A Report on "Human Capital, Unequal Opportunities and Productivity Convergence: A Global Historical Perspective, 1800–2100" by Bharti et al. (2026)

Reviewer 2

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> I am wiser than this person; for it is likely that neither of us knows anything fine and good, but he thinks he knows something when he does not know it, whereas I, just as I do not know, do not think I know, either. I seem, then, to be wiser than him in this small way, at least: that what I do not know, I do not think I know, either.
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> Plato, *The Apology of Socrates*, 21d

> To err is human. All human knowledge is fallible and therefore uncertain. It follows that we must distinguish sharply between truth and certainty. That to err is human means not only that we must constantly struggle against error, but also that, even when we have taken the greatest care, we cannot be completely certain that we have not made a mistake.
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> Karl Popper, 'Knowledge and the Shaping of Reality'

Overview

Citation: Bharti, N., Gethin, A., Jenmana, T. M., Mo, Z., Piketty, T., & Yang, L. (2026). Human Capital, Unequal Opportunities and Productivity Convergence: A Global Historical Perspective, 1800–2100. *Journal of Public Economics*. Vol. 255, 105578.

Abstract Summary: This paper constructs a new global historical database on public expenditure and revenue (1800 – 2025), documenting a substantial rise in human capital expenditure alongside large and persistent inequalities. The analysis finds a strong correlation between human capital expenditure and productivity growth, suggesting that convergence in human capital investment could lead to global productivity convergence by 2100.

Key Methodology: Construction of a new global historical database on public expenditure and revenue (World Human Capital Expenditure Database), macro-historical regression analysis to estimate returns on investment, and illustrative counterfactual simulations of human capital expenditure trajectories.

Research Question: To what extent did access to education and health become more inclusive at the global level in recent decades, and are we heading towards global convergence in human capital, well-being and productivity, or will substantial expansion in educational and health resources be required for this to happen over the course of the 21st century?

Summary

Is It Credible?

The article by Bharti et al. presents a monumental effort in economic history, introducing the World Human Capital Expenditure (WHCE) Database. This dataset tracks public and private spending on education and health across 57 core territories from 1800 to 2025. The authors use this data to argue that while human capital expenditure has risen globally, "large and persistent inequalities" remain, with the gap between rich and poor regions stabilizing rather than shrinking in recent decades (p. 1). They further posit a strong correlation between these expenditures and productivity growth, estimating a return on investment of approximately 10% (p. 2). Finally, they use these historical relationships to simulate future scenarios, suggesting that a "global convergence" in spending could drive a massive reduction in the global productivity gap by 2100.

The construction of the database itself appears to be a significant and credible contribution to the field. By homogenizing disparate historical records and applying consistent international guidelines (SNA/COFOG), the authors provide a clearer picture of "fiscal mobilization" over two centuries (p. 8). A key methodological strength often overlooked is the integration of *private* expenditure, which the authors note makes a "significant difference" in country rankings, particularly for the US and Latin America (pp. 5, 20). However, the credibility of the historical trends relies on specific methodological choices. For instance, the authors apply a fixed ratio for age-adjusted health spending—assuming the elderly spend three times more than the young—across the entire historical period based on recent data (p. 8). While the authors reasonably argue that the low absolute levels of spending and small elderly populations in the 19th century minimize the mathematical impact of this assumption, it remains a projection of modern patterns onto the past

(pp. 8, 10). Additionally, for the 1800–1880 period, while the authors conducted substantial archival work, they rely on interpolation or averages from similar countries for "missing items for non-Western countries" (p. 5). While the authors perform robustness checks on their regression results, the main text lacks formal sensitivity analysis regarding how these specific *data construction* choices might affect the descriptive trends (p. 24).

The article's analytical leap from historical correlation to future simulation warrants skepticism. The authors explicitly state that their regression analysis, which finds a positive relationship between spending and productivity, should not be interpreted as causal (p. 25). They acknowledge that "public expenditure and productivity likely influenced one another" and that omitted variables like institutional quality play a role (p. 23). Yet, the simulations for 2025–2100 are constructed on the implicit assumption that this correlation can be modeled mechanistically. The "global convergence" scenario projects that increasing spending to 38% of GDP—combined with high, albeit declining, returns—could generate productivity growth rates of 4.4% in Sub-Saharan Africa (p. 27). While the authors frame this as an "illustrative scenario" rather than a hard forecast, the model treats expenditure and high returns as sufficient conditions for growth, abstracting away from the "black box" of how funds are actually converted into human capital (p. 1).

This view is challenged by the article's own evidence regarding the United States, where high health expenditure has not translated into superior health outcomes compared to Europe (p. 20). This disconnect highlights a conceptual mismatch: the article measures financial *inputs*, but its conclusions regarding productivity rely on the generation of *outcomes* (skills and health). By modeling scenarios where returns are consistently positive (ranging from 20% to 5%), the authors likely overstate the ease with which fiscal convergence can generate economic convergence. Similarly, the finding that state capacity differences correlate with "around 60–80%" of the early 19th-century productivity gap is a powerful descriptive statistic, but one that

risks being misread as a causal explanation if not carefully contextualized, as the authors themselves note (p. 24, p. 23). While the descriptive findings on global inequality are robust and valuable, the predictive scenarios should be viewed as optimistic illustrations of potential rather than probable economic trajectories.

The Bottom Line

The descriptive contributions of this article are highly credible, particularly the documentation of persistent global inequalities in human capital spending—both public and private—despite a general rise in levels. However, the claims linking this spending to future productivity convergence are speculative. The simulations rely on a causal interpretation of historical data that the authors themselves disavow, assuming that increased funding and high returns can be sustained without fully accounting for institutional capacity or spending efficiency.

Potential Issues

Transition from correlation to causal simulation: The article's analysis of the 1800–2025 period is explicitly correlational, yet its forward-looking simulations for 2025–2100 are built upon these correlations in a way that implies a causal mechanism. The authors state, "we do not claim our cross-country regressions to be causal" and "we do not pretend that such results can directly be interpreted as causal" (pp. 2, 25). Despite these disclaimers, the simulation exercise in Section 5 uses the regression coefficients to project future productivity growth based on different expenditure trajectories. The authors frame these projections as "exploratory exercises" rather than "forecasts" and note they "abstract from many factors that would shape actual outcomes" (pp. 25, 28). However, this framing does not resolve the significant tension between the non-causal nature of the historical evidence and the causal structure of the simulation model. For instance, the projection that Sub-Saharan Africa could achieve a 4.4% annual productivity growth rate under a "global convergence" scenario is a direct output of this application, potentially overstating the certainty with which expenditure can be converted into productivity gains (p. 28).

Conceptual mismatch between expenditure and human capital outcomes: The article uses expenditure on education and health as its primary measure of human capital investment, a design choice that focuses on financial inputs rather than human capital outcomes like knowledge or health status. The authors are explicit about this choice, stating their goal is to measure the "real resources that various societies have devoted to education and healthcare" and acknowledging that "Higher spending does not necessarily translate into better outcomes," citing the example of US health spending (pp. 2, 20). While the article's contribution is framed as measuring "fiscal mobilization," its central argument and title link "human capital" to "productivity convergence" (p. 8). The simulations, which project productivity based on spending levels, therefore rely on an implicit link between expenditure and productive human

capital. This potential mismatch between spending and actual outcomes represents a foundational limitation on the interpretation of the article's main conclusions about productivity.

Potential for unaddressed endogeneity: The article's core finding of a strong positive correlation between human capital expenditure and productivity growth is susceptible to endogeneity from reverse causality and omitted variables. The authors acknowledge both possibilities, noting that "public expenditure and productivity likely influenced one another" and that "omitted factors—such as institutional quality… were also relevant" (p. 23). The regression analysis attempts to mitigate these concerns by including country fixed effects, interacted region-period fixed effects, and controls for capital-output ratios (pp. 24–25). However, these controls may not fully account for within-country changes in factors like institutional quality over time, leaving the estimated coefficients potentially biased. The authors mention that instrumental variable analysis could provide a more robust test but leave this to "future work," meaning the presented correlations cannot confidently be interpreted as the isolated effect of expenditure (p. 25).

Implicit assumption of universally positive returns in simulations: The article's simulation models for the 2025–2100 period are built on the assumption that increased human capital expenditure will generate positive productivity growth in all regions. The "global convergence" scenario, for example, models returns that decline with income but remain positive, ranging from roughly 20% in low-income settings to 5% in high-income settings (p. 25). This framework does not account for conditions under which spending might yield zero or even negative returns, such as in contexts of high corruption, severe institutional inefficiency, or poor service quality that could cause increased budgets to be wasted or misallocated. While the authors acknowledge elsewhere that higher spending does not guarantee better outcomes, the simulation model does not incorporate this possibility (p. 20). By assuming a universally positive, if diminishing, return, the simulations may present an

overly optimistic view of the development process, framing the primary barrier to productivity convergence as the quantity of expenditure rather than the capacity to spend it effectively.

Absence of sensitivity analysis for data construction assumptions in the main text: The construction of the article's historical database for the 1800–2025 period relies on several significant assumptions, particularly for periods and regions with sparse data. These include applying a 3:1 ratio for per capita health spending on the elderly versus the non-elderly, which is based on recent data but applied historically, and the imputation of missing data points using "interpolation or on averages of similar countries" (pp. 8, 5). The authors argue that "the main trends and orders of magnitude appear to be very robust" and that any errors in 19th-century data are unlikely to have a large impact because spending levels were uniformly low (pp. 3, 5). They also cite Morgan and Mueller to support the stability of the 3:1 health spending ratio (p. 8). However, the main text does not present any formal sensitivity analysis to demonstrate how its main results might change if these key assumptions were altered. While the authors refer to an "Online Appendix" containing the "detailed replication package," the absence of such checks in the article itself makes it difficult for a reader to independently assess the robustness of the findings to the methodological choices made during data construction (p. 3).

Potential overstatement of historical explanatory power: In its analysis of the early 19th-century productivity gap, the article notes that differences in state capacity, proxied by total public expenditure, "correlates with around 60–80%" of the productivity gap between Europe and poorer regions specifically for the 1800–1820 period (p. 24). The authors preface this finding with the caveat that the correlation should not be interpreted causally and is meant as "illustrative evidence" (p. 23). Despite these qualifications, the quantitative claim is exceptionally strong. Attributing such a large portion of a complex historical phenomenon to a single variable's correlation, even for a limited time frame, risks oversimplification if readers mistake this

statistical relationship for a claim of monocausal historical determination.

Future Research

Investigating the efficiency of expenditure: Future work should move beyond measuring the volume of expenditure to assessing the efficiency with which different regions convert financial inputs into human capital outcomes. Research could develop metrics that adjust expenditure for local cost structures, corruption levels, and service delivery quality to understand why high spending does not always correlate with high productivity, as noted in the US case.

Causal identification of returns: To validate the 10% return on investment figure, researchers should employ quasi-experimental designs that exploit exogenous shocks to human capital spending. As the authors suggest, analyzing political discontinuities or specific policy interventions—rather than broad cross-country regressions—would provide a more reliable basis for causal claims and help determine if the correlation is driven by spending or by the underlying institutional quality that enables such spending.

Heterogeneity in absorptive capacity: Future simulations should incorporate constraints on absorptive capacity. Rather than assuming positive returns to spending in all contexts, models could test scenarios where the marginal return on investment is conditional on governance indicators or existing infrastructure. This would provide a more realistic range of outcomes for the "global convergence" scenario, distinguishing between countries where funding is the primary constraint and those where structural barriers prevent effective utilization of resources.

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