Revisiting Nonlinearities in the Quality of Economic Growth Story and the Age Dependency Impact in Africa

by

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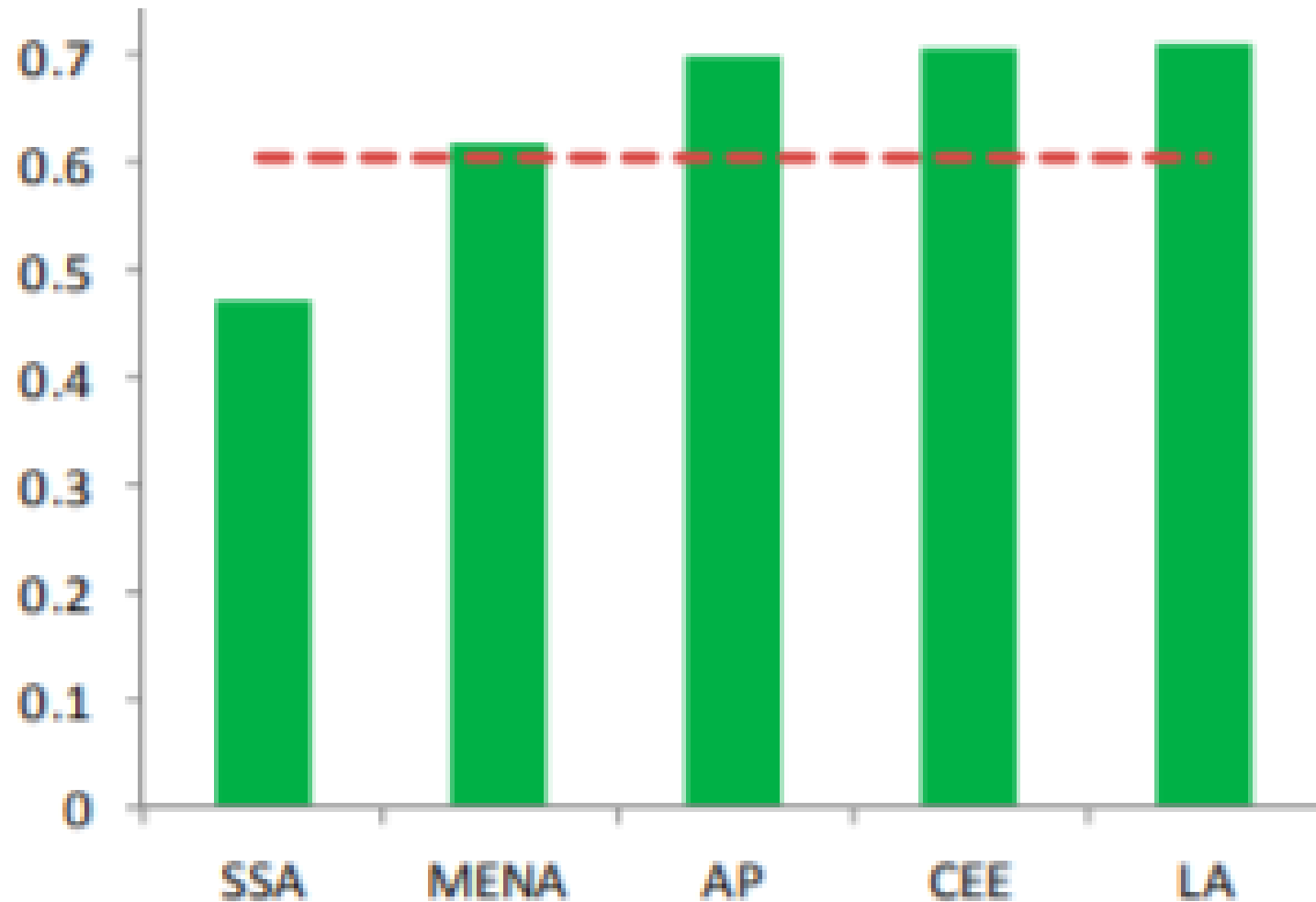
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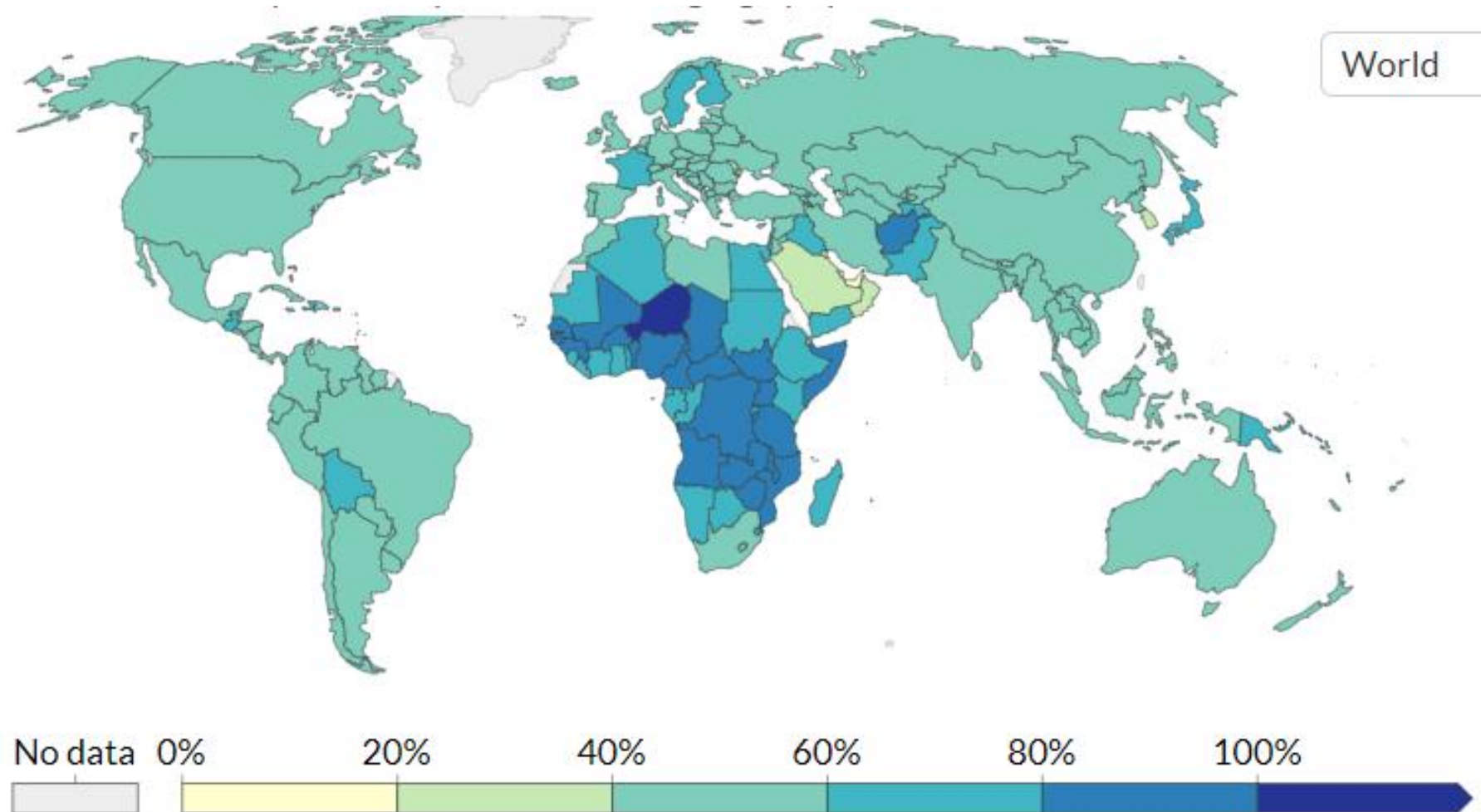
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Outline

- Motivation and Objectives of the Paper

- Research Goals and Contributions to existing literature

- The Empirical Models

- Summary and Interpretations of Results

- Conclusions and Policy Implications

Quality of Growth Index by Region Source: Mlachila et al. 2014

Age Dependency by Region, 2020
Source: Our World in Data

Goals and Contributions

Re-estimate the Quality of Growth Index for African Countries

- Using more current data
- Adding another social outcome variable (poverty) to the index

Investigate the presence of nonlinearities in the Quality of Growth determination accounting for the Age Dependency Ratio

Conceptual Depiction of the *Quality of Growth Index*
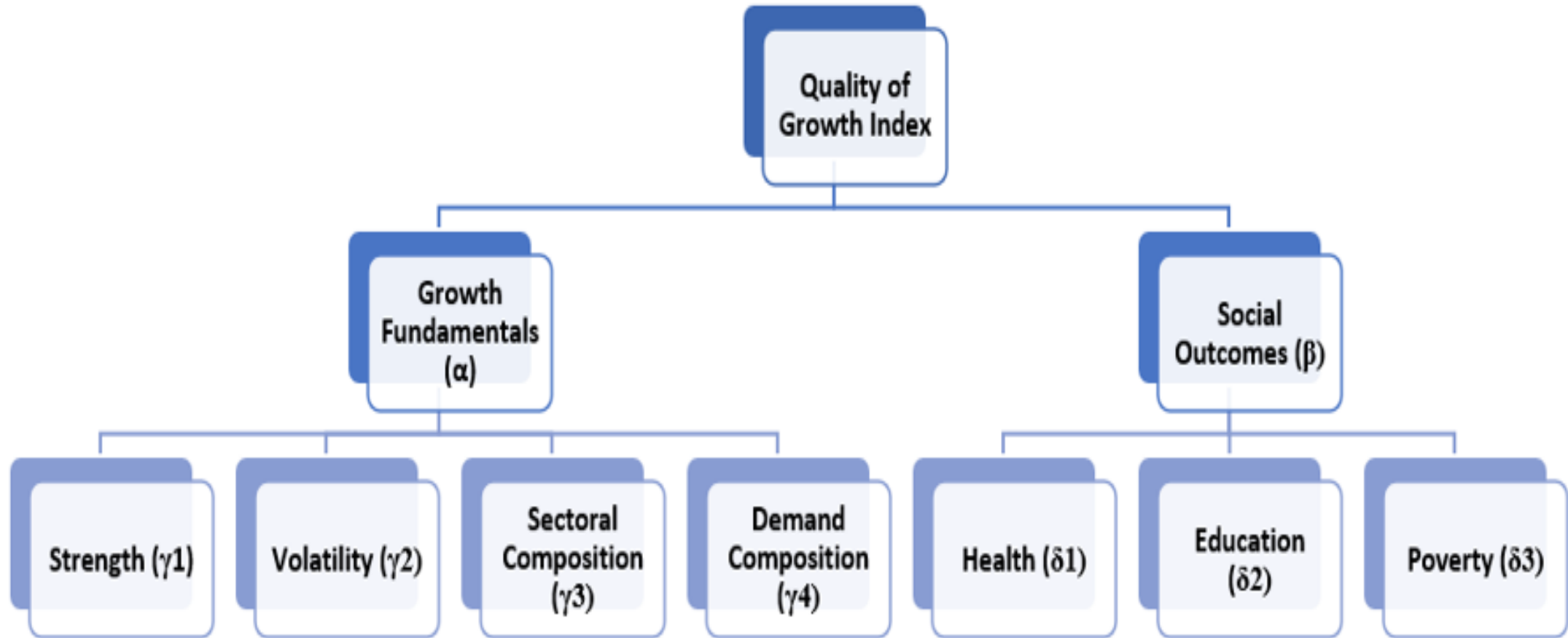
Quality of Growth Index Construction Process

Growth Fundamentals

- **Strength of the economic growth** - growth of real per capita income.
- **Economic stability** - Inverse coefficient of variation (CV) of economic growth (the ratio of the standard deviation and average growth over a five-year rolling average)
- **The sectoral composition (diversification of the sources of growth)** - Herfindahl-Hirschman index (HHI) using exports data.
- **The demand composition (Degree of outward orientation of growth momentum)** - the share of net external demand in GDP.

Social Outcomes

- **Educational outcomes** - Educational index from the Human Development Index.
- **Health** (Mlachila et al. , 2014) - two variables including the inverse infant mortality rate per thousand births and life expectancy at birth from the World Development Indicators.
- **Poverty** - inverse share of the population below the extreme poverty line ($1.90 per day) as an additional measure of inclusive growth.

- Step 1. Use the Min/Max approach to transform all variables
- $V_i = \frac{(X - Xmin)}{(Xmax - Xmin)}$
- Step 2. Find geometric mean for the transformed values for all growth fundamental variables and multiply by 50%
- Step 3. Find geometric mean for the transformed values for all social outcomes variables and multiply by 50%
- Step 3. Add values for step 1 and step 2

Matrix of Average QGI & Growth Compared to Mean

Growth Stars

- Algeria, Botswana, Cabo Verde, Guinea, Mauritius, Morocco, Senegal, Seychelles, Sierra Leone, Tunisia, Zambia

Potential Growth Stars

- Congo, Rep, Côte d'Ivoire, Gabon, Gambia, Madagascar, Niger, South Africa, Zimbabwe
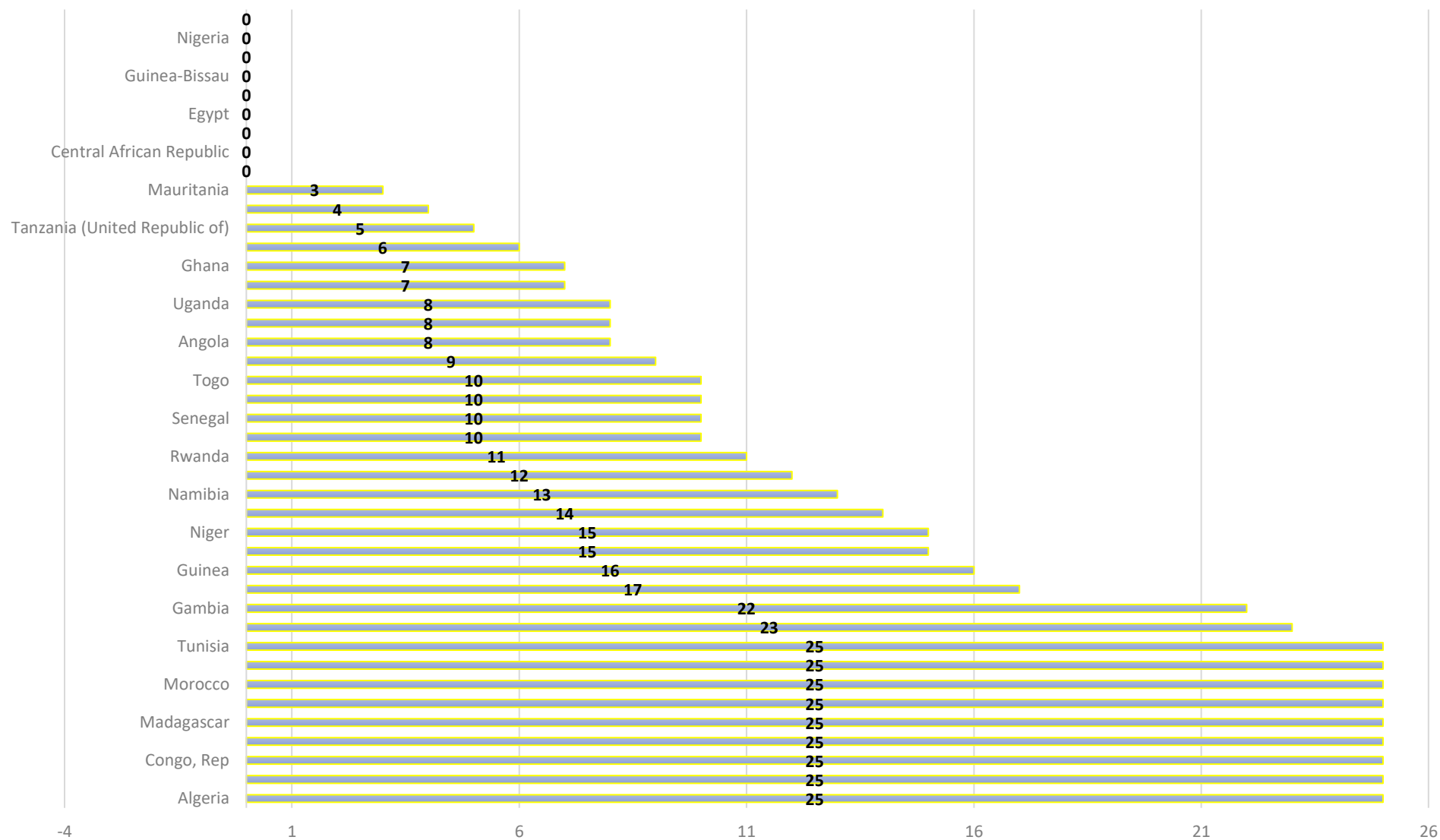
Non-inclusive Growth

- Angola, Benin, Burkina Faso, Cameroon, Chad, Egypt, Eswatini, Ghana, Kenya, Mali, Mozambique, Namibia, Nigeria, Rwanda, Sudan, Tanzania, Uganda

Strugglers

- Central African Republic, Comoros, Congo, Democratic Republic, Guinea-Bissau, Mauritania, Togo

Number of QGI (Geometric Mean) Above the African Average QGI for 1995-2019

Models

- *Dynamic Panel Threshold Analysis (Seo et al.,2019)*

- $QGI_{it} = x'_{it}\beta + (1, x'_{it})\delta 1\{q_{it} > \gamma\} + \mu_{it} + \varepsilon_{it}, \ i = 1, \dots, n; t = 1, \dots, T,$ (2)

  - Where QG_{it} denotes the quality of growth, x_{it} denotes the control variables, which may include the lagged quality of growth proxy, the dependent variable.

  - This baseline dynamic threshold model presented in equation 2 indicates the existence of a discontinuity in the regression function (jump).

- However, the function could be continuous but exhibiting a kink, not a jump in the case where $(1, x'_{it})\delta = k(q_{it} - \Upsilon)$ for some k.

  - This condition occurs when an element of the x_{it} is q_{it} with the coefficient k, and the first element δ equates $-\Upsilon k$.

- Equation 2 transforms into Equation 3:

- $QGI_{it} = x'_{it} + k(q_{it} - \gamma)1\{q_{it} > \gamma\} + \alpha_i + \varepsilon_{it}, i = 1, \dots, n; t = 1, \dots, T.$ (3)

Data & Variables: Five Year Averages (1995-2019)

Dependent Variable

- Quality of growth index (geometric mean)

Threshold Variable

- Age Dependency Ratio

Control Variables

- Official development assistance
- Stock of foreign direct investment
- Personal migrant remittances
- Trade as a % of GDP
- Investments
- Governance
- Financial development
- Government expenditure on education, total (% of GDP)
- Domestic general government health expenditure (% of GDP)

Variable Description and Summary Statistics

| Variable	Description	Mean	Std. dev.	Min	Max
QG	Quality of Growth Index (Arithmetic Mean)	0.30	0.06	0.17	0.49
DEPEN	Age dependency ratio (% of working-age population)	81.29	16.09	41.46	111.54
INFLA	Inflation, GDP deflator (annual %)	7.31	7.13	-0.90	43.64
ODA	Net ODA received (% of GNI)	6.82	6.08	0.09	28.70
REM	Personal remittances, received (% of GDP)	2.81	3.37	0.00	16.98
TRADE	Trade (% of GDP)	67.04	27.48	19.85	162.09
INVEST	Total investment (Expressed as a ratio of total investment in current local currency and GDP in current local currency. Investment or gross capital formation is measured by the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables for a unit or sector)	23.01	9.79	4.05	56.26
FDI	Foreign direct investment: Inward stock, annual US dollars at current prices per capita	608.45	911.06	2.69	4526.52
GEXPED	Government expenditure on education, total (% of GDP)	4.07	1.81	1.01	10.68
GEXHGD	Domestic general government health expenditure (% of GDP)	1.79	1.06	0.26	5.04
GOV	Governance indciator (Using the Min/Max approach and geometric mean of all trasnformed values of Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Qualit, Rule of Law and Conrtol of Corruption)	0.71	0.10	0.49	0.91
FIND	Financial Development Index (Overall)	0.14	0.10	0.00	0.55

Notes: The data denotes five-year averages for the period 1995 to 2019.

Results: Dynamic Panel Threshold Analysis with a Kink

Variable	Coefficient	Standard Error
QG Lag	0.540 ***	0.116
DEPEN	0.006**	0.002
INFLA	-0.012***	0.004
ODA	-0.004	0.005
REM	0.002	0.002
TRADE	0.157***	0.011
INVEST	0.027*	0.156
FDI	0.023***	0.007
GEXPED	-0.054**	0.022
GEXHGDP	-0.015	0.015
GOV	0.068	0.298
FIND	0.005	0.012
Threshold Value (R)	73.71***	2.473
Kink-slope	-0.014***	0.004
P-Value Linearity	0.00***	

Notes: ***, **, and * represent statistical significance at the levels of 1%, 5%, and 10%, respectively. The model is estimated with 1,000 bootstrap replications. All variables are in log-linear format (inflation is in semi-log) apart from the age dependency ratio and the governance indicator.

Estimation results of dynamic panel threshold Kink model (Threshold variable: ln(RED)).
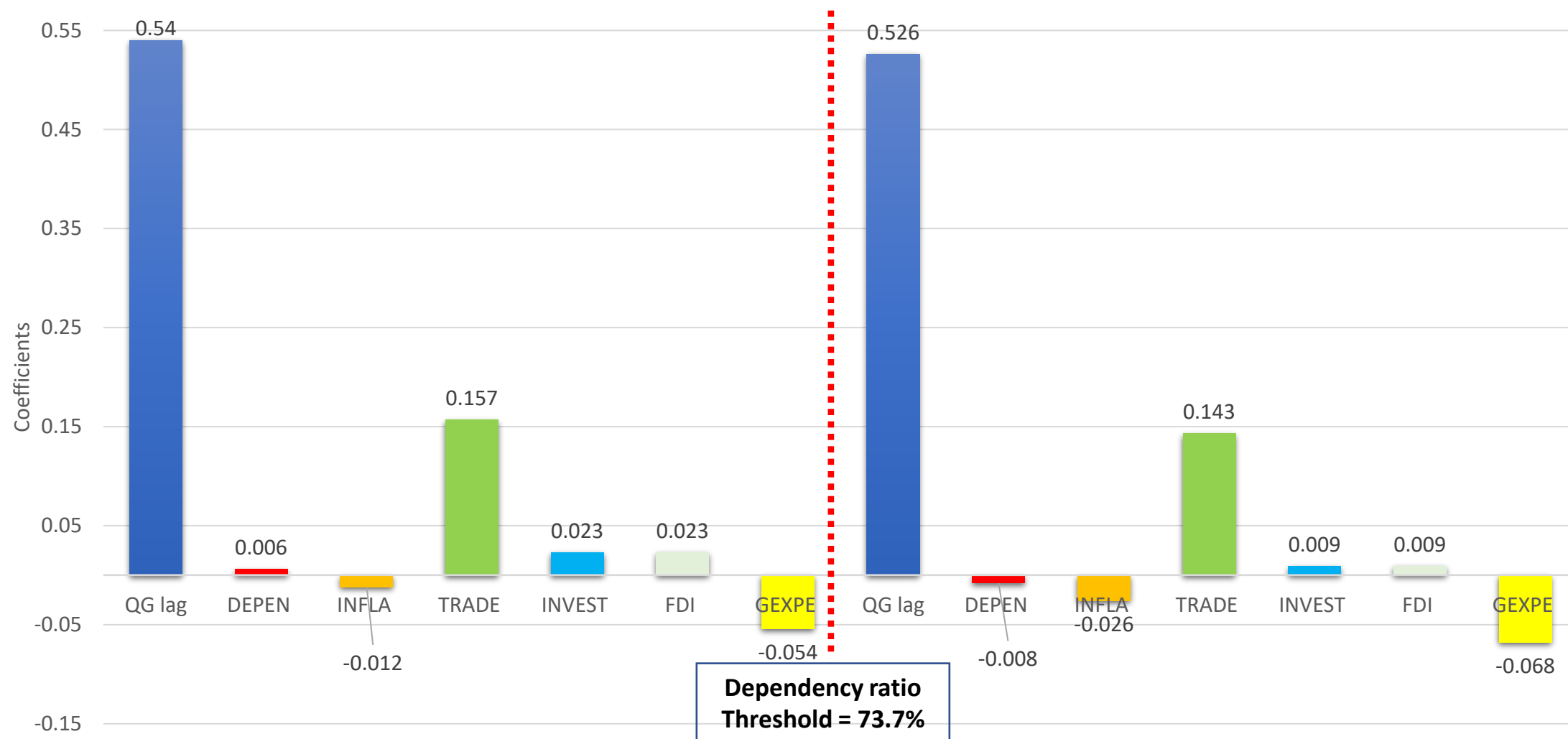
Results Summary

Linearity Test Rejected — > P-Value =0

Dependency Ratio Threshold -> 73.7%

Kink-slope -> -0.014

Impact of the age dependency ratio

- Below Threshold -> 0.6%
- Above Threshold -> -0.8%

Other controls (only significant)

- Positives -> Trade % of GDP; Overall Investment, Stock of FDI
- Negatives -> Inflation, Government expenditure on education, total (% of GDP)

Conclusions

Lower dependency rates can yield positive quality of growth impacts labeled demographic dividend (Bloom et al., 2003).

- The positive growth impact of relatively lower age dependency emanates from the related increases in savings, working hours on a per capita basis, and a reduction in capital dilution.
- The aforementioned dynamic changes increase productivity, increase income growth, reduce poverty, and improve quality of growth.

On the other hand, the impact is negative at dependency rates greater than the estimated threshold.

- This result may be due to lower savings, higher capital dilution, lower productivity, lower tax revenues, higher government spending, higher poverty rates, and higher inequality, which negatively impact the quality of growth.

We also find that openness to trade, foreign direct investment, and overall investment positively impact growth.

- However, the positive impacts are mitigated by relatively higher dependency ratios above the threshold

Negative impacts (Inflation and government educational spending)

Policy Implications

Despite the declining dependency ratio for Africa, policymakers need to implement policies that mitigate the negative impacts of higher dependency ratios.

Further, another area of concern will be the increasing workforce population due to the relatively higher youth dependency ratio.

Without a complementary adequate and sustainable jobs created to take advantage of the future possible burgeoning labor force, which can cause severe economic and socio-economic issues and further deteriorate the quality of growth.

Last, to improve the quality of growth, policymakers may enact policies that increase trade openness, foreign direct investments, and overall investment and keep inflation in check.

Limitations of Study and Possible Future Direction

The impact of the age dependency ratio may depend on the stage of quality of growth.

Therefore, future studies should investigate the differential impact by income groups (low vs. medium and high-income groups) classes and quantile regression analysis, which provides a view on the nonlinearity emanating from the dependent variable.

Thus, helping to analyze if the impact of the explanatory variables depends on the income level classification of the country, and or the level of quality of growth quantile.