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COMPARATIVE ADVANTAGE AND OPENNESS UNDER GLOBAL FRAGMENTATION: LESSONS FROM THE PAST 65 YEARS

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Comparative Advantage and Openness under Global Fragmentation: Lessons from the Past 65 Years

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ABSTRACT

This paper asks why openness has been such a strong catalyst for catch-up growth in some regions or countries, while in others it has been followed by stalled convergence, divergence, or stagnation. We conclude that "openness" in today's geoeconomically fragmented world encompasses much more than trade intensity or formal trade integration. Positioning in trade networks, trade fundamentals, human capital, institutional capacity, and stability all matter for the potential productivity gains from trade. Using an unbalanced panel of up to 145 economies per year from 1960 to 2024, we estimate a dynamic growth equation with country and year effects. The baseline specification relates real GDP growth to lagged income and growth. We extend the traditional drivers of growth by controlling for positioning variables in the world economy: a proxy for economic integration based on the cumulative number of regional trade arrangements ratified by each economy; a commodity-dependence indicator; geoeconomic vulnerability (GeoV), which measures a country's export exposure to geopolitically distant partners; and geoeconomic connectedness (GeoC), which measures the breadth of trade relationships across the geopolitical spectrum. GeoC captures an external "connector" position that may offset the costs of geoeconomic fragmentation by securing access to a wider variety of markets and resources. Our results indicate that the more geopolitically connected a country is, the stronger its investment-growth link. More diversified positioning improves an economy's capacity to transform investment into output while reducing its dependence on past growth momentum, thereby strengthening shock absorption under fragmentation.

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1. Introduction

The empirical literature on economic growth owes much to the Maddison Project Database[1]. One striking regularity in these data is the compression of the time needed for poor economies to double income per capita. Raising GDP per capita from roughly $2,000 to $4,000 (in 1990 U.S. dollars) took about fifty years in the early nineteenth century, but closer to twenty years in the late twentieth century. Thus, while nineteenth-century takeoffs tended to benefit primarily the next generation, many late-twentieth-century takeoffs raised living standards within the lifetime of the generation experiencing them[2].

This acceleration fostered a large theoretical and empirical literature on catch-up growth. Gerschenkron's (1962) economic-backwardness hypothesis, often interpreted as a leapfrogging mechanism, argues that economies far from the technological frontier can grow rapidly by adopting existing technologies, organizational methods, and business models rather than inventing them from scratch.

The leapfrogging logic, however, sharpens the central puzzle: why have many economies not taken off despite wider access to global markets and technologies over the last four decades? Catch-up is not automatic. It requires human-capital accumulation, credible financial intermediation, political stability, and institutions capable of coordinating public infrastructure with private investment. Without these complementarities, openness can expose domestic firms to competition without delivering sustained learning, technology diffusion, or productivity growth.

The regional literature on East Asia framed these dynamics through the Flying Geese Paradigm (FGP). Akamatsu (1961, 1962) described a sequence in which a lead economy pioneers new industries, moves progressively into higher-value-added activities, and transfers older labor-intensive production to follower economies with lower labor costs. In this interpretation, trade, investment, and learning spillovers can generate a regional pattern of sequential industrial upgrading.

Lin's (2012) "Leading Dragon" hypothesis applied this logic to the 21st century by emphasizing China and India as potential sources of industrial relocation. China's graduation from low-skilled manufacturing was expected to release a large volume of labor-intensive activities to lower-income economies, creating a new window for structural transformation[3]. The policy implication was that latecomers could benefit if they combined openness with credible industrial strategies, infrastructure, and skills.

The Chinese case also illustrates the limits of this optimistic extrapolation. Around China's accession to the WTO, U.S. policy discussions were dominated by a win-win interpretation: lower trade barriers would expand market access, encourage reform, and integrate China more fully into a liberal trading system. Three contemporary assessments captured this expectation:

- Official assessments projected expanding U.S. exports to China and only moderate import growth, implying reciprocal gains from accession.

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[1] The Maddison Project Database continues Angus Maddison's work on long-run comparative economic performance and is hosted by the Groningen Growth and Development Centre at the University of Groningen; see Bolt and Van Zanden (2025).

[2] See Parente and Prescott (2005) and Galor (2011) for further analysis and interpretation of these observations in the context of growth theories.

[3] Ang (2018) provides an important qualification to the conventional cross-country interpretation of the Flying Geese model. Because China is continental in scale and combines wide regional disparities within a common national market, industrial relocation can also occur domestically: earlier transfers from other East Asian economies to coastal China were followed by transfers from coastal areas to central and western provinces. China therefore changes the geography of sequential industrial relocation rather than bringing it to an end. Beyond this analysis, the same logic is consistent with supply-chain relocation toward Vietnam under heightened trade tensions and with the higher-skill upgrading trajectories of Singapore and Taiwan.

- The bilateral agreement emphasized tariff reductions and market-opening commitments across industrial goods, agriculture, and services.
- Administration statements argued that trade integration would reinforce market reforms and create pressure for privatization and economic liberalization.

These expectations were increasingly challenged after the Global Financial Crisis. China's combination of high growth, large current-account surpluses, rapid FDI inflows, and scale-driven upgrading altered the political economy of globalization. Multinational firms benefited from market access, but joint ventures and supplier relationships also accelerated local capability building, allowing China to move from labor-intensive manufacturing into more sophisticated sectors, including transport equipment, digital platforms, and advanced industrial projects.

Over time, the Belt and Road Initiative, industrial overcapacity concerns, and the strategic salience of supply chains contributed to a policy reversal in the United States and the European Union. The earlier presumption that deeper integration would be unambiguously win-win gave way to concerns about geoeconomic vulnerability, industrial dependence, and geopolitical leverage. In this environment, Lin's (2012) argument overstates the ease with which poorer or medium-sized economies can replicate China's takeoff, although countries with coherent policies can still use openness to accelerate growth[4].

This paper takes a global perspective on these issues. We ask why openness has supported catch-up in some regions while coinciding with stalled convergence, divergence, or stagnation in others. Our core argument is that openness in a fragmented world cannot be reduced to trade intensity or the number of trade agreements. Its growth consequences depend on a country's external position, its exposure to geopolitically distant partners, its ability to connect across blocs, and the domestic fundamentals that convert external opportunities into productivity gains.

Figures 1–10 provide the descriptive motivation for the empirical analysis. Figures 1–5 are five bubble scatter plots that relate country-level median real GDP growth after 2010 to the main domestic fundamentals and external-positioning variables used later in the regressions: institutional quality, human capital, geoeconomic connectedness (GeoC), geoeconomic vulnerability (GeoV), and state capacity. Each bubble represents one country; the vertical axis is median real GDP growth; the horizontal-axis variable changes across figures; regional colors identify broad geographic groups; and bubble size is proportional to the country's median real GDP, so large bubbles represent economically large sample countries. Figures 6–10 complement the scatter plots with regional maps of median growth and state capacity over 1960–2024. Taken together, the figures show why openness is studied here as a conditional growth environment rather than as a simple trade-volume ratio: high-growth cases tend to combine external connectedness with domestic capacity, while countries with similar state capacity can occupy very different growth regimes.

Our contribution is to integrate these elements into a long-horizon growth framework. We estimate dynamic panel models for an unbalanced global panel of up to 145 economies over 1960–2024, controlling for country and year effects and using lagged covariates to reduce simultaneity concerns. The baseline specification relates real GDP growth to convergence forces, investment, population dynamics, inflation, and economic integration. We then extend the analysis by introducing external-positioning variables that capture commodity dependence, geoeconomic vulnerability (GeoV), and geoeconomic connectedness (GeoC). These measures allow us to distinguish between being open in a generic sense and being positioned in diversified, geopolitically resilient trade networks. The paper also connects to the literature on institutions, state capacity, and human capital. Institutional quality and administrative capacity shape

[4] Boullenois and Jordan (2024) indicate that China's overcapacity could hinder the development of other emerging countries.

whether investment projects are selected, implemented, and maintained, while human capital determines whether firms and workers can absorb imported technologies and adapt to changing comparative advantage.

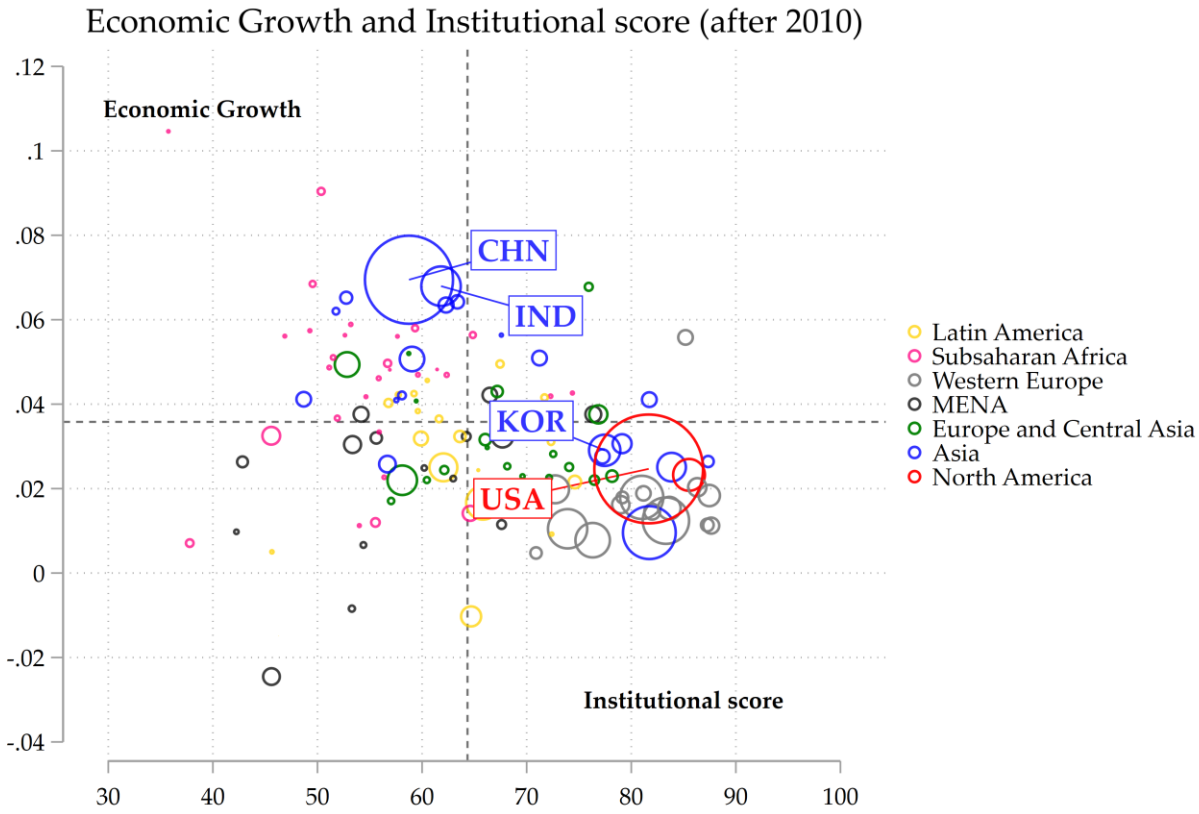


Figure 1. Economic growth and institutional score, country medians, after 2010.

Notes: Western Europe (light gray): high institutional scores (80–90) and steady-state growth (around 2 percent). North America (red): the United States and Canada display comparably strong institutional performance and steady-state growth, broadly paralleling Western Europe. Asia (blue): high institutional scores coincide with above-median growth in developed economies, while China records rapid growth despite mid-range institutional scores. Europe and Central Asia (green): structural diversity produces mixed outcomes, with some countries scoring highly on institutions but only moderately on growth. Middle East and North Africa (black): median performance overall, although some countries show robust growth despite weak institutions. Sub-Saharan Africa (pink): weak institutional performance and moderate growth. Latin America (yellow): middle-of-the-range institutional performance and median growth.

Finally, the study contributes to the literature on geoeconomic fragmentation by treating trade networks as part of the growth environment. In a world where partners differ not only by distance and income but also by geopolitical alignment, countries with broad and balanced external links may be better able to manage shocks, preserve market access, and sustain investment-led growth.

The rest of the paper is organized as follows. Section 2 presents the data. Section 3 describes the estimation strategy. Section 4 reports the empirical results and discusses the heterogeneous role of openness, financial conditions, and external positioning. The final section concludes with policy interpretations and avenues for future research.

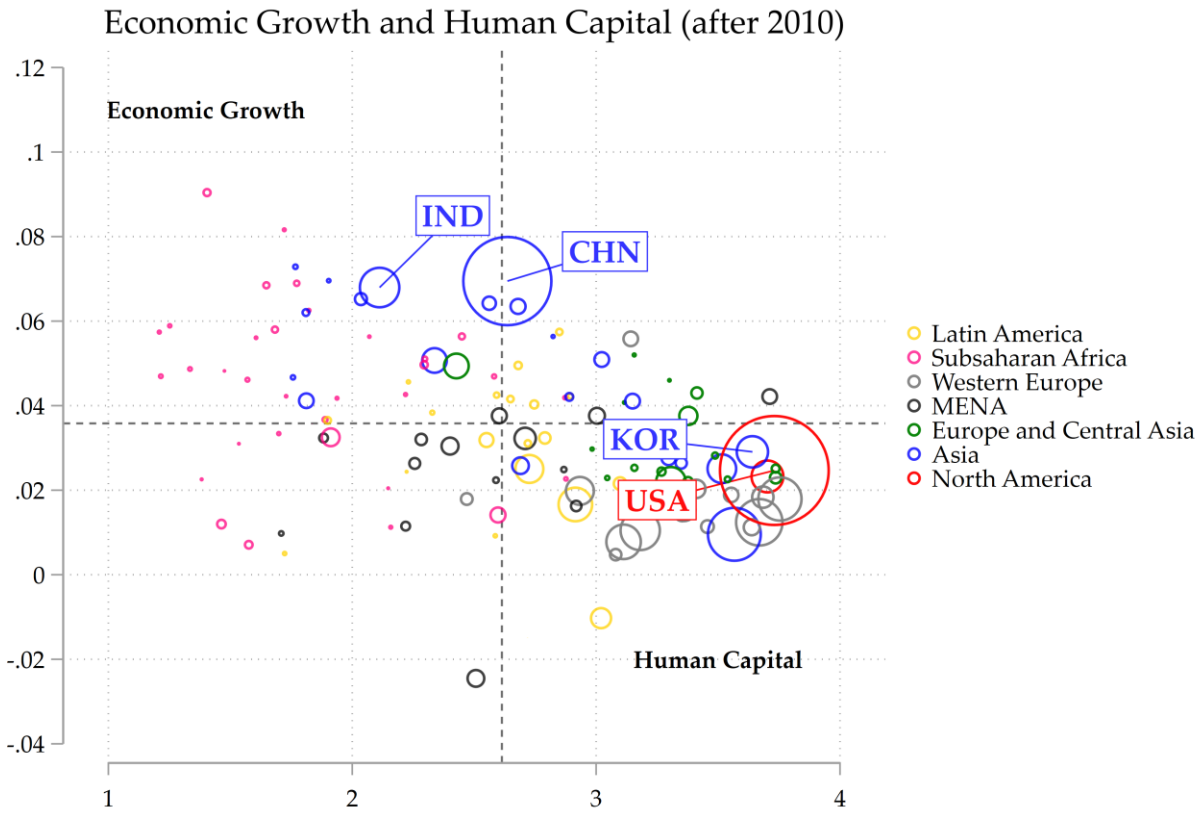


Figure 2. Economic growth and human capital, country medians, after 2010.

Notes: Western Europe (light gray): high and fairly homogeneous human capital (2.7–3.3) and steady-state growth. North America (red): the United States and Canada exhibit very high human capital (3.1–3.5) and steady-state growth. Asia (blue): China exhibits medium-level human capital and extraordinary growth, while emerging Asia grows above the median with medium-level human capital. Europe and Central Asia (green): high human capital (2.8–3.7), with some countries performing comparably to Western Europe. Middle East and North Africa (black): Gulf countries grow moderately with medium-to-high or high human capital. Sub-Saharan Africa (pink): human capital is low (0.9–1.8); growth rates vary widely, and fragile states face difficulties. Latin America (yellow): medium-to-low human capital (1.6–2.8).

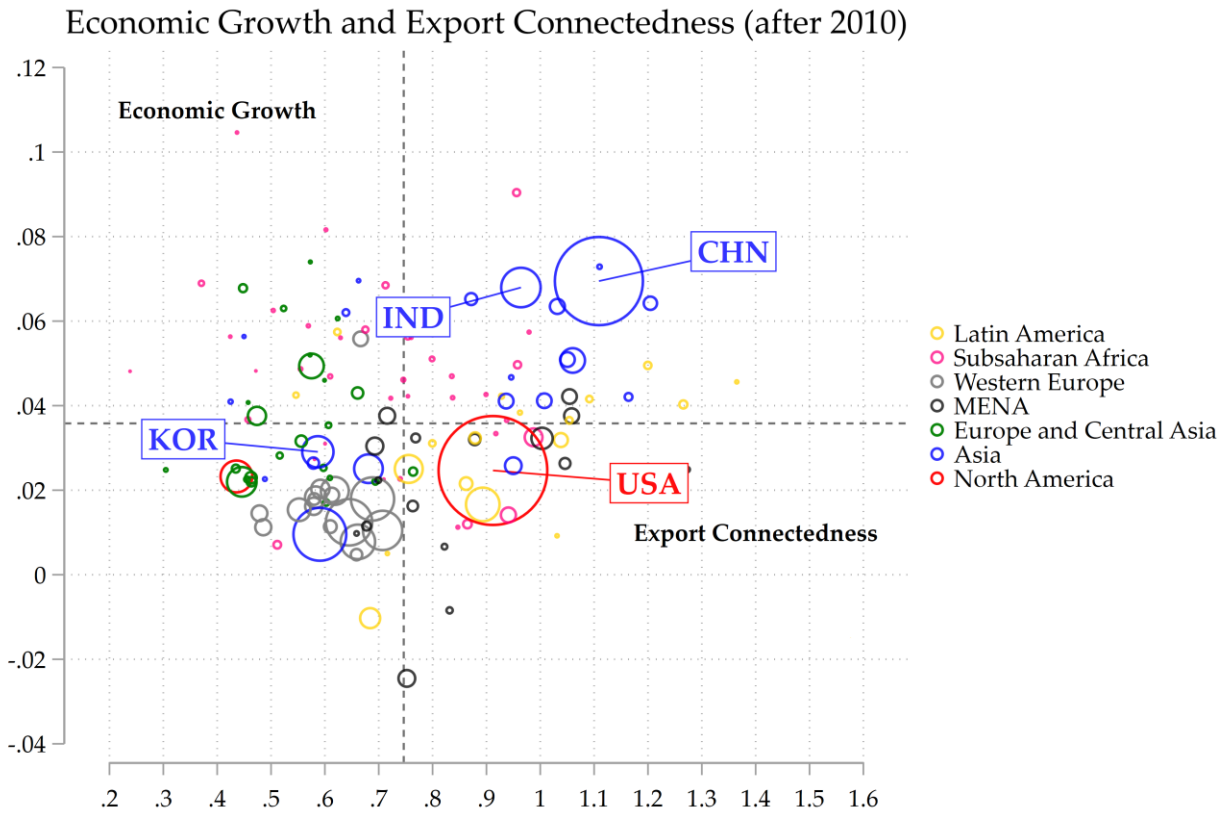


Figure 3. Economic growth and geoeconomic connectedness (GeoC), country medians, after 2010.

Notes: Western Europe (gray): low-to-median export connectedness. North America (red): the U.S. stands out because its export partners are geopolitically diversified. Asia (blue): high export connectedness and rapid growth. Europe and Central Asia (green): substantial heterogeneity in both growth performance and export connectedness. Middle East and North Africa (black): export connectedness is generally medium-to-high, but growth performance is below the world median. Sub-Saharan Africa (pink): some countries have high export connectedness because they export commodities and raw materials to geopolitically diverse partners. Latin America (yellow): countries are highly export connected but have mediocre growth performance.

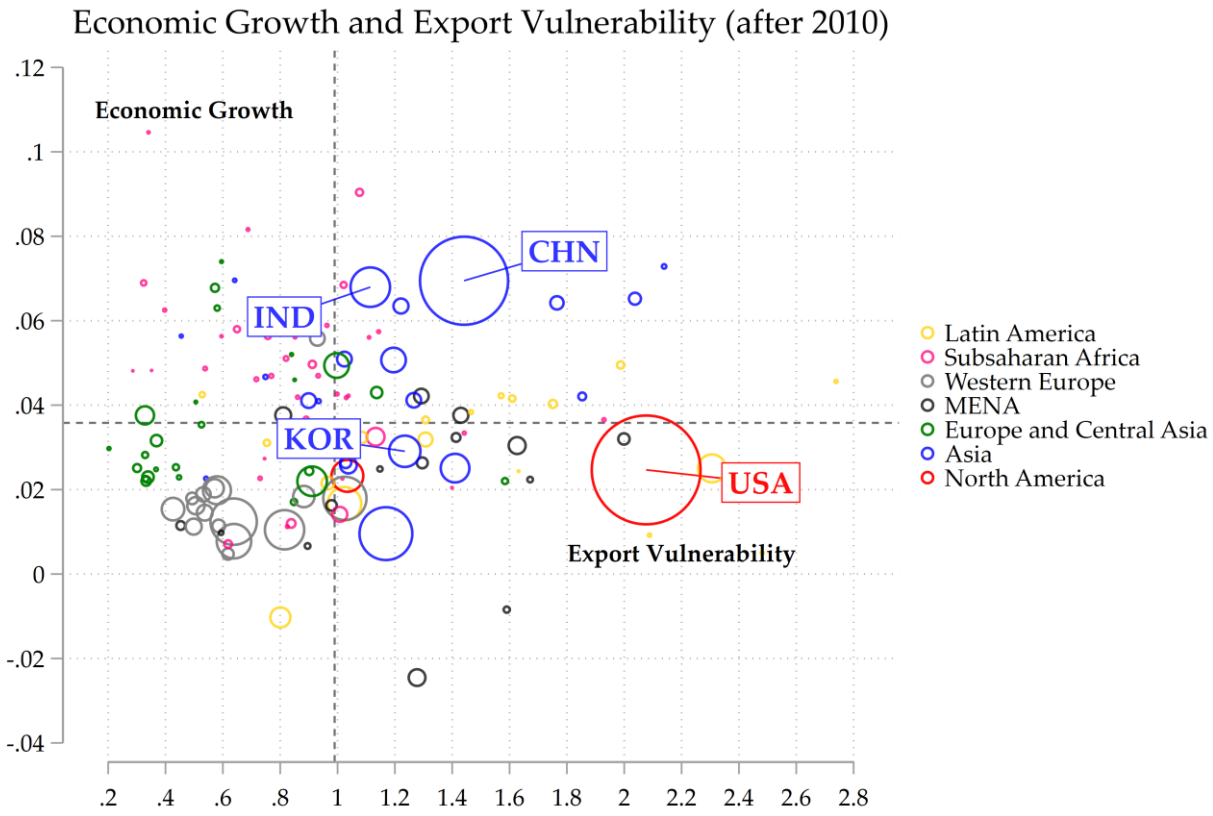


Figure 4. Economic growth and geoeconomic vulnerability (GeoV), country medians, after 2010.

Notes: Western Europe (gray): low export vulnerability and steady-state growth. North America (red): the U.S. has high export vulnerability and stands out among developed economies, probably because of the growing geopolitical isolation of the United States. Asia (blue): economies enjoy high growth associated with structural change and moderate-to-high export vulnerability. Europe and Central Asia (green): economies have varying levels of growth and export vulnerability. Middle East and North Africa (black): economies have moderate growth and moderate-to-high export vulnerability. Sub-Saharan Africa (pink): economies experience moderate growth and moderate export vulnerability; however, those with high vulnerability also experience low growth, underscoring the need for export diversification. Latin America (yellow): high export vulnerability is associated with low growth, while moderate vulnerability is associated with moderate growth.

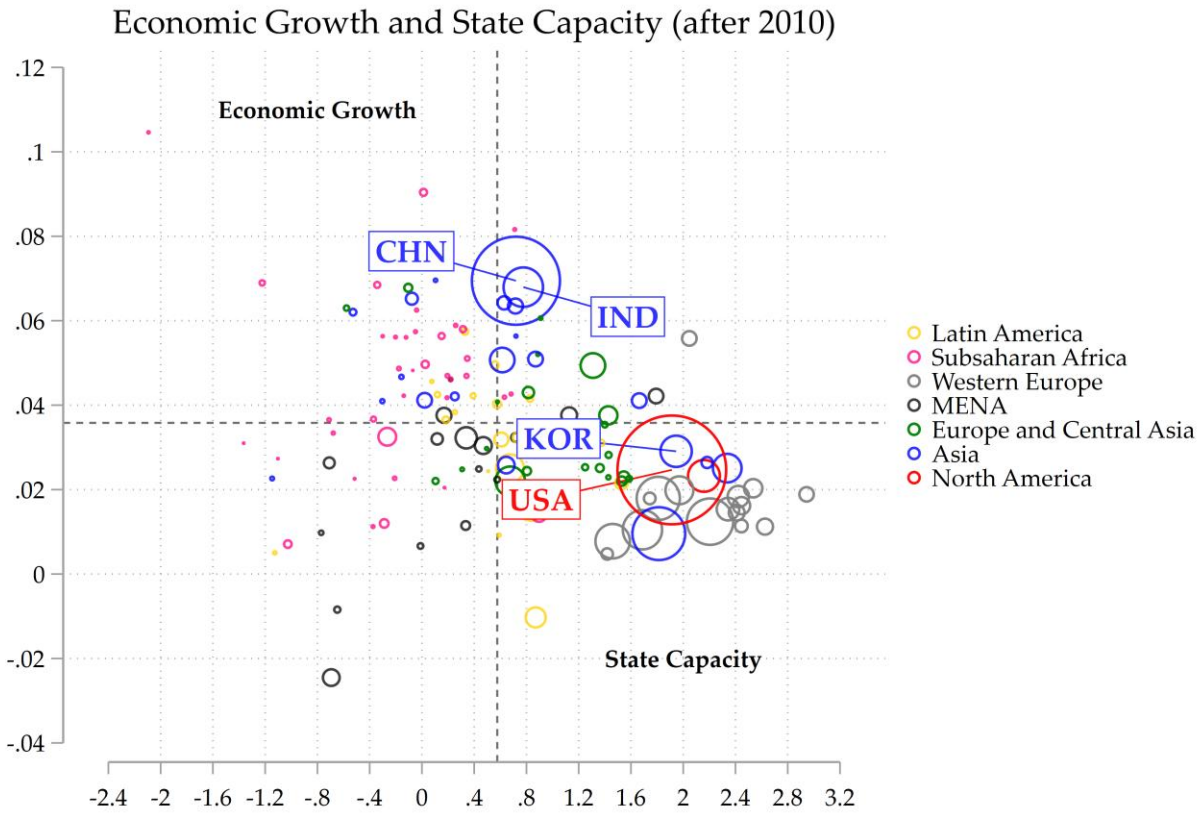


Figure 5. Economic growth and state capacity, country medians, after 2010.

Notes: Western Europe (gray): high capacity (1.5–2.3) and steady-state growth, as in North America (red). Asia (blue): diverse capacity; Korea and Singapore exhibit high capacity (1.6–1.8) and rapid growth (7 percent), while China has extremely rapid growth and moderate, stable capacity. Other countries display medium capacity and high growth. Europe and Central Asia (green): medium-to-high state capacity and growth. Middle East and North Africa (black): low-to-medium capacity and moderate growth.

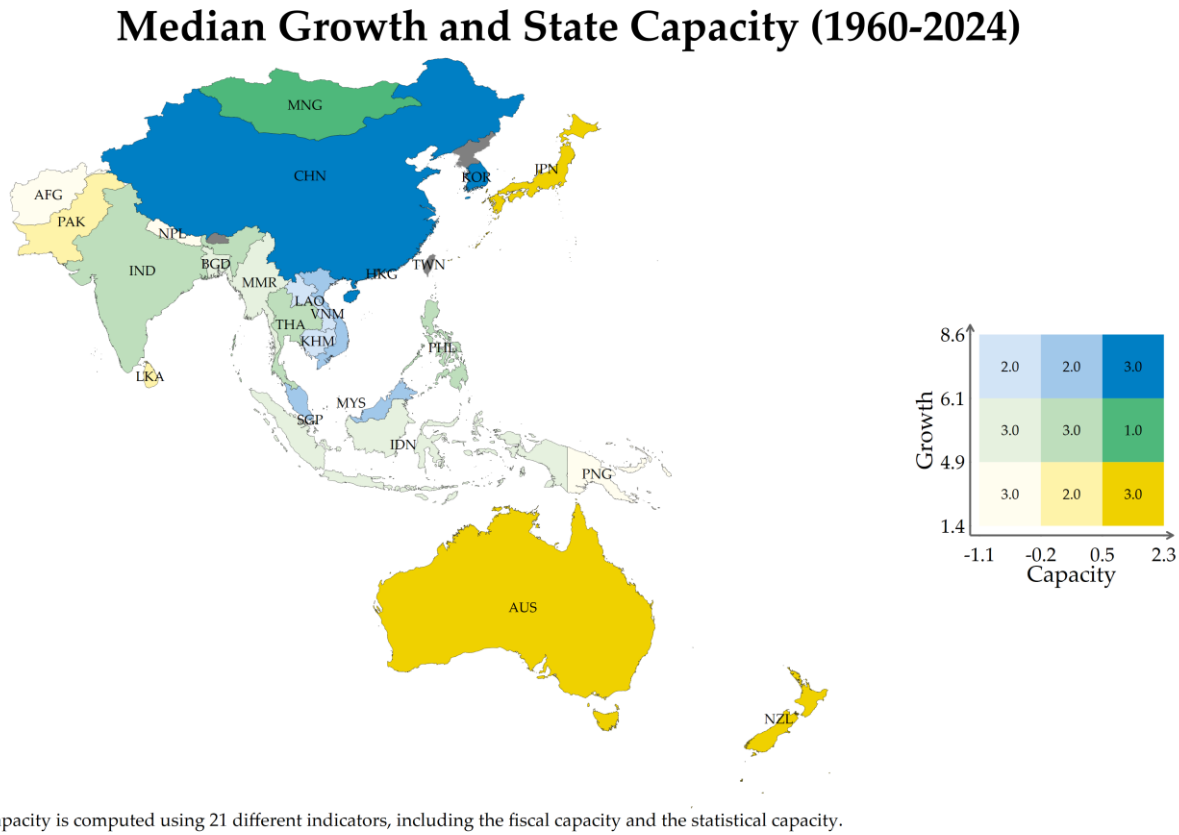


Figure 6. Median real GDP growth and state capacity in Asia and the Pacific, 1960–2024.
Notes: This map shows the relationship between countries' median real GDP growth and state capacity from 1960 to 2024. High growth is concentrated in East and Southeast Asia, especially China and regional economies like Korea and Vietnam, where growth often aligns with moderate or higher state capacity. In contrast, advanced economies such as Japan, Australia, and New Zealand have high state capacity but only moderate growth, reflecting mature economies. South Asian countries like India and Bangladesh generally fall in intermediate positions, suggesting that limited capacity or other structural factors constrain their growth.

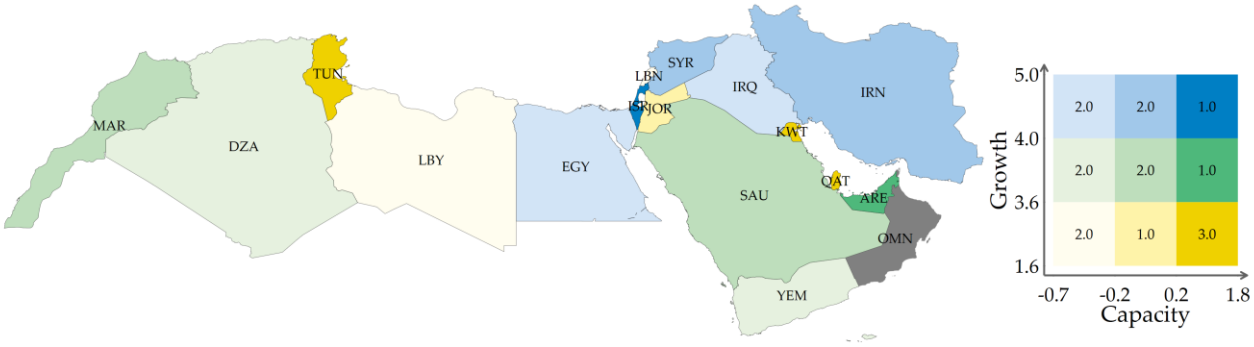


Figure 7. Median real GDP growth and state capacity in the Middle East and North Africa, 1960–2024.
Notes: The figure shows significant differences in median growth and state capacity across MENA. Gulf states exhibit high administrative capacity but only moderate growth, likely due to mature hydrocarbon sectors and limited population expansion. Some countries achieve high growth with intermediate capacity, such as Israel, while conflict-affected economies like Syria and Yemen experience low growth regardless of capacity. North African nations generally fall in the middle for both measures, with Tunisia having relatively higher capacity levels. Overall, state capacity is essential for macroeconomic stability, but growth varies due to factors like economic structure, conflict, sanctions, and private sector development.

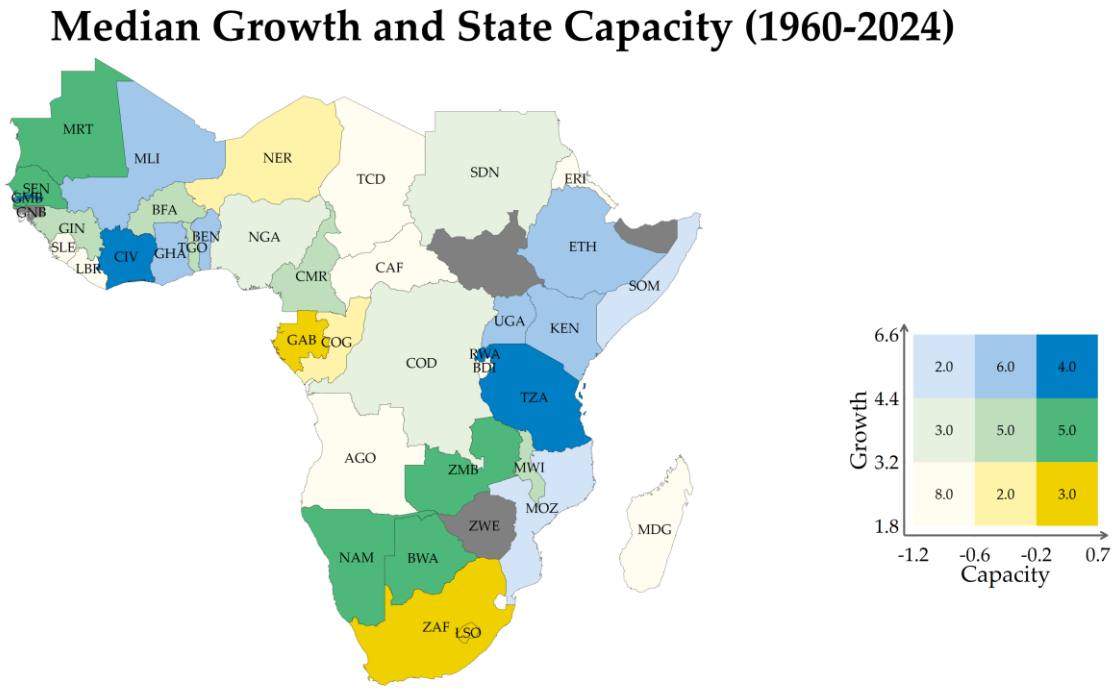


Figure 8. Median real GDP growth and state capacity in Sub-Saharan Africa, 1960–2024.

Notes: The map highlights that most Sub-Saharan African countries have had limited state capacity from 1960–2024, yet growth varies widely within this range. Some countries, like Tanzania and Rwanda, show high growth despite weak capacity, suggesting that robust growth can occur without high administrative strength. In contrast, fragile states tend to experience both low capacity and low growth, while South Africa demonstrates moderate growth with relatively higher capacity. Smaller southern economies sometimes achieve higher growth at similar or lower capacity levels, showing that capacity alone does not guarantee growth. West Africa is diverse, with differences in diversification, stability, and institutions shaping outcomes. Overall, while state capacity is important for resilience and policy, other factors and shocks strongly influence long-term growth patterns in the region.

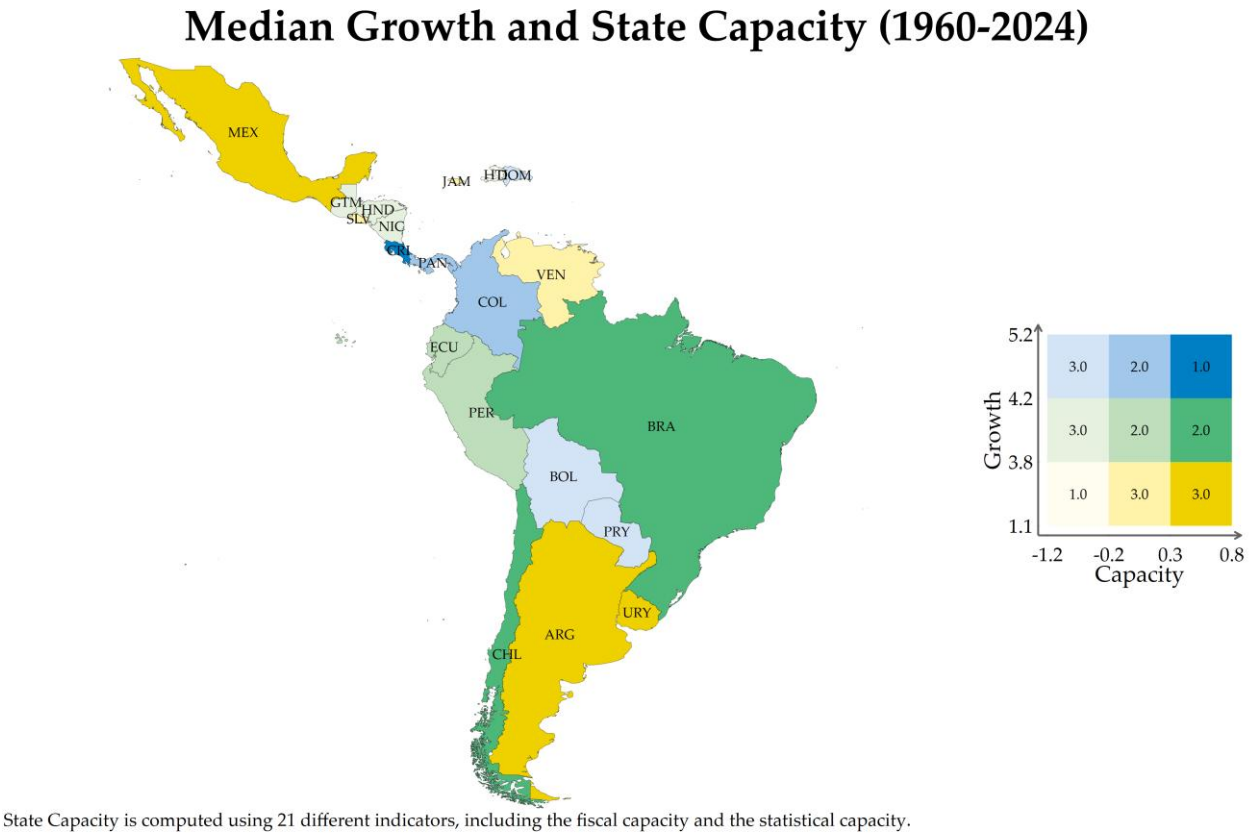


Figure 9. Median real GDP growth and state capacity in Latin America and the Caribbean, 1960–2024.
Notes: The Latin America map shows most countries in intermediate state capacity and moderate growth, with few reaching the highest growth levels. Large economies like Brazil and Mexico have relatively high capacity but only experience moderate growth. The Andean and Northern Latin American countries are diverse: Colombia has moderate capacity and higher growth, while Peru and Ecuador are closer to the middle. Venezuela is an outlier with low capacity and weak growth due to long-term instability. In the Southern Cone, Chile and Uruguay have high capacity but only moderate growth, and Argentina's growth lags behind its potential, reflecting ongoing macroeconomic challenges. Central America and the Caribbean are scattered across the lower-capacity, moderate-growth range, where small size and vulnerability to external shocks affect outcomes. Overall, the region is characterized by "capacity-constrained convergence," where higher state capacity provides stability but does not consistently lead to high median growth.

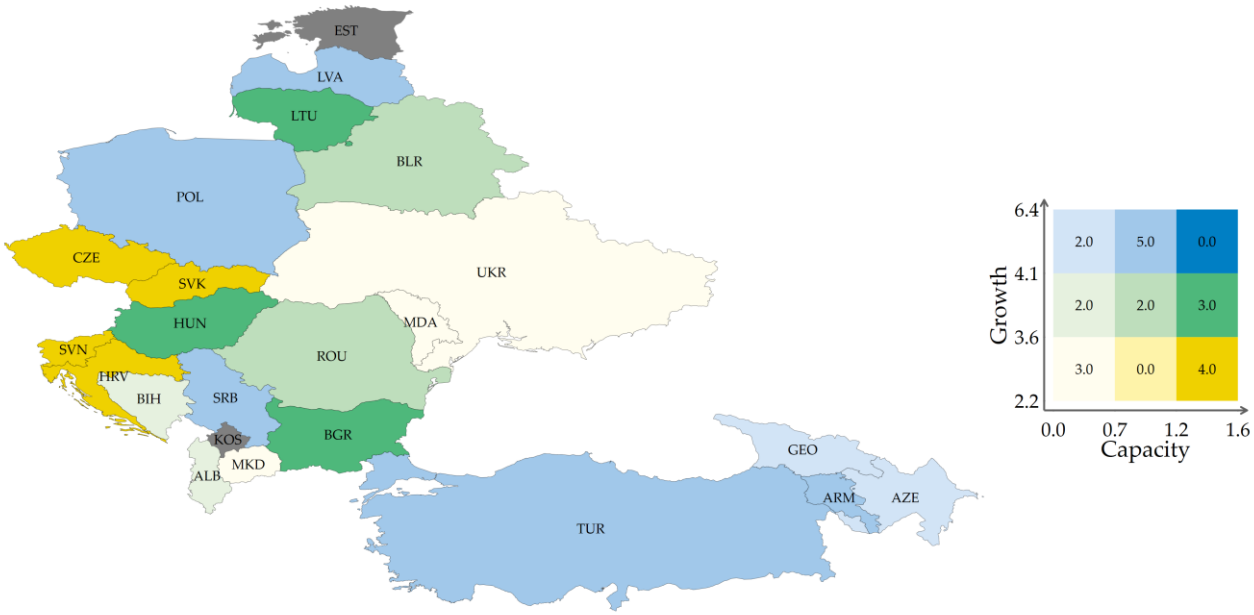


Figure 10. Median real GDP growth and state capacity in Europe and Central Asia, 1960–2024.
Notes: The Europe and Central Asia map shows a gradient in state capacity, though its connection to median growth is inconsistent. EU and near-EU transition countries typically have higher capacity and moderate growth, while post-Soviet states vary widely: the Baltic states differ in capacity; the Caucasus and Moldova have lower capacity with mixed growth; and Ukraine has low growth despite moderate capacity because of disruptions. Turkey sits between high-capacity peers.

2. Data and descriptive evidence

We construct an unbalanced annual panel for 145 countries over 1960–2024, restricting the estimation sample to economies with populations of at least 2 million. The country count is the maximum number of economies appearing in the merged panel; the effective number of countries and observations varies across specifications because the institutional, state-capacity, human-capital, financial-development, and geoeconomic variables are not all available for the full 1960–2024 window. Table 1 reports descriptive statistics for the baseline regression sample; Table A1 documents variable definitions and sources; and Appendix A reports country coverage by specification.

Table 1. Descriptive statistics.

	Mean	SD	P10	D50	D90	Min.	Max.
Real GDP Growth	0.04	0.07	-0.01	0.04	0.09	-0.64	2.30
Real GDP	10.75	2.17	8.23	10.73	13.45	1.22	16.90
Investment	0.23	0.09	0.12	0.22	0.34	-0.13	0.88
Population	2.66	1.28	1.16	2.39	4.36	0.69	7.27
Population Growth	0.02	0.01	0.00	0.02	0.03	-0.18	0.17
Inflation	0.12	0.25	0.01	0.06	0.26	-0.71	3.39
Economic Integration Agreement	2.54	7.86	0.00	0.00	9.00	0.00	32.00
Observations				7263			

Notes: The descriptive-statistics sample comprises 7,263 country-year observations from economies with populations of at least 2 million and complete data for all variables reported in the table.

The macroeconomic variables are drawn from the Global Macro Database (GMD) of Müller et al. (2025), which harmonizes contemporary and historical macroeconomic series into annual country-level data. We use real GDP growth as the dependent variable. The baseline controls are real GDP in constant U.S. dollars, entered in logs; the investment share of GDP; population in millions, entered in logs; population growth; and CPI inflation, measured as the annual growth rate of the consumer price index. This choice separates the scale component of aggregate output growth from demographic growth, rather than mechanically embedding population dynamics in a per capita dependent variable.

Our main de jure openness variable is the number of Economic Integration Agreements. It is constructed from the Regional Trade Agreements Database of Larch (2024), based on Egger and Larch (2008). The Larch database records WTO-notified regional trade agreements and classifies them into agreement types, including Economic Integration Agreements and combinations that contain an Economic Integration Agreement component. For each country-year, we cumulate the number of Economic Integration Agreements in force. This is intentionally different from the conventional trade-openness ratio, (exports + imports)/GDP. The latter is an equilibrium outcome shaped by country size, geography, commodity prices, exchange rates, and growth itself. The EIA measure is closer to a policy and institutional variable: it captures accumulated commitments to deep formal economic integration rather than realized trade volumes.

We complement the EIA measure with two external-positioning variables that are directly related to the paper's fragmentation argument. Following Aiyar and Ohnsorge (2024), geoeconomic vulnerability (GeoV) is measured as the export-share-weighted average geopolitical distance between a country and its export partners. Higher GeoV indicates that a country's export structure is more exposed to partners that are geopolitically distant, so a geopolitical shock is more likely to affect

export relationships. Geoeconomic connectedness (GeoC) is measured as the normalized export-share-weighted dispersion of geopolitical distances across partners. Higher GeoC indicates that export links are more balanced across partners from different geopolitical blocs, capturing the horizontal "connector" position emphasized in the recent literature on geoeconomic fragmentation.

Domestic fundamentals are measured from three sources. The institutional score is constructed from the PRS Group's International Country Risk Guide (ICRG; PRS Group, 2022) political-risk components. We sum the 12 political-risk dimensions. Higher values indicate lower political risk and stronger institutional quality. State capacity is the Hanson and Sigman (2021) latent state-capacity index, based on extractive, coercive, and administrative dimensions of the state. Human capital is the Penn World Table human-capital index (Feenstra, Inklaar, and Timmer, 2015), which is based on years of schooling and returns to education. Figure 24 in Appendix E illustrates the close positive association between state capacity and the institutional score across countries.

Figures 1–5 use country medians after 2010, while Figures 6–10 use country medians over 1960–2024. In each case, the median summarizes each country's position over the relevant period and reduces the influence of crises, wars, commodity-price spikes, and other short-lived shocks. The figures are therefore descriptive evidence, not identification. Their purpose is to organize the main empirical question: why does openness translate into catch-up growth for some economies but not for others? In Figures 1–5, the vertical axis is median real GDP growth. Across the five figures, the horizontal variables are institutional score, human capital, GeoC, GeoV, and state capacity, respectively. Each bubble is a country; bubble size is proportional to median real GDP, so larger bubbles indicate economically larger sample economies; and colors identify regions.

Several patterns stand out. Advanced economies in Western Europe and North America tend to have high institutions, high human capital, and high state capacity, but only moderate median growth, consistent with mature-economy convergence dynamics. Emerging Asian economies appear more frequently in the high-growth region of the scatter plots, often combining medium-to-high human capital, improving institutional capacity, and relatively favorable export connectedness. Other regions display wider dispersion: some commodity-dependent economies are externally connected but do not achieve high median growth, while several Latin American, Middle Eastern, and Sub-Saharan African economies occupy intermediate or low-growth regions despite some formal integration with world markets. The descriptive message is that external openness is not sufficient by itself; it must be converted into productivity gains through domestic absorptive capacity and resilient network positioning.

Figures 6–10 provide the spatial counterpart to these scatter plots by mapping median growth and state capacity across regions. The maps make two points that are difficult to see from the global scatter plots. First, growth regimes cluster geographically: emerging Asia stands out as a region where high median growth often coincides with moderate or rising state capacity, while advanced economies have higher state capacity but lower growth because they are closer to the frontier. Second, the same level of state capacity can be associated with very different long-run growth outcomes, especially in Latin America, the Middle East and North Africa, Europe and Central Asia, and Sub-Saharan Africa. This motivates the heterogeneous and quantile-based empirical analysis below: the payoff from openness and investment depends on the regime in which an economy operates.

Figure 11 summarizes the evolution of global growth since 1960 by plotting the cross-country median together with vertical bars for the interquartile range in each year. Two features stand out. First, outside major global disruptions, the central tendency of growth is relatively stable, with stronger performance in the 1960s, a slowdown around the late 1970s and early 1980s, a recovery

around the late 1990s and mid-2000s, and a lower-growth plateau through much of the 2010s. Second, global crises coincide with both lower median growth and greater cross-country dispersion: the Global Financial Crisis appears as a pronounced downturn around 2009, while the COVID-19 episode produces an exceptional collapse followed by a strong rebound. The figure reinforces the paper's empirical strategy: global growth is a distribution, not a single average, so the analysis must allow for heterogeneity across countries and across growth regimes.

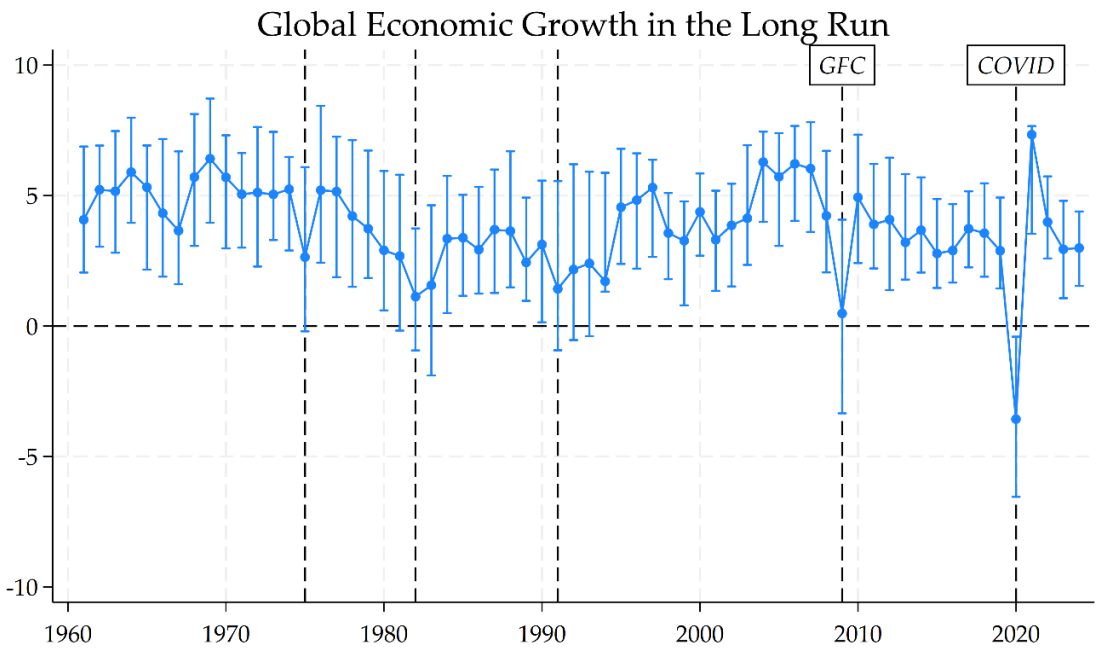


Figure 11. Evolution of economic growth, 1960–2024.
Notes: The line reports the annual median; bars report the interquartile range; vertical dashed lines identify global recessions.

3. Estimation strategy

We study the determinants of long-run growth at the global level using a dynamic two-way fixed-effects (TWFE) panel model. The empirical strategy exploits heterogeneity over time while controlling for country-specific heterogeneity (geography, culture, long-run institutions) via country fixed effects. We also control for common global shocks (GFC, COVID-19, etc.) via time fixed effects. To reduce simultaneity concerns, all policy and state variables on the right-hand side are lagged one period. Our baseline specification is:

$$g_{it} = \phi g_{i,t-1} + \rho \ln y_{i,t-1} + \beta' X_{i,t-1} + \mu_i + \tau_t + \varepsilon_{it}. \qquad (1)$$

where i indexes countries and t years. $g_{it} \equiv \Delta \ln y_{it}$ is (annual) real GDP growth; $\ln y_{i,t-1}$ is lagged log real GDP (the "convergence" term); the vector of controls includes the investment share of GDP; the log population (a scale/agglomeration channel); population growth (the Solow capital-dilution channel); CPI inflation; and the cumulative number of Economic Integration Agreements. The parameters μ_i and τ_t are, respectively, country and time fixed effects; ε_{it} is the idiosyncratic error. Identification relies on strict exogeneity of controls conditional on μ_i, τ_t and on lagging the regressors

to mitigate reverse causality. The inclusion of both log population and population growth separates scale effects (market size, agglomeration, urban density) from capital dilution (population growth), which theory suggests have opposite signs in growth regressions. Country fixed effects absorb time-invariant confounders; time fixed effects purge global shocks and common trends.

Real GDP also lets us separate extensive-margin and intensive-margin growth rather than building the population denominator into the dependent variable. In a per capita specification, population dynamics are mechanically embedded in the outcome; this blurs interpretation and can obscure the role of the demographic transition that has been central in some regions of the world economy. By modeling real GDP growth and entering population level (scale/agglomeration) and population growth (labor-supply expansion) as explicit regressors, we can quantify how much of aggregate growth comes from market size and labor supply versus capital deepening and other factors. This decomposition is informative for policy: a government designing industrial parks, ports, or power grids would benefit from knowing whether output gains are coming from more workers, denser markets, or higher productivity.

We estimate Equation (1) with the three complementary approaches summarized in Table B1 of Appendix B. Appendix C reports heterogeneous marginal effects across moderators. For all three estimators, we keep the same covariates and the fixed effects in the baseline, ensuring that differences reflect inference assumptions rather than design changes. All right-hand-side variables enter the regressions with a one-year lag, so that current real GDP growth is related to past investment, demographic developments and macro conditions rather than to contemporaneous decisions. This timing restriction does not make the regressors strictly exogenous. Investment is inherently forward-looking and responds to expected profitability, and fertility and migration decisions are influenced by perceptions of future economic prospects. For this reason, we do not claim that lagging alone "solves" endogeneity or that our estimates are fully structural.

Our identification strategy therefore combines lagged regressors with a rich fixed-effects structure and a dynamic specification. Country fixed effects absorb time-invariant determinants of both growth and expectations (such as geography, institutional history or culture), while time fixed effects capture global shocks and news that simultaneously affect investment decisions and output in all economies (for example the global financial crisis or changes in world interest rates). The inclusion of lagged growth allows for persistence and helps control for forward-looking behavior: to the extent that investors react to predictable growth, this component is absorbed by the lagged dependent variable. In this sense, we treat investment and demographic variables as predetermined rather than strictly exogenous, which is standard in the empirical growth literature.

We view the resulting coefficients as conditional effects rather than as fully causal parameters: they show how growth comoves with past investment and demographics after controlling for country and time effects, not what a policymaker would obtain from a randomized experiment. The fact that the estimates are extremely similar across three different estimators (namely, bias-corrected dynamic fixed effects, two-way fixed effects with clustered standard errors, and Driscoll–Kraay standard errors) suggests that residual endogeneity is unlikely to overturn the main patterns we document[5].

[5] Aizenman, Ito, and Saadaoui (2026) study changes in EIA exposure using a heterogeneity-robust difference-in-differences estimator for multivalued, nonabsorbing treatments. They find no significant growth response in the switch year but an increase of about 3 percentage points one year later. Four horizon-matched placebo estimates are individually and jointly insignificant, and the result is robust to alternative control groups, sample restrictions, and leave-one-switcher-out checks.

4. Empirical results

Table 2 reports the baseline estimates for Equation (1). The main result is the stability of the coefficients across the three estimators. Column (1) uses the bias-corrected dynamic fixed-effects estimator of Breitung, Kripfganz, and Hayakawa (2022) to address the Nickell bias created by the lagged dependent variable. Column (2) reports the standard two-way fixed-effects estimator, and column (3) uses Driscoll–Kraay standard errors to account for cross-sectional and serial dependence. Because the time dimension is long (more than sixty annual observations for many countries), the Nickell bias is limited, and the point estimates remain close across specifications.

Table 2. Baseline empirical results.

	(1) Real GDP Growth	(2) Real GDP Growth	(3) Real GDP Growth
Real GDP Growth $_{t-1}$	0.1328***	0.1042**	0.1042**
	(0.0505)	(0.0500)	(0.0446)
Real GDP $_{t-1}$	-0.0324***	-0.0392***	-0.0392***
	(0.0061)	(0.0071)	(0.0068)
Investment $_{t-1}$	0.0812***	0.0881***	0.0881***
	(0.0201)	(0.0280)	(0.0201)
Population $_{t-1}$	0.0182*	0.0183**	0.0183**
	(0.0096)	(0.0092)	(0.0070)
Population Growth $_{t-1}$	-0.0700	0.0724	0.0724
	(0.1537)	(0.1828)	(0.1772)
Inflation $_{t-1}$	-0.0102*	-0.0084**	-0.0084*
	(0.0058)	(0.0042)	(0.0042)
Economic Integration $_{t-1}$	-0.0003	-0.0003	-0.0003
	(0.0002)	(0.0002)	(0.0002)
R-squared	-	0.17	0.13
Observations	6,197	7,242	7,244
F-stat	-	7.29	12.78
Number of countries	119	143	145
Country FE	Included	Included	Included
Time FE	Included	Included	Included

*Notes: Standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. Country and year fixed effects are included.*

The baseline results convey four robust patterns. First, lagged real GDP is negative and highly significant, supporting conditional convergence once country and time effects and the baseline controls are included. Second, investment is positive and significant across estimators, confirming

that capital accumulation is a central proximate driver of aggregate growth. Third, population scale enters positively, suggesting that market size and agglomeration can support growth, while population growth itself is less stable across specifications. Fourth, inflation is negative in the preferred estimates, consistent with the view that macroeconomic instability weakens the growth process.

The heterogeneous specifications qualify this average picture. Countries above the commodity-dependence threshold display weaker growth persistence: the coefficient on lagged growth is lower and, in some cases, not statistically different from zero. This pattern is consistent with stop-and-go dynamics in which commodity booms generate temporary accelerations but do not necessarily produce durable structural transformation. In contrast, lower-commodity-dependence economies exhibit more persistent growth, suggesting that diversification helps convert favorable shocks into cumulative upgrading.

Splitting the sample around the Global Financial Crisis also reveals a change in the growth process. After the GFC, growth persistence declines while the investment-growth link strengthens, suggesting a post-crisis environment in which external demand and global financial conditions are less reliable engines of expansion. This places greater weight on domestic investment policy, macroeconomic credibility, and the capacity to turn investment into productive capital rather than into short-lived stimulus.

Appendix C complements these results by showing how the marginal effects vary across moderators. The interaction evidence indicates that institutions, human capital, and geoeconomic connectedness amplify the growth payoff of investment. The GeoC results are particularly important: economies with more diversified geopolitical trade links appear better able to transform investment into output, while relying less on past growth momentum. This supports the interpretation that external positioning works as a resilience mechanism under fragmentation rather than as a simple measure of trade volume.

At the same time, this interpretation is conditional. GeoC is valuable when combined with institutional capacity and human capital; a country may be connected to many partners but still fail to capture growth gains if domestic capabilities are weak or export diversification is limited.

Figure 12 moves beyond mean effects by estimating the baseline specification across the conditional distribution of real GDP growth. This is important because Unified Growth Theory predicts that the link between initial income and subsequent growth depends on the development regime. In pre-takeoff or post-Malthusian settings, productivity improvements can be offset by demographic pressures and weak absorptive capacity. In modern-growth regimes, by contrast, human capital accumulation, technology adoption, and structural change make catch-up more powerful.

Using the Machado and Santos Silva (2019) method-of-moments panel quantile estimator, the evidence is consistent with this regime-switching view. At the lower tail of the conditional growth distribution, the coefficient on lagged log GDP is weakly identified and even positive at $\tau = 0.01$ ($\beta(0.01) = 0.024$), indicating that low-growth "failure" regimes exhibit little automatic pull toward the conditional steady state. Moving up the distribution, the convergence coefficient becomes increasingly negative: $\beta(0.10) = -0.0178$, $\beta(0.25) = -0.0298$, $\beta(0.50) = -0.0397$, $\beta(0.75) = -0.0496$, $\beta(0.90) = -0.0595$, and $\beta(0.99) = -0.0922$. The implied half-life of income gaps falls from about 38.5 years at $\tau = 0.10$ to 22.9 years at $\tau = 0.25$, 17.1 years at the median, 13.6 years at $\tau = 0.75$, and 11.3 years at $\tau = 0.90$.

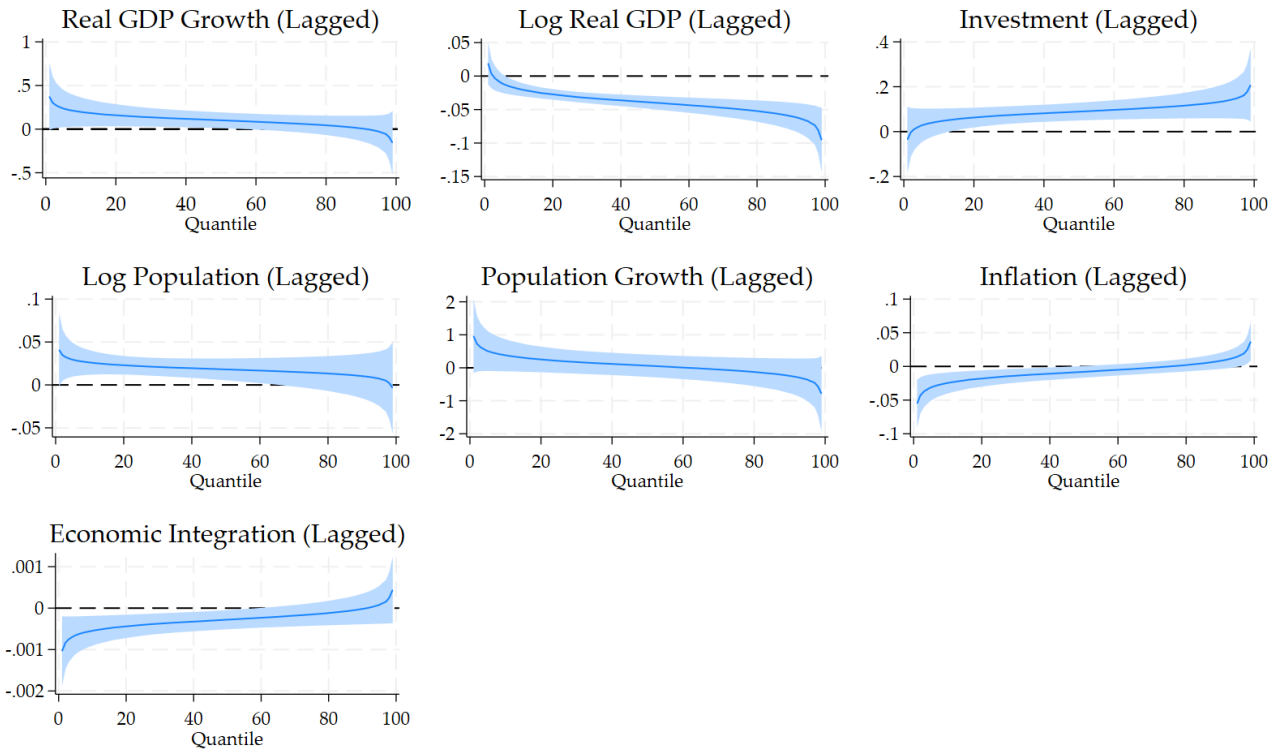


Figure 12. Panel quantile regressions with two-way fixed effects.

Notes: Each panel reports a coefficient from the baseline growth specification across conditional quantiles. Solid lines are point estimates and shaded bands are 95 percent confidence intervals. Regressors are lagged one year; the sample is restricted to economies with populations of at least 2 million.

This pattern reconciles two views that are often treated separately. Low-growth economies can remain trapped because adverse shocks, weak institutions, demographic pressures, or narrow export structures prevent convergence forces from operating. Once economies enter higher-growth states, however, the same convergence logic becomes economically meaningful, and the distance from the frontier can translate into faster catch-up.

The quantile evidence therefore reinforces the heterogeneity results. Mean regressions identify an average convergence force, but they understate the divergence between failure regimes and success regimes. For policy, the lower-tail weakness of convergence implies that growth accelerations require binding constraints to be removed before openness and investment can generate sustained catch-up. In the upper tail, the shorter half-life suggests that complementary reforms can convert the distance from the frontier into rapid growth. These results motivate a more explicit discussion of trade openness, financial openness, and the channels through which they influence long-run growth.

Trade openness, financial openness, and economic growth

We now interpret the empirical evidence through the channels of trade and finance. Trade openness is measured primarily through economic integration agreements and export-network positioning, while financial openness is captured indirectly through the financial-market and financial-institution moderators reported in Appendix C. This distinction is important because the data show that de jure integration alone is not sufficient to explain growth.

The baseline coefficient on economic integration is small and generally insignificant, which should not be read as evidence that trade integration is irrelevant. Rather, it suggests that the number of ratified agreements is a coarse measure of openness. The growth payoff depends on what trade enables: access to larger markets, imported inputs, learning-by-exporting, technology diffusion, and the relocation of activities along evolving comparative advantage.

The network measures refine this interpretation. GeoV captures exposure to geopolitically distant trading partners, while GeoC captures the breadth of a country's links across geopolitical space. In a fragmented world, higher connectedness can reduce the cost of shocks by preserving alternative markets and suppliers. Conversely, high vulnerability without diversification can turn openness into a source of instability.

Financial openness operates through a related but distinct channel. Access to external finance and deeper domestic financial markets can raise investment, smooth shocks, and support entry into more capital- and technology-intensive sectors. Yet these benefits are conditional on regulation, institutional quality, and macroeconomic credibility. Financial integration can amplify growth when it funds productive investment, but it can also transmit crises when balance sheets are fragile or when capital inflows finance consumption booms and real-estate cycles. The trade and financial channels interact with domestic fundamentals in at least five ways. First, human capital determines whether firms can absorb imported technologies and upgrade production processes. Second, state capacity affects whether ports, logistics, power, and digital infrastructure are delivered at the scale required for export expansion. Third, institutions shape the credibility of contracts and the allocation of credit, affecting whether investment reaches productive firms. Fourth, macroeconomic stability reduces the risk that inflation, exchange-rate volatility, or sudden stops interrupt learning. Fifth, diversified trade networks reduce dependence on any single geopolitical bloc and increase the option value of openness.

These mechanisms help explain why openness generates catch-up in some regions but not in others. Emerging Asia combined external integration with export discipline, human-capital formation, and state capacity, allowing investment to be translated into productivity-enhancing structural change. Many commodity-dependent economies became open to global markets but remained concentrated in sectors with weak spillovers and high price volatility. The relevant question is therefore not whether economies are open, but whether they are open in a way that supports capability accumulation and resilience.

The policy implication is that trade and financial openness should be evaluated as complements to domestic development strategy. Trade agreements, export diversification, and financial liberalization are more likely to raise long-run growth when sequenced with human-capital investments, prudential regulation, credible macroeconomic policy, and institutions that facilitate reallocation. Under geoeconomic fragmentation, the additional objective is to build connections across blocs without becoming excessively vulnerable to any one partner or source of finance[6].

Figures 13–16 visualize these interactions. Figures 13–15 show how the marginal effect of economic integration on growth varies with financial-market development, financial-institution

[6] Aizenman and Noy (2009) show that trade and financial openness are interdependent dimensions of international integration. Our interaction estimates add a related qualification: the marginal association between an additional EIA and growth weakens as financial-market development, financial-institution development, or financial openness rises. This suggests that the incremental growth association of formal trade integration is smaller where financial channels are already deeper or more open.

development, and financial openness, respectively, while Figure 16 shows how its marginal effect on changes in government tax revenue varies with financial openness.

Figure 13. Marginal effect of economic integration on growth across financial-market development.

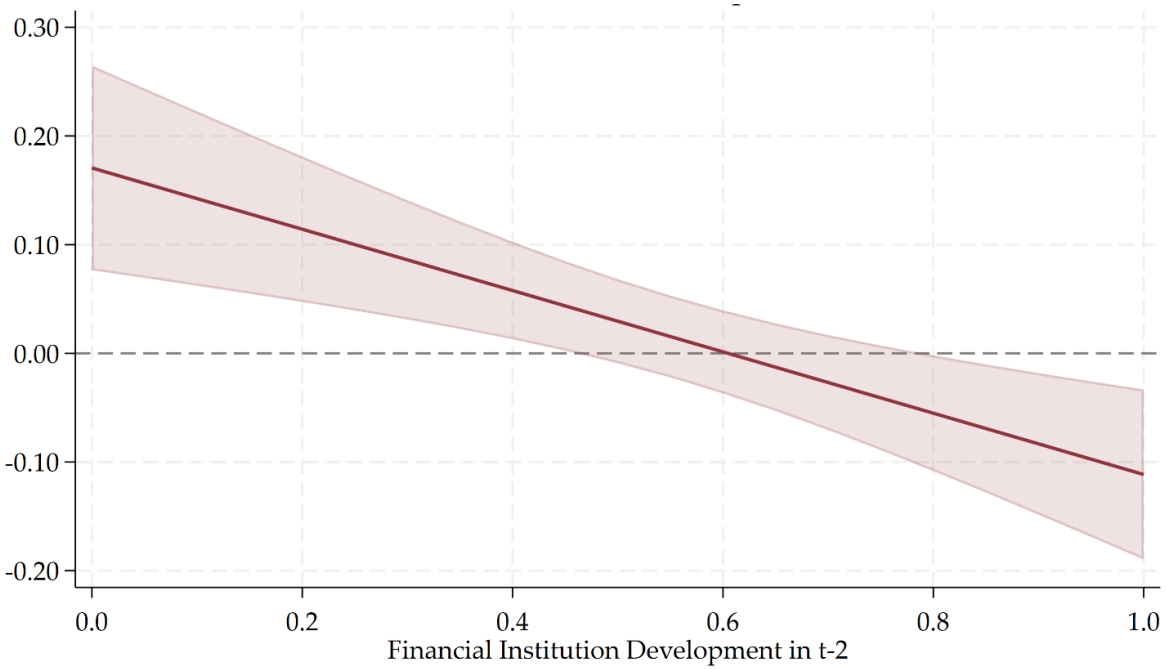


Figure 14. Marginal effect of economic integration on growth across financial-institution development.

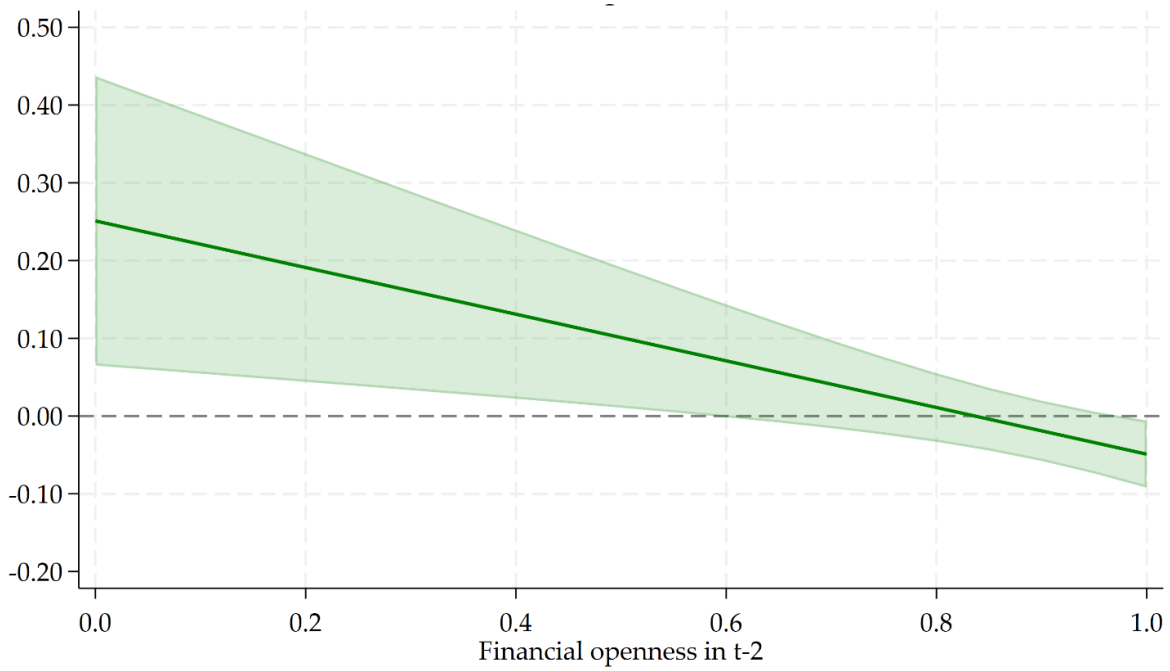


Figure 15. Marginal effect of economic integration on growth across financial openness.

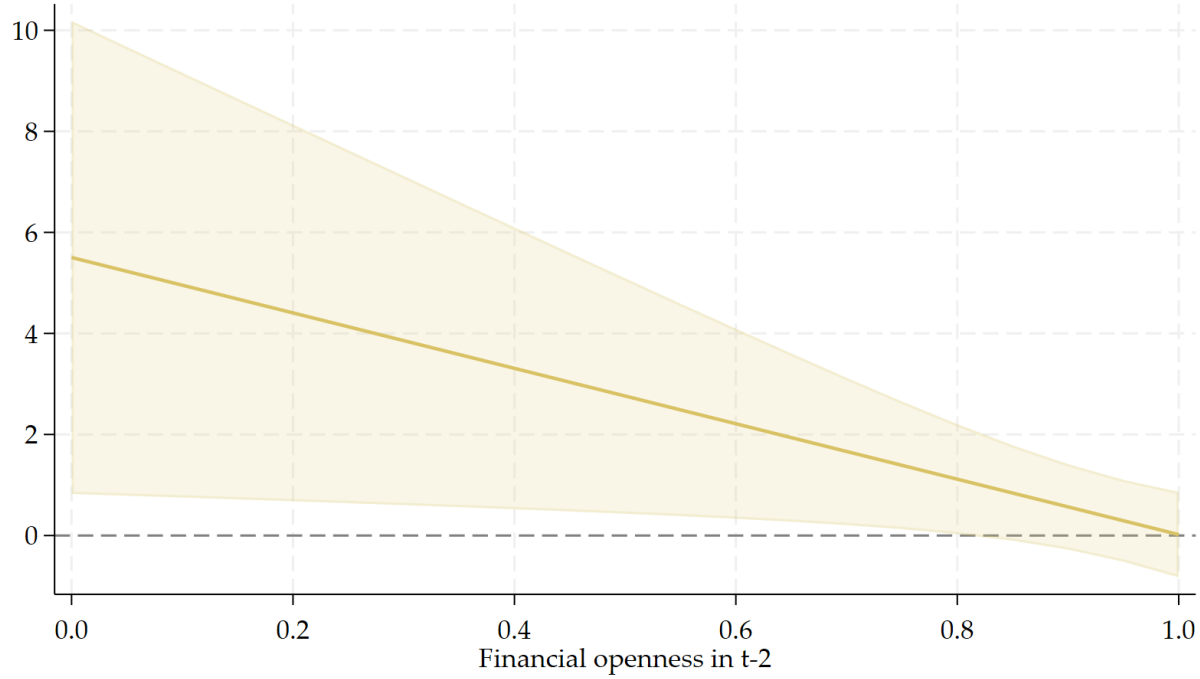


Figure 16. Marginal effect of economic integration on changes in government tax revenue across financial openness.

Notes to Figures 13–16: Figures 13–15 report the marginal effect of EIAs on growth when interacted with financial-market development, financial-institution development, and financial openness, respectively; Figure 16 reports the marginal effect of EIAs on changes in government tax revenue when interacted with financial openness. The moderators are normalized to the [0, 1] interval and lagged two years. Shaded bands are 95 percent confidence intervals.

A direct extension of the empirical work would be to add de jure and de facto financial-openness indicators and interact them with institutional capacity, human capital, and GeoC. That would allow the paper to distinguish more clearly between domestic financial development and cross-border financial integration.

5. Concluding remarks and policy implications

This paper asks why openness has been a powerful catalyst for catch-up growth in some economies but has coincided with stalled convergence or divergence in others. Extending the dynamic growth framework of the Asia-focused companion paper (Aizenman and Saadaoui, 2026) to a global panel of up to 145 economies over 1960–2024, the analysis shows that openness is best understood as a set of complementarities rather than as a single policy variable.

Three conclusions emerge. First, the conventional correlates of growth remain robust: conditional convergence is present on average, investment is strongly associated with subsequent growth, population scale matters, and inflation tends to reduce growth. These findings are stable across bias-corrected dynamic fixed effects, two-way fixed effects with clustered standard errors, and Driscoll–Kraay inference.

Second, the growth payoff from investment is state-contingent. Better institutions, higher human capital, stronger state capacity, and more resilient external positioning increase the likelihood that investment becomes productive capital and productivity growth rather than temporary demand stimulus or rent extraction.

Third, openness is most valuable when it generates learning, diversification, and network resilience. The economic integration variable alone is not a sufficient predictor of growth, whereas the geoeconomic positioning measures show that diversified links across geopolitical space can strengthen the investment-growth channel and reduce dependence on inherited growth momentum.

Commodity dependence illustrates the opposite case. Commodity booms can produce short-run accelerations, but the weaker persistence of growth in high-dependence economies suggests that bonanzas often fail to become durable takeoffs unless they are accompanied by diversification, institutional deepening, and human-capital accumulation.

The quantile results further show that convergence is not uniform. In the lower tail of the growth distribution, convergence forces are weak, consistent with poverty traps, conflict exposure, demographic pressures, or institutional bottlenecks. In the upper tail, convergence becomes strong and the implied half-life of income gaps falls sharply, indicating that once complementary conditions are in place, distance from the frontier can become an engine of rapid catch-up. These findings qualify the optimism associated with the Flying Geese and Leading Dragon narratives. Sequential industrial relocation remains possible, but it is not automatic.

The replication of China's takeoff is unlikely for most medium-sized economies under current fragmentation, especially when supply chains are increasingly shaped by security concerns, industrial policy, and geopolitical alignment. The policy message is therefore pragmatic. Governments seeking to benefit from openness should focus on the domestic and external conditions that make openness growth-enhancing: human-capital formation, credible institutions, effective public infrastructure, macroeconomic stability, prudential financial regulation, and diversified trade and financial links.

Two forward-looking issues deserve special attention. The first is demography. In Sub-Saharan Africa, high fertility can make human-capital deepening more difficult because each cohort entering school is large relative to fiscal and administrative capacity. In parts of Asia and Europe, lower

fertility eases education per cohort but creates ageing pressures and potential labor-supply constraints. The second issue is conflict and fragmentation. Persistent conflict, sanctions, and geopolitical instability can dominate the growth process by interrupting investment, weakening state capacity, and severing trade and financial relationships. Future work should incorporate explicit measures of conflict exposure, sanctions, and geoeconomic fragmentation into the growth framework.

Future empirical extensions should also distinguish more sharply between trade openness, financial openness, and domestic financial development. Adding direct measures of capital-account openness, cross-border financial flows, and banking-sector depth would help identify when finance complements trade-led structural change and when it becomes a channel of vulnerability. Overall, the evidence supports a conditional view of openness. Openness matters most when it is embedded in a development strategy that builds capabilities, diversifies exposure, and preserves resilience in a fragmented global economy.

References

Aiyar, S., & Ohnsorge, F. (2024). Geoeconomic fragmentation and "connector" countries. CEPR Discussion Paper No. 19352.

Akamatsu, K. (1961). A theory of unbalanced growth in the world economy. Weltwirtschaftliches Archiv, 196-217.

Akamatsu, K. (1962). A historical pattern of economic growth in developing countries. The Developing Economies (March-August 1962), 1-25.

Aizenman, J., Ito, H., & Saadaoui, J. (2026). Economic integration agreements and growth: Dynamic evidence from switching treatments. SSRN.

Aizenman, J., & Noy, I. (2009). Endogenous financial and trade openness. Review of Development Economics, 13(2), 175–189.

Aizenman, J., & Saadaoui, J. (2026). Openness and Comparative Advantages: Asian Successes and Failures. Presented at the ADBI annual conference.

Ang, Y. Y. (2018). Domestic flying geese: Industrial transfer and delayed policy diffusion in China. The China Quarterly, 234, 420–443.

Bolt, J., & Van Zanden, J. L. (2025). Maddison-style estimates of the evolution of the world economy: A new 2023 update. Journal of Economic Surveys, 39(2), 631-671.

Boullenois, C., & Jordan, C. A. (2024). How China's overcapacity holds back emerging economies. Rhodium Group.

Breitung, J., Kripfganz, S., & Hayakawa, K. (2022). Bias-corrected method of moments estimators for dynamic panel data models. Econometrics and Statistics, 24, 116-132.

Bruno, G. S. F. (2005). Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models. Economics Letters, 87(3), 361–366. https://doi.org/10.1016/j.econlet.2005.01.005

Egger, P., & Larch, M. (2008). Interdependent preferential trade agreement memberships: An empirical analysis. Journal of International Economics, 76(2), 384-399.

Feenstra, R. C., Inklaar, R., & Timmer, M. P. (2015). The next generation of the Penn World Table. American Economic Review, 105(10), 3150-3182.

Galor, O. (2011). Unified growth theory. Princeton University Press.

Gerschenkron, A. (1962). Economic backwardness in historical perspective. Harvard University Press, Cambridge, MA.

Hanson, J. K., & Sigman, R. (2021). Leviathan's latent dimensions: Measuring state capacity for comparative political research. The Journal of Politics, 83(4), 1495-1510.

Larch, M. (2024). Mario Larch's Regional Trade Agreements Database, Readme-RTA, version July 12, 2024. University of Bayreuth.

Lin, J. Y. (2012). From flying geese to leading dragons: New opportunities and strategies for structural transformation in developing countries. Global Policy, 3(4), 397–409.

Machado, J. A., & Santos Silva, J. (2019). Quantiles via moments. Journal of Econometrics, 213(1), 145–173.

Müller, K., Xu, C., Lehbib, M., & Chen, Z. (2025). The global macro database: A new international macroeconomic dataset (No. w33714). National Bureau of Economic Research.

Parente, S. L., & Prescott, E. C. (2005). A unified theory of the evolution of international income levels. In P. Aghion & S. N. Durlauf (Eds.), Handbook of Economic Growth (Vol. 1, pp. 1371–1416). Elsevier.

PRS Group. (2022). International Country Risk Guide methodology. The PRS Group.

Appendix A. Variable definitions, sources and country lists

Table A1. Variable definitions and sources

Variable	Definition	Transformation	Source
Real GDP Growth	Real Gross Domestic Product in Millions of USD	Growth rate	Global Macro Database: https://www.globalmacrodata.com/
Real GDP	Real Gross Domestic Product in Millions of USD	Log	Global Macro Database: https://www.globalmacrodata.com/
Investment	Total Investment as % of GDP	None	Global Macro Database: https://www.globalmacrodata.com/
Population	Population in millions of inhabitants	Log	Global Macro Database: https://www.globalmacrodata.com/
Population Growth	Population in millions of inhabitants	Growth rate	Global Macro Database: https://www.globalmacrodata.com/
Inflation	Consumer Price Index, 2010 = 100	Growth rate	Global Macro Database: https://www.globalmacrodata.com/
Economic Integration	Regional Trade Agreements	Cumulative number of Economic Integration Agreements	Mario Larch's website: https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html EIA is defined under Article V of the General Agreement on Trade in Services: https://www.wto.org/english/docs_e/legal_e/gats_e.htm#articleV
Institutional Score	Political Risk: 12 Dimensions	Sum	PRS Group: https://www.prsgroup.com/
Human Capital	Human capital index	None	Penn World Table: https://www.rug.nl/ggdc/productivity/pwt/

Countries included in column (1) of Table 2:

1. Afghanistan, 2. Albania, 3. Algeria, 4. Armenia, 5. Australia, 6. Austria, 7. Azerbaijan, 8. Bangladesh, 9. Belgium, 10. Benin, 11. Bosnia and Herzegovina, 12. Botswana, 13. Burkina Faso, 14. Burundi, 15. Cambodia, 16. Cameroon, 17. Canada, 18. Central African Republic, 19. Chad, 20. China, 21. Colombia, 22. Congo, 23. Costa Rica, 24. Cote d'Ivoire, 25. Croatia, 26. Czech Republic, 27. Denmark, 28. Dominican Republic, 29. Ecuador, 30. Egypt, 31. El Salvador, 32. Eritrea, 33. Ethiopia, 34. Finland, 35. France, 36. Gabon, 37. Gambia, 38. Georgia, 39. Germany, 40. Ghana, 41. Greece, 42. Guatemala, 43. Guinea, 44. Guinea-Bissau, 45. Haiti, 46. Honduras, 47. Hong Kong, 48. Hungary, 49. India, 50. Indonesia, 51. Iran, 52. Ireland, 53. Italy, 54. Jamaica, 55. Japan, 56. Jordan, 57. Kazakhstan, 58. Kenya, 59. Kyrgyz Republic, 60. Laos, 61. Latvia, 62. Libya, 63. Madagascar, 64. Malaysia, 65. Mali, 66. Mauritania, 67. Mexico, 68. Moldova, 69. Mongolia, 70. Morocco, 71. Mozambique, 72. Myanmar, 73. Namibia, 74. Nepal, 75. Netherlands, 76. New Zealand, 77. Niger, 78. Nigeria, 79. Norway, 80. Pakistan, 81. Panama, 82. Papua New Guinea, 83. Paraguay, 84. Philippines, 85. Portugal, 86. Qatar, 87. Romania, 88. Rwanda, 89. Saudi Arabia, 90. Senegal, 91. Sierra Leone, 92. Singapore, 93. Slovak Republic, 94. Slovenia, 95. South Africa, 96. South Korea, 97. Spain, 98. Sri Lanka, 99. Sudan, 100. Sweden, 101. Switzerland, 102. Syria, 103. Taiwan, 104. Tajikistan, 105. Tanzania, 106. Thailand, 107. Togo, 108. Tunisia, 109. Turkey, 110. Turkmenistan, 111. Uganda, 112. United Arab Emirates, 113. United Kingdom, 114. United States, 115. Uruguay, 116. Uzbekistan, 117. Venezuela, 118. Yemen Arab Republic, 119. Zambia

Countries included in column (2) of Table 2:

1. Afghanistan, 2. Albania, 3. Algeria, 4. Angola, 5. Argentina, 6. Armenia, 7. Australia, 8. Austria, 9. Azerbaijan, 10. Bangladesh, 11. Belarus, 12. Belgium, 13. Benin, 14. Bolivia, 15. Bosnia and Herzegovina, 16. Botswana, 17. Brazil, 18. Bulgaria, 19. Burkina Faso, 20. Burundi, 21. Cambodia, 22. Cameroon, 23. Canada, 24. Central African Republic, 25. Chad, 26. Chile, 27. China, 28. Colombia, 29. Congo, 30. Costa Rica, 31. Cote d'Ivoire, 32. Croatia, 33. Czech Republic, 34. Democratic Republic of Congo, 35. Denmark, 36. Dominican Republic, 37. Ecuador, 38. Egypt, 39. El Salvador, 40. Eritrea, 41. Ethiopia, 42. Finland, 43. France, 44. Gabon, 45. Gambia, 46. Georgia, 47. Germany, 48. Ghana, 49. Greece, 50. Guatemala, 51. Guinea, 52. Guinea-Bissau, 53. Haiti, 54. Honduras, 55. Hong Kong, 56. Hungary, 57. India, 58. Indonesia, 59. Iran, 60. Iraq, 61. Ireland, 62. Israel, 63. Italy, 64. Jamaica, 65. Japan, 66. Jordan, 67. Kazakhstan, 68. Kenya, 69. Kuwait, 70. Kyrgyz Republic, 71. Laos, 72. Latvia, 73. Lebanon, 74. Lesotho, 75. Liberia, 76. Libya, 77. Lithuania, 78. Macedonia, 79. Madagascar, 80. Malawi, 81. Malaysia, 82. Mali, 83. Mauritania, 84. Mexico, 85. Moldova, 86. Mongolia, 87. Morocco, 88. Mozambique, 89. Myanmar, 90. Namibia, 91. Nepal, 92. Netherlands, 93. New Zealand, 94. Nicaragua, 95. Niger, 96. Nigeria, 97. Norway, 98. Pakistan, 99. Panama, 100. Papua New Guinea, 101. Paraguay, 102. Peru, 103. Philippines, 104. Poland, 105. Portugal, 106. Qatar, 107. Romania, 108. Russia, 109. Rwanda, 110. Saudi Arabia, 111. Senegal, 112. Sierra Leone, 113. Singapore, 114. Slovak Republic, 115. Slovenia, 116. Somalia, 117. South Africa, 118. South Korea, 119. Spain, 120. Sri Lanka, 121. Sudan, 122. Sweden, 123. Switzerland, 124. Syria, 125. Taiwan, 126. Tajikistan, 127. Tanzania, 128. Thailand, 129. Togo, 130. Tunisia, 131. Turkey, 132. Turkmenistan, 133. Uganda, 134. Ukraine, 135. United Arab Emirates, 136. United Kingdom, 137. United States, 138. Uruguay, 139. Uzbekistan, 140. Venezuela, 141. Vietnam, 142. Yemen Arab Republic, 143. Zambia

Countries included in column (3) of Table 2:

1. Afghanistan, 2. Albania, 3. Algeria, 4. Angola, 5. Anguilla, 6. Argentina, 7. Armenia, 8. Australia, 9. Austria, 10. Azerbaijan, 11. Bangladesh, 12. Belarus, 13. Belgium, 14. Benin, 15. Bolivia, 16. Bosnia and Herzegovina, 17. Botswana, 18. Brazil, 19. Bulgaria, 20. Burkina Faso, 21. Burundi, 22. Cambodia, 23.

Cameroon, 24. Canada, 25. Central African Republic, 26. Chad, 27. Chile, 28. China, 29. Colombia, 30. Congo, 31. Costa Rica, 32. Cote d'Ivoire, 33. Croatia, 34. Czech Republic, 35. Democratic Republic of Congo, 36. Denmark, 37. Dominican Republic, 38. Ecuador, 39. Egypt, 40. El Salvador, 41. Eritrea, 42. Ethiopia, 43. Finland, 44. France, 45. Gabon, 46. Gambia, 47. Georgia, 48. Germany, 49. Ghana, 50. Greece, 51. Guatemala, 52. Guinea, 53. Guinea-Bissau, 54. Haiti, 55. Honduras, 56. Hong Kong, 57. Hungary, 58. India, 59. Indonesia, 60. Iran, 61. Iraq, 62. Ireland, 63. Israel, 64. Italy, 65. Jamaica, 66. Japan, 67. Jordan, 68. Kazakhstan, 69. Kenya, 70. Kuwait, 71. Kyrgyz Republic, 72. Laos, 73. Latvia, 74. Lebanon, 75. Lesotho, 76. Liberia, 77. Libya, 78. Lithuania, 79. Macedonia, 80. Madagascar, 81. Malawi, 82. Malaysia, 83. Mali, 84. Mauritania, 85. Mexico, 86. Moldova, 87. Mongolia, 88. Montserrat, 89. Morocco, 90. Mozambique, 91. Myanmar, 92. Namibia, 93. Nepal, 94. Netherlands, 95. New Zealand, 96. Nicaragua, 97. Niger, 98. Nigeria, 99. Norway, 100. Pakistan, 101. Panama, 102. Papua New Guinea, 103. Paraguay, 104. Peru, 105. Philippines, 106. Poland, 107. Portugal, 108. Qatar, 109. Romania, 110. Russia, 111. Rwanda, 112. Saudi Arabia, 113. Senegal, 114. Sierra Leone, 115. Singapore, 116. Slovak Republic, 117. Slovenia, 118. Somalia, 119. South Africa, 120. South Korea, 121. Spain, 122. Sri Lanka, 123. Sudan, 124. Sweden, 125. Switzerland, 126. Syria, 127. Taiwan, 128. Tajikistan, 129. Tanzania, 130. Thailand, 131. Togo, 132. Tunisia, 133. Turkey, 134. Turkmenistan, 135. Uganda, 136. Ukraine, 137. United Arab Emirates, 138. United Kingdom, 139. United States, 140. Uruguay, 141. Uzbekistan, 142. Venezuela, 143. Vietnam, 144. Yemen Arab Republic, 145. Zambia

Appendix B. Further details on the econometric methodology

Table B1. Overview of the three estimators used in the baseline analysis.

Estimator	Core idea and econometric form	Bias correction / SE structure	Advantages	Limitations / remarks
Bias-corrected dynamic FE (xtdpdbc)	Dynamic panel estimator based on Bruno (2005) and Breitung, Kripfganz, and Hayakawa (2022). Estimates a fixed-effects model with lagged dependent variable and corrects the small-T bias analytically.	Analytical or iterative bias correction for the Nickell bias; cluster-robust standard errors.	Consistent and efficient for long or moderately long panels without requiring GMM. Avoids instrument proliferation. Retains two-way fixed effects and allows unbalanced data.	Requires sufficient time dimension ($T \geq 20$) and assumes weak exogeneity of regressors. Computationally heavier with many dummies but stable in our panel (1960–2024).
Two-way fixed effects (TWFE) with clustered SE (reghdfe)	Standard within transformation with country and period fixed effects.	Cluster-robust SEs by country (handles heteroskedasticity and serial correlation within countries).	Transparent baseline; easy to interpret; robust to country-specific heterogeneity and global shocks (absorbed by FE).	The coefficient on $g_{i,t-1}(\varphi)$ is slightly biased downward when T is small (Nickell bias). Consistency relies on long T.
Two-way FE with Driscoll–Kraay SE (xtscc)	Same structural equation as TWFE, but inference uses Driscoll–Kraay covariance matrix (lag 3). Allows for cross-sectional dependence and serial correlation.	Bias-robust point estimates; Driscoll–Kraay SEs account for spatial and temporal dependence in errors.	Reliable inference when countries experience correlated shocks (e.g., oil crises, GFC, COVID-19). Complements clustered SE results.	Point estimates are identical to TWFE, but DK SEs require balanced panels and are asymptotic in T.

Appendix C. Heterogeneous marginal effects across moderators

Figures 17–23 report the marginal effects implied by the interaction specifications corresponding to Table 2. Each figure focuses on one coefficient from the baseline model and reports estimates from nine separate interaction specifications that differ only by the moderator. The horizontal axis reports the moderator normalized to the [0, 1] interval, while the vertical axis reports the corresponding marginal effect on growth. The dashed horizontal line marks the 0 threshold.

The full sample spans 1960–2024, but effective time coverage and sample size vary across moderators because of data availability. The fuel-exports specification uses $N = 5{,}516$ observations over 1962–2024. The institutions and religious-tensions specifications each use $N = 4{,}399$ observations over 1984–2023. The human-capital specification uses $N = 6{,}558$ observations over 1962–2023. The geoeconomic-connectedness specification uses $N = 2{,}941$ observations over 2002–2023. The financial-markets and financial-institutions specifications each use $N = 5{,}099$ observations over 1980–2021. Finally, the age-dependency and old-age-dependency specifications each use $N = 7{,}179$ observations over 1962–2024.

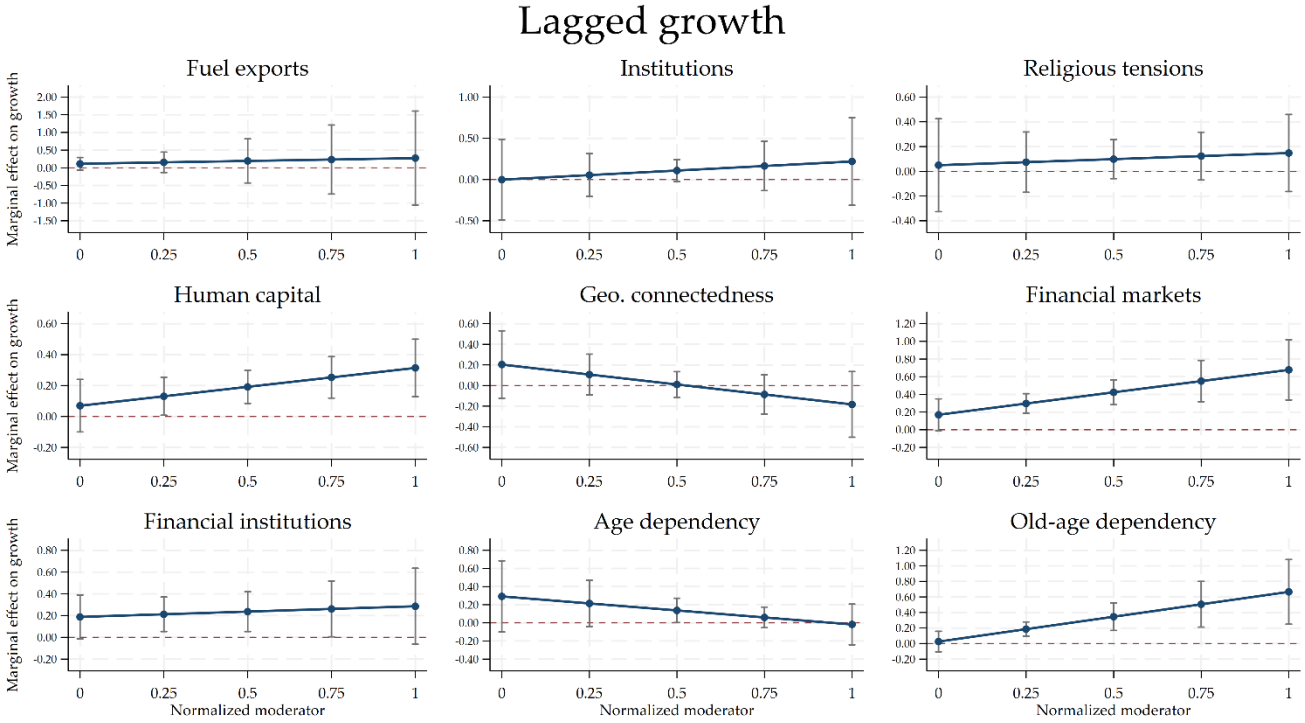
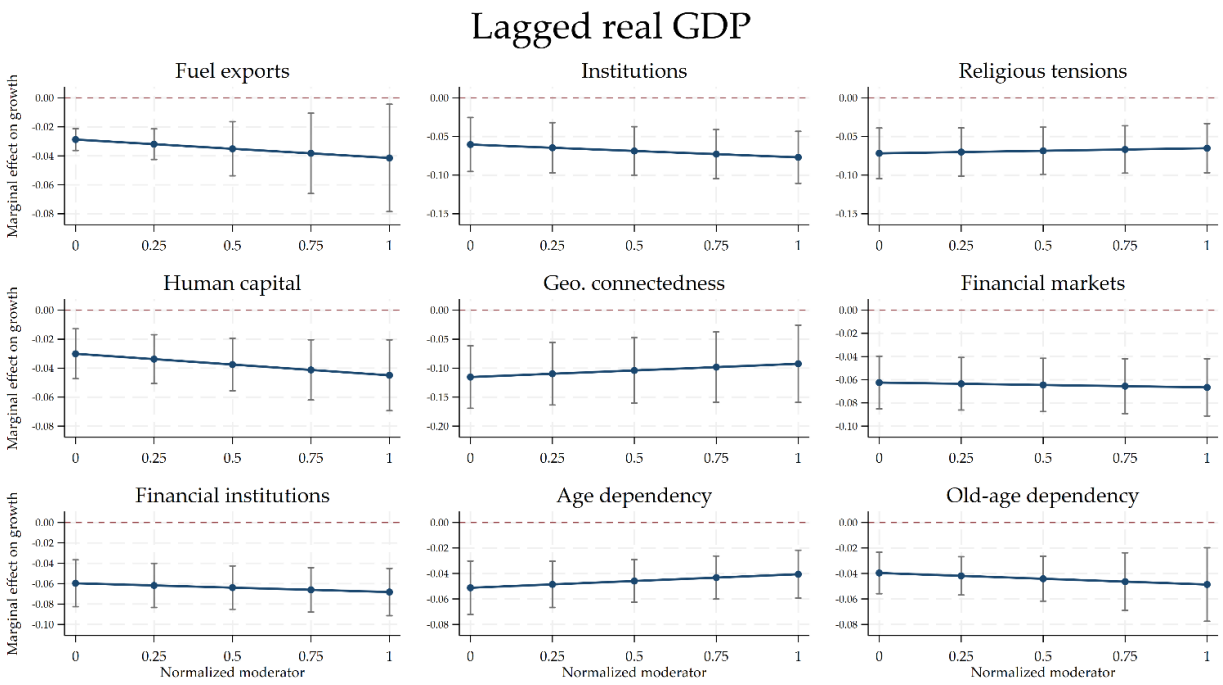
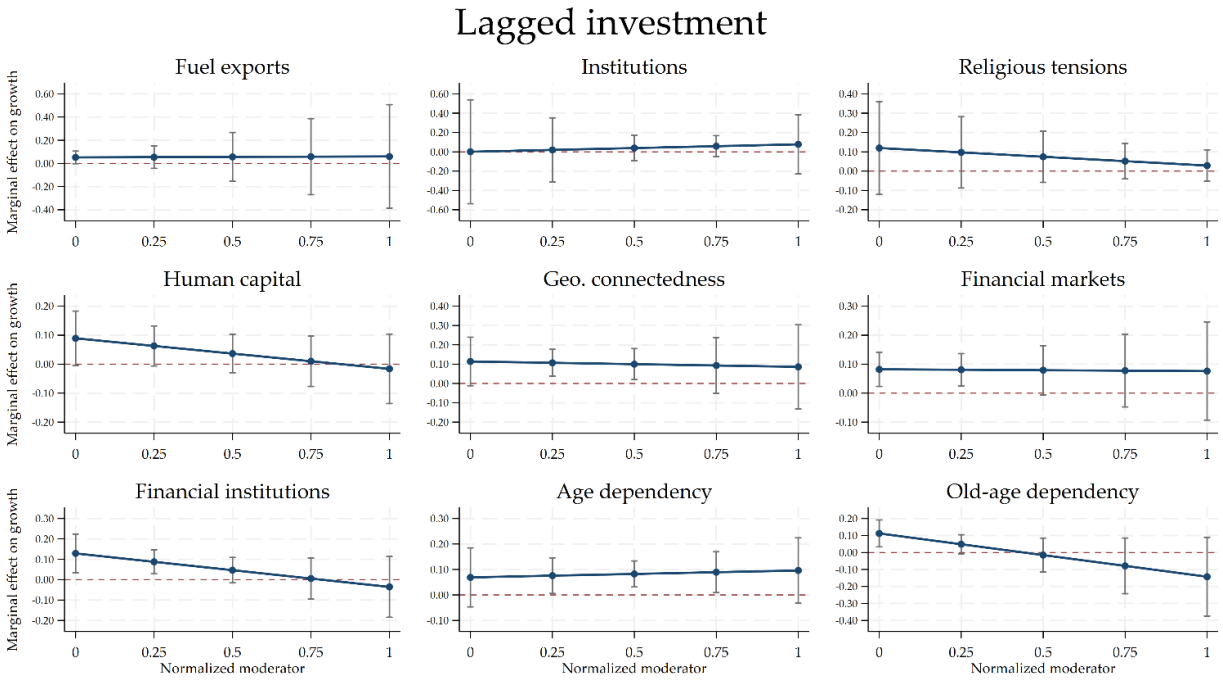


Figure 17. Marginal effects of lagged growth across moderators.



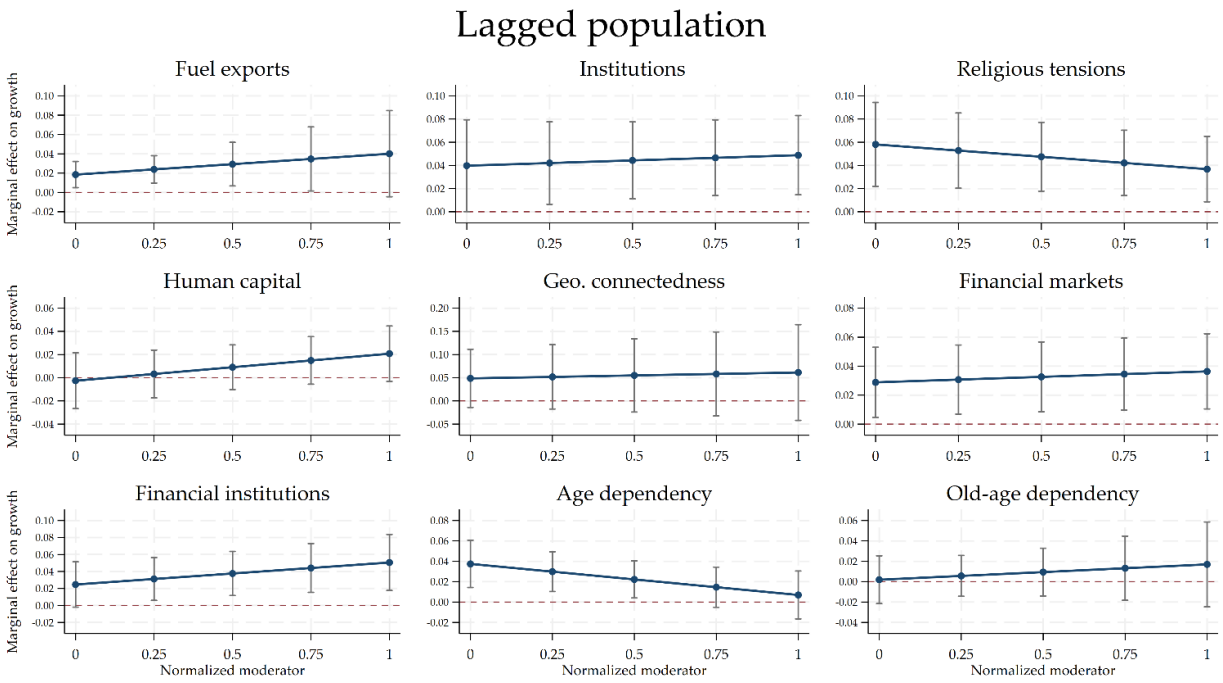
The convergence coefficient is similar across moderators.
Each panel reports the same baseline coefficient from Table 2, re-estimated in 9 separate interaction models with different moderators.

Figure 18. Marginal effects of lagged real GDP across moderators.



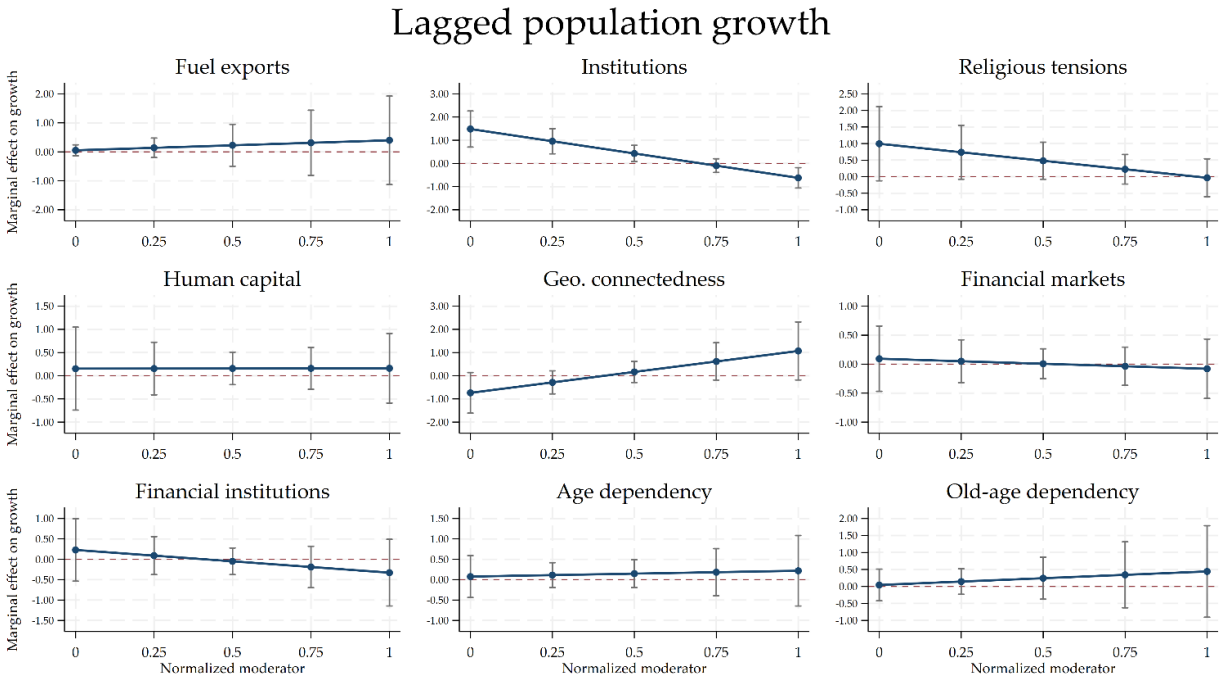
Investment is growth-enhancing for intermediate levels of geoconomic connectedness, in younger countries, and for low levels of financial development.
Each panel reports the same baseline coefficient from Table 2, re-estimated in 9 separate interaction models with different moderators.

Figure 19. Marginal effects of lagged investment across moderators.



Better insitutions and financial markets, along with a younger population make the marginal effect of the population level on growth stronger.
Each panel reports the same baseline coefficient from Table 2, re-estimated in 9 separate interaction models with different moderators.

Figure 20. Marginal effects of lagged population across moderators.



The effect of population growth is similar accross moderators. Expect for different levels of institutions.
Each panel reports the same baseline coefficient from Table 2, re-estimated in 9 separate interaction models with different moderators.

Figure 21. Marginal effects of lagged population growth across moderators.

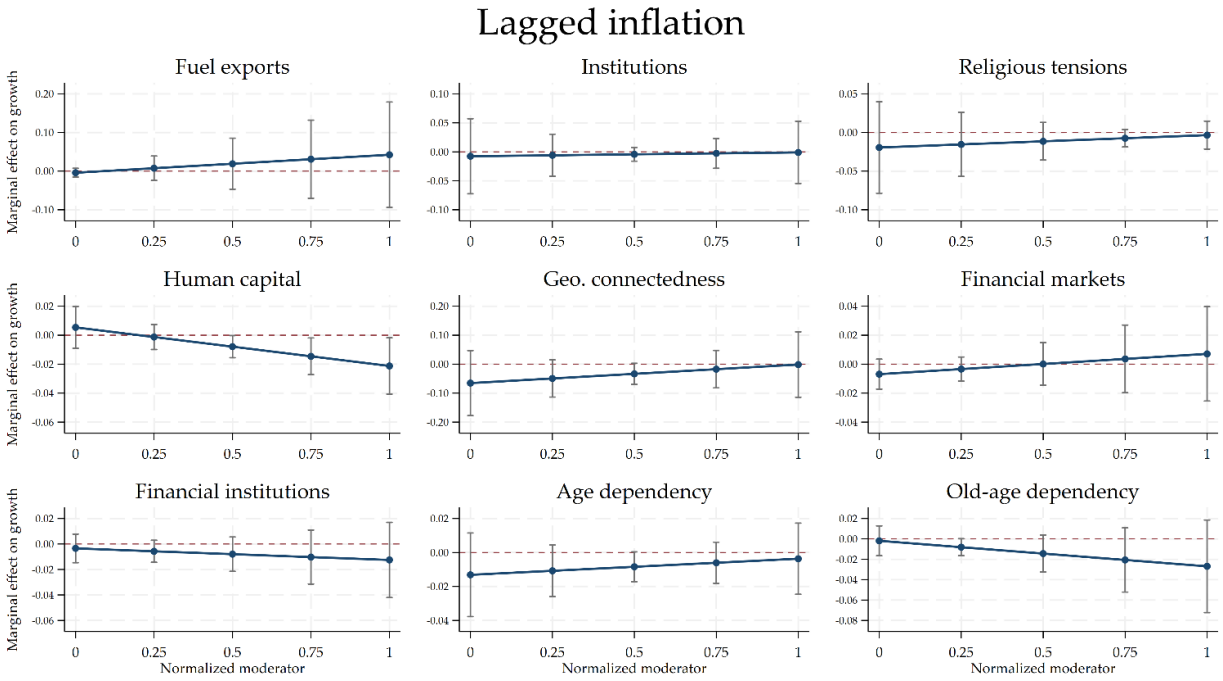


Figure 22. Marginal effects of lagged inflation across moderators.

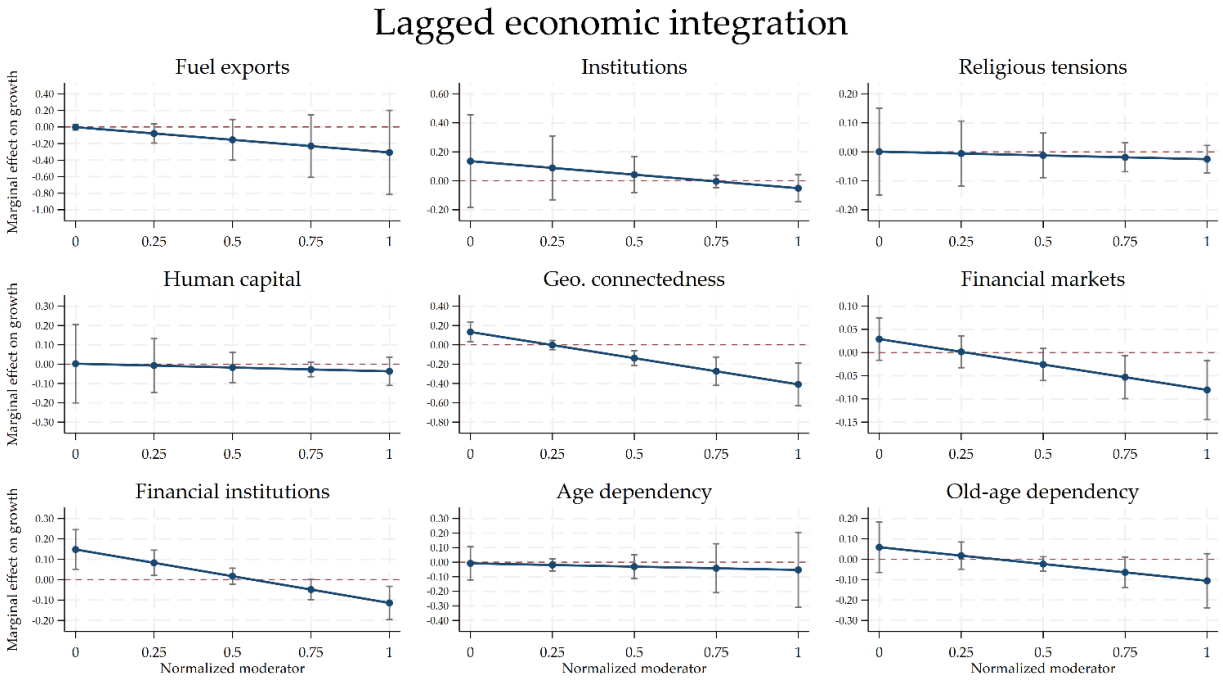


Figure 23. Marginal effects of lagged economic integration across moderators.

Notes to Figures 17–23: Each figure reports one baseline coefficient from Table 2, re-estimated in nine separate interaction models with different moderators. The horizontal axis reports the normalized moderator, and the vertical axis reports the implied marginal effect on growth. The full sample spans 1960–2024, but effective time coverage and sample size vary across moderators because of data availability.

Appendix D. Geoeconomic fragmentation

Table D1 illustrates how reallocating export shares across partners at different geopolitical distances affects geoeconomic vulnerability (GeoV) and geoeconomic connectedness (GeoC).

Table D1. Illustration of vulnerability and connectedness indices.

Partner country	Ideal Point Distance to partner country	Share of exports		
		Scenario 1	Scenario 2	Scenario 3
A	1	0.25	0	0.5
B	2	0.25	0.25	0.25
C	3	0.25	0.25	0.25
D	4	0.25	0.5	0
GeoV		2.5	3.25	1.75
GeoC		1.0	0.8	0.8

Notes: Recalculated and updated from Aiyar and Ohnsorge (2024). A country trades equally with four partners at varying geopolitical distances (ideal-point distances). Reducing the weight of the nearest geopolitical connection (partner country A) raises the vulnerability index (GeoV), whereas reducing the weight of the farthest geopolitical connection (partner country D) lowers GeoV. Connectedness (GeoC) decreases in both cases.

Appendix E. State capacity and institutional score

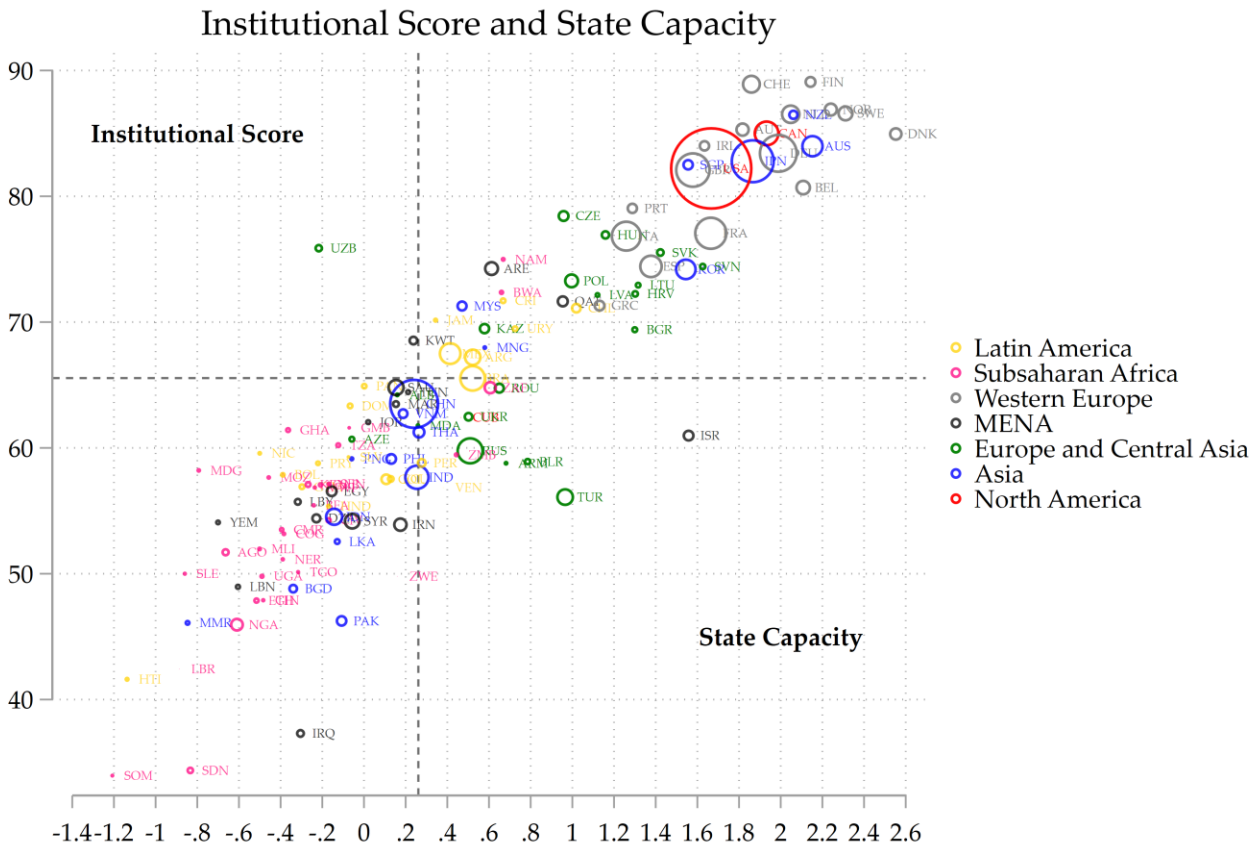


Figure 24. Illustrating the link between state capacity and institutions.

Notes: The state-capacity and institutional-score measures have a strong correlation (above 90 percent). The state-capacity data come from Hanson and Sigman (2021).