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The asymmetric puzzle of economic growth spillovers: Iran and South Africa

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Abstract

This study aims to identify the direction, intensity, and persistence of economic growth spillovers between two emerging economies, Iran and South Africa, over the period 1961–2024. "Spillover" is understood here as predictive and average co-movement between the two growth series, not as a structural causal effect. Annual GDP growth rate data for the two countries were collected from the World Bank's World Development Indicators database and analyzed within a bivariate, constant-parameter vector autoregression, using Granger causality tests, forecast error variance decomposition, and impulse response functions. Because both series are stationary in levels, the model was estimated in levels and cointegration tests were not applied. The Granger causality test indicates a unidirectional predictive relationship, significant at the 99% confidence level, running from South Africa's economic growth to Iran's economic growth, while the reverse relationship is not significant. Based on the variance decomposition (ordering: Iran, South Africa), in the long run about 15% of the fluctuations in Iran's growth are associated with South African shocks, whereas the share of Iranian shocks in South Africa's growth fluctuations is estimated at less than 3%. A positive growth shock in South Africa has a positive, short-lived, and transitory effect on Iran's growth, which peaks in the second period and dissipates after about eight periods. These results are conditional on parameter stability, the ordering of the variables, and the absence of common global variables from the model. The findings indicate an asymmetry in growth predictability: past South African growth carries information about Iranian growth, but not the reverse. Given the limited direct trade between the two countries and the omission of oil prices, commodity prices, and Chinese demand from the model, this pattern should not be read as a net causal spillover and may partly reflect common global shocks. Monitoring South Africa's economy as a leading indicator, diversification of Iran's export basket, and use of the institutional capacity of BRICS-Plus are recommended.

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Extended Abstract

1. Introduction

The cross-border transmission of growth shocks has become a central concern of contemporary development economics. In an era of deepening financial integration, expanding South–South trade corridors, and new multilateral frameworks such as BRICS-Plus, understanding the bilateral economic linkages among developing countries has gained growing scientific and policy relevance. Iran and South Africa are two large emerging economies with strategic positions in their regions. Iran is a major hydrocarbon exporter that has operated under prolonged international sanctions, whereas South Africa is the most industrialized economy in Africa and a founding member of BRICS (Besada & Tok, 2014; Marais, 2011). Both economies are rich in natural resources, and both have gone through long periods of external isolation and import-substituting industrialization.

The literature documents growth spillovers within regional groups such as Asia-Pacific, Latin America, Sub-Saharan Africa, and the MENA region (Crosby, 2003; Canova, 2005; Ncube et al., 2014; Hakura, 2004), but the bilateral growth linkage between Iran and South Africa has received little systematic attention. Theoretically, growth shocks can travel through four channels: bilateral trade flows (Krugman, 1993; Frankel & Rose, 1998), co-movement of global commodity prices (Cashin et al., 2014), common external demand shocks from major partners such as China (Kose et al., 2003), and financial contagion and global risk sentiment (Forbes & Rigobon, 2002; Kaminsky & Reinhart, 2000). Because direct trade between Iran and South Africa is small, the study asks whether growth spillovers nevertheless exist, in which direction they run, how strong they are, and how long they last. It addresses three gaps in the existing literature: the absence of a dynamic bilateral analysis based on up-to-date data, the lack of direct analysis of causality and growth spillovers between the two economies, and the neglect of asymmetric absorptive capacity. Time variation in these relationships is acknowledged but is left for future research.

2. Methodology

The study uses annual real GDP growth rates of Iran and South Africa from the World Bank's World Development Indicators for 1961–2024, which gives 64 observations per country (1961 is the first year for which growth is consistently available for both countries). The Phillips–Perron test shows that both series are stationary in levels (test statistics of −4.70 and −4.94). A bivariate, constant-parameter unrestricted vector autoregression (VAR) model in the tradition of Sims (1980) was therefore estimated in levels, with the lag length chosen by information criteria (one lag) and stability verified through the roots of the characteristic polynomial. Because both series are I(0), the Johansen

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cointegration test is not applicable and was not used. Predictive causality was examined with Granger causality tests. Forecast error variance decomposition (Cholesky ordering: Iran, South Africa) and impulse response functions over a 15-period horizon were used to measure the size and persistence of the spillovers.

3. Findings

The Granger causality test reveals a unidirectional predictive relationship from South Africa's economic growth to Iran's economic growth at the 99% confidence level, whereas the reverse relationship has no statistical significance. Because the model is bivariate and omits oil prices, other commodity prices, and Chinese demand, this result indicates predictive content rather than structural causality.

The variance decomposition shows the same asymmetry. In the first period, Iran's growth fluctuations are attributed entirely to its own shocks, which is a mechanical result of the Cholesky ordering. In the long run, South African shocks account for about 15 percent of the fluctuations in Iran's growth, while Iranian shocks explain less than 3% of the fluctuations in South Africa's growth. The impulse response of Iran's growth to a one-standard-deviation shock in South African growth is close to zero in the first period, rises quickly to a peak of about two units in the second period, then declines steadily and becomes negligible from about the eighth period onward. In the opposite direction, South Africa's response to an Iranian shock is small and negative (about −0.3 to −0.4) in the first period, moves toward zero by the third or fourth period, and stays flat afterwards. The impulse responses are point estimates; confidence bands are not reported.

4. Conclusion

The results point to a one-sided asymmetry in growth predictability: past South African growth carries information about Iranian growth, but not the reverse. This is consistent with South Africa being the larger and more diversified economy and with Iran, with its oil-dependent structure and limited trade ties, being more exposed to external shocks; however, given the omitted global variables, it cannot be interpreted as a net causal transmission. Since direct bilateral trade is small, the co-movement most likely passes through global commodity prices of energy and metals, common demand shocks from major partners such as China, and financial linkages among emerging markets. The estimated effect on Iran is positive but short-lived and transitory. The main limitations are constant parameters over a period with major structural breaks, sensitivity to variable ordering, and omitted variables.

The policy implications fall into two groups. Those directly related to the findings: Iranian authorities may monitor leading indicators of the South African economy (platinum-group metal prices, industrial production, interest rates, political risk) as a supplementary early-

warning tool, and reduce exposure to common commodity cycles through export diversification and counter-cyclical foreign-exchange buffers. Complementary measures, derived from the structure of bilateral trade rather than from the VAR, include using the institutional framework of BRICS-Plus to attract investment, strengthening local-currency credit and settlement arrangements, and feasibility studies for joint special economic zones and mining ventures. Future research could extend the analysis with time-varying spillover indices (Diebold–Yilmaz, TVP-VAR), structural-break tests, bootstrapped confidence bands, and global variables such as oil prices and Chinese demand.

Conflict of interest

The authors declared no conflicts of interest.

Ethical considerations

The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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