BBVA Research

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Human Capital and The Catching-up Process between Poorer and Richer Economies

Motivation

- For much of the postwar period, poorer countries did not systematically grow faster than richer economies.
- A renewed era of unconditional income convergence emerged from the 2000s onward.
- Educational attainment had already been converging since the 1970s, nearly three decades earlier.

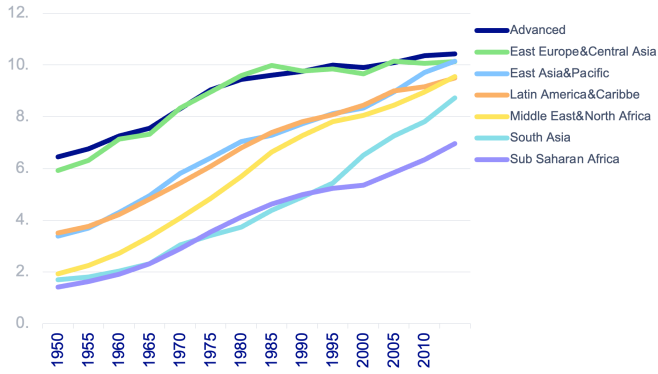
Research question

Did convergence in human capital help accelerate income convergence between poorer and richer economies?

Main Contributions

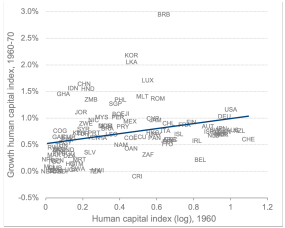
1. Document robust β-convergence in human capital over 1960–2020.
2. Quantify the contribution of human capital using the omitted-variable decomposition of absolute and conditional income convergence.
3. Show that the contribution is larger when education quality is considered, not only years of schooling.
4. Provide complementary evidence on directionality using panel Granger-causality tests and long-horizon predictive regressions.

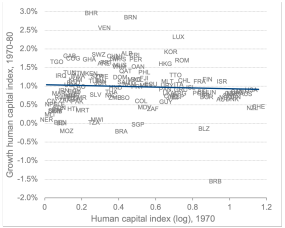
Educational Catch-Up Preceded Income Convergence

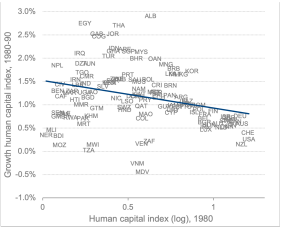


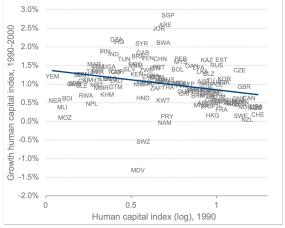
Average years of schooling among the population aged 15–24.

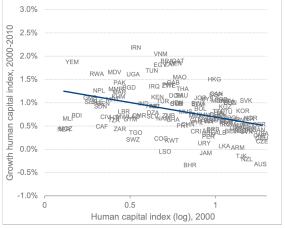
Human Capital Has Converged Since the 1970s

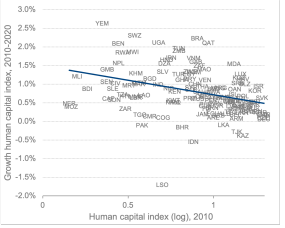












Countries with lower initial human capital subsequently accumulated it faster, particularly from the 1970s onward.

The Speed of Human Capital Convergence Increased

Decade	PWT human capital $\ln h \times y_t$	Barro–Lee human capital $\ln h \times y_t$
1960s	0.474***	0.124
1970s	-0.105	-0.356**
1980s	-0.590***	-0.796***
1990s	-0.536***	-0.532***
2000s	-0.628***	-1.090***
2010s	-0.780***	-2.015***

- Convergence starts around 1970 with Barro–Lee and around 1980 with PWT.
- The increasingly negative coefficients indicate a strengthening process.

Regional Dynamics Behind Educational Convergence

Initially high human capital

- Advanced economies
- Europe and Central Asia

Human capital growth decelerated.

Initially low human capital

- South Asia
- Sub-Saharan Africa
- Middle East and North Africa

Human capital growth accelerated.

Educational catch-up reflects both a slowdown at the top and acceleration at the bottom.

Empirical Strategy

Absolute income convergence

$$\frac{1}{T}\left[\ln y_{i,t+T} - \ln y_{i,t}\right] = \alpha + \beta_t \ln y_{i,t} + \mu_t + \epsilon_{i,t}$$

Income convergence conditional on human capital

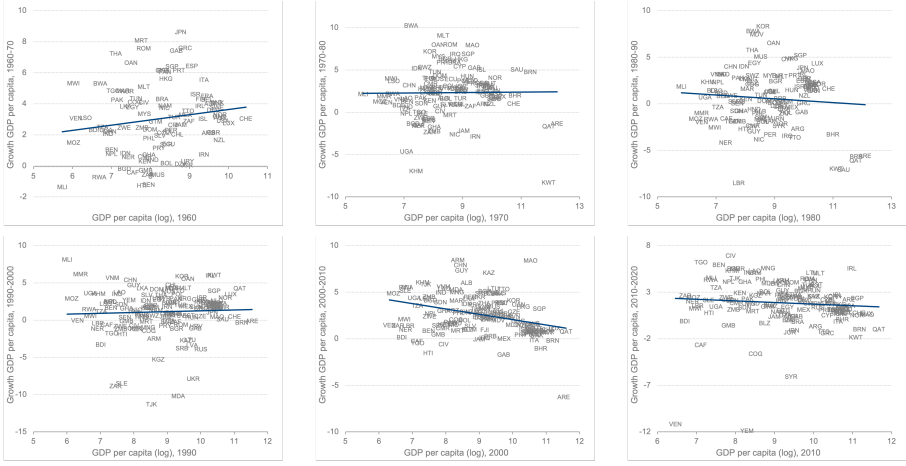
$$\frac{1}{T}\left[\ln y_{i,t+T} - \ln y_{i,t}\right] = \alpha + \beta_t^* \ln y_{i,t} + \lambda_t \ln h_{i,t} + \mu_t + \varepsilon_{i,t}$$

Omitted-variable decomposition

$$\ln h_{i,t} = \phi + \delta_t \ln y_{i,t} + \mu_t + v_{i,t}, \qquad \boxed{\beta_t = \beta_t^* + \lambda_t \delta_t}$$

Human capital contributes to convergence when $\beta_t - \beta_t^* = \lambda_t \delta_t > 0$.

Income Convergence Reemerged in the 2000s



The negative slope becomes clear in the 2000s and 2010s.

Conditioning on Human Capital More Than Doubles Convergence

	β	PWT human capital		Barro–Lee human capital	
Decade	Absolute	β^*	$\lambda\delta$	β^*	$\lambda\delta$
2000s	-0.575	-1.359	0.731	-1.190	0.614
2010s	-0.440	-0.904	0.449	-0.965	0.508

Central result

During the 2000s, schooling attainment accelerated relative income convergence by approximately 0.74 percentage points per year.

Why Does Conditioning on Human Capital Increase Convergence?

Human capital and growth

Initial human capital predicts subsequent GDP per capita growth:

$$\lambda_t > 0.$$

Human capital and initial income

Richer economies begin with higher human capital:

$$\delta_t > 0.$$

$$\beta_t = \underbrace{\beta_t^*}_{\text{conditional convergence}} + \underbrace{\lambda_t \delta_t}_{\text{human capital contribution}}$$

Omitting human capital masks a substantial part of the underlying cross-country convergence process.

Education Quality Strengthens the Result

	Increase in convergence coefficient, $\beta - \beta^*$			
Decade	HC BL	HC LL	HCQ LL	HCQ2 LL
2000s	0.269	0.248	0.383	**0.411**
2010s	0.426	0.404	0.584	**0.614**

- Quantity-only measures understate the role of education.
- Quality-adjusted human capital produces a substantially larger convergence contribution.

What students learn matters as much as how long they stay in school.

Human Capital Matters Beyond Institutions

	Absolute β	Conditional β^*	Increase in convergence
2000s			
Human capital (PWT)	-0.575	-1.359	0.784
Binary democracy	-0.629	-0.686	0.057
V-Dem	-0.609	-0.661	0.052
Three-level regime	-0.570	-0.686	0.116
2010s			
Human capital (PWT)	-0.440	-0.904	0.464
Binary democracy	-0.436	-0.497	0.061
V-Dem	-0.416	-0.551	0.135
Three-level regime	-0.417	-0.581	0.164

Institutions accelerated convergence mainly in the 1980s; their contribution from the 2000s is much smaller than that of human capital.

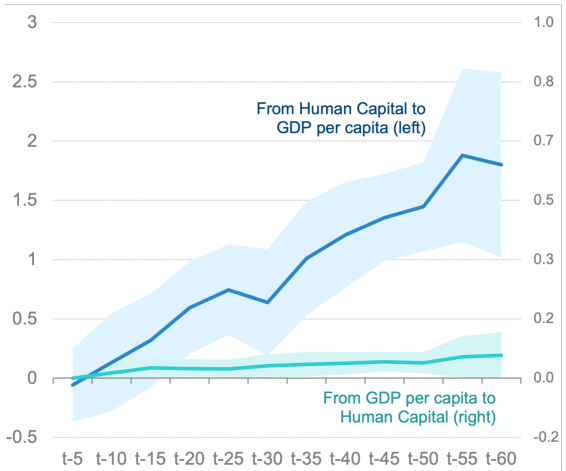
Robust Across Specifications

- **Alternative income measure:** WDI instead of Penn World Tables.
- **Education quality:** quality-adjusted Lee and Lee (2024) measures strengthen the result.
- **Institutions:** binary democracy, V-Dem and three-level political regime classifications.
- **Unobserved heterogeneity:** country fixed effects and regional effects.
- **Functional form:** nonlinear convergence specifications.

Across specifications, conditioning on human capital substantially raises the estimated speed of convergence.

Directionality: Human Capital Predicts Subsequent Income

- Country-by-country panel Granger-causality tests cover 100 countries.
- The mean-group Wald statistic strongly rejects no predictive content from human capital to GDP per capita.
- **78 countries** display a positive coefficient; 53 reject the null at the 5% level.
- Finite-sample corrections leave the conclusion unchanged.



Long-Horizon Evidence Is Asymmetric

Human capital → income

Lagged human capital robustly predicts 2020 GDP per capita after controlling for lagged income. Its predictive power strengthens at longer horizons.

Income → human capital

The reverse relationship is small and statistically indistinguishable from zero across horizons.

The evidence is consistent with human capital acting as a structural determinant of income, although the cross-country regressions should not be interpreted as definitive causal proof.

Conclusions

1. Human capital convergence began in the 1970s, nearly three decades before the resurgence of income convergence.
2. Conditioning on human capital approximately doubles the estimated cross-country income convergence rate in the 2000s.
3. Schooling attainment contributed about 0.74 percentage points per year to relative income convergence during the 2000s.
4. The contribution is larger when education quality is incorporated.
5. Directionality tests indicate that earlier human capital predicts later income, while the reverse channel is weak.

Policy Implication

Policies that combine expanded access to schooling with improvements in learning outcomes can promote both **higher growth** and **faster cross-country convergence**.

Thank you