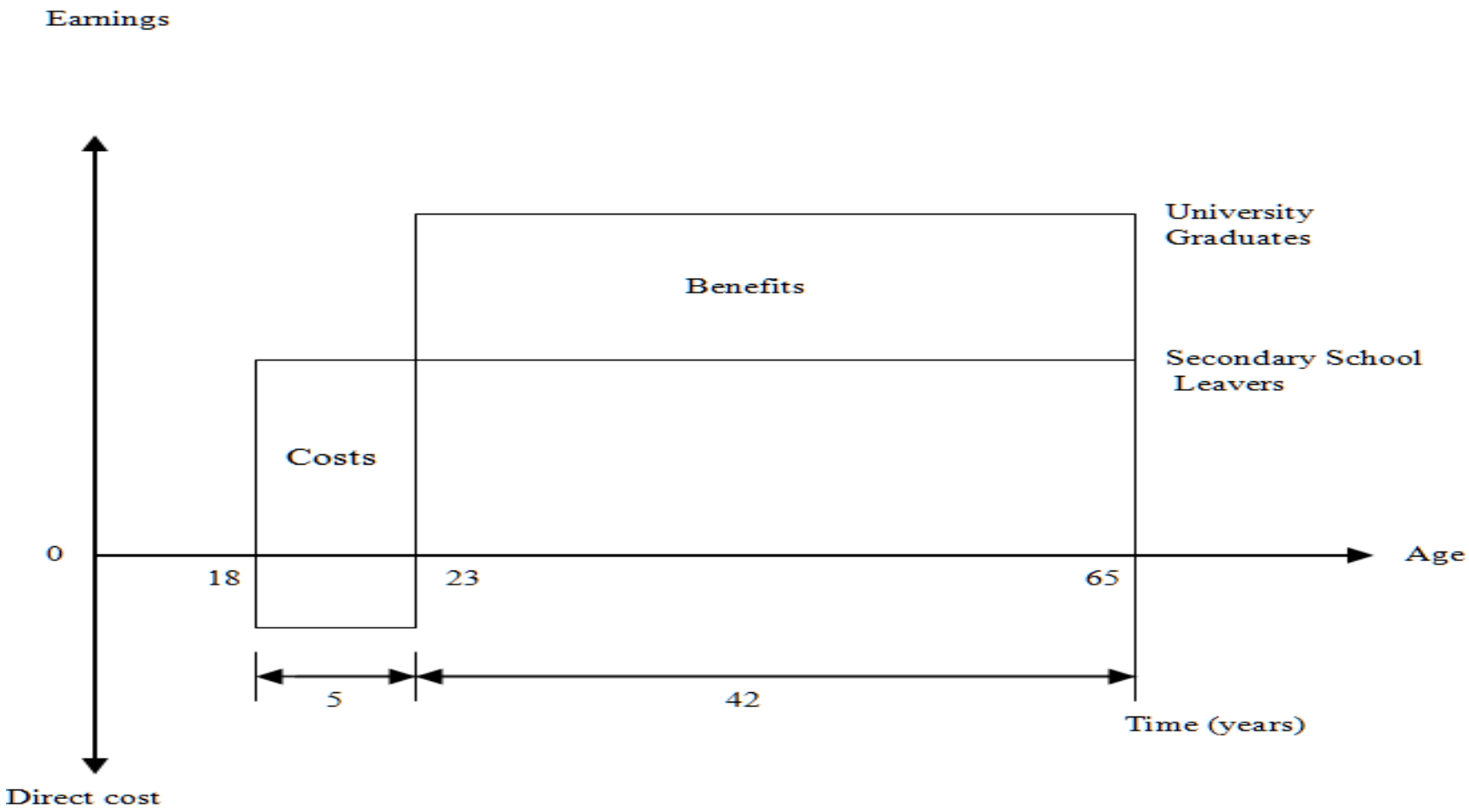
Interest rate links stock and flows, e.g.

$5 annual interest flow = 5% ($100 stock)

C- B stream



Flat age-earnings profiles



The short-cut method

$$r = \frac{(\overline{W}_u - \overline{W}_s)}{5(\overline{W}_s + \overline{C}_u)}$$

The full method

Benefits = Costs

Solve for the internal rate of **return**, r

$$\sum_{t=1}^{43} \frac{\left(W_u - W_s\right)_t}{\left(1+r\right)^t} = \sum_{t=1}^{4} \left(W_s + C_u\right)_t \left(1+r\right)^t$$

The Mincerian method

Basic earnings function

$$\ln W_i = \alpha + \beta S_i + \gamma_1 EX_i + \gamma_2 EX_i^2 + \varepsilon_i$$

$$\beta = \frac{\partial \ln W}{\partial S}$$ = Rate of return

The extended earnings function

$$\ln W_i = \alpha + \beta_p D_p + \beta_p D_p + \beta_u D_u + \gamma_1 EX_i + \gamma_2 EX_i^2 + \varepsilon_i$$

$$r_p = \frac{\beta_p}{S_p},$$

$$r_s = \frac{\beta_s - \beta_p}{S_s - S_p},$$

$$r_u = \frac{\beta_u - \beta_s}{S_u - S_s},$$

Return types and uses

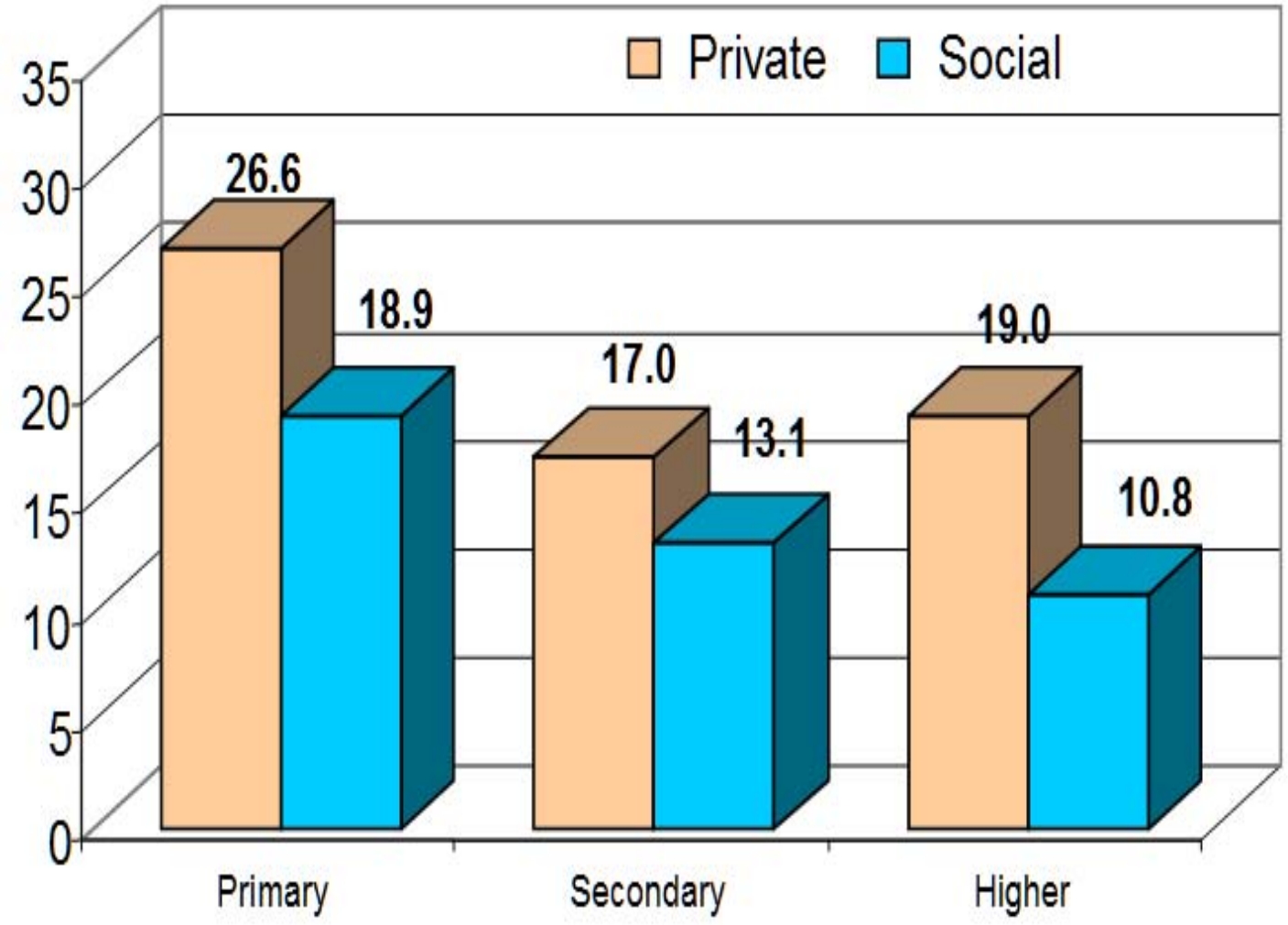
- Private → Explain demand for education
- Narrow social → Education policy
- Wide social → Education policy
- (Fiscal)

Micro estimates

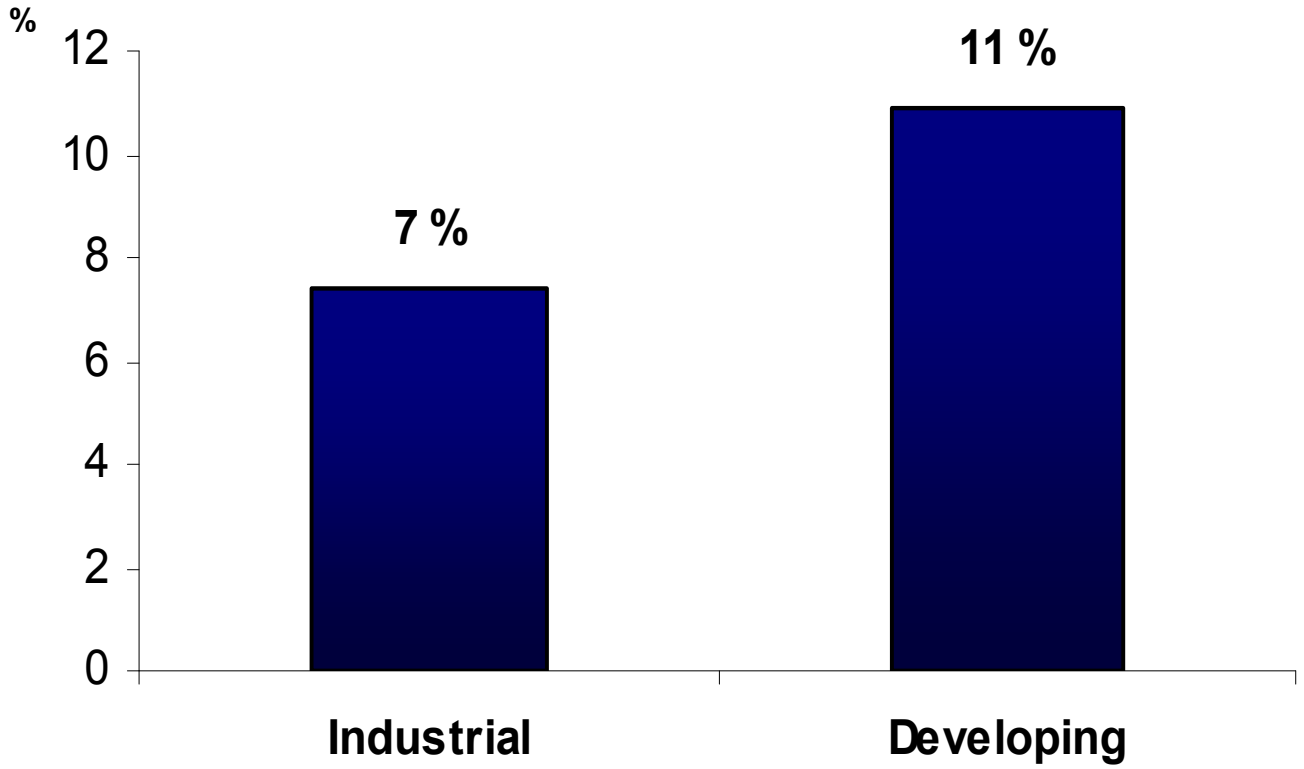
Mincerian $r \approx 10\%$

Beckerian $r \approx 5\%$ to 30%

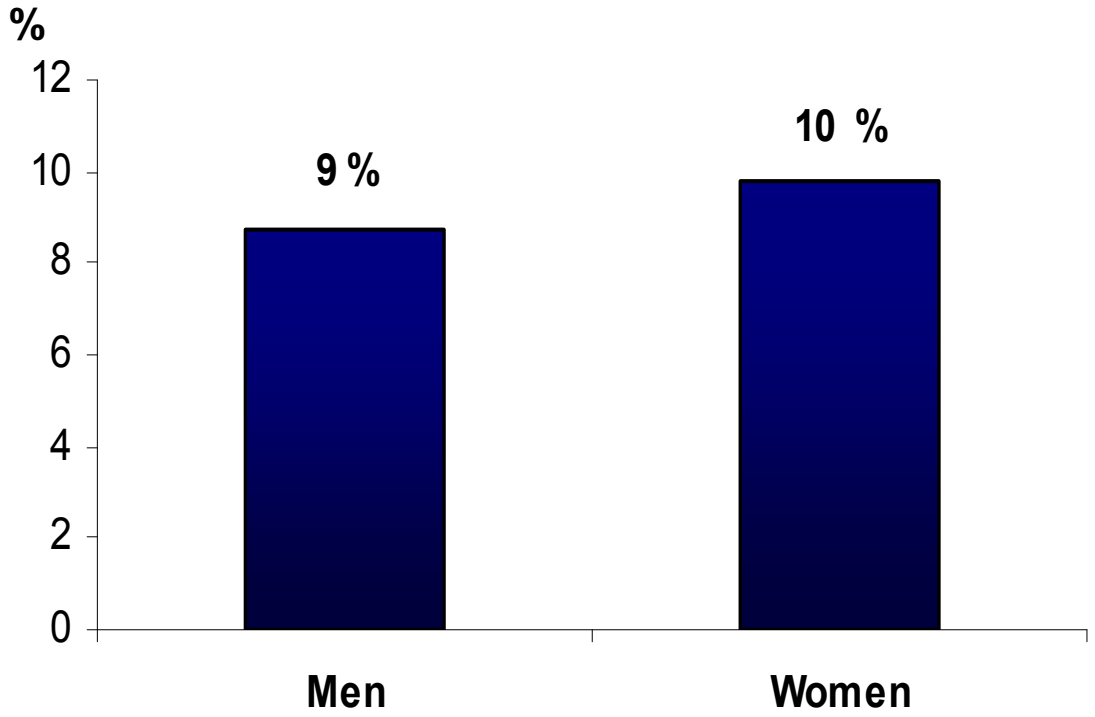
Returns to Education by Level



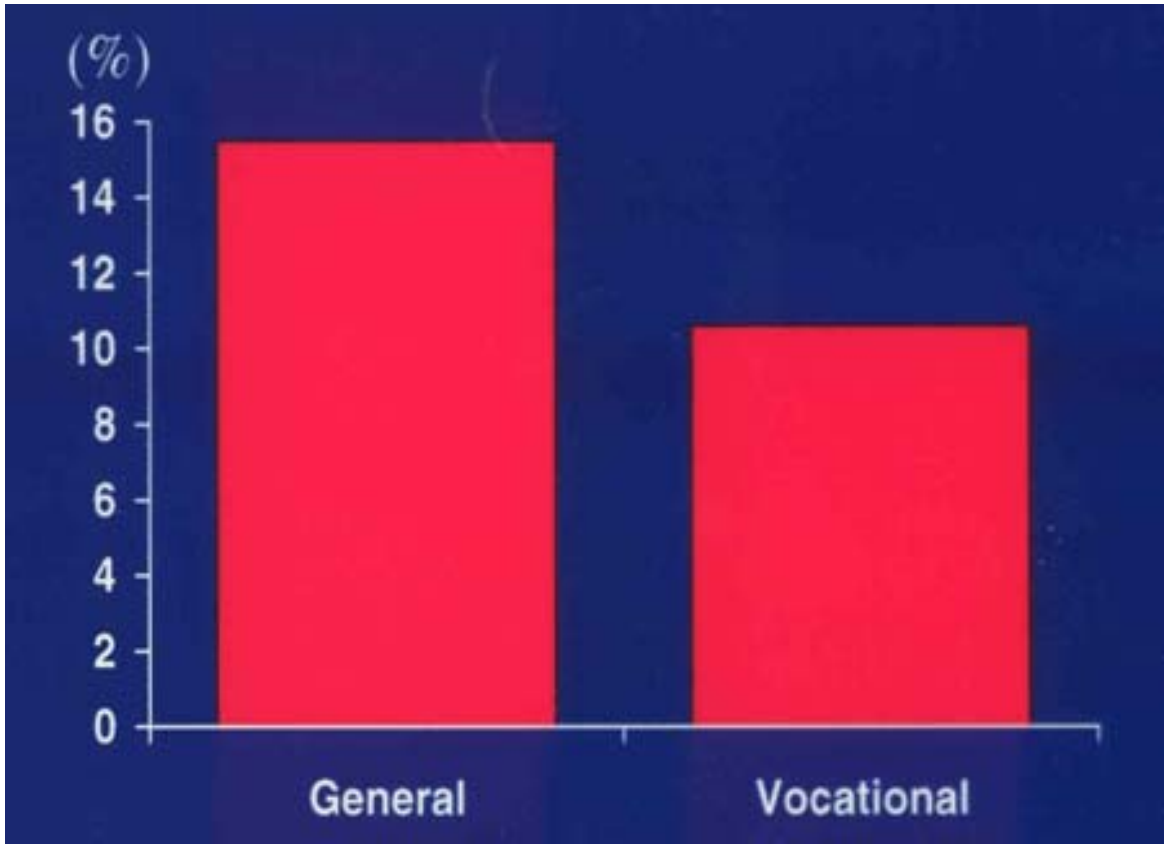
Higher returns in developing countries



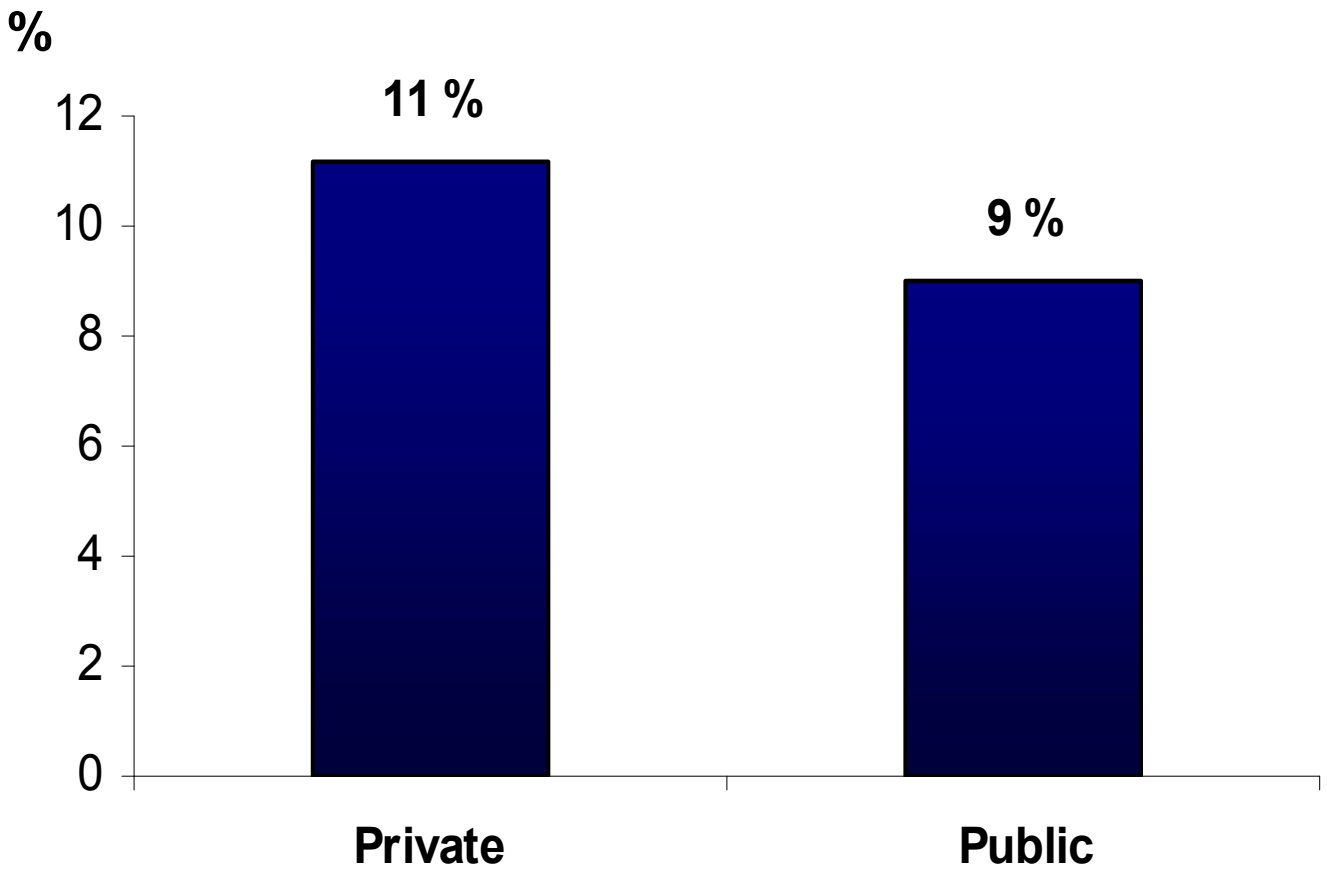
Higher returns to female education



Returns by Curriculum Type



Higher returns in the private sector



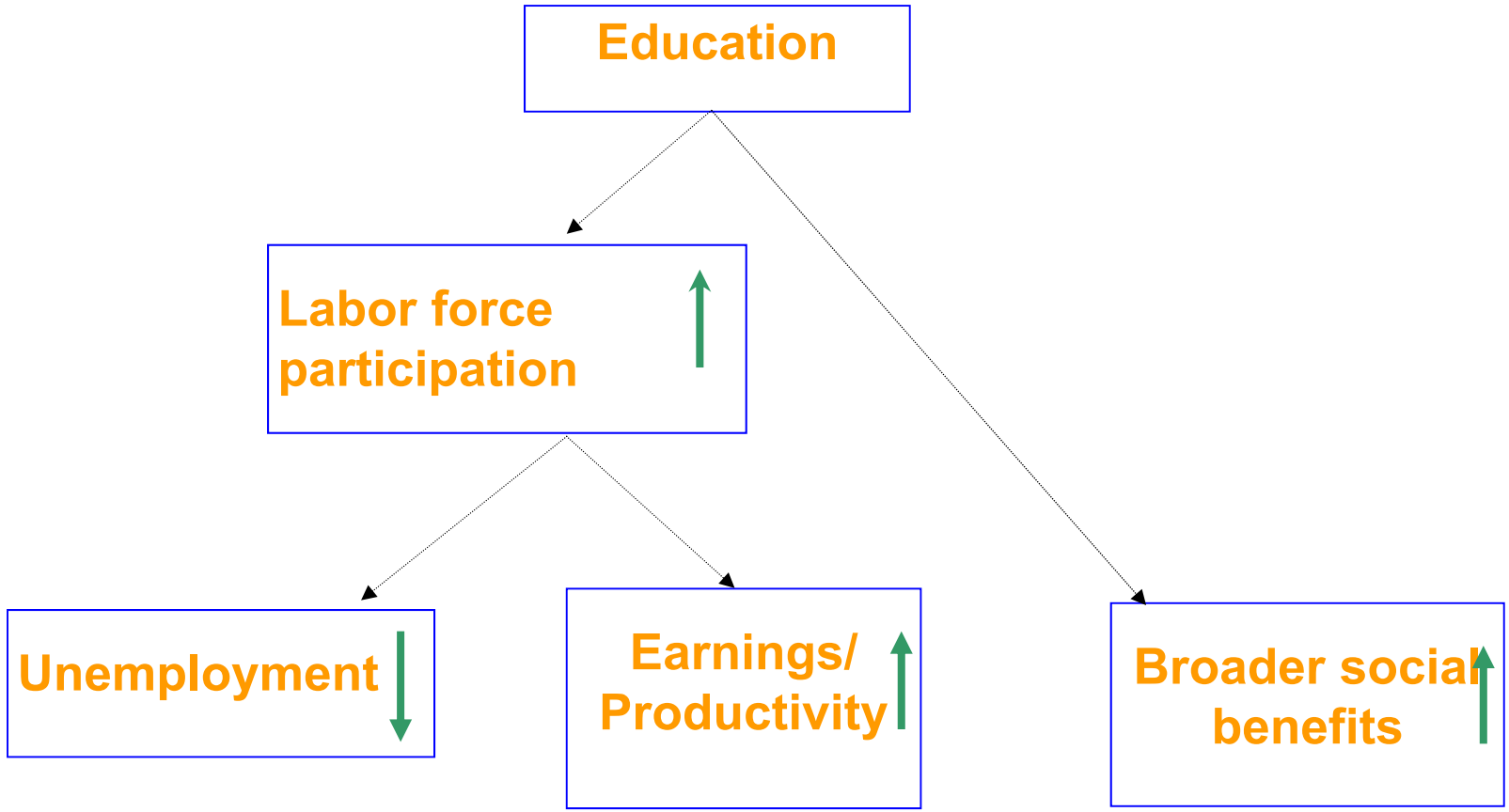
Preschool benefits

- Less grade repetition
- Less special education
- High school graduation
- Better employment chances
- Higher earnings
- More taxes
- Less crime
- Less dependence on public assistance
- Less health costs
- Less single mothers
- More equity

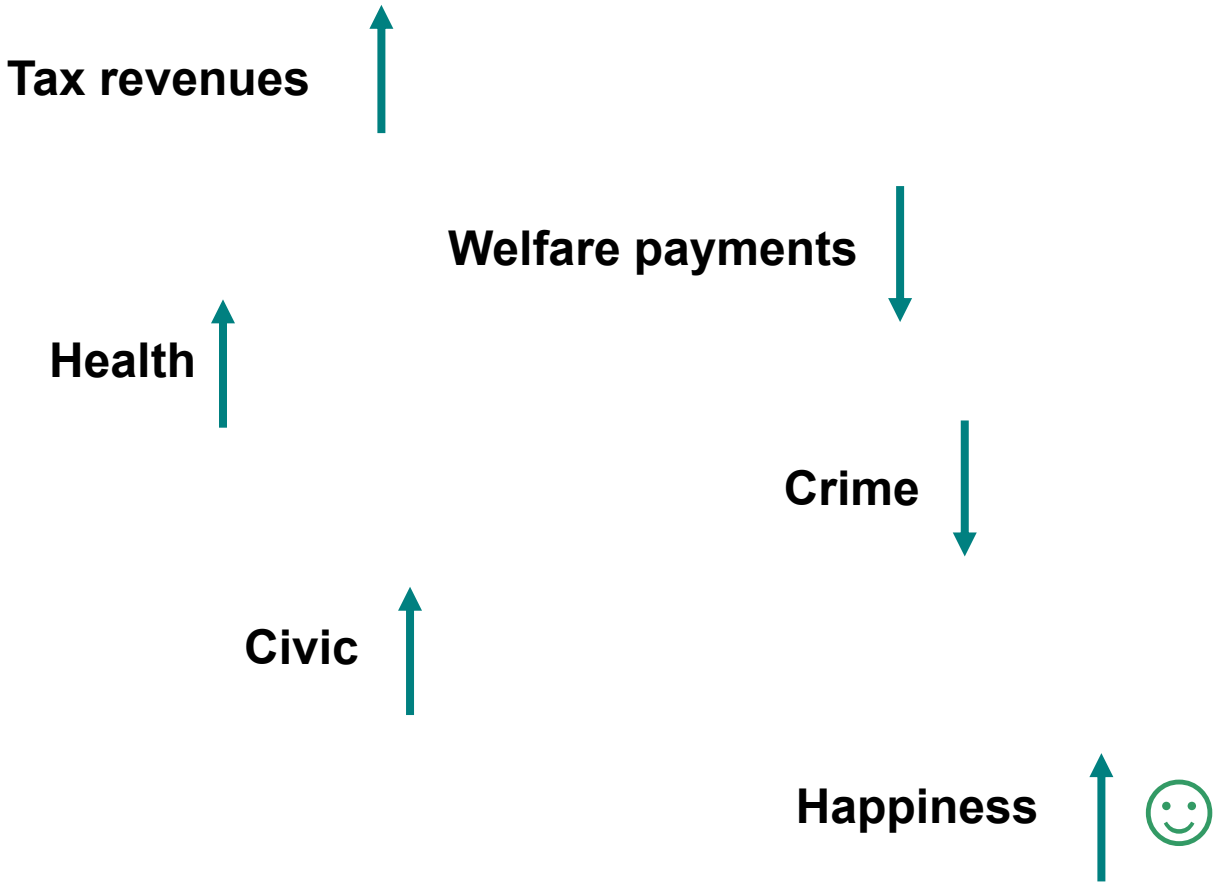
Preschool benefit-cost ratios

- Perry Preschool B/C = 8
- Chicago Child-Parent B/C = 7

Education effect channels



The wider social effects

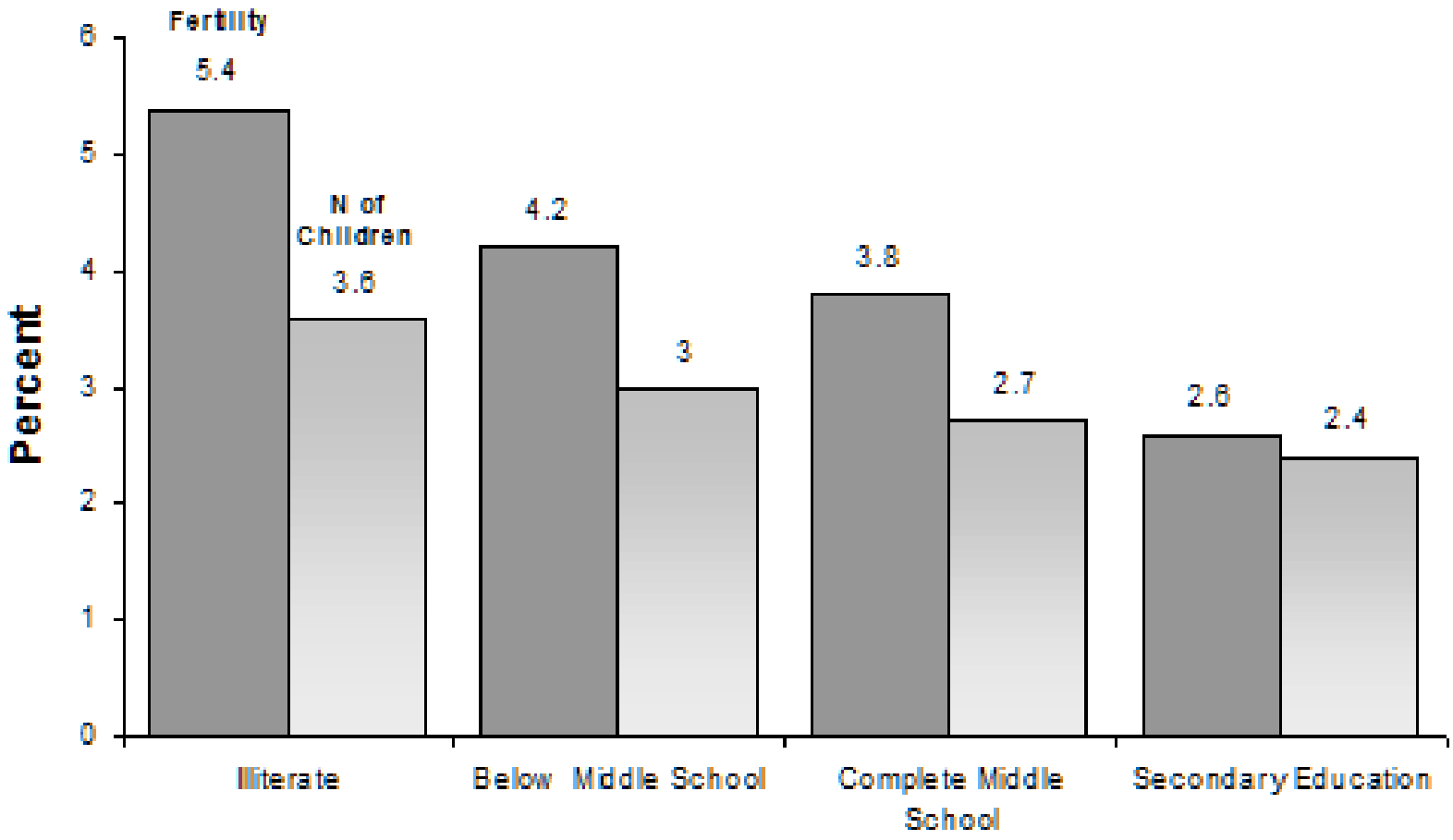


Wider social benefits

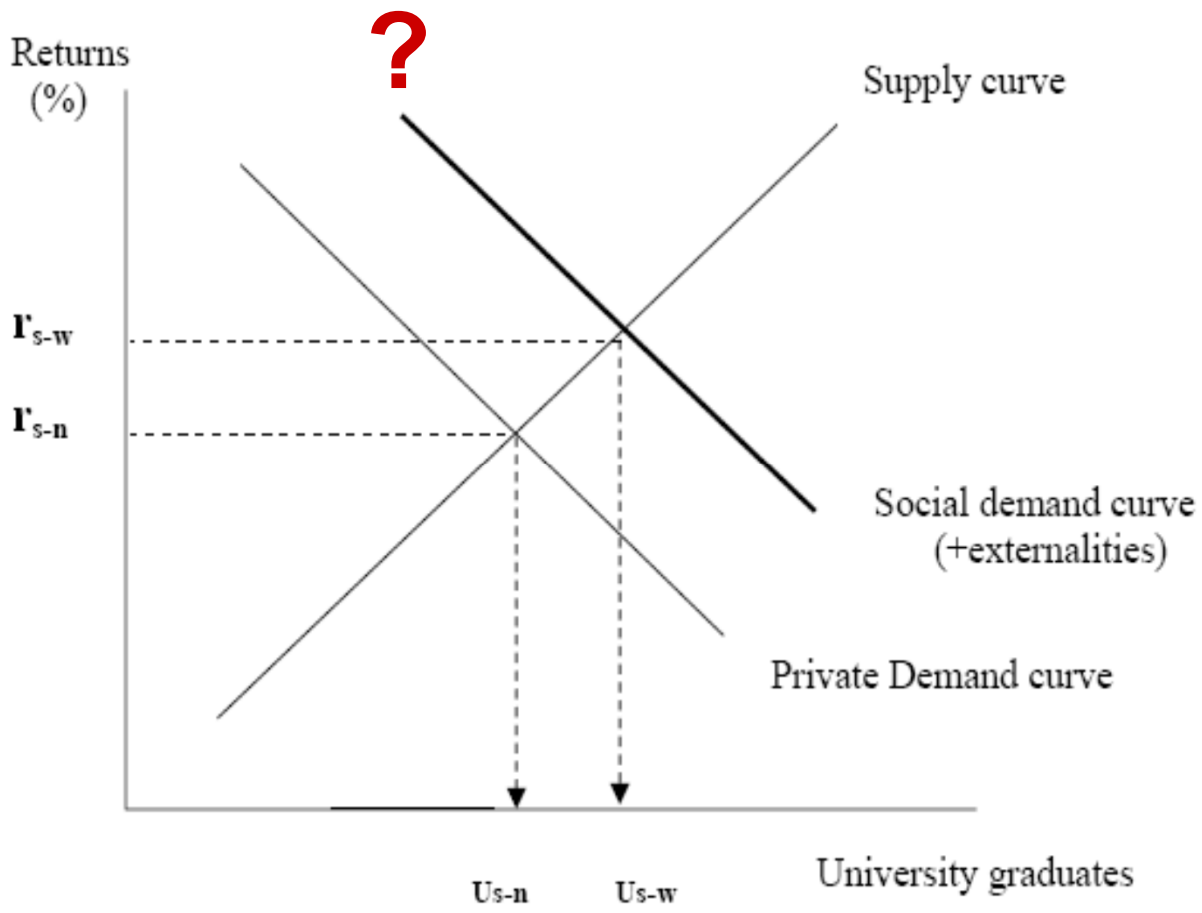
(High school completion vs. dropping out)

- **$192 billion extra income and tax**
- **$58 billion health cost savings**
- **$1.4 billion/year in reduced crime costs**
- **9.2 years longer life expectancy**

Fertility and N children, India



Narrow vs. wide social returns



Macro estimates

Y = f (Physical capital, Human capital, Labor, Land)

Human capital measured as:

- **$ investment in education**

or

- **Labor split by education level: L_0, L_p, L_s, L_h**

Alternative specifications

Exogenous	$Y = f(K, L, T)$	Solow
	$Y = f(K, L, S)$	Schultz, Denison
Endogenous	$Y = S\, f(K, L)$	Lucas, Romer
	$S' = g(Y)$	

Private returns properties

- Undisputable
- Universal, global
- Explaining behavior
- Analyzing distribution effects

1970s - The debates

Δ (earnings) due to:

-- Δ (education)

or

-- Δ (ability)

Econometric nightmares

- Endogeneity
- Simultaneity
- Reverse causality
- Self selection
- Hawthorne effect
- Omitted variables
- Measurement error

Assessing causal effects

- Controlled experiments
- Natural experiments

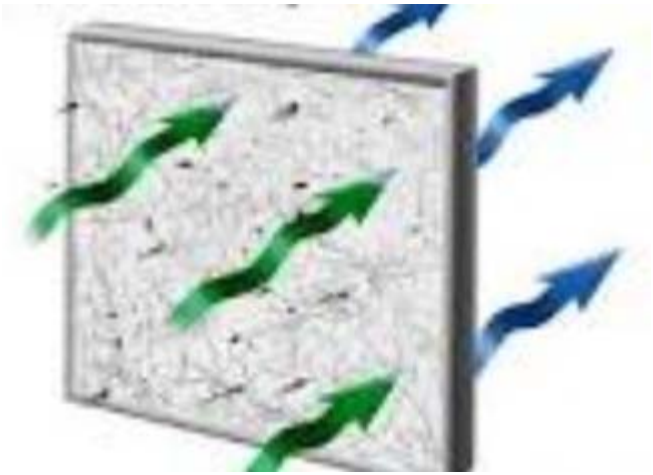
IQ in the earnings function

Griliches' Malmo sample finding:

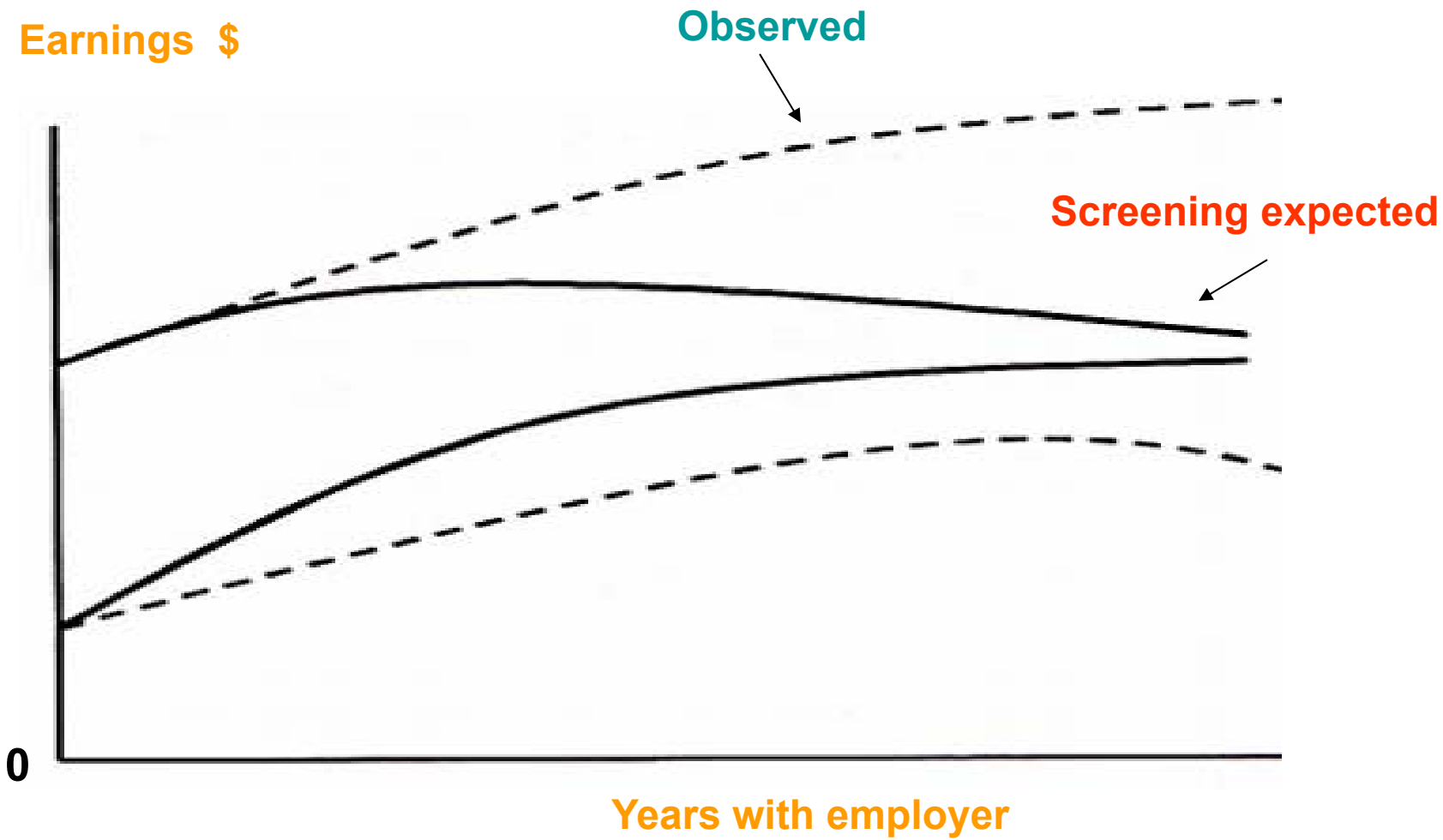
$\alpha = 0.10$

The screening hypothesis

Kenneth Arrow ⇨ Education as a filter



Weak vs. strong screening



Assessing causal effects

Ashenfelter's natural experiment:

Monozygotic twins separated early in life and having received different levels of education

$$\alpha < 0$$

Earnings vs. productivity

Two solutions:

- **Private sector earnings ≈ Productivity**
- **Marginal product of education in production functions**

Production function

Rice = f (Land, tractors, fertilizers, **S**=farmer's education, Z)

$$\frac{\partial \text{ Rice}}{\partial \text{ S}} = \text{(lbs rice) x (price of rice)}$$

Compare benefit to cost of education ⟶ 10% rate of return

Education policy origins

- 1940s – 1950s — Economic planning
  - ➢ Physical capital requirements
- 1960s – 1970s — Educational planning
  - ➢ Educated labor requirements

Two schools of thought and techniques

1. Forecasting manpower requirements
2. Estimating the profitability of investment in education

Divergent policy advice

- Forecasting → **Expand technical vocational education and universities**

- Profitability → **Expand primary education**

Early exponents and practitioners

1. Forecasting = dominant

World Bank, OECD, ILO, Governments of several countries with the support of these international organizations

2. Profitability= minority

Academics, especially University of Chicago, Columbia, London School of Economics

Typical manpower forecasting

Occupation	1970 Manpower Stock (supply)	1995 Manpower Requirements (demand)	1970-1995 Training Needs (demand minus supply)
Electrical Engineer	10,000	12,000	2,000
Mechanical Engineer	15,000	18,000	3,000
Foreman	20,000	24,000	4,000
Supervisor	15,000	16,000	1,000
Skilled Worker	50,000	60,000	10,000
Middle-Level Technician	30,000	35,000	5,000
Etc.	...	...	...

Post mortem of forecasts

1970s

- Gross prediction errors, even for occupations such as teachers
- Diametrically opposite policy conclusions to the human capital approach

Why manpower forecasting failed?

- Mechanical/engineering approach
- Ignores prices and elasticities
- Ignores substitution effects
- Ignores multiple routes to given skill

From planning to policy

- Educational planning (1960's)

  . Social demand (Robbins 1963)
  . Manpower forecasting (Parnes 1964)

- Educational policy (1990's)

  . Vouchers (Friedman 1955)
  . Charter schools (Geske, Davis and Hingle 1997)

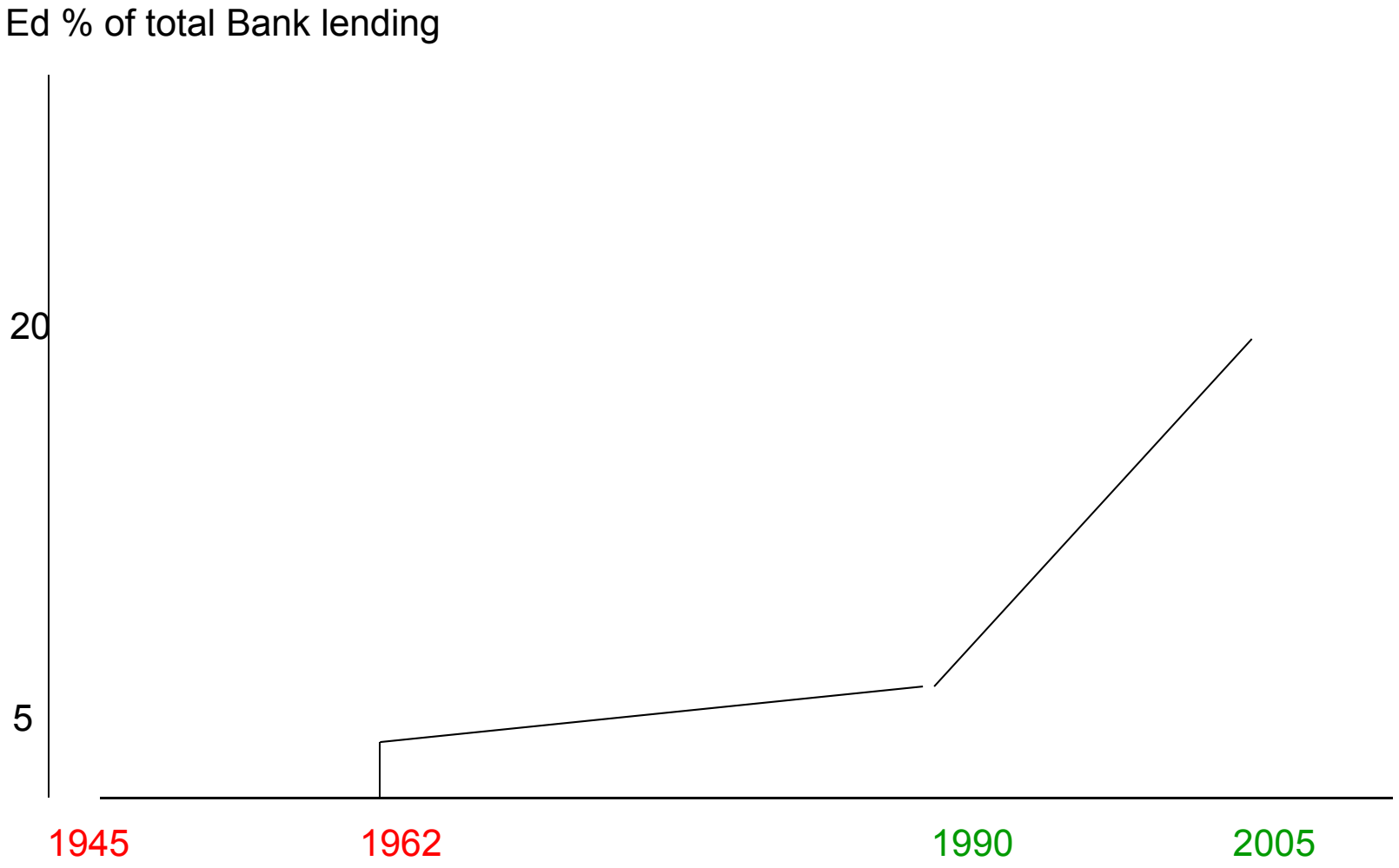
1990's expansions

- Education quality
- Institutional framework
- Political economy

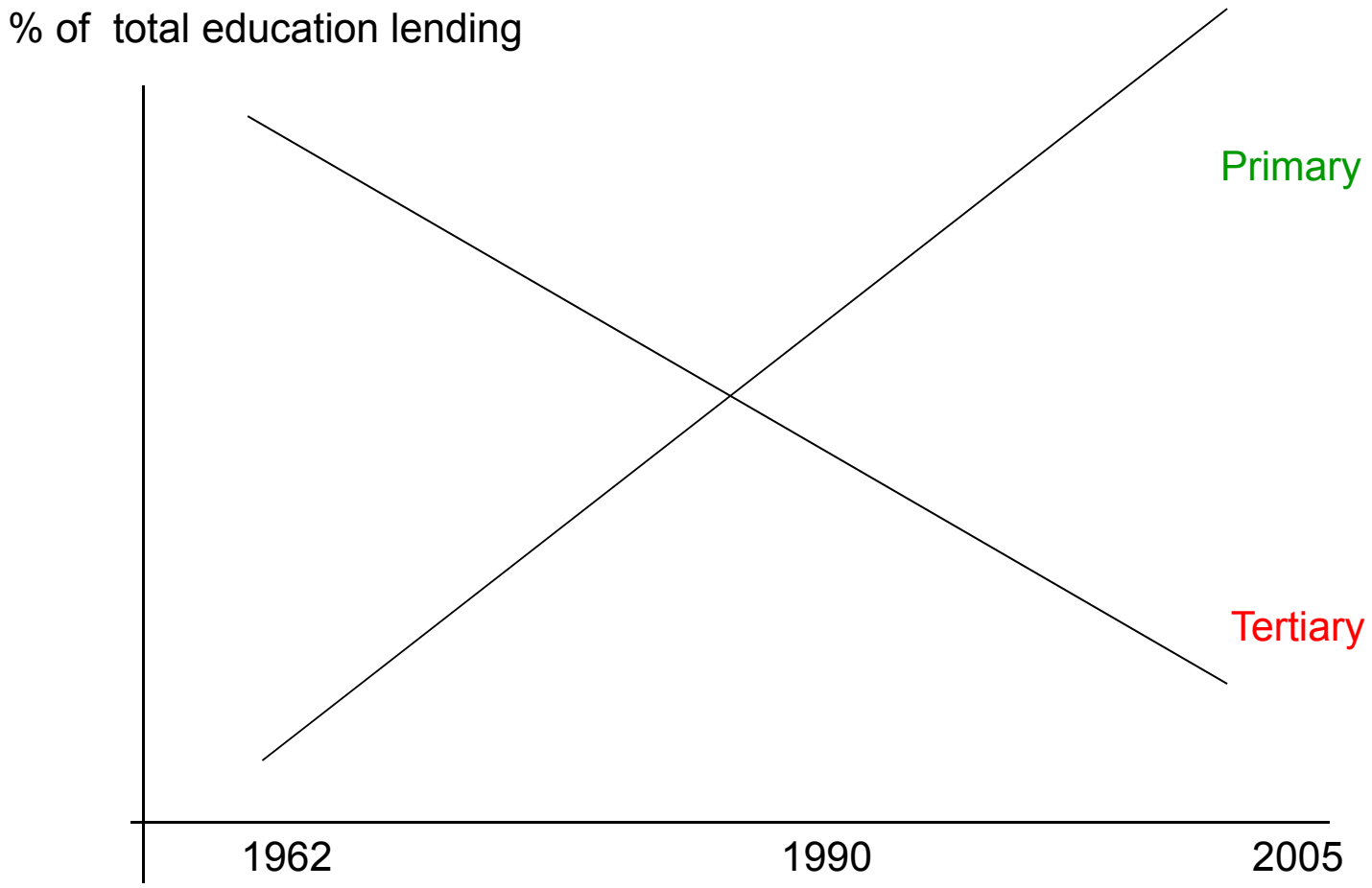
Policy implications

- Do not fund by inertia
- Give priority to funding human capital
- Within education, give priority to lower levels
- Fund general curricula
- Fund quality improvements
- Decentralize education decision making

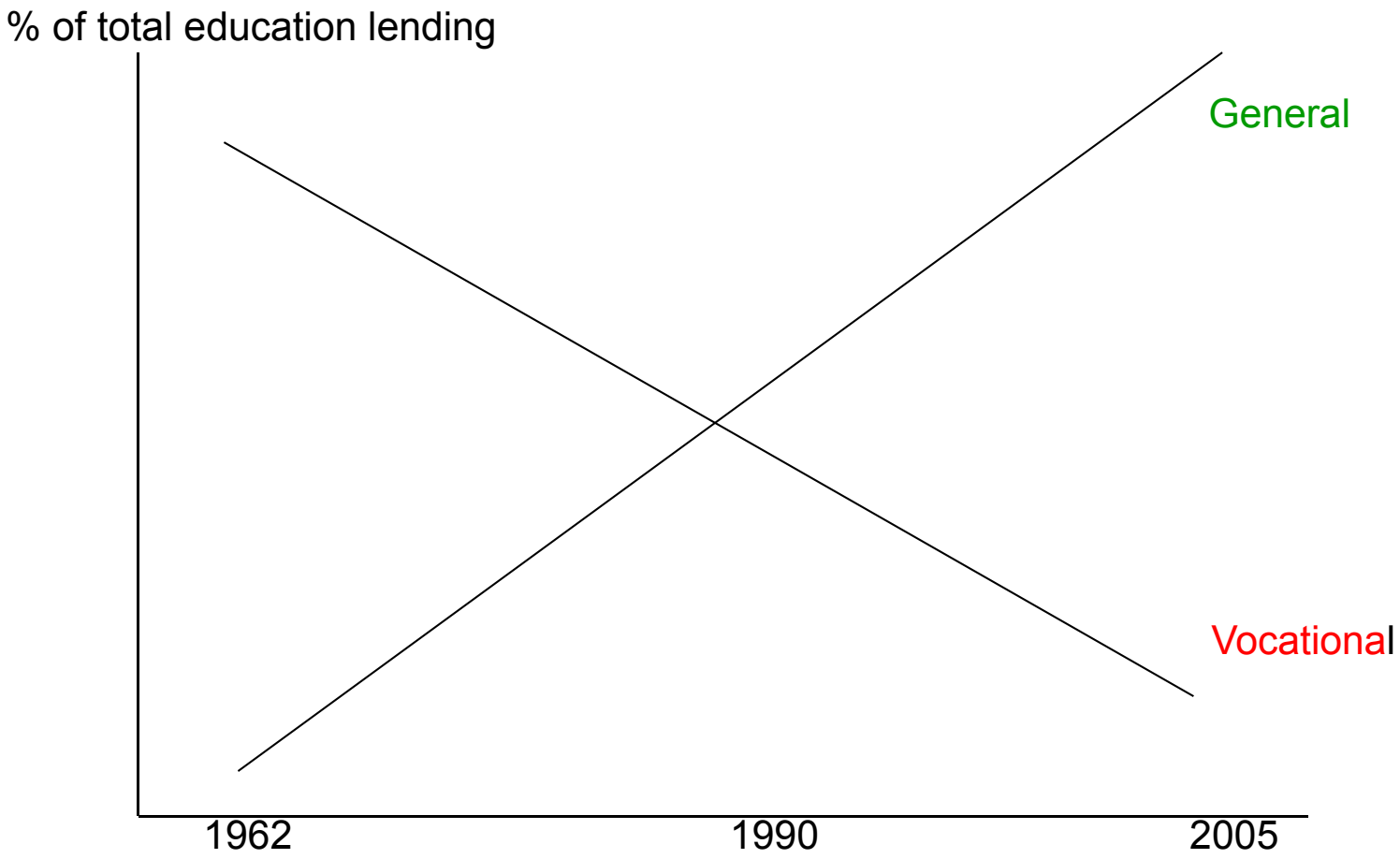
Evolution of lending for education



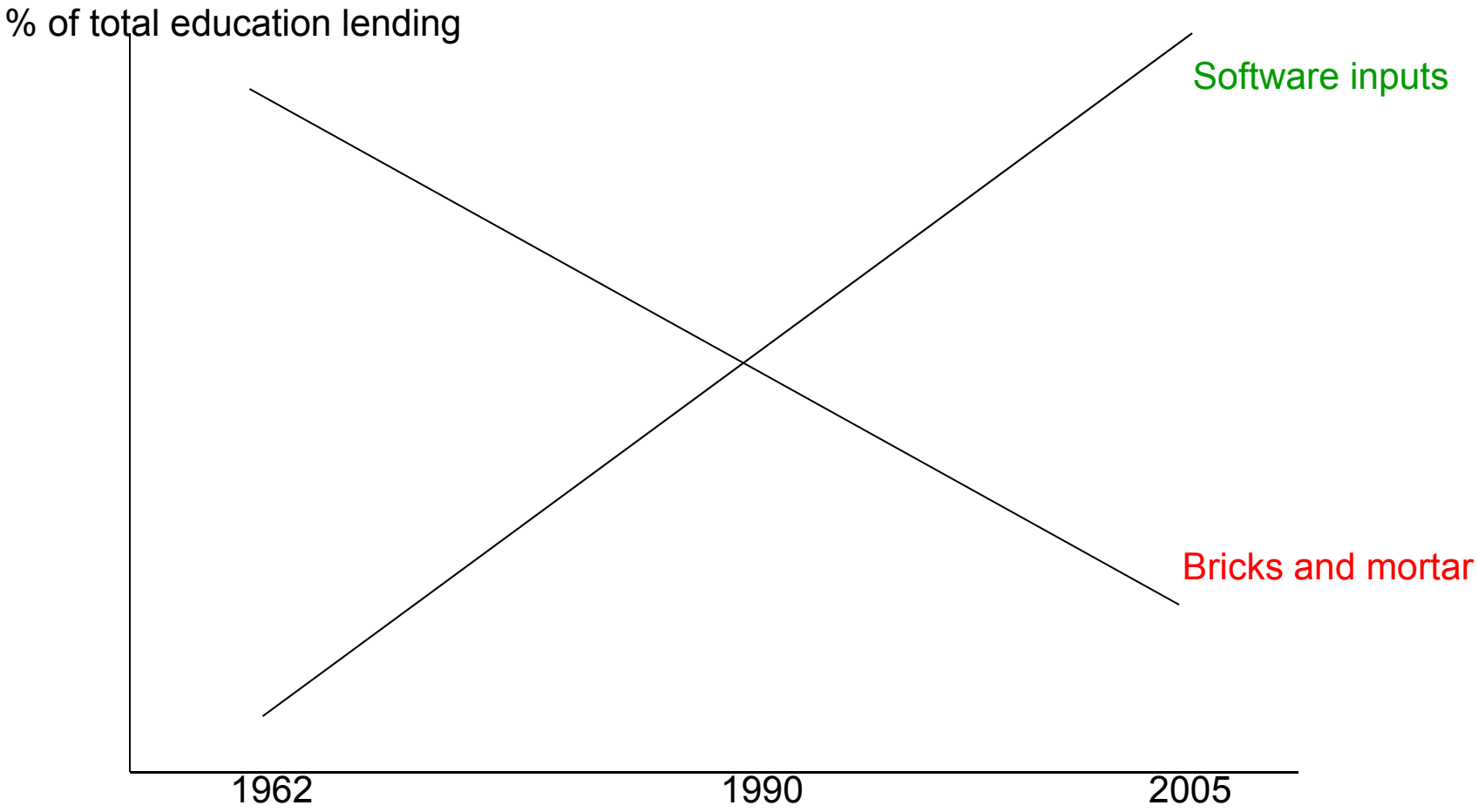
Level composition of education lending



Vocational composition of education lending



Material composition of education lending



Evaluation

- Not among those already employed!

- Not retrospective tracer studies!

- Establish control group by random assignment

- Measure private and social costs of training

Today's divide between ….

- **Research evidence**
- **Policy practice**

Reasons for the divide

- Professional ineptiness
- Political economy
- Petty politics

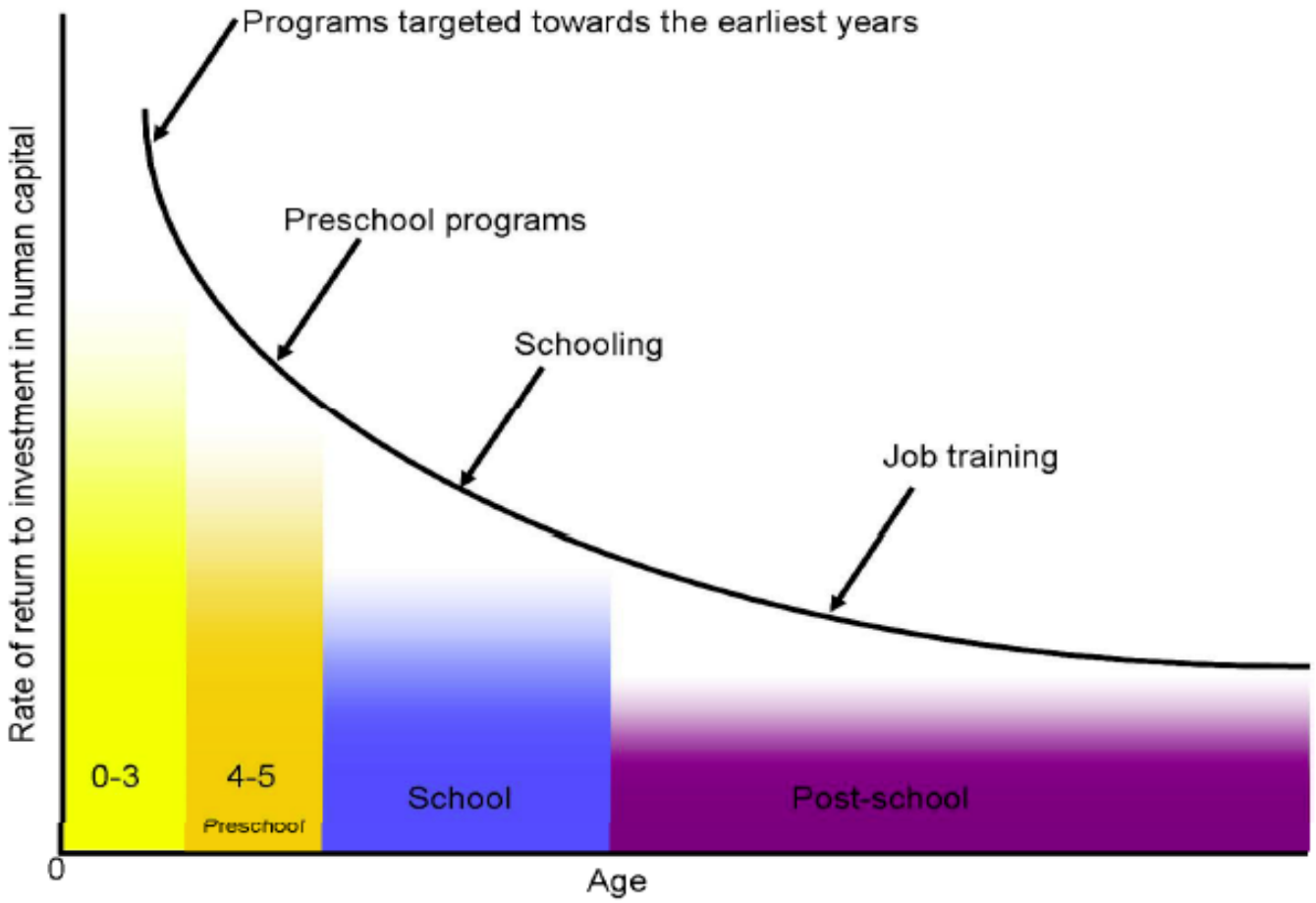
What most Education Ministries do

- Free provision of education, while lowering its quality
- Heavier subsidization of higher education, benefiting the rich
- Limited offering of student loans, the most efficient and equitable way of financing higher education
- Prohibition of private schools and/or regulation of their fees
- Prohibition of vouchers
- Regulation of university places
- Central control of the school curriculum and books
- Underpayment of teachers and professors
- Concern for quantity rather than quality
- Doubtful training programs for the unemployed
- Education budgeting by inertia
- Fear of competition (GATS)

Current facts

- 250 million children out of school
- 150 million children in child labor
- 5% of women are illiterate in some poor countries
- 25% of the adult population functionally iliterate in some in
- Wide variation in education quality across countries,
- Gross inequities in educational opportunity and outcomes
- Regressivity of public spending on education

Heckman's grand policy summary



UN Post-2015 MDGs

- **Education of all levels and kinds**
- **For All**

UN targets are not feasible

- **Limited state funds**
- **Limited international aid**

Previous targets have failed

Grandiose education declarations known as:

- Addis Ababa, 1960
- Jom Tien, 1990
- Dakar, 2000

Priorities must be established

- Treating education as investment
- Apply cost-benefit analysis

Based on the evidence …

- **Reducing by 50% the number of children who are not attending preschool in sub-Saharan Africa has a benefit-cost ratio of 28 to 39.**
- **Increasing the primary education enrollment ratio in sub-Saharan Africa from 75% to 100% has a benefit-cost ratio between 5.1 and 8.5.**
- **Improving school quality by increasing student test scores by one standard deviation has a benefit-cost ratio between 3.0 and 5.0.**

Ineffective targets

- **Providing vocational education within the main school system**

- **Education and training programs for older workers**

Concluding comments

- Setting MDG targets is a pointless exercise

- Investing in the most profitable levels and types of education should be a continuous process

- "Education for All" should be replaced by "Education for Some", i.e. the most needy