

## Population and development

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## Outline

- A little demographics
- The demographic transition
- An ethical problem
- Economic theory of fertility
  - How can fertility be too high?
  - The puzzle
- Economic consequences
  - Positive
  - Negative
  - indeterminate

## A little demographics

- **Death (mortality) rate:** annual number of deaths per 1,000 inhabitants.
- **Birth (natality) rate:** annual number of births per 1,000 inhabitants.
- **(Biological) Population growth rate:** birth minus death rate.

## A little demographics

- **Population growth rate:** biological population growth rate plus net immigration rate.
- **Fertility rate:** the average number of children that would be born alive to a woman during her lifetime.
  - Fertility rates and birth rates related but similar fertility rates can result in different birth and pop. growth rates: **momentum**
  - **tempo effect:** effect of delaying births with the same fertility

## A little demographics

- **Infant mortality rate:** probability of dying between birth and 1 year---annual number of deaths of babies under one year per 1000 live births.
- **Children mortality rate:** probability of dying between birth and 5 years---annual number of deaths of children under 5 years per 1000 live births.
- **Life expectancy at birth:** number of years a newborn would live if patterns of mortality at the time of its birth remain constant.

## Age distribution/structure

- Extremely important :
  1. two countries with the same fertility ratio can have different birth rates depending age structure
  2. Similar observation with death rates
  3. **Dependency ratio:** ratio of pop 15- and 64+ to 15< pop<64

## Demographic transition

- As econ. growth, pop. growth a relatively modern phenomenon.
  - Until 15th cent., global population growth almost zero.
  - During 15th, 16th and 17th cent., some population growth. Cyclical behaviour (Malthus 1798 *An Essay on the Principle of Population*).
- **first phase:** (prior to 18th cent. In Europe): high birth +high death rates = low population growth
- Demographic transition composed of
  - a mortality transition: death rates began to fall around 1700 in Europe
  - and a fertility transition: birth rates adjust to death rates with a lag (later)

## Demographic transition

- **Second phase:** high birth+ low death rates = high population growth:
- **third phase:** low birth + low death rates = low population growth.
- Countries in the world in the 2nd (SSA) or 3rd phase of the transition:
  - Europe and North America done with demographic transition by end of 19th, beginning of 20th cent.
  - Most developing countries went through it during the 20th century.
  - SSA still going through it.

## Demographic transition

- Speed different in Europe (more gradual) than in the rest of the world (sudden)
- Consequence: geographical distribution of global population changed over time: future “larger” countries, poorest countries: **composition effect** on average growth of global income:
  - Richland grows by 10% from 20,000 to 22,000 and
  - Poorland grows by 10% from 2,000 to 2,200.
  - In year 1 pop. same in both: average global income = 11,000.
  - In year 2 pop. of Poorland twice as large: average global income = 8,800.

## An ethical problem

- An implicit ethical judgement
- between two alternatives:
  1. a larger population with lower standards of living on average; and
  2. a smaller population with higher standards of living on average

Widespread consensus but, from an ethics point of view, no easy solution  
(see "The veil of ignorance" in page 118 of Rawls' *A theory of Justice*)

## Economic theory of fertility

- For an issue to be considered an economic problem:
  1. Parents want children
    1. Direct source of satisfaction.
    2. Labour.
    3. (Social, psychological, and economic) security in parents' old age.
      - Children = durable good

## Economic theory of fertility

1. Children are costly
2. Parents must be able to make a decision: whether to have children, how many and when.  
  
Generally speaking, we are able to make a decision.

## Discrepancies between "desired" and "actual" number of children

1. Access to technologies.
  - high correlation between desired and actual number of children: at an individual level there may be a lot of difference but an aggregate level some couples will have more children than desired and some fewer
2. Relation between mortality and fertility.

## Mortality and fertility

- children as investment good when there is no social security system & children are the only support in old age.
- DCS: three main ways of saving for old age:
  1. social security. A combination of a compulsory saving plan and a progressive tax system. In some countries it includes medical care
  2. pension plans: promoted by the government or employer subsidized.
  3. other ways of saving.

## Mortality and fertility

- Social security is difficult to implement in low-income countries
- non-compulsory forms of saving are not used because saving is a luxury good:
- Under these conditions it makes sense to use children as both a consumption good and an investment good.

## Fertility too high?

Means: families (individual) decisions are not optimal: we need a "failure"

**Uncertainty (risk) and optimality:** need to differentiate between *ex-ante* and *ex-post* optimality. If Individuals have PERFECT information, on average families will be correct.

## Fertility too high?

First welfare theorem: individual decisions are optimal assuming

1. property rights are well established,
2. complete markets,
3. perfect information
4. no externalities

## Fertility too high?

What are the Failures?

1. Imperfect information : common explanation of the demographic transition
2. Lack of markets: non-existence of an old age insurance system.
3. Externalities. Typically negative but not necessarily so.
  1. pressure on the environment.
  2. use of children as labour.
  3. positive externalities: in a SS system: my children's taxes will support childless people.

## The puzzle

- children a normal good,
- relation between # of children and  $y$  negative
  - across-countries and
  - time-series studies
  - within countries

## The puzzle

- Two reasons:
  - 1. The quantity-quality trade-off** Becker: satisfaction depends on :
    1. quantity: the number of children; and
    2. quality (infelicitous term: not referring to a child being better than other): expenditure or investment on human capital of each child.

(Reminder: human capital investment refers to expenses that increase future productivity: health, nutrition, education, cultural capital, etc. )

## Trade-off quantity/quality

Parents can either have 1) a large number of poorly *educated* children or 2) fewer more *educated* children.

Implications?

- Groups with higher returns to education would have fewer children and viceversa
- Factors that affect education have an impact on fertility.
  - if the returns of investing in education increase, parent will have fewer, more educated children.
  - Decrease in the cost of education → increase in education and decrease in fertility.

## Quantity/quality trade-off

- Joint decision: this conjecture not easy to test: Rosenzweig and Wolpin (1980) use twins (University of Minnesota database) as a natural experiment: results corroborate Becker's insight.

## The puzzle

- 2. Opportunity cost.** The opportunity cost Children involve two kinds of costs:
  - Financial costs: health care, food, clothes, shelter, education.
  - OC of bearing and rearing children, roughly proportional to the going wage rate

## Effects of population on development: negative

- 1. The Solow model:** direct effect: dilution of capital
  - Level effect

## Negative

2. **Population and saving:** indirect effect:  
lower the saving rate
- more intuitive: "high dependency burden theory"
  - argument applies to both physical and human capital:
  - Empirics: effect on human capital more clear
  - level effect

## Negative

3. **Pressure on the environment .**
- In 1972 the Meadows published the *Limits to Growth* (also known as the Club of Rome Report)
1. explanation of why there has been no economic disaster: technical progress allows us to compensate for the environmental pressure of population growth.
  2. actual technical progress is greater than the measured technical progress
  3. negative effect on economic growth

## Indeterminate

- A decrease in population growth increases productivity (output per worker).
- We do not care about productivity, we care about income (output) per capita.
- What is the relation between these two?

## Positive

- no technological progress without putting people in the picture.
- Technological progress affected by population growth
- 1970s: The reaction to the *Limits to Growth* from many Third World leaders was to denounce it as a conspiracy of rich countries to curtail population growth in the Third World (expression of the time) so not to be outnumbered.
- A couple of economists, Boserup and Simon, sided with the Third World leaders on doubting the negative effects of population growth.

## Demand arguments:

- **Necessity is the mother of invention:** E. Boserup in *Population and Technical Progress* (1981).
- Population growth puts pressure on the supply of food and this pressure drives innovation in agriculture.
- May apply to very early technical progress

## Supply arguments

- **People are the ultimate resource:** J. Simon in *The Ultimate Resource* (1981).
- People are not only mouths to feed and labour, they are also the generator of ideas.
- Kremer (1993) tested the model.
- The argument only applies to global population.

## New growth theory

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## Outline

- Human capital
- Augmented Solow model
- Technological progress
  - What is TP?
  - A model of R&D
- Technology transfer

## Human capital

- Human capital has three components:
  1. Nutrition,
  2. health, and
  3. Education (formal plus learning-by-doing or on-the-job training)
- A durable good: both a consumption good and an investment good.
- causality runs both ways:
- Measurement: only formal education and with problems

## Why capita does not flow to poor countries? (Lucas)

- C-D: poor countries have lots of labour:  
 $MPK_p > MPK_r$
- Counterfactual: larger in rich countries but not by much (risk premium)
- Suppose that  $Y=(K, H)$ , CRS
- In per worker terms  $y = (k, h)$ , CRS
- This formulation explains why capital does not flow to poor countries: rich countries have more human capital :  $MPK_r > MPK_p$

## Lucas

- assume households invest a fraction  $s$  of income in physical capital and another fraction  $q$  in human capital:  
 $g = f(q, s)$
- implications are counterfactual: no correlation between  $g$ ,  $q$  and  $s$
- Problems of measurement:
  1. appropriate measure? Usual: weighted average of enrollment in primary, secondary and post-secondary (larger weight to primary than to secondary and to secondary than to post-secondary: DMR)
  2. problem of quality: de la Fuente and Domenech.

## Augmented Solow model

- abandon the hypothesized production function: both a function of skilled and unskilled labour
- return to a per worker production function that is DRS.
- looks like the Solow model: augmented Solow model.
- But introducing another FP (human capital) explains why capital does not flow to poor countries and  $r$  (MPK) is not enormous in LDCs
- $SS = f(s, q, n)$ ; third factors to explain differences and deviations from SS

## Technological progress

- TP explains sustained growth
- difference with Solow model: R&D: result of a **conscious and deliberate** (firms and government) effort to generate new ideas.
- Requires resources
- (only) some of the innovation happens by chance

## What is TP?

- Output of R&D: ideas
- Embodied in:
  - a) product innovation:
    - a) new consumer products
    - b) new capital goods
    - c) new intermediate products:
  - b) process innovation.
- All increase Y (value) with the same FPs

## What is not TP?

- (Basic) research: mostly done at Universities and nonprofit institutions: does not have an application.
- Development: application of research usually done by firms.
- One cannot exist without the other, but
- TP (econ. def.) increases the standards of everyday living.
- relation between R&D is not as linear as this simple model proposes.

## Intellectual property legislation

- Original innovation followed by diffusion new technology. Tension:
  1. good insofar as it increases TP.
  2. Bad if inventors do not have an incentive
- The challenge for copyright legislation: proper balance between
  1. providing incentive: patent gives a monopoly, and
  2. making sure ideas are shared: disclosure clause
  3. Inventions are subject to a "market test".

## A model of R&D

- Technical progress is driven by R&D.
- Economy devotes a fraction of human resources to R&D.
- Creation of new ideas is a function of two things:
  - amount of people thinking new ideas, ·
  - stock of knowledge at this point.
- The rest is the Solow model.
- Model for rich countries that do most (not all) research. LDCs mostly "borrow" technology.

## A model of technology transfer

- Knowledge "spill-overs."
- Assumption: even for importing technology, a country needs to invest in human resources: a more sophisticated technology requires more sophisticated workers (*tacit knowledge*)

## Technology transfer

- Transfer of technology (assumed in the model to occur automatically)
  1. countries can buy goods
  2. they can buy patents.
  3. they may need to spend a (smaller) fixed cost in adapting the technology
  4. Process transferred with DFI

## Technology transfer

- Two issues:
  1. one of the advantages of free trade is that a country has access to new technologies (import goods, patents, "reverse engineering")
  2. Protectionists: countries import not-suitable technologies

## A model (microfoundations for the augmented model)

- How many "ideas" can this country use?
- Individuals learn to use more advanced goods depending on:
  - Education and training
  - "openness"
  - "Distance" to the frontier

## Women and development

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## Outline

- Impact of development on women's status
  - Investing in human capital: gender differences
- Impact of women's status on development
  - Education
  - Microfinance

## Investing in human capital

- Economic models assume parents are make decisions
  - students' decision largely determined by previous decisions.
  - DCs: primary & secondary compulsory (free)
    - not compulsory and/or free in all countries
    - even DCs: parents decide public or private; which public: buy a house in a certain neighbourhood (good schools increase prices).

## Human capital

- Parents invest in their children for two main reasons:
  - Altruistic
  - Selfish
- Differential treatment of siblings respond to two kinds of concerns:
  1. Equity concerns.
  2. Efficiency concerns.

## Human capital

- Girls (women) receive less education, health care and food than boys (men) in many countries.
- Explanations fall into these two categories:
  1. **Equity concerns.** Parents prefer boys to girls in many cultures
  2. **Efficiency concerns.** Returns to investment in education, health or nutrition are lower for girls:
    1. Discrimination in the labour market.
    2. A shorter working lifetime
    3. A higher opportunity cost.

## Human capital

Plus other cultural reasons.

Compulsory and free education probably a factor explaining smaller gender gap

## Health and nutrition

- Women live longer than men: more resilient; given symmetrical care, survive better.
- This difference is lower in LDCs than DCs.
- Six countries in which men lived longer than women: Bangladesh, India, Iran, Maldives, Nepal, and Pakistan.
- The difference in the spread due to:
  - Maternal mortality
  - Lower nutritional levels
  - Worse health care for women and girls:

## Missing Women

- Sen (1999, pages 104-107): excess mortality and artificially low survival rates of women in many parts of the world.
- Europe and North America: ratio of women to men: 1.05.
- North Africa: 0.95
- Bangladesh and China: 0.94,
- India: 0.93
- Pakistan: 0.90

## Missing Women

- Sub-Saharan Africa: 1.022: women receive more symmetrical care
- Using the SSA ratio, Sen calculated # women **should** live in these countries:
  - China should have 44 million more women
  - India should have 37 million more women
- The "missing" women > 100 million.
- Main reason: comparative neglect of women.
- China: one-child policy (1979): sex-selective abortion widespread

## Impact of women's status on development

- Two strategies:
  - educating women and
  - creating job opportunities for them, basically through the use of microcredit.

## Investing in women's human capital

- Education enhances labour market productivity (income), for both men and women, but...
- educating women has effects not always measured by the market.

## Benefits

1. **Direct benefits:** evidence of decreasing social returns education → a country should invest on the population segments with lower levels of education (women in many countries)

## Benefits

- 2. Through fertility:** negative correlation between female education and fertility.  
Explained by:
- a. Women's self-esteem and special value**
  - b. Educated women are better able to attain their desired level of fertility.**
  - c. The opportunity cost.** The most important

## Benefits

- 3. Through the parenting role:**
- a. Importance of early child development.**
  - b. A more educated woman provides better health for the whole family:** Educating women reduces infant mortality
  - c. Women spend more on children**