Human Capital and Development

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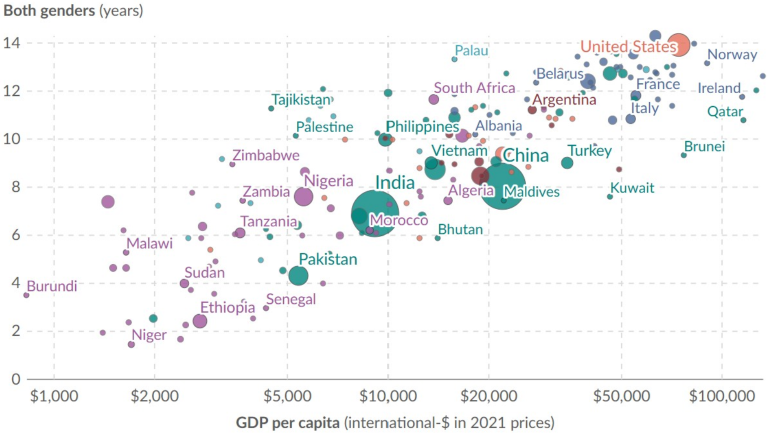
Structure of Chapter

1. Overview of theories for growth and development
2. Results from Cross country regressions
3. Evidence from microeconomic studies in developing countries
4. Why do we have low investment in Human Capital? Obstacles to growth and HC Investments
5. Empirical approaches to understanding obstacles to Human Capital accumulation
6. What do we learn from interventions on human capital policy?

Correlation: Years of schooling and GDP per capita



Does education matter for growth?

- A set of complementary approaches:
  - **Lucas–Becker**: human capital accumulation drives growth (augmented Solow à la Mankiw, Romer and Weil, 1992; Lucas, 1988).
  - **Nelson–Phelps**: *stock* of human capital raises ability to innovate & catch up (Nelson and Phelps, 1966; Benhabib and Spiegel, 1994).
  - **Akcigit-style micro**: heterogeneity (parental income/wealth; research choices) shapes growth contributions.
- Key distinction: ΔH (accumulation) vs. H (stock).

Mincer equation and private returns

$$\ln w_i = \alpha_0 + \alpha_1 n_i$$

- α_1: marginal wage return to an extra year of schooling.
- Equilibrium idea: foregone wage this year equals future wage gain.
- Cross-country evidence (Weil, 2010): returns decline with level (13.4% grades 1–4; 10.1% grades 5–8; 6.8% beyond).
- Assumptions: wages reflect marginal product; Strong assumptions to establish causality.
- Misses **externalities**:
  1. Within-generation human capital spillovers (AK-style).
  2. Intergenerational transmission (parents $\rightarrow$ children).
  3. Knowledge externalities via technical progress.
- Policy takeaway: wages inform us on *private* returns, not full growth impact.

Krueger-Lindahl

- In a landmark paper Krueger and Lindahl (2001) analyze empirically the empirical implications of the various models
- They combine empirically the Lucas and the Nelson and Phelps approach.
- They emphasize:
  - Measurement error in education is a dominant factor in earlier studies. When this is allowed, changes in human capital seem to have an effect on growth.
  - Reverse causality can confound the results.
  - "... education has a heterogeneous effect on economic growth across countries." (K-L -2001)
  - "The results consistently indicated that education was statistically significantly and positively associated with subsequent growth only for the countries with the lowest level of education" (K-L -2001)

Types of Education and Stages of Development

- Growth can be driven by innovation or imitation (catch-up growth) (Benhabib-Spiegel, 1994 and Acemoglu, Aghion, Zilibotti, 2006)
- Both innovation and imitation require a mix of skills: advanced and basic skills (Vandenbussche, Aghion and Meghir, 2006)
- The productivity of each in producing technical change depends on the distance to the frontier, with countries further from the frontier benefiting from increases in basic skills.
- The implication is that growth in low-income countries is stimulated by the development of basic skills
- Despite the difficulties with cross country regression these ideas are supported (also controlling for endogeneity and measurement error)

Updated Vandenbusche, Aghion and Meghir

Table: TFP Growth Equation (Fractions BL): Comparison through 2005 and 2015

	Data through 2005	Data through 2015
Proximity	-0.284*** (0.049)	-0.292*** (0.094)
Fraction	0.160 (0.132)	0.283 (0.260)
Proximity $\times$ Fraction	0.873*** (0.205)	0.983* (0.566)
Country dummies	Groups	Groups
Proximity threshold	-0.183 (0.125)	-0.288 (0.120)
Number of observations	138	164

New Developments on Innovation and Growth

Bell, A., Chetty, R., Jaravel, X., Petkova, N., and Van Reenen, J. (2019)

- Key Lessons:

  1. First, there is a clear connection between parental income and children's likelihood of innovating at the top of the income distribution
  2. This is in part explained due to associated family background.
  3. There is a significant cultural barrier relating to aspirations depending on family origin.
  4. These findings are consistent with the "Finish enigma" (Aghion, Akcigit, Hyytinen, and Toivanen, 2023): Why does income play a similar role in Finland with such a compressed income distribution and free education at all levels?
  5. The answer seems to be education and family background.

New Developments on Innovation and Growth

Akcigit, Pearce, Prato

- There are two main policy Instruments:
  1. R&D Subsidies
  2. Education Expenditures
- They find that education is a priority input to growth, especially in lower income and more unequal countries,
- R&D expenditures come second to education and become part of the mix as the overall budget rises.

Microeconomic Evidence for the role of Human Capital and Development

- Some of the most valuable evidence comes from exogenous increases in technology and in education
- A key paper here is Foster and Rosenzweig (1996).
- Results and implications:
  1. The returns to education increase with the use of the technology.
  2. The return to technology increases with education.
  3. Increases in the supply of schooling increases the amount of education obtained, indicating that the technology made it worthwhile to acquire skills and that lack of access to schooling restricted individual choices.
- This study shows a complementarity between human capital and technological improvement
- Implies that investments in education are driven by the opportunities available - which we would expect!

Microeconomic Evidence for the role of Human Capital and Development

- Another landmark paper is Duflo, 2001 on Indonesia
- It uses a school construction program to estimate the impact of expansion in school access
- It finds that educational participation increases.
- Wages increase as a result of increased education, consistent with a Becker/Mincer/Lucas model.
- The returns to education for wage workers is 7.5% but when the self-employed are included with imputed income it falls to 3.5%
- These increases are from a very low basis, implying very low skill prices.
- One interpretation is that Human capital causes small increases in GDP, but the lack of other physical investments constrains growth and further human capital accumulation.

Microeconomic Evidence for the role of Human Capital and Development

- Our next microeconomic exhibit is the recent paper by Porzio, Rossi and Santangelo (2022)
- They show that as younger cohorts achieve higher levels of education, they leave agriculture and move into sectors where the returns to schooling are greater.
- Productivity gains within agriculture reduce the sector's demand for labor.
- These forces jointly account for the decline in agricultural employment and the reallocation of workers toward more productive activities
- This highlights the importance of human capital for structural transformation and by implication for growth and development.

What can we learn from China

- China's extraordinary growth was initiated by market reform that stimulated investment
- Human capital increased thereafter and according to Whalley and Zhao, human capital explains 39% of China's growth.
- This again is a story of complementarity of institutional structure, physical investment and human capital.

Is Human Capital growth Sufficient to kick-start growth

- The growth models we presented assume perfect capital markets and no obstacles to physical investments
- However, in many contexts investment is constrained from over-regulation
  1. (Heckman and Pagés, 2004) discuss the implications of labor regulations in Latin America
  2. (Besley and Burgess, 2004) Discuss the impacts of labor regulations across India
- The key point here is the complementarity between Human and Physical capital investments
- Evidence can be found in the Green revolution (Foster and Rosenzweig, 1996)

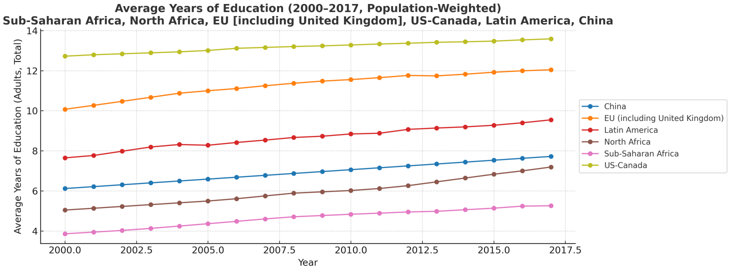
Summary

- There are strong theoretical reasons supporting the role of human capital in Development
- Different types of human capital matter for different stages of development
- However, cross country regressions suffer from several empirical issues and microeconomic analysis is key to establishing the role of human capital.
- Microeconomic studies suggest that even modest increases in education, particularly those that ensure basic numeracy and literacy, can increase the returns of investment in new technologies.
- Education-promoting policies can serve as powerful instruments for development.
- However, the key story is one of **complementarity between human capital and other investments**

Human Capital Accumulation in low-income countries

- If human capital is so important why don't we have more of it?
- We now look into the obstacles and challenges for human capital accumulation
- We discuss empirical results from observational models and interventions.

Years of schooling



Learning Outcomes

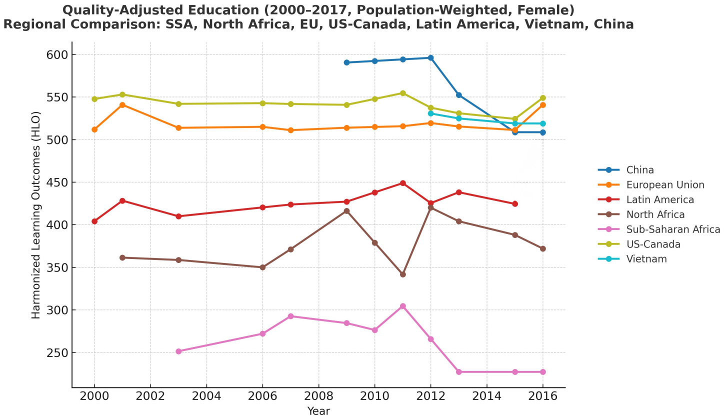


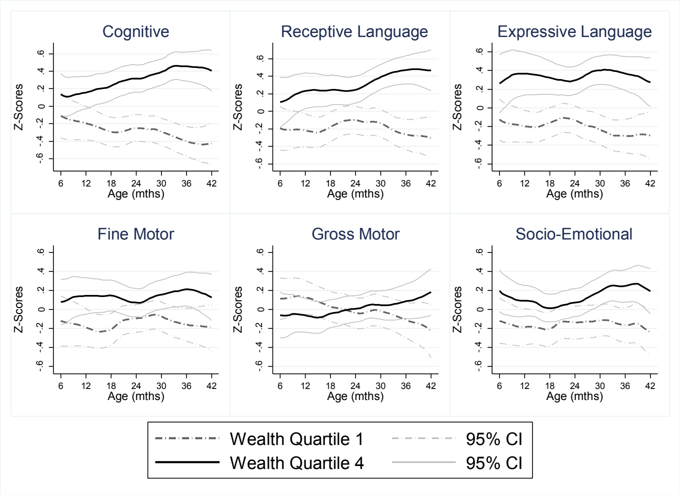
Figure: Source (Angrist et al., 2021)

Schooling

- Years of formal schooling has increased steadily in the world and in low-income countries in general, but:
- Large differences in *levels* and no obvious catch-up across countries.
- Increase in years of schooling has not been matched by increases in learning outcomes (Angrist et al., 2021).

Obstacles to Human Capital Accumulation

SES gradient in Child Development: Bogota. Source Rubio Codina et al 2015



Obstacles to Human Capital Accumulation

- Low returns to education driven by underinvestment in physical capital - Labor market regulations (Besley and Burgess, 2004, Heckman and Pages (2004))
- Preferences and imperfect altruism
- Parental resources
- Parental Beliefs - missed windows of opportunity
- Cultural norms
- Intrahousehold allocations and the position of women
- Access to education/schools
- Pre-School and school quality

The Human Capital Production Function

- The literature on human capital production functions (Cunha, Heckman and Schennach, 2010) emphasizes static and dynamic complementarities
- This implies that:
  1. Parental background enhances the productivity of investments in children
  2. Success builds on success over stages of childhood
- The implication is that intervention may be needed to compensate for parental background and to ensure deficits do not build up.

Obstacles to Human Capital Accumulation

Parental Resources

- The standard view on why investments in children are low (Becker) is the lack of resources
- Carneiro, Lopez-Garcia, Salvanes and Tominey (2021) emphasize the importance of timing of resources in a context with imperfect capital markets
- Duncan et al. (2025) shows that in the US a substantial cash transfer intended to last from birth to six ($313 a week) has no effect on child outcomes at age 4.
- Could this also be true in LMICs - we are working on this.
- Added to this is imperfect altruism: Parents do not internalize fully the benefits of investing in their child.

Obstacles to Human Capital Accumulation

Intrahousehold allocations and women's bargaining position

- A possible obstacle in human capital investments is the position of women in the household relative to that of men and their diverging preferences.
- If the father has control of the income (and the mother has the highest elasticity WtP) this will reduce substantially parental investments.
- Evidence:
  1. Duflo (2003) on South African Pensions: When Grandmothers are offered grandchildren do substantially better
  2. Duncan Thomas (1990) (Brazil): Mother's share of unearned income reduces fertility and improves child health, including stunting.
  3. Dunbar, Lewbel, and Pendakur (Malawi) on sharing: As households become larger the share of the husband remains the same, while the mother shares hers with the children

Obstacles to Human Capital Accumulation

Parental Beliefs

- Parents (may) hold distorted beliefs
- Their decisions may be governed by an alternative production function (Cunha, Elo, and Culhane, 2013 and Attanasio, Cunha, and Jervis, 2024)
- In very different contexts (Low-income mothers in Pennsylvania and Colombia respectively) parents underestimate the productivity of child investments.
- This is a key point for understanding why and how human capital interventions work.

Culture and other restrictions

- In Senegal it is considered spiritually detrimental to talk to "someone who is not there" (Weber et al., 2017)
- In India preserving caste networks prevents parents from sending their children ot English speaking schools, which would mean escaping to high return white collar jobs. (Munshi and Rosenzweig, 2006)

Empirical Work on understanding Human Capital Accumulation and the effects of policies

- The overarching aim is to design policies that can remove some of the obstacles to human capital accumulation.
- Empirical analysis has taken two complementary forms:
  1. Structural models that seek to understand the production function for human capital accumulation
  2. Randomized trials and quasi-experimental work investigating the impact of specific interventions.

Empirical Work on understanding Human Capital Accumulation and the effects of policies

- The difficulty is that the experiments are piecemeal and typically address one or two specific problems at a time.
- Structural models are also incomplete in many ways:
  1. Estimating the production function of human capital poses serious measurement and endogeneity issues
  2. Estimating a choice model requires prices that we do not and in many cases cannot observe.

Parenting and Quality of Education

Jamaica Intervention and the aftermath

- How effective can human capital policy be to reverse these deficits
- The Grantham McGregor et al (1991) ECD intervention in Jamaica has demonstrated the possibilities of well-designed policy
- This is the prototypical home visiting stimulation intervention
- The impacts are large and sustained, with adult wages at 30 increasing by at least 25% with no further intervention.
- Inspired by this seminal intervention, we implemented (with Grantham McGregor) a set of experiments in India.

Intervention in Odisha - India: The potential to scale

	Midline	Endline
Home visiting and nutritional education		
Cognitive	0.313	0.324
	(0.002)	($<$ 0.001)
Language	0.156	0.239
	(0.090)	(0.001)
Cost of intervention	**$135 per child per year**	
Group sessions and nutritional education		
Cognitive	0.298	0.281
	(0.004)	(0.002)
Language	0.313	0.302
	(0.004)	($<$ 0.001)
Cost of intervention	**$35 per child per year**	

source: Grantham McGregor et al (2020) Pediatrics

Early Childhood Intervention and pre-school in India

Table: Treatment Effects on IQ and School Readiness

	IQ	SR
Only Eearly Stimulation	0.179	0.133
	(0.072) [0.035]	(0.076) [0.080]
Only Enhanced Preschool	0.166	0.239
	(0.068) [0.035]	(0.073) [0.005]
Both ES and EP	0.243	0.209
	(0.077) [0.007]	(0.069) [0.009]
N	1283	1272

Source: Meghir et al (2023) Pediatrics

Parenting and Quality of Education

- Some lessons from these results (and the rest of this literature):

  1. Substantial improvement in child development can be achieved with almost costless inputs from the perspective of the parents. So why don't parents do this anyway?

  2. The interventions are all about parenting methods and minimal materials and can be delivered at relatively low cost.

- Further work has shown that simple low-cost pre-school interventions in ultra poor contexts can have spectacular results

- Some of these interventions have been shown to have longer term effects (as in the Jamaica case) but not all.

Formal schooling from Primary and onward

We review the evidence of policies and programs that focus on:

- Infrastructure (Duflo, 2001)
- Increased student attendance (Miguel and Kremer, 2004; Hamory et al., 2021; Duflo et al., 2015)
- Teacher incentives and presence (Muralidharan and Sundararaman, 2011; Glewwe et al., 2006; Bold et al., 2017, 2019; Duflo et al., 2012)
- Quality of teaching and work readiness (Banerjee et al., 2007)

Conclusions

- We have a rich theoretical framework that argues for the importance of human capital in development.
- Various mechanisms have been proposed, including increasing the efficiency units of labor and promoting innovation
- Human Capital is not homogeneous and different types are important at different stages of development.
- Improving skills is complementary to promoting investment - together they can lead to rapid growth (China for example)
- In low-income countries, education is lacking, and inequality builds up from the very beginning.
- Policies that promote human capital accumulation can be very effective: expanding access to schooling, parenting interventions, etc.