The International Trade Journal

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uitj20

Is Export Diversification or Export Specialization Responsible for Economic Growth in BRICS Countries?

Sinesipho Siswana & Andrew Phiri

To cite this article: Sinesipho Siswana & Andrew Phiri (2021) Is Export Diversification or Export Specialization Responsible for Economic Growth in BRICS Countries?, The International Trade Journal, 35:3, 243-261, DOI: 10.1080/08853908.2020.1842823

To link to this article: https://doi.org/10.1080/08853908.2020.1842823

Published online: 27 Nov 2020.

Submit your article to this journal

Article views: 363

View related articles

View Crossmark data

Citing articles: 5 View citing articles

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=uitj20

THE INTERNATIONAL TRADE JOURNAL
2021, VOL. 35, NO. 3, 243–261
https://doi.org/10.1080/08853908.2020.1842823

Routledge
Taylor & Francis Group

Check for updates

Is Export Diversification or Export Specialization Responsible for Economic Growth in BRICS Countries?

Sinesipho Siswana and Andrew Phiri

Department of Economics, Faculty of Business and Economic Studies, Nelson Mandela University, Port Elizabeth, South Africa

ABSTRACT
The study investigates whether export diversification or export specialization is more useful toward promoting economic growth in BRICS countries. We estimate a dynamic growth model augmented with trade activity to capture the diversification-concentration trade-off with economic growth for BRICS economies over the period of 1995 to 2017 using FMOLS, DOLS, and PMG estimators. Altogether, we find a positive (negative) relationship between export concentration (diversification) and economic growth in BRICS countries. Further analysis points to a semi-inverted U-shaped diversification schedule, of which the BRICS countries have crossed their "inflexion point" of development and need to re-specialize their export baskets.

KEYWORDS
Export specialization; export diversification; economic growth; BRICS countries

I. Introduction

Recently, international governing bodies such as the World Trade Organization (WTO) and the World Bank (WB) have increasingly stressed the importance of shifting the structure and configuration of international trade in ensuring a successful transition of the global economy into the Fourth Industrial Revolution. At the seat of these recommendations is the notion that the diversification of trade activities is necessary to keep international markets more competitive whilst concurrently promoting economic growth and development. This ideology is in sharp contrast from that preached a few decades ago when the World Bank strongly advocated for trade concentration as a facilitator of growth and development. To recall their 1993 landmark study, the World Bank attributed the "Asian miracle" to the trade specialization activities of the "Asian Tigers," especially in the concentration of manufacturing export products which was promoted by the government's establishment of appropriate marketing institutions (World Bank 1993). Many authors have cited this publication as an advocation for trade concentration as a significant policy objective for enhanced economic development in emerging and developing countries (Balassa 1978; Feder 1983; Fosu 1990;

CONTACT Andrew Phiri phiricandrew@gmail.com Department of Economics, Faculty of Business and Economic Studies, Nelson Mandela University, Port Elizabeth 6031, South Africa
© 2020 Taylor & Francis Group, LLC

Greenaway, Morgan, and Wright 1999; Plumper and Graff 2001; Murshed and Serino 2011; Lee 2011).

The paradigm shift of thinking from export specialization toward trade diversification has been promoted by the fact that many economies, especially in developing regions, focus their scope of production and trade on traditional products (some of which are prone to the "resource curse"), whereas the gist of rapid economic development experienced by the "Asian Tigers" is based on trade activities in the manufacturing industry. The theoretical justifications for shifting trade policies away from export concentration toward export diversification are not difficult to point out in the literature. Firstly, it is believed that export diversification can help curb export instability caused by an inelastic demand for a narrow basket of exports and, consequentially, stabilize export earnings in the long run (Hesse 2008). In this regard, dependence on exporting a limited basket of products has been considered the cause of a slow growth rate and highly volatile exchange rates experienced in developing countries (Herzer and Nowak-Lehnmann 2006). Secondly, it is argued that diversification of trade structures from the production and trade of a primary commodity to manufacturing products will ultimately weaken the long-term dependence of less developed countries on industrialized markets for manufactures (Hamed, Hadi, and Hossein 2014). Thirdly, export diversification generates new production technologies and managerial efficiencies through international competition, thereby leading to increasing returns to scale and spill-over effects which promote growth and development (Hodey, Oduro, and Senadza 2015). All in all, it is believed that developing countries can only exhibit "catch-up" effects to their industrialized counterparts if their trade and production structures are similar, and hence, trade diversification is theorized as the main facilitator of these developmental "catch-up" effects (Linder 1961; Posner 1961; Prebisch 1950; Singer 1950).

In our study, we present a comparative analysis of the effects of trade concentration and diversification on economic growth for the BRICS economies (Brazil, Russia, India, China, and South Africa). The economic bloc was brought into existence by Jim O'Neill in his 2001 Goldman Sachs Global Economics Paper in which he identified this group of countries as the fastest growing emerging economies whose combined global dominance is comparable to that of the elite G7 economies (O'Neill 2001). These countries are considered to be economically important given that they are a combination of rapidly developing economies with strategically important geographical areas spread across the globe (Mostafa and Mahmood 2015). The BRICS countries have caused a reallocation of global economic activities and the global consumption to emerging and developing countries which has caused trade destination shifts (De Castro 2013). Since 2009, the BRICS countries have held annual summits with the most recent meetings placing great emphasis on balancing trade baskets amongst the bloc members and forming a free trade agreement amongst the members. The extent to which the desired increase in intra-BRICS trade activity can provide mutual economic growth benefits amongst the countries could depend on whether these export markets are specialized or diversified. Exempting the work of Naudé, Bosker, and Matthee (2010) and Naudé and Rossouw (2011), studies on the concentration-diversification trade-off for BRICS economies are non-existent as far as we are concerned. Nevertheless, the study of Naudé, Bosker, and Matthee (2010) presents an analysis at the regional level for South Africa, which may not be conducive for policy decisions made at the national level; and the study by Naudé, Bosker, and Matthee (2010) uses data on BRICS countries covering periods prior to the global recession period of 2009 to 2010. In our study, we make use of datasets on export concentration and export diversification covering more recent periods and apply three panel cointegration models (i.e., fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), and pooled mean group (PMG) estimators) to examine whether diversified or concentrated export markets are most beneficial for economic growth within an augmented endogenous growth setting. As part of our sensitivity analysis, we further examine whether the existing asymmetries found in the export concentration/diversification–growth relationship by Naudé, Bosker, and Matthee (2010) for BRICS countries also holds using more recent data.

The rest of the article is structured as follows: Section 2 presents the literature review. Section 3 presents the empirical framework. Section 4 presents the data and unit root tests. Section 5 presents our empirical analysis, and Section 6 concludes the study.

II. Literature review

From a theoretical perspective, the debate on the growth effects of export concentration and export diversification has its roots going as far back as the writing of Ricardo (1817) who advocated for specializing in areas of trade where countries have a comparative advantage over its trading partners. These arguments were specifically advanced by Heckscher (1919), Ohlin (1933), and Krugman (1979) who found that economies of scale in facilitating trade specialization can be gained through the efficient allocation of technology, factor endowments, and increasing returns to scale across sectors. However, Prebisch (1950) and Singer (1950) cautioned economies against an over-concentration of traditional agricultural and mineral products since the price of these primary products relative to that of manufactured goods tends to deteriorate over the long run, which would lead to several structural bottlenecks. The Prebisch-Singer hypothesis is more formally supported by new growth theorists who view the diversification of exports away from primary products into high-skilled, high-technology goods as allowing for more opportunity for endogenous growth due to spillover effects of skills, knowledge, and technological upgrading (Grossman and Helpman 1991).

On the empirical side of the literature, there are a handful of studies which have demonstrated the positive influence of trade diversification on growth. Al-Marhubi (2000) analyzed the relationship between export diversification, export concentration, and economic growth for 91 countries and found that diversification, rather than export concentration, promotes economic growth within the empirical sample. Similarly, Lederman and Maloney (2003) found that both the export concentration index and natural resources exports have a negative effect on per capita income, whilst intra-industry trade contributes significantly toward economic development. Balaguer and Cantavella-Joda (2004) present empirical evidence from a cointegration and causality analysis confirming Spain's progression from "traditional" exports to manufactured and semi-manufactured exports as a key factor behind Spain's economic development. For the Chilean economy, Herzer and Nowak-Lehnmann (2006) estimate an augmented Cobb-Douglas production function using vector error correction model (VECM) and dynamic ordinary least squares (DOLS) estimators to demonstrate that export diversification leads to economic growth via externality effects of "learning-by-doing" and "learning-by-exporting."

Agosin (2008) developed a theoretical model which outlines the growth dynamics in economies that themselves do not innovate but catch up to the technological frontier by adding new activities to production and trade activities. The authors present empirical evidence for 17 Latin American and eight fast-growing Asian economies, depicting how diversification leads to lower export and economic growth volatility which creates a stable environment for real economic development. Hesse (2008) investigates the concentration-diversification trade-off for 99 countries using system generalized method of moments (GMM) estimators and finds a negative and significant estimate on the concentration index whilst manufacturing exports produced a positive and significant effect on growth. Hodey, Oduro, and Senadza (2015) apply the system GMM estimators to an augmented growth regression to validate the positive and significant effect of export diversification on economic growth for 42 Sub-Saharan African (SSA) countries. Önder and Yilmazkuday (2016) investigate the effects of trade partner diversification on income for 83 developing and developed countries. The authors find that the quantity of trade partners, a country's "prestige," and the geodesic distance between trade partners are important hedge factors against country-specific shocks. Further, threshold analysis shows that the growth effects of trade partner diversification are more pronounced in economies characterized by undeveloped financial systems, high inflation rates, and low levels of human capital.

It is, however, interesting to note that the empirical evidence supporting the positive effects of diversification on economic growth is not altogether dominant in the literature as there is a second strand of literature which fails to empirically verify a positive diversification-growth relationship. For instance, De Piñeres and Ferrantino (1997) find that for the Chilean economy, large moves toward export diversification coincide with weak macroeconomic performance. The authors suggest that a policy of deliberate diversification of exports may not be as desirable as the diversification process facilitated through currency valuation and trade liberalization. Matthee, Idsardi, and Krugell (2016) find that the exporting of South African goods and services that are not closely related to the country's specialized products do not contribute much to the country's economic growth. McIntyre et al. (2018) find that export diversification in 34 small countries has a significant effect in reducing output volatility but not in promoting economic growth and development. Similarly, Lee and Zhang (2019) find that whilst export diversification reduces gross domestic product (GDP) volatility for a group of 84 lower-income countries, there is no evidence of export diversification causing economic growth gains. For Asian and EU countries, Blancheton and Chhorn (2018) find that high sectoral diversification in export trade increases inequality whilst high specialization in exporting manufacturing products reduces inequality. More recently, Mania and Rieber (2019) applied GMM estimates to examine the impact of export diversification on growth for three groups of developing countries (i.e., 17 Asian, 21 Sub-Saharan African, and 16 Latin American countries) by examining the structural impact of diversification on the income elasticities of exports and imports and reveal three important insights. Firstly, a re-concentration of exports in more sophisticated products would benefit Asian countries. Secondly, the concentration on current exports in Latin American economies has led to a dependency on imports of manufacturing goods. Lastly, the change in diversification of export composition in SSA countries has not lead to changes in productive structures.

Some of the empirical literature further hypothesizes on a nonlinear, U-shaped (or inverted U-shaped) relationship between export diversification and growth. Imbs and Wacziarg (2003) were amongst the first to identify a U-shaped relationship between sectoral concentration and per capita income whereby countries firstly diversify economic activity equally across sectors, but then reach a point late in the development process where countries begin to specialize again. Conversely, Klinger and Lederman (2006) find that for 100 countries, exports are concentrated during the initial stages of development, whereas in transitioning to a more developed state, economies begin to diversify exports; during the later stages of development, economies begin to re-concentrate their exports. For a sample of 65 countries, Aditya and Acharyya (2013) find that it is only beyond a critical level that export diversification leads to higher growth, whereas below this level, concentration leads to growth. For a sample of 156 countries, Cadot, Carrère, and Strauss-Kahn (2011) find a humped-shaped (inverted U-shaped) relationship between export diversification and growth, with an inflexion point estimated at

25,000 USD per capita GDP; beyond this point, specialization promotes economic growth. Using export data from 354 districts in South Africa, Naudé, Bosker, and Matthee (2010) used localities data to find that it is export specialization in mining and agriculture, as opposed to diversification into other trade sectors, which is beneficial for economic growth. In a rare study for BICS countries (Brazil, India, China, and South Africa) and a study closer to ours, Naudé and Rossouw (2011) use an applied general equilibrium (AGE) model to find a U-shaped relationship between export concentration and growth for China and South Africa, whereas diversification only positively influences economic growth in South Africa. Notably, Naudé and Rossouw (2011) use export data collected for periods between 1962 and 2000, and this data does not cover important structural changes caused by the global financial period of 2007 to 2008 and the global recession period of 2009 to 2010. Our study contributes to the literature by using more recent data to investigate the long-run and short-run cointegration relationship between export concentration/diversification and economic growth for the five BRICS countries.

III. Empirical framework

The dynamic growth theory was initially popularized by neoclassical growth theorists, such as Solow (1956) and Swan (1956), placing strong emphasis on exogenous factors as drivers of steady-state growth. On the other hand, endogenous growth theorists, such as Romer (1986) and Lucas (1988), contended neoclassical growth dynamics by assuming that growth is driven by endogenous factors such as human capital development, increasing returns to scale, innovation, trade openness, and research and development. Using a baseline endogenous growth model presented by Mankiw, Romer, and Well (1992), our growth specification incorporates both physical and human capital into the production function, i.e.,

$$y_t = ak_t^{\alpha} h_t^{\alpha} l_t^{\alpha} \tag{1}$$

where y_t is output production, a is the level of technology, k_t is the physical capital stock, l_t is the stock of labor, and h_t is the measure of the average quality of workers. In log-linearizing Equation (1), we obtain:

$$y = \beta_0 + \beta_1 k + \beta_2 h + \beta_3 l + e_t \tag{2}$$

where β_0, β_i, and e_t are the intercept, regression coefficients, and error terms, respectively. We further augment Regression (3) to include export activity as a possible driver of economic growth, i.e.,

$$y = \beta_0 + \beta_1 k + \beta_2 h + \beta_3 l + \beta_4 x + e_t \tag{3}$$

From the above, the export variable is classified as either being export diversification (x_div) or export concentration (x_con), hence producing the following two empirical regressions:

$$y = \beta_0 + \beta_1 k + \beta_2 h + \beta_3 l + \beta_4 x\_con + e_t \quad (4)$$

$$y = \beta_0 + \beta_1 k + \beta_2 h + \beta_3 l + \beta_4 x\_div + e_t \quad (5)$$

Regressions (4) and (5) represent our empirical growth regressions which are to be estimated using the dynamic OLS (DOLS) and fully modified OLS (FMOLS) techniques described in Kao (1999) and Pedroni (1999, 2004), respectively. Equations (4) and (5) can be compactly written as:

$$y_{it} = \alpha_i + x_{it}'\beta + u_{it} \quad (6)$$

where y_{it} is economic growth, β is a k × 1 vector of slope parameters of growth determinants, α_i are the intercepts, and x_{it}' are integrated processes of order I (1) for all *i* such that:

$$x_{it}' = x_{it-1} + e_{it} \quad (7)$$

The FMOLS estimator is constructed by making corrections for endogeneity and serial correlation to the traditional OLS estimator, i.e.,

$$\widehat{\beta}_{FMOLS} = \left[\sum\nolimits_{i=1}^{N}\sum\nolimits_{t=1}^{T}(x_{it} - \hat{x}_i)'\right]^{-1}\left[\sum\nolimits_{i=1}^{N}\left(\sum\nolimits_{t=1}^{T}(x_{it} - \hat{x}_i\right)\hat{y}_{it}^{+} - T\widehat{\Delta}_{eu}^{+})\right] \quad (8)$$

where $\hat{y}_{it}^{+}$ = y_{it} – $\widehat{\Omega}_{ue}\widehat{\Omega}_e^{-1}\Delta x_{it}$, $\widehat{\Delta}_{eu}^{+}=\widehat{\Delta}_{eu}\widehat{\Omega}_e^{-1}\widehat{\Omega}_{ue}$, and $\widehat{\Delta}_{eu}$ and $\widehat{\Delta}_e$ are kernel estimates of Δ_{eu} and Δ_e. On the other hand, the DOLS estimator, $\widehat{\beta}_{DOLS}$, uses the past and future values of Δx_{it} in Equation (9) as additional regressors, i.e.,

$$y_{it} = \alpha_{\mathrm{i}} + x_{\mathrm{it}}{}'\beta_{\mathrm{D}} + \sum\nolimits_{j=-q}^{q} c_{ij}\Delta \mathrm{x}_{it+j} + \dot{v}_{\mathrm{it}} \quad (9)$$

where:

$$\dot{v} = \mathrm{v}_{\mathrm{it}} + \sum\nolimits_{j>q}^{q} c_{ij}e_{it+j} \quad (10)$$

Since the FMOLS and DOLS panel estimators can only account for the long run, we also apply the pooled mean group (PMG) estimators of Pesaran, Shin, and Smith (1999) which further consider short-run dynamics and the cross-section differences within estimated regressions. We specify the following panel autoregressive distributive lag (P-ARDL) specification:

$$rgdp_{it} = \sum_{j=1}^{p-1} \lambda_{i,j} rgdp_{i,t-j} + \sum_{j=0}^{q-1} \delta_{1i,j}\, x\_con(div)_{i,t-j} + \sum_{j=0}^{q-1} \delta_{2i,j} X_{i,t-j} + \varepsilon_{it} \tag{11}$$

where $\lambda_{i,j}$ and $\delta_{I,j}$ are vector of regression coefficients, X is a vector of endogenous growth determinants (i.e., physical capital stock, human capital, and labor employment), and $\varepsilon_i = (\varepsilon_{i1}, \ldots, \varepsilon_{iT})'$ is a vector of error term. The long-run coefficients and intercept are computed as $\beta_{0i} = \frac{u}{1-\sum_{j=1}^{p-1}\lambda_{i,j}}$, $\beta_{1i} = \frac{\sum_{j=0}^{q-1}\delta_{1i,j}}{1-\sum_{j=1}^{p-1}\lambda_{i,j}}$, and $\beta_{2i} = \frac{\sum_{j=0}^{q-1}\delta_{2i,j}}{1-\sum_{j=1}^{p-1}\lambda_{i,j}}$, and the associated error correction model is specified as:

$$\Delta \mathrm{rgdp}_{it} = \phi_i(\mathrm{rgdp}_{i,t-1} - \beta_{0i} - \beta_{1i} x\_con(div)_{i,t} - \beta_{2i} X_{i,t}) + \sum_{j=1}^{p-1} \lambda^*_{i,j} \Delta rgdp_{i,t-j} + \sum_{j=0}^{q-1} \delta^*_{1i,j} \Delta x\_con(div)_{i,t-j} + \sum_{j=0}^{q-1} \delta^*_{2i,j} \Delta X_{i,t-j} + u_{it} \tag{12}$$

where Δ is a first difference operator, $\lambda^*_{i,j} = -\sum_{m=j+1_{i,m}}^{p}$, $\delta^*_{i,j} = -\sum_{m=j+1_{i,m}}^{q}$, and $\phi_i = -(1 - \sum_{j=1}^{p}\lambda_{i,j})$ is the error correction term which measures the speed of adjustment back to a steady state equilibrium subsequent to a shock to the system, and the parameter is expected to be significantly negative in value. The PMG estimator allows the short-term coefficients and error correction terms to vary across individual countries; yet, over the long term, the coefficients are identical for all countries ($\theta_i = \theta$).

To test for cointegration effects within the FMOLS and DOLS estimators, we make use of Kao's (1999) cointegration test, which is performed on the residual terms of the estimated FMOLS and DOLS regressions, e_{it}, expressed as:

$$e_{it} = \rho e_{it} + \sum_{j=1_j}^{n} e_{it-j} + v_{itp} \tag{13}$$

From Equation (13), the null hypothesis of no cointegration is tested as, H_0: $\rho = 1$, using Kao's (1999) modified augmented Dickey-Fuller (ADF) type test statistic:

$$t_{kao} = \frac{t_{adf} + \sqrt{6N}_v/(2_{ov})}{\sqrt{^2_{ov}/(2^2_v) + 3^2_v/(10^2_{ov})}} \sim N(0,1) \tag{14}$$

where

$$t_{adf} = \frac{(\rho - 1)\left[\sum_{i=1}^{N}(e_i' Q_i e_i)\right]^{\frac{1}{2}}}{s_v} \tag{15}$$

IV. Data and empirical results

Data description and unit root tests

We construct our panel dataset by using annual time series variables collected for the BRICS countries between 1995 and 2017, which are transformed into their natural logarithm for empirical purposes. We depend on two online databases for our data collection. Firstly, we consult the Penn State Word Tables and collect real gross domestic products (rgdp), human capital index (human index), number of employed persons (labor), and share of capital stock in GDP (capital stock). Secondly, we consult the United Nations Conference on Trade and Development (UNCTAD) database to collect the export concentration and export diversification indices. The concentration index is the Herfindahl-Hirschmann index (HHI) which is computed as:

$$HHI_j = \frac{\sqrt{\sum_{i=1}^{n}\left(\frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}}\right)^2} - \sqrt{1/n}}{1 - \sqrt{1/n}} \tag{16}$$

where x_{ij} is the export value of product t for country j, and n is the number of products at the 3-digit SITC product level. The index ranges between 0 and 1, where values closer to 1 indicate a higher concentration of exports toward a few products whilst values which approach 0 reflect a more widely distributed series of export products. On the other hand, the diversification index is a modification of the Finger and Kreinin (1979) similarity index and is computed as:

$$S_j = \frac{\sum_i /h_{ij} - h_i/}{2} \tag{17}$$

where h_{ij} is the share of product i in total exports of country j, and h_i is the share of product i in total world exports. The modified Finger and Kreinin (1979) index also ranges between 0 and 1, where values closer to 1 indicate higher export diversification toward the world's pattern whilst values approaching zero indicate higher convergence toward the world's pattern.

To draw stylized facts on our data, we present cross-sectional plots between export concentration and real GDP in tens of millions of US$ in Figure 1 and between export diversification and real GDP in tens of millions of US$ in Figure 2. From Figure 1, we can visually observe that from 1995 to 2017, export concentration has been highest in Russia and Brazil whilst being lowest in China and India. Further note that the high export concentration trends in Russia and Brazil appear to have been accompanied with steady increases in GDP output except for periods roughly corresponding to the pre-global recession period of 1995 to 2008, whereas these variables mutually follow a downward trend in the post-recession period. Moreover, no clear co-

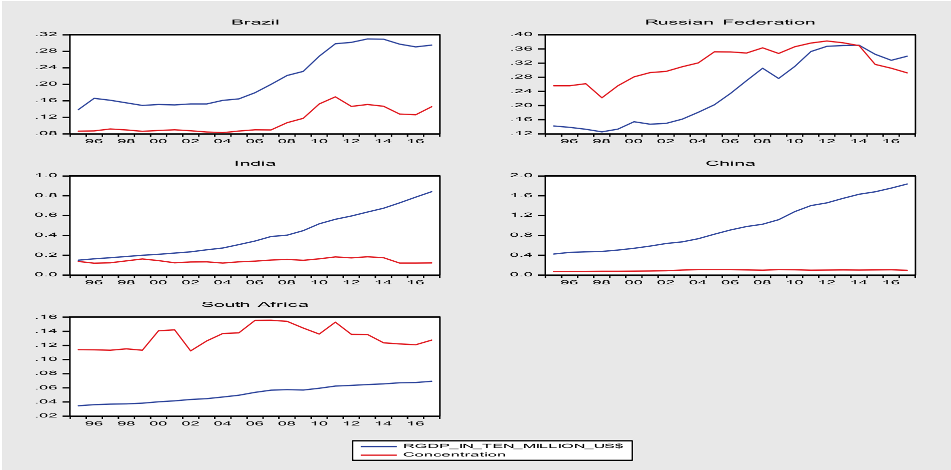

Figure 1. Export concentration and real GDP in US$ (10 millions).

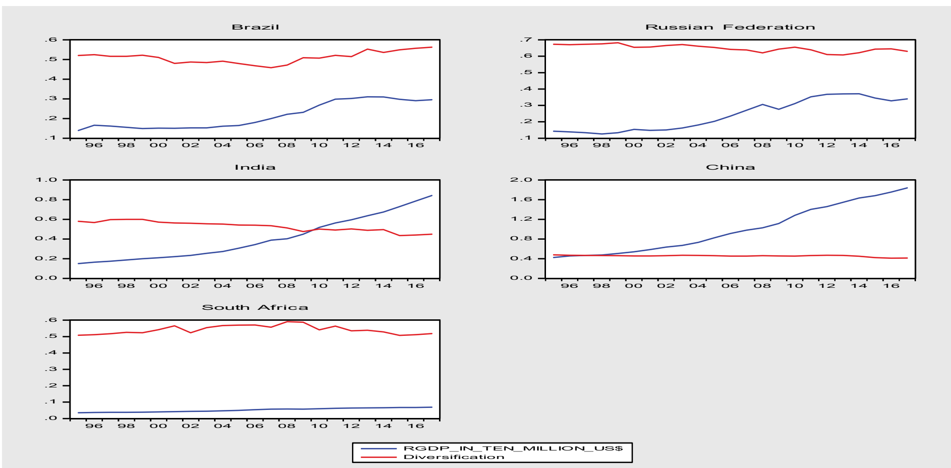

Figure 2. Export diversification and real GDP in US$ (10 millions).

movements can be visually observed between the export concentration and growth for India, China, and South Africa, although export concentration has been on a downward trend in these countries since the early-to-mid 2000's. On the other hand, Figure 2 shows that export diversification is more intense in China and Russia, although exports markets in the BRICS countries have been diversifying less since the global recession period, with the sole exception of Brazil. We also notice a general negative co-movement between export diversification and growth in Brazil, Russia, and India, although no trends are visually observed for China and South Africa.

To ensure data compatibility with the FMOLS and DOLS estimators (i.e., I (1) properties in all time series), we perform three types of panel-based unit

Table 1. Panel unit root tests results.

	LLC		IPS		ADF-Fisher χ^2		PP-Fisher χ^2	
	Int.	Int +trend	Int.	Int+trend	Int.	Int. +trend	Int	Int+trend
PANEL A: LEVELS								
RGDP	4.863	−0.918	5.685	0.298	0.803	8.934	0.730	3.787
	(0.568)	(0.179)	(1.000)	(0.617)	(0.999)	(0.538)	(1.000)	(0.956)
Concentration	−0.819	0.823	−0.211	1.108	8.899	6.731	9.187	2.935
	(0.206)	(0.795)	(0.416)	(0.866)	(0.542)	(0.751)	(0.515)	(0.983)
Diversification	0.079	−2.28***	0.426	−2.78***	7.472	27.719***	5.018	9.040
	(0.531)	(0.011)	(0.665)	(0.003)	(0.680)	(0.002)	(0.890)	(0.528)
Capital Stock	1.995	1.325	3.445	2.082	1.353	11.962	0.070	3.398
	(0.977)	(0.908)	(0.999)	(0.981)	(0.999)	(0.288)	(1.000)	(0.970)
Human Index	5.118	−7.02***	6.552	−13.5***	2.006	38.326***	14.791	21.98***
	(1.000)	(0.000)	(1.000)	(0.000)	(0.996)	(0.000)	(0.140)	(0.015)
Labor	0.619	1.675	2.853	1.353	1.247	10.717	28.512***	5.823
	(0.732)	(0.953)	(0.998)	(0.9120	(0.999)	(0.380)	(0.002)	(0.829)
PANEL B: FIRST DIFFERENCES								
RGDP	−3.84***	−2.83***	−2.70***	−1.458**	25.072***	21.139**	21.897***	22.251***
	(0.000)	(0.002)	(0.002)	(0.072)	(0.005)	(0.020)	(0.016)	(0.014)
Concentration	−5.93***	−5.47***	−4.2***	−3.17***	40.267***	32.249***	51.901***	64.894***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Diversification	−3.90***	−0.890	−7.3***	−5.92***	65.287***	49.216***	69.173***	247.492***
	(0.000)	(0.187)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital Stock	0.369	−1.296	1.148	−1.132	5.791	15.255	5.169	5.442
	(0.644)	(0.097)	(0.874)	(0.129)	(0.833)	(0.123)	(0.879)	(0.860)
Human Index	−640***	−320***	−37.0***	−184***	308.67***	45.49***	10.47	9.912
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.400)	(0.448)
Labor	−0.324	−3.17***	−2.09***	−3.63***	34.90***	30.82	32.71***	25.227***
	(0.373)	(0.001)	(0.00)	(0.000)	(0.000)	(0.001)	(0.000)	(0.005)

Notes: ***, **, and * represent the 1%, 5%, and 10% critical levels, respectively. p-values are reported in parentheses ().

root tests, namely the LLC test of Levin, Lin, and Chu (2002), the IPS test of Im, Pesaran, and Shin (2003), and the ADF-PP Fisher-type tests of Maddala and Wu (1999). Whilst the LLC test assumes a common unit root process, the IPS and ADF-PP Fisher tests assume individual unit root processes in the panel test regressions. All panel unit root tests are performed with a drift and with a trend inclusive of a drift. The results are reported in Table 1 with Panel A reporting the test statistics for the series in their levels and Panel B reporting the test statistics for the series in their first differences. In their levels, the panel series displays very weak evidence in favor of stationary processes with the unit root being rejected for eight out of the 48 test cases. On the other hand, the panel series in their first differences rejects the unit root null hypothesis in 47 out of the 48 cases which provides substantial evidence of the panel series being I(1) processes. This latter result confirms the compatibility of the panel time series variables with the FMOLS and DOLS estimators.

FMOLS and DOLS cointegration regression estimates

Table 2 presents our baseline empirical estimates of our augmented growth regression. Panel A presents the empirical results for the FMOLS estimators,

Table 2. FMOLS and DOLS regression estimates.

	F(Y ~ X_con)	F(Y ~ X_div)	F(Y ~ K, H, L, X_con)	F(Y ~ K, H, L, X_div)
Panel A: FMOLS estimates				
Concentration	10.112		5.112	
	(0.00)***		(0.00)***	
Diversification		−4.023		−1.474
		(0.00)***		(0.00)**
Capital Stock			0.635	0.503
			(0.00)***	(0.00)***
Human Index			−1.228	2.770
			(0.02)**	(0.02)**
Labor			0.161	−2.630
			(0.46)	(0.02)**
Panel B: DOLS estimates				
Concentration			6.023	
			(0.00)***	
Diversification				−2.062
				(0.01)**
Capital Stock			0.763	0.915
			(0.00)***	(0.00)***
Human Index			−0.996	3.306
			(0.21)	(0.43)
Labor			−0.474	−5.341
			(0.65)	(0.00)***
Panel C: Cointegration tests				
t_{kao} cointegration test	−1.77	−1.61	−2.66	−2.15
	(0.03)**	(0.05)*	(0.00)***	(0.00)***

Notes: ***, **, and * represent the 1%, 5%, and 10% critical levels, respectively. p-values are reported in parentheses ().

and Panel B presents those for the DOLS estimators. Moreover, for control purposes, we also provide estimates of bivariate regressions between export concentration (diversification) and economic growth. For the cases of the FMOLS and DOLS estimators in both bivariate and multivariate regressions inclusive of other growth determinants, we find a positive and statistically significant estimate on the concentration index, whereas we establish a negative and statistically significant estimate on the diversification index. On one hand, our finding of a positive effect of export concentration on growth is comparable to those similarly found in the previous works of Balassa (1978), Feder (1983), Fosu (1990), Lee (2011), and Plumper and Graff (2001). On the other hand, the finding of an adverse effect of export diversification on economic growth has been similarly found in the previous studies of De Piñeres and Ferrantino (1997), Matthee, Idsardi, and Krugell (2016), McIntyre et al. (2018), and Lee and Zhang (2019). Moreover, the control variables, more or less, produce their theoretical expected coefficient signs.

Pooled mean group (PMG) estimators

Having presented our baseline linear estimates, in this section of the article, we present the empirical findings from the PMG estimators. The findings reported in Table 3 show a positive (negative) effect of export concentration (diversification)

Table 3. PMG estimators.

	F(Y ~ K, H, L, X_con)		F(Y ~ K, H, L, X_div)	
	Coefficient	p-value	Coefficient	p-value
Panel A: Long-run estimates				
Concentration	0.11	0.00***		
Diversification			−0.51	0.00***
Capital Stock	0.70	0.00***	0.72	0.00***
Human Index	−2.95	0.00***	−2.18	0.00***
Labor	1.95	000***	1.20	0.02**
Panel B: Short -run estimates				
ect(−1)	−0.25	0.07*	−0.25	0.04**
ΔConcentration	0.14	0.18		
ΔDiversification			−0.23	0.50
ΔCapital Stock	−0.01	0.95	0.11	0.48
Human Index	0.71	0.31	0.29	0.78
ΔLabor	0.99	0.37	1.80	0.27

Notes: ***, **, and * represent the 1%, 5%, and 10% critical levels, respectively.

on growth over the long run (Panel A) but not over the homogenous short run (Panel B). Note that the long-run PMG coefficients do not differ in sign or significance from those previously obtained from the DOLS and FMOLS. However, the cross-sectional estimates for the individual BRICS countries reported in Table 4 show a negative and significant estimate on the export concentration variable for China, whereas the remaining countries retain positive and significant estimates. Similarly, for the export diversification coefficients, only Russia and South Africa produce positive and significant estimates whilst India and China have negative and significant estimates, and Brazil has an insignificant coefficient. In conclusion, these results indicate discrepancies in the

Table 4. PMG cross-sectional estimates.

	F(Y ~ K, H, L, X_div)				
	Brazil	Russia	India	China	South Africa
ect(−1)	−0.48	−0.01	−0.27	−0.61	−0.12
	(0.00)***	(0.01)**	(0.00)***	(0.00)***	(0.00)***
ΔConcentration	0.15	0.53	0.02	−0.09	0.10
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
ΔCapital Stock	−0.28	0.78	−0.40	−0.12	−0.03
	(0.15)	(0.00)***	(0.05)*	(0.48)	(0.01)**
Human Index	2.61	2.15	−0.89	−0.51	0.20
	(0.72)	(0.82)	(0.72)	(0.89)	(0.90)
ΔLabor	−1.55	353	−0.97	3.60	0.35
	(0.00)***	(0.23)	(0.12)	(0.89)	(0.00)***
			F(Y ~ K, H, L, X_con)		
	Brazil	Russia	India	China	South Africa
ect(−1)	−0.44	−0.07	−0.35	−0.55	0.14
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.000***
ΔDiversification	0.07	−1.53	0.13	0.25	−0.05
	(0.42)	(0.01)**	(0.00)***	(0.04)*	(0.01)**
ΔCapital Stock	0.22	0.51	−0.41	0.30	−0.06
	(0.11)	(0.00)***	(0.06)*	(0.12)	(0.00)***
ΔHuman Index	4.39	−0.80	−0.95	−127	0.08
	(0.55)	(0.94)	(0.81)	(0.73)	(0.96)
ΔLabor	−1.38	3.99	−0.92	7.02	0.31
	(0.01)**	(0.20)	(0.26)	(0.79)	(0.00)***

Notes: ***, **, and * represent the 1%, 5%, and 10% critical levels, respectively. p-values are reported in parentheses ().

diversification-growth relationship for BRICS countries, with China and India being the only member countries who have benefited from diversification strategies.

Sensitivity analysis: Examining nonlinearities

In this section of the article, we investigate for possible asymmetric relationships between export concentration/diversification and economic growth, and we achieve this by adding squared terms of export concentration (concentration^2) and export diversification (concentration^2) in our empirical regressions. The findings from the FMOLS, DOLS, and PMG estimators are reported in Table 5, whereas the cross-sectional PMG estimates for the individual countries are presented in Table 6. The long-run regression coefficients reported in Panel A of Table 5 reveal positive (negative) estimates and statistically significant estimates on both export concentration (diversification) variables and it's squared term across all estimators. Similar findings hold for the short-run PMG estimates reported in Panel B of Table 5. We note that the squared term on the export concentration (diversification) variable in all estimated regressions is lower in

Table 5. Nonlinear estimations.

	FMOLS		DOLS		PMG	
	F(Y ~ K, H, L, X_con, X_consq)	F(Y ~ K, H, L, X_div, X_divsq)	F(Y ~ K, H, L, X_con, X_consq)	F(Y ~ K, H, L, X_div, X_divsq)	F(Y ~ K, H, L, X_con, X_consq)	F(Y ~ K, H, L, X_div, X_divsq)
Concentration	3.87 (0.00)***		4.02 (0.00)***		3.44 (0.00)***	
Concentration^2	0.86 (0.00)***		0.96 (0.00)***		2.32 (0.00)***	
Diversification		−14.93 (0.00)***		−14.78 (0.00)***		−1.05 (0.18)
Diversification^2		−10.41 (0.00)***		−10.54 (0.00)***		−0.29 (0.12)
Capital Stock	0.70 (0.00)***	0.58 (0.00)***	0.84 (0.00)***	0.63 (0.00)***	0.69 (0.00)***	0.69 (0.00)***
Human Index	−0.56 (0.27)	2.52 (0.00)***	0.01 (0.99)	−0.42 (0.74)	−0.41 (0.46)	−3.16 (0.00)***
Labor	−0.45 (0.30)	−2.74 (0.00)***	−1.58 (0.09)*	−0.57 (0.61)	0.59 (0.00)***	2.11 (0.00)***
ect(−1)					−0.28 (0.22)	−0.25 (0.12)
ΔConcentration						
ΔConcentration^2						
ΔDiversification					4.18 (0.57)	−4.54 (0.46)
ΔDiversification^2					−4.26 (0.28)	−3.56 (0.58)
ΔCapital Stock					0.18 (0.00)***	0.10 (0.81)
ΔHuman Index					−0.51 (0.45)	−0.02 (0.98)
ΔLabor					0.25 (0.00)***	0.59 (0.00)***

Notes: ***, **, and * represent the 1%, 5%, and 10% critical levels, respectively. p-values are reported in parentheses ().

Table 6. Cross-sectional nonlinear estimations.

	F(Y ~ K, H, L, X_con, X_consq)				
	Brazil	Russia	India	China	South Africa
ect(−1)	−0.48	−0.04	−0.25	−0.73	−0.15
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
ΔConcentration	0.84	3.79	0.12	−5.23	3.46
	(0.49)	(0.04)*	(0.09)*	(0.43)	(0.10)
ΔConcentration^2	0.17	1.30	0.51	−1.09	0.83
	(0.08)*	(0.00)***	(055)	(0.02)**	(0.00)***
ΔCapital Stock	−0.30	0.60	−0.50	−0.34	−0.04
	(0.17)	(0.00)***	(0.04)*	(0.16)	(0.00)***
Human Index	2.51	5.30	−1.81	2.48	−1.08
	(0.76)	(0.52)	(0.47)	(0.55)	(0.58)
ΔLabor	−1.55	5.29	−1.40	2.68	0.13
	(0.00)***	(0.07)*	(0.04)*	(0.91)	(0.00)***
	F(Y ~ K, H, L, X_div, X-divsq)				
	Brazil	Russia	India	China	South Africa
ect(−1)	−0.01	−0.08	−1.19	−0.26	−0.08
	(0.18)	(0.00)***	(0.00)***	(0.00)***	(0.00)***
ΔDiversification	3.76	−9.16	−2.33	−10.41	−4.60
	(0.88)	(0.89)	(0.17)	(0.79)	(0.30)
ΔDiversification^2	2.87	−8.46	−1.77	−6.59	−3.83
	(0.84)	(0.92)	(0.06)*	(0.67)	(0.24)
ΔCapital Stock	1.09	0.53	−1.36	0.23	0.01
	(0.00)***	(0.00)***	(0.00)***	(0.160	(0.35)
ΔHuman Index	2.01	−1.51	−0.04	−3.23	2.66
	(0.84)	(0.89)	(0.99)	(0.30)	(0.06)*
ΔLabor	−0.64	3.59	−0.58	8.69	0.47
	(0.110	(0.23)	(0.34)	(0.78)	(0.00)***

Notes: ***, **, and * represent the 1%, 5%, and 10% critical levels, respectively. p-values are reported in parentheses ().

magnitude, implying that the positive (negative) growth effects of concentration (diversification) diminish at higher levels but do not cross some “inflexion point” where these effects are reversed. The observed asymmetry presents a semi-humped-shaped concentration/diversification-growth relationship, which, if traced onto the inverted U-shaped schedule, would correspond to the second stage of economic development which occurs after crossing the inflexion point (Cadot, Carrère, and Strauss-Kahn 2011; Klinger and Lederman 2006). Note that this asymmetry does not correspond to the U-shaped relationship as found in Imbs and Wacziarg (2003), Aditya and Acharyya (2013), and Naudé and Rossouw (2011), which hypothesizes on diversification adversely and increasingly affecting economic growth during the first stage of development before reaching the inflexion point.

Table 6 presents the PMG cross-sectional estimates for the individual countries and reveal weak “nonlinear” links between concentration and growth as reported in Panel A, and between diversification and growth as reported in Panel B. From Panel A, we note that only Russia has positive and statistically significant estimates on both the concentration variable and its squared term (i.e., significant growth effects at all concentration levels), India has a statistically significant estimate only on the concentration variable (i.e., significant growth effects at low concentration levels), Brazil and South Africa have a statistically significant estimate only on the squared concentration variable (i.e., significant growth effects at high concentration levels), whilst China is the only country with negative estimates which are statistically significant on the squared term (i.e., significant growth losses at high concentration levels). On the other hand, the cross-section estimates for export diversification as reported in Panel B reveal negative and insignificant estimates on the diversification variable and its squared term across all countries with the sole exception of India which has a statistically significant negative estimate on the squared diversification term. All in all, our findings support the idea that low-to-moderate levels of concentrations of export products are most beneficial to economic growth in BRICS. In other words, markets characterized by perfectly competitive firm production and trade, as indicated by low-to-moderate concentration ratios, respectively, are most beneficial for economic growth, whereas purely monopolistic markets with high concentration ratios have diminishing growth effects.

V. Conclusion and policy implications

In our study, we shed more light on the export diversification versus export concentration debate as a catalyst for improved economic growth performance in BRICS countries. Empirically, we estimate an augmented endogenous growth model using FMOLS, DOLS, and PMG estimators applied to an annual time series spanning between 1995 and 2017. Within the augmented growth model, we proxy export concentration with the Herfindahl-Hirschmann index, whereas export diversification is proxied with the modified Finger-Kreinin index. The regression estimates unanimously indicate a positive and statistically significant estimate on the concentration index, whereas we find negative and statistically significant estimates on the diversification index. On a broad level, this implies that export concentration would be a more suitable trade objective in comparison to export diversification for BRICS economies in their pursuit of improved future economic growth rates. Our cross-sectional estimates indicate that China would primarily benefit by shifting from concentration to diversification, whereas Brazil and South Africa will be the most adversely affected economies using such a policy design.

To ensure the robustness of our analysis, we further checked for possible asymmetries in the estimated regression but were unable to establish any turning or threshold points in the regressions. We, however, note that the negative effects of diversification diminish at higher levels, thus lending evidence of a semi-U-shaped diversification-growth schedule. This implies that BRICS policymakers need to be aware that they may have crossed their second stage of development where diversification does not improve growth and that they need to re-concentrate their basket of export products. The re-specialization of exports should be done at “low-to-moderate” levels where BRICS countries should avoid re-concentrating their exports on monopoly type markets.

Nevertheless, the specific product groups which the BRICS countries need to re-concentrate their export efforts on is beyond the scope of this study and remains an open avenue for future research.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Sinesipho Siswana http://orcid.org/0000-0002-8217-0526
Andrew Phiri http://orcid.org/0000-0003-1775-3546

References

Aditya, A., and R. Acharyya. 2013. "Export Diversification, Composition, and Economic Growth: Evidence from Cross-country Analysis." *The Journal of International Trade & Economic Development* 22 (7):959–992. doi:10.1080/09638199.2011.619009.

Agosin, M. 2008. "Export Diversification and Growth in Emerging Economies." *Cepal Review* 97:95–113.

Al-Marhubi, F. 2000. "Export Diversification and Growth: An Empirical Investigation." *Applied Economics Letters* 7 (9):559–562. doi:10.1080/13504850050059005.

Balaguer, J., and M. Cantavella-Joda. 2004. "Structural Change in Exports and Economic Growth: Cointegation and Causality Analysis for Spain (1961-2000)." *Applied Economics* 35 (5):473–477.

Balassa, B. 1978. "Exports and Economic Growth: Further Evidence." *Journal of Development Economics* 5 (2):181–189.

Blancheton, B., and D. Chhorn. 2018. "Export Diversification, Specialization and Inequality: Evidence from Asian and Western Countries." *The Journal of International Trade & Economic Development* 28 (2):189–229.

Cadot, O., C. Carrère, and V. Strauss-Kahn. 2011. "Export Diversification: What Is behind the Hump?" *Review of Economics and Statistics* 93 (2):590–605.

De Castro, T. 2013. "Trade among BRICS Countries: Changes Towards Closer Cooperation." *ER-CEREI* 16:131–147.

De Piñeres, S., and M. Ferrantino. 1997. "Export Diversification and Structural Dynamics in the Growth Process: The Case of Chile." *Journal of Development Economics* 52 (2):375–391.

Feder, G. 1983. "On Exports and Economic Growth." *Journal of Development Economics* 12 (1–2):59–73.

Finger, J., and M. Kreinin. 1979. "A Measure of 'Export Similarity' and Its Possible Uses." *The Economic Journal* 89 (356):905–912.

Fosu, A. 1990. "Exports and Economic Growth." *World Development* 18 (6):831–835.

Greenaway, D., W. Morgan, and P. Wright. 1999. "Exports, Export Composition and Growth." *The Journal of International Trade and Economic Development* 8 (1):41–51.

Grossman, G., and E. Helpman. 1991. "Trade, Knowledge Spillovers and Growth." *European Economic Review* 35 (2–3):517–526.

Hamed, K., D. Hadi, and K. Hossein. 2014. "Export Diversification and Economic Growth in Some Selected Developing Countries." *African Journal of Business Management* 8 (17):700–704.
Heckscher, E. 1919. "Utrikshandelns Verkan Pa Inkomstfoerdelningen." *Ekonomist Tradskrift* 21 (2):1–32.
Herzer, D., and F. Nowak-Lehnmann. 2006. ""What Does Export Diversification Do for Growth?" an Econometric Analysis." *Applied Economics* 38 (15):1825–1838.
Hesse, H. 2008. "Export Diversification and Economic Growth". Commission on Growth and Development Working Paper No. 21. Washington, DC: World Bank.
Hodey, L., A. Oduro, and B. Senadza. 2015. "Export Diversification and Economic Growth in Sub-Saharan Africa." *Journal of African Development* 17 (2):67–81.
Im, K., M. Pesaran, and Y. Shin. 2003. "Testing for Unit Roots in Heterogeneous Panels." *Journal of Econometrics* 115 (1):53–74.
Imbs, J., and R. Wacziarg. 2003. "Stages of Diversification." *American Economic Review* 93 (1):63–86.
Kao, C. 1999. "Spurious Regression and Residual-based Tests for Cointegration in Panel Data." *Journal of Econometrics* 90 (1):1–44.
Klinger, B., and D. Lederman. 2006. "Diversification, Innovation, and Imitation inside the Global Technology Frontier." World Bank Policy Research Working Paper No. 3872. Washington DC.
Krugman, P. 1979. "Increasing Returns, Monopolistic Competition and International Trade." *Journal of International Economics* 9 (4):469–479.
Lederman, D., and W. Maloney. 2003. "Trade Structure and Growth." World Bank Policy Research Working Papers No. 3025, April. Washington DC.
Lee, D., and H. Zhang. 2019. "Export Diversification in Low-income Countries and Small States: Do Country Size and Income Level Matter?" IMF Working Paper No. 19-118, May. Washington DC.
Lee, J. 2011. "Export Specialization and Economic Growth around the World." *Economic Systems* 35 (1):45–63.
Levin, A., C. Lin, and C. Chu. 2002. "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties." *Journal of Econometrics* 108 (1):1–22.
Linder, S. 1961. *An Essay on Trade and Transformation*, 82–109. Stockholm: Almqvist & Wiksell.
Lucas, R. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22 (1):3–42.
Maddala, G., and S. Wu. 1999. "A Comparative Study of Unit Roots with Panel Data and A New Simple Test." *Oxford Bulletin of Economics and Statistics* 61 (51):631–652.
Mania, E., and A. Rieber. 2019. "Product Export Diversification and Sustainable Economic Growth in Developing Countries." *Structural Change and Economic Dynamics* 51 (c):138–151.
Mankiw, G., D. Romer, and D. Well. 1992. "A Contribution to the Empirics of Economic Growth." *The Quarterly Journal of Economics* 107 (2):407–437.
Matthee, M., E. Idsardi, and W. Krugell. 2016. "Can South Africa Sustain and Diversity Its Exports?" *South African Journal of Economic and Management Sciences* 19 (2):249–263.
McIntyre, A., M. Li, K. Wang, and H. Yun. 2018. "Economic Benefits of Export Diversification in Small States." IMF Working Paper No. 18/86, April. Washington DC.
Mostafa, G., and M. Mahmood. 2015. "The Rise of the BRICS and Their Challenge to the G7." *International Journal of Emerging Markets* 10 (1):156–170.

Murshed, S., and L. Serino. 2011. "The Pattern of Specialization and Economic Growth: The Resource Curse Hypothesis Revisited." *Structural Change and Economic Dynamics* 22 (2):151–161.

Naudé, W., M. Bosker, and M. Matthee. 2010. "Export Specialization and Local Economic Growth." *World Economy* 33 (4):552–572.

Naudé, W., and R. Rossouw. 2011. "Export Diversification and Economic Performance: Evidence from Brazil, China, India and South Africa." *Economic Change and Re-structuring* 44 (1):99–134.

O'Neill, J. 2001. "Building Better Global Economic BRICs." Global Economics Paper No. 66. New York: Goldman-Sachs.

Ohlin, B. 1933. *Interregional and International Trade*. Cambridge: Harvard University Press.

Önder, A., and H. Yilmazkuday. 2016. "Trade Partner Diversification and Growth: How Trade Links Matter." *Journal of Macroeconomics* 50 (c):241–258.

Pedroni, P. 1999. "Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors." *Oxford Bulletin of Economics and Statistics* 61 (S1):653–670.

Pedroni, P. 2004. "Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis." *Econometric Theory* 20 (3):597–625.

Pesaran, H., Y. Shin, and R. Smith. 1999. "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels." *Journal of the American Statistical Association* 94 (44):621–634.

Plumper, T., and M. Graff. 2001. "Export Specialization and Economic Growth." *Review of International Political Economy* 8 (4):661–688.

Posner, M. 1961. "International Trade and Technical Change." *Oxford Economic Papers* 13 (3):323–341.

Prebisch, R. 1950. "The Economic Development of Latin America and It Principal Problems." *Economic Bulletin for Latin America* 7 (1):385–421.

Ricardo, D. 1817. *On the Principles of Political Economy and Taxation*. London: J. M'Creery Publishers.

Romer, P. 1986. "Increasing Returns and Long-run Growth." *Journal of Political Economy* 94 (5):1002–1037.

Singer, H. 1950. "Gains and Losses from Trade and Investment in under Developed Countries." *American Economic Review* 40 (2):473–485.

Solow, R. 1956. "A Contribution to the Theory of Economic Growth." *The Quarterly Journal of Economics* 70 (1):65–94.

Swan, T. 1956. "Economic Growth and Capital Accumulation." *Economic Record* 32 (2):334–361.

World Bank. 1993. "The East Asian Miracle: Economic Growth and Public Policy." World Bank Policy Research Report No. 12351, September. Washington, D.C.: World Bank Group.