Motivation

- Human capital is at the centre of so-called new economic growth theory
  - Most studies focus on education human capital
  - This study takes a health human capital perspective
- China’s recent growth has been startling
  - A relatively well-educated workforce by late 1970s combined with a huge inflow of foreign capital from the 1980s enabled that growth. Since late 1990s a focus on upgrading human capital, especially H.E.
  - The story neglects the role of health as a capability factor and direct contributor to that growth.

Health and economic development, 1

- A positive correlation between health and per capita income has long ben observed
  - Causal relationship presumed to flow from income to health; higher income ...
- The causal link could be health to income.
  Four pathways (Bloom & Canning, 2000):
    - Productivity
    - Education
    - Investment in physical capital
    - Demographic dividend

Health and economic development, 2

- Productivity
  - Healthier populations have higher productivity; physically and mentally stronger; less absenteeism
- Education
  - Longevity encourages investment in HC; children have better attendance and cognitive development
- Investment in physical capital
  - Longevity encourages savings and in turn investment, which raises capital/worker and per capita incomes
- Demographic dividend
  - Post-transition high to low fertility sees a low dependency workforce regime with corresponding higher incomes, but one-off and will reverse … China now in the reverse
The aim of the paper … still very early stages

- To examine long-run change in human welfare since the 1950s focused on nutritional status of children, looking at the huge inequalities, but also how much of the productivity spurt of the early 1980s and beyond can be attributed to improved nutrition of children and young workers.
  - Data are drawn from surveys of Chinese school children and adolescents, official Chinese economic statistics and World Health Organisation (WHO)

Contemporary China

- What are some of major issues?
  - Increased income disparities since 1980s has made China one of the most unequal places in Asia. How does that affect the welfare of children? What are the implications for human welfare generally and for future economic growth as China’s population ages?
  - Secular trend in heights
  - Interregional differences
  - Overweight and obesity
  - Ethnic minority welfare
    … inequalities obvious in BMI distributions

Height data in economics and economic history – a survey

- The average height of a population in a low income economy is a robust measure of net nutrition and thus human welfare
  - An output measure of human growth that reflects the impact of the environment on the potential for human growth, including income, disease load, provision of public goods, etc.
  - Most within population differences in average height are due to environmental effects; genetic differences are not significant.
- Economic historians pioneered use of heights
  - Robert Fogel, 1993 Nobel Prize in Economics
- Since late 1990s height has been increasingly used in mainstream economics
  - Strauss and Thomas, Deaton, Case & Paxton, etc
Basic anthropometric measures: height, weight and body mass

- **Height or physical stature (cm)**
  - Partly genetic, partly environmental
  - Differences between populations in average height reflect differences in net nutrition (the environment); it is an historical measure of inputs to human growth

- **Body weight (kg)**
  - Measures current nutritional status; can vary quickly

- **Body mass (kg/m²)**
  - A measure of body fat relative to height
  - Standardised weight for height
  - Taller people are heavier on average

Making sense of height

- “stature is a gauge of the health of a nation’s economic development”
  - Louis-René Villermé, early 19th C French public health pioneer

- Think of the body as a biological machine
  - It needs fuel: food – about 12-1400 calories per day at rest, as much as 10,000 calories/day guiding a dog sled
  - Nutrition required varies: an adequate diet depends on the demand for fuel. In states of inadequate net nutrition human growths slows or stagnates; return of good times, catch up growth, but …; chronic malnutrition inevitably stunts …

- Achievement of anthropometric research
  - Height is a useful measure of human welfare comparable to conventional measures such as income, wages, inequality or life expectancy … allows measure of non-labor market participants

Selected studies

- **Height as a proxy for standard of living**
  - Most early economic history focused on using height to estimate changes in human welfare over time
  - Other studies: welfare of slaves, Irish women convicts, role of colonial regimes, migrants, affects of small pox …

- **Height and economists’ studies of …**
  - Labor market outcomes: taller people enjoy higher incomes on average; they are better educated; migrate more, marry better
  - The health gradient: the short die young; mean height correlates with mortality; the impact of obesity on morbidity and mortality
  - Cognitive development and school performance: children who are stunted (-2 SD) are more likely to drop out, perform poorly; mother-daughter-granddaughter intergenerational benefits

Selected studies, A

- **Early economic history studies**
  - Proxy for poor conventional data height used to estimate changes in human welfare over time
  - Controversy focused on industrialisation and human welfare: mid-19thC reversal points to negative externalities of growth
  - Other studies: welfare of slaves, Irish women convicts, role of colonial regimes, migrants, affects of small pox …
  - Stature is the dependent variable explained by other variables

- **Determinants of height**
  - Economic conditions; Mother’s education; Technology change; regional variations; inequalities (income, class, gender, etc)
  - Reverse causation: on ways height determine socio-economic outcomes, such as marriage prospects and migration decisions
Selected studies, B

- **Convergence**
  - Instead of GDP or real wages, height ... differences in skills, education and social status act to retard growth

- **Crisis in social performance**
  - Children respond quickly to nutritional crises ... pinpoint short-term adversity ... public policy uses

- **Health and economic growth**
  - Highly correlated if not causal, but ... Fogel: improved health accounted for 30% productivity gain in 19thC Britain ... mortality

- **Wages and labor market outcomes**
  - Physical labor obvious, but also in dev'd economies ... premium for beauty? Mechanism better childhood >cognitive skills

Data are from large-scale surveys

- **Data are drawn from national surveys**
  - Students from 7 years of age to 22 years have been measured about every 5 years since 1979; stratified random sample in nearly even province
  - Sample size over half a million subjects some years
  - 1985 onward included national minority children

- **Biases ... the data below are for Han children**
  - School-based surveys
  - Especially for older children measurements are likely to be biased to those who live near urban centres

Contemporary Chinese anthropometric data

- **Anthropometric data from small-scale clinical studies through large surveys >200,000 subjects**
  - These use standard measurement methods

- **Examples include**
  - Chinese Health and Nutrition Survey (CHNS), 1988
  - Min of Ed et al Survey of the physical health of Chinese school children, since 1979

Beijing urban height-for-age (males, left), 1955-2010
Beijing height-for-age (males, left) 1955-2010

National trends in height for selected ages, 1979-2010

Summary of contemporary trends – male height-for-age, 1979-2010 (cm)

- National means
  - >1.5 cm per decade
- 7-year olds
  - Urban 121.2 to 126.9
  - + 5.7 cm
  - Rural 117.3 to 124.1
  - + 6.8 cm
- 17-year olds
  - Urban 168.6 to 172.2
  - + 3.6 cm
  - Rural 164.4 to 170.5
  - + 6.1 cm

Change in international terms (WHO 2007 reference standard)*

National mean Chinese height-for-age z-scores 7, 12 and 17 year olds (right: F)
But there is large inter-regional differences in height and weight

Measure of productivity

- Use labor productivity instead of TFP
  - Defined as the gross regional product (GRP: output of a province) as a proportion of the economically active population (in effect use the gross dependency rate)
- Variables used in the models
  - Dependent is Log GRP/worker 2010 and 2012 (below used 2012 to reduce collinearity issues)
  - Z-score 1985 for height against WHO 2007 reference
  - Z-score change 1985 to 2010
  - Age dummies for 7, 12 and 17 year olds
  - Region dummies East, NE, Central, W, Metropolitan (metropolitan regions Beijing, Tianjin and Shanghai)

Regions matter...

- Big differences in inequality as measured by anthropometric indicators
  - Partly due to specific long-existing geographic traits
  - Mostly due to economic differences
- Use z-score to control heterogeneity
  - Examine change over time in height
  - Two questions asked:
    1. to what extent is labor productivity in 2012 predicted by health human capital (z-score for height) in 1985?
    2. to what extent is labor productivity in 2012 conditional on improved human capital as captured in the change in the height z-score between 1985 and 2010?

Correlations z-score 1985 and log grp/wker 2012 (males)
Correlations z-score 1985 and log grp/wker 2012 (females)

Correlations z-change 85-2010 and log grp/wker 2012 (M)

Correlations z-change 85-2010 and log grp/wker 2012 (F)

Selected results

- Model stats: $R^2 = 0.705$  Adjusted $R^2 = 0.688$  $F = 41.891$

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* Dependent Variable: log grp/wker2012
* Excluded reference dummies are age 7 and Metro
Next steps

- Modelling so far just OLS
- Consider panel methods
- Add explanatory variables
- Adopt two-stage (IV) strategy

Conclusion

- Anthropometric indicators of human capital and contribution to economic growth
- Positive returns to economic reform
  - Richer, taller and increasingly fatter …
- Inequalities have widened
  - Dispersion around the mean greater
- Next … develop a panel approach to estimate the role of health human capital in improving labor productivity in China