ЕКОНОМИКА
ISSN 0350-137X, EISSN 2334-9190, UDK 338 (497,1)
Vol. 71, july-september 2025, № 3
P. 51-64

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ORIGINAL SCIENTIFIC ARTICLE
DOI: 10.5937/ekonomika2503051T
Received: January 13, 2025
Accepted: April 09, 2025

THE IMPACT OF SOUTH AFRICA'S MANUFACTURING OUTPUT GROWTH ON LESOTHO'S ECONOMIC GROWTH: AN EXAMINATION OF KALDOR'S FIRST LAW

Abstract

Purpose *- This study investigates the applicability of a modified Kaldor's First Law in the context of Lesotho's economic growth, with particular focus on the role of South Africa's manufacturing sector output as a key driver.*

Research design/method/approach *- This study employs a modified Kaldor's framework, incorporating gross domestic product of Lesotho for economic growth as the dependent variable, Lesotho manufacturing sector output, South Africa's manufacturing sector output, capital investment proxy by gross fixed capital formation of Lesotho, and population of Lesotho as explanatory variables. With date series from 1980 to 2022, the study applied descriptive statistics, correlation analysis, and econometric estimation technique (Autoregressive Distributed Lag modelling) to explore both short-run and long-run period relationships.*

Findings *- The descriptive and correlation analysis highlight the interconnectedness of these variables, with the ARDL bounds test confirming the presence of a long-term cointegration relationship. The results reveal that South Africa's manufacturing sector output indeed have a positive and statistically significant impact on Lesotho's GDP in the long run thereby validating the modified Kaldor's First Law, same is Lesotho capital investment.*

Practical implication *- The study's findings underscore the importance of South Africa's manufacturing sector in driving economic growth in Lesotho, emphasizing the role of cross-border economic linkages. Lesotho can capitalize on the positive spillover effects of South Africa's manufacturing sector, improve its investment climate, and achieve sustainable economic growth. This study contributes to the discourse on Kaldor's Law and intercountry collaboration. Actionable insights for Lesotho's policymakers are suggested.*

Originality/Value - *This study contributes to literature on Kaldor's First Law by extending its application and relevance to inter-country context.*

Key words: *Kaldor's First Law, Landlocked Country, Lesotho, South Africa.*

JEL classification: *O40, 014*

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УТИЦАЈ РАСТА ПРОИЗВОДЊЕ У ЈУЖНОЈ АФРИЦИ НА ЕКОНОМСКИ РАСТ ЛЕСОТА: ИСПИТИВАЊЕ КАЛДОРОВОГ ПРВОГ ЗАКОНА

Апстракт

Сврха - Ова студија истражује применљивост модификованог Калдоровог првог закона у контексту економског раста Лесота, са посебним фокусом на улогу производње производног сектора Јужне Африке као кључног покретача.

Дизајн/метод/приступ истраживања - Ова студија користи модификовани Калдоров оквир, укључујући бруто домаћи производ Лесота за економски раст као зависну променљиву, производњу производног сектора Лесота, производњу производног сектора Јужне Африке, замену капиталних инвестиција кроз бруто инвестиције у фиксни капитал Лесота и број становника Лесота као објашњавајуће променљиве. Са датумским серијама од 1980. до 2022. године, студија је применила дескриптивну статистику, анализу корелације и технику економетријске процене (ауторегресивно дистрибуирано моделирање кашњења) како би се истражили и краткорочни и дугорочни периодски односи.

Резултати - Дескриптивна и корелациона анализа истичу међусобну повезаност ових варијабли, при чему ARDL тест граница потврђује присуство дугорочног коинтеграционог односа. Резултати показују да производња у производном сектору Јужне Африке заиста има позитиван и статистички значајан утицај на БДП Лесота на дужи рок, чиме се потврђује модификовани Калдоров први закон, исто важи и за капиталне инвестиције у Лесото.

Практична импликација - Резултати студије истичу важност производног сектора Јужне Африке у покретању економског раста у Лесоту, наглашавајући улогу прекограничних економских веза. Лесото може да искористи позитивне ефекте преливања производног сектора Јужне Африке, побољша своју инвестициону климу и постигне одрживи економски раст. Ова студија доприноси дискурсу о Калдоровом закону и међудржавној сарадњи. Предлажу се практични увиди за креаторе политике Лесота.

Оригиналност/Вредност - Ова студија доприноси литератури о Калдоровом првом закону проширујући његову примену и релевантност на међудржавни контекст.

Кључне речи: *Калдоров први закон, земља без излаза на море, Лесото, Јужна Африка.*

Introduction

Landlocked Countries (LLCs), majority of which are developing countries are unique economic entities whose development trajectories are significantly shaped by their geographic positioning, primarily the absence of direct access to the sea (United Nations, 2020). These countries depend on neighbouring countries for access to seaports for their export and import (Kafilah & Tregenna, 2024), thereby indirectly increasing their reliance on the infrastructural

efficiency, political stability, and economic policies of their neighbours (ESCAP, U. (2020). This geographical limitation places these LLDCs at a disadvantage in terms of trade, transport, and connectivity to global markets. Apparently, limitation leads to challenges of inadequate access to international markets, high dependency on transport corridors controlled by neighbouring states, and greater exposure or vulnerability to cross-border risks such as political instability, trade restrictions, and economic shocks. As a result, these LLDCs face higher transportation and transaction costs which affect their competitiveness in international trade (Adhikari et al., 2024; Paudel & Cooray, 2018). Likewise, they often experience lower economic growth, weaker industrial development, and higher vulnerability to global economic fluctuations compared to their coastal counterparts (UN-OHRLLS, 2013; Dairabayeva, 2013).

The interconnected nature of modern economies highlights the importance of cross-border economic interdependence. For LLDCs, neighbouring coastal economies play a vital role in their development due to the critical role of transit corridors and trade networks (Frederic et al., 2021). This interdependence implies that the growth dynamics of neighbouring economies, particularly the strength of their manufacturing sectors can significantly influence the economic performance of LLDCs. It need be mentioned that the role of the manufacturing sector as a driver of economic growth especially for developing countries is well-documented in the literature (Mnguni and Simbanegavi, 2020; Pata and Zengin, 2020; Sallam, 2021; Tsukada, 2024; Lugina et al. 2022). Such that the manufacturing sector is regarded as a "growth engine" due to its ability to generate employment, enhance productivity, promote technological advancement, and inter-sectoral linkages that encompasses both upstream supply chains and downstream processing and distribution networks. Neighbouring coastal countries with strong manufacturing sectors offer LLDCs the opportunity to integrate into regional value chains. For instance, LLDCs can supply raw materials or intermediate inputs to neighbouring manufacturing firms, thereby enhancing their own production capacities. In addition, neighbouring economies with well-developed infrastructure, efficient customs procedures, and modern logistics networks reduce the transit costs for LLDCs, making their exports more competitive in international markets. Regional trade agreements, customs unions, and bilateral trade agreements further facilitate this integration, providing LLDCs with an opportunity to leverage their neighbours' manufacturing capacity to boost their own economic growth. Besides, there can be knowledge spillovers arising from the transfer of technical know-how, skills, and innovations from manufacturing firms in neighbouring economies to local firms in LLDCs. These spillovers can enhance the technological capabilities of LLDCs' domestic firms and improve productivity. Workers from the landlocked economy may migrate to the neighbouring economy for employment in its manufacturing sector. The remittances they send back home contribute to the landlocked economy's GDP.

The sub-Saharan Africa, Central Asia, and South America regions are hosts to the 32 LLDC countries identified by the United Nations, including Lesotho. The economic growth trend in Lesotho from 2017 to 2022 highlights significant structural challenges. With four consecutive years of negative growth (-3.14%, -1.48%, -1.41%, -7.46%) and modest recoveries of 1.85% in 2021 and 1.29% in 2022, it is evident that Lesotho faces internal and external barriers to sustained economic expansion. The prolonged period of low economic performance in Lesotho from 2017 to 2022 has several significant consequences, both at the macroeconomic and socio-economic levels. The consequences include high unemployment relative to its population (estimated at averagely 17.1%) (World Bank, 2024), low human

development with a human development index of 0.51 (UNDP, 2024), poor household welfare, and weak fiscal positioning among others. One of the most prominent constraints on Lesotho's economic growth is its geographical positioning as a landlocked country, surrounded by South Africa. This unique geographical feature imposes substantial economic and logistical dependencies on its larger neighbour. Lesotho relies on South Africa's economic environment and performances for instance for inputs, production linkages, and trade facilitation, as well as access to critical regional and international markets.

While Kaldor's First Law emphasizes the positive relationship between manufacturing output growth and overall economic growth, this relationship is more complex for LLDCs like Lesotho, where the neighbouring economy's manufacturing sector plays an important role. Lesotho's heavy reliance on South Africa's production capacity, importation of intermediate goods, and revenue from the Southern African Customs Union (SACU) introduces asymmetries in economic linkages. Moreover, Lesotho's domestic manufacturing sector remains underdeveloped, with limited capacity to produce higher-value exports or establish meaningful backward and forward linkages in regional value chains. Despite its participation in regional economic agreements like SACU and SADC, Lesotho's growth remains significantly shaped by the performance of South Africa's manufacturing sector. This dependency poses critical questions about Lesotho's ability to achieve structural economic transformation. Apparently, these asymmetries require a modification of Kaldor's First Law to reflect the indirect impact of neighbouring economies on LLDCs. Testing a modified Kaldor's First Law, which accounts for the role of neighbouring economies' manufacturing sectors, is crucial for understanding how such dependence affects the growth trajectories of LLDCs like Lesotho.

Thus, the main objective of this study is to examine the impact of a neighbouring (coastal) economy's manufacturing sector growth on the economic growth of Lesotho a LLDC using a modified version of Kaldor's First Law. The specific objectives are i) to test Kaldor's First Law in the context of LLDCs and a modified Kaldor's First Law that incorporates the influence of the neighbouring economy's manufacturing sector, ii) to empirically analyse the extent to which growth in the manufacturing sector of a neighbouring economy influences the economic performance of a LLDC, Lesotho. This study contributes to literature on Kaldor's First Law by extending its application to cross-border linkages.

Literature review

Kaldor's (1966) first law posits that the growth of the manufacturing sector an economy serves as an engine of overall economic growth for same economy. This proposition, rooted in structuralist economics, asserts that an increase in manufacturing output stimulates GDP growth due to technological progress, economies of scale, and backward and forward linkages with other sectors. Over the past decades, researchers have continued to explore the validity of this law in both developed and developing economies. A summary of brief empirical findings is summarized in Table 1.

Table 1: Summary of Brief Empirical Findings

Author(s)	Region/Country	Period	Methodology	Key Findings
Pata and Zengin (2020)	Turkey	1980–2014	Symmetric & Asymmetric Causality	Industry value-added positively affects growth, supporting Kaldor's first law.
Ferraz (2024)	Portugal	1950–2019	Vector Autoregressive (VAR)	1% growth in basic metallurgical industries leads to a 0.07% rise in GDP.
Lazarov (2024)	North Macedonia	2002-2022	OLS	Manufacturing sector positively affects growth, supporting Kaldor's first law.
Tsukada (2024)	Vietnam, Indonesia, Malaysia, Thailand, Philippines	1986-2020	Fully modified ordinary least squares	Kaldor's law held for all countries except the Philippines.
Karami et al. (2019)	25 European Economies	1995-2016	OLS, Fixed-Effects Models	Manufacturing significantly influences GDP, supporting Kaldor's first law.
Keho (2018)	11 ECOWAS Countries	1970–2014	ARDL, Granger Causality Tests	Manufacturing growth positively affects economic growth in 8 of 11 countries.
Mongale & Tafadzwa (2018)	South Africa	1980–2016	Vector Error Correction Model (VECM)	Manufacturing output positively contributes to economic growth in South Africa.
Moyo & Jeke (2019)	37 African Countries	1990–2017	System-GMM Model	Manufacturing value positively affects GDP in African countries.
Wan et al. (2022)	130 Developing Countries	1996–2019	GMM, OLS, Fixed-Effects Regression	Manufacturing positively contributes to growth; exports play an indirect role.
Sichoongwe (2024)	Uganda	1990–2022	Time-Series Analysis	Manufacturing growth significantly drives GDP growth, supporting Kaldor's law.
Habanabakize & Dickason-Koekemoer (2023)	South Africa	1998-2019	ARDL, Error Correction Model (ECM)	Industrialization (e.g., automotive and metal industries) drives economic growth.
Sallam (2021)	Saudi Arabia	1985-2017	VECM	Bidirectional causal link between manufacturing and economic growth.
Edward & Ngasamiaku (2021)	Tanzania	1985–2017	OLS	Economic growth Granger-causes manufacturing growth, contradicting Kaldor's law.

A critical review of these studies reveals a consensus on the role of the manufacturing sector in driving economic growth, underscoring a strong empirical support for Kaldor's first law. The studies employ diverse methodologies, including OLS, GMM, ARDL, VAR, and VECM models, and span various regions, including Africa, Asia, and Europe. While many of these studies provide robust evidence for the positive impact of domestic manufacturing on GDP, they overlook the potential spillover effects of larger, open economies on the GDP of smaller, landlocked economies. While studies like those by Keho (2018) and Moyo and

Jeke (2019) analyze multiple African countries, they do not explicitly address cross-border manufacturing effects. This oversight is significant, as countries like Lesotho, which rely heavily on trade with larger neighbours like South Africa, may experience unique growth dynamics driven by the industrial output of these larger economies. Addressing this gap could provide crucial insights for policymakers in landlocked developing countries and for the extension or applicability of the Kaldor's first law in another context.

Research Design, Methodology, and Research Tasks

Research Design and Data

To investigate the impact of the manufacturing sector growth of South Africa (a larger open economy) on the GDP of Lesotho (a smaller landlocked economy), this study applied a quantitative research method, and it used time series data that were obtained from the World Bank Development Indicator database for a period of 43 years (1980 to 2022). Variables considered in the study include Gross Domestic Product of Lesotho, Gross Fixed Capital Formation of Lesotho, the population of Lesotho and manufacturing sector output growth of South Africa.

Model Estimation

While Kaldor's First Law focuses on the role of a country's own manufacturing sector in driving its economic growth as reflected in equation (1),

$$GDPL_t = \alpha_0 + \alpha_1 MSL_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

This study proposes a modification of the law to include the role of a neighbouring economy's manufacturing sector. The premise of this modified law is that, for LLDCs, economic growth is not solely dependent on the performance of their own manufacturing sector but also on the growth dynamics of neighbouring countries' manufacturing sectors. This is particularly relevant for LLDCs that have limited domestic manufacturing capacity but maintain strong trade and production linkages with neighbouring economies. Thus, in line with theory and orientation of this study (that is the modification of Kaldor's first law), GDP growth of Lesotho is a function of its own manufacturing sector output growth and that of its' neighbouring country, South Africa. Therefore, equation (1) is extended as follows.

$$GDPL_t = \alpha_0 + \alpha_1 MSL_t + \alpha_2 MSSA_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Furthermore, in line with previous studies (Aslan & Altinoz, 2022; Achar et al., 2024; Alemu, 2020; Ajayi, 2024) control variables are included in this study to avoid errors in bivariate modelling, enhance precision and accuracy and improve the model fit. Consequently, capital investment proxy by gross fixed capital formation (GFCF) and population are included in the model. Thus, the multivariate model specification showing the relation among variables of interest and other economic and demographic factors is expressed as follows:

$$GDPL_t = \alpha_0 + \alpha_1 MSL_t + \alpha_2 MSSA_t + \alpha_3 Z_t + e_t \ldots\ldots\ldots\ldots (2)$$

Where GDPL stands for the gross domestic product of Lesotho, it is the dependent variable representing the overall economic output of Lesotho. MSSA is manufacturing sector output growth of South Africa, Z is a vector of control variables considered in this study. Supported by various studies (Poku et al., 2022; Aslan & Altinoz, 2022; Meyer & Sanusi, 2019; Achar et al., 2024, Alimi et al. 2021; Alemu, 2020; Ajayi, 2024), control variables are gross fixed capital formation of Lesotho and population of Lesotho represented as GFCFL and PopL, respectively. MSL and MSSA are main independent variable representing the growth in Lesotho and South Africa's manufacturing sector output, respectively, which serves as the channel for potential spillover effects on Lesotho's GDP, as presented in the literature review section.

Analytical Techniques: Econometric Analysis Procedure

To estimate the relationship between South Africa's manufacturing output and Lesotho's GDP, both descriptive and inferential or econometrics modelling techniques were used. For econometrics modelling, the study employs the widely applied Autoregressive Distributed Lag (ARDL) estimation tool introduced by Pesaran et al. (2001). The ARDL approach is suitable due to its capacity to estimate relationships irrespective of whether the variables are integrated of order I(1), or a combination of both I(0) and I(1), though the dependent variable is expected to be an I(1) variable (Sam et al., 2019). This makes it appropriate for time-series data that may exhibit mixed levels of stationarity. The key step of the analysis comprises of testing of unit root, specification of the ARDL model, model lag length selection, determining of long-run relationship or otherwise, long-run and short-run analysis estimation, and estimated model validation. Through the comprehensive ARDL approach, the study provides empirical evidence on the extent to which South Africa's manufacturing growth influences the economic growth of Lesotho. This methodology allows for the analysis of both long-run equilibrium relationships and short-run adjustments, offering an understanding of the cross-border manufacturing-GDP link in a landlocked developing economy context.

Research results and Discussion

Stationarity and Cointegration Test Results

Following a descriptive and correlation analysis of variables (though not reported), necessary econometric pre-estimation tests were conducted. Table 1 reports the results of the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) unit root tests of stationarity for the variables *lnGDPL*, *lnMSL, lnMSSA*, *lnGFCFL*, and *lnPOPL*. The results indicate that *GDPL*, *MSSA*, and *GFCFL*0 are non-stationary at level but become stationary at first difference, denoted as I(1). This is evidenced by significant test statistics at the 1% level for both ADF and PP tests after first differencing. On the other hand, *POPL* is stationary at level (I(0)) under the PP test, but the ADF test indicates non-stationarity, suggesting a mixed conclusion for the population variable. The integration order of the variables has important implications for the estimation approach. Since most variables are I(1), the use of the ARDL bound testing approach to assess cointegration is appropriate.

Table 1: ADF and Phillip-Perron unit root test results

	ADF		P-P		Decision
	Level	First Difference	Level	First Difference	
*Ln*GDPL	-1.1237	-4.7473*	-0.9993	-4.8594*	I(1)
lnMSL	-3.3298**	-	-3.4822	-	I(0)
*ln*MSSA	-1.0999	-6.8497*	-1.0693	-6.9103	I(1)
*ln*GFCFL	-2.6812***	-4.7148*	-2.4006	-4.9137*	I(1)
lnPOPL	-0.6898	-2.1751	-3.3418*	-	I(0)

Source: Computed by Authors

Also, using the AIC to select the lag length automatically, Table 2 provides the results of the ARDL bounds tests approach for establishing the long-run relationship among the variable, where it is shown that the calculated F-statistic of each of the models (9.82, 7.05, 5.62) are significantly higher than the upper bound critical values at all significance levels (10%, 5%, 2.5%, and 1%). Since the F-statistic exceeds the upper bound, it implies the existence of a long-run cointegration relationship between the dependent variable (*lnGDPL*) and the independent variables in each of the models. This result confirms the relevance of the modified Kaldor's First Law in the context of Lesotho's economy.

Table 2: Bound test (F-stat) results

Model	**Model 1**	**Model 2**	**Model 3**
Lag Order	***ARDL (2,3, 0, 3)***	***ARDL (1, 4, 4, 0)***	***ARDL (4,0, 4, 4, 1)***
K	3	3	4
F-statistic	9.82	7.05	5.62
Bounds 10% [I(0), I(1)]	[2.37, 3.20]	[2.37, 3.20]	[2.20, 3.09]
Bounds 5% [I(0), I(1)]	[2.79, 3.67]	[2.79, 3.67]	[2.56, 3.49]
Bounds 2.5%[I(0), I(1)]	[3.15, 4.08]	[3.15, 4.08]	[3.88, 3.87]
Bounds 1% [I(0), I(1)]	[3.65, 4.66]	[3.65, 4.66]	[3.29, 4.37]

Source: Computed by Authors

ARDL Estimation Result

Table 3 presents the short-run and long-run estimation results of the ARDL model. The results offer valuable insights into the nature of the relationships between Lesotho's Gross Domestic Product (GDPL) and the explanatory variables: Manufacturing Sector Output of South Africa (MSSA), Gross Fixed Capital Formation of Lesotho (GFCFL), and Population of Lesotho (POPL).

Panel 1: Long-term estimates

The long-run coefficient of Lesotho's manufacturing sector output (*lnMSL*) is positive (0.4516) and statistically significant as shown in the Table 3. The coefficient primarily validating Kadlor's first law indicates that all things being equal, 1% increase in Lesotho's manufacturing sector output is associated with about 0.45% increase in Lesotho's GDP. Similarly, the testing of the modified Kadlor's first law in models 2 and 3 is validated through the estimated positive coefficients of South Africa's manufacturing output. The positive and

highly significant coefficients of *lnMSSA* (model 2 = 0.9015; model 3 = 0.8305) indicates that a 1% increase in South Africa's manufacturing output is associated with a 0.90% and 0.83% increase in Lesotho's GDP in the long run. This result is consistent with Kaldor's First Law, which posits that manufacturing is a critical engine of growth. The result is also aligned with those from previous studies (Pata and Zengin, 2020; Ferraz, 2024; Karami et al., 2019; Moyo and Jeke, 2019; Sichoongwe, 2024) as discussed in the literature review section. Furthermore, it is surprising to note from the result in Table 3 that comparatively, the impact of South Africa's manufacturing output on Lesotho's GDP is higher than the manufacturing sector output of Lesotho itself. The high magnitude of these coefficient underscores Lesotho's economic dependence on South Africa's industrial sector, given the close trade and labour linkages between the two countries. Plausible reasons for this outcome include Lesotho's reliance on imports of manufactured goods and the role of remittances from Lesotho's labour force employed in South Africa's manufacturing sector.

The coefficients of capital investment proxy by gross fixed capital formation (*lnGFCFL*) are positive (model 1 =0.4346; model 2 = 0.2705; model 3 = 0.2029) and statistically significant in all the models as seen in Table 3. These findings imply that a 1% increase in fixed capital investment in Lesotho is associated with about 0.2029% to 0.4346% increase in GDP when other factors are held constant. This result aligns with growth theories and several previous studies (Poku et al., 2022; Aslan & Altinoz, 2022; Meyer & Sanusi, 2019; Achar et al., 2024) that emphasize and empirically demonstrated the role of investment in physical capital in driving economic growth. Possible reasons for this outcome are the enhanced production capacity and expanded economic output through public and private sector investments in infrastructure, machinery, and other productive capital.

The coefficient for population (*lnPOPL*) is negative (-0.8725) and statistically significant. This result is counterintuitive, as population growth is often expected to have a positive impact on GDP due to an increase in labor supply and market size. However, in the context of Lesotho, the negative sign may reflect the adverse effects of population pressures, such as unemployment, strain on public resources, and underemployment. Additionally, Lesotho's population growth might be outpacing the country's capacity to create jobs, leading to a negative impact on economic growth. This result could also reflect the demographic transition, where a larger share of the population may be dependent, rather than economically active.

Panel 2: Short-term estimates

Primarily, the coefficients for the error correction terms (CointEq(-1)) resented in the Table 3 are all negative (-0.2091, -0.5494, -1.0171) and statistically significant at the 1% level of significance as required. This indicates that, respectively 22%, 54.94%, and 1.02% of the deviations from the long-run equilibrium are corrected each period. This high speed of adjustment especially for models 2 and 3 highlights the strong long-term relationship among the variables, suggesting that Lesotho's economy adjusts relatively quickly to shocks that push GDP away from its equilibrium path.

Table 3: *ARDL Regression Estimation Result*

	Model 1 *ARDL (2,3,0,3)*	**Model 2** *ARDL (1, 4, 4, 0)*	**Model 3** *ARDL (4,0, 4, 4, 1)*
Variable	Coef.	Coef.	Coef.
Panel 1: Long-term estimates			
lnMSL	0.4516*	-	0.0467***
lnMSSA	-	0.9015*	0.8305*
lnGFCFL	0.4346*	0.2705*	0.2029*
lnPOPL	-3.8886**	-0.8725*	-0.0474
C	60.4363*	6.7305	-3.1616
Panel 2: Short-term estimates			
D(LNGDPL(-1))	-0.2496***	-	0.2951**
D(LNGDPL(-2))	-	-	0.4379*
D(LNGDPL(-3))	-	-	0.2860**
D(LNMSL)	0.1055**	-	-
D(LNMSL(-1))	-0.0403	-	-
D(LNMSL(-2))	-0.0678**	- -	- -
D(LNMSA)	-	0.3855*	0.4599*
D(LNMSSA(-1))	-	-0.2210*	-0.3300*
D(LNMSSA(-2))	-	-0.1982*	-0.3095*
D(LNMSSA(-3))	-	-0.1419**	-0.2184*
D(LNGFCFL)	-	0.0703*	0.0252
D(LNGFCFL(-1))	-	-0.0435***	-0.1358*
D(LNGFCFL(-2))	-	-0.0156	-0.0829*
D(LNGFCFL(-3))	-	-0.0402**	-0.0788*
D(LNPopL)	6.0123	-	2.6462*
D(LNPopL(-1))	-12.6277**	-	-
D(LNPopL(-2))	8.2738**	-	-
CointEq(-1)/$ECeq_{t-1}$	-0.2091*	-0.5494*	-1.0171*
R^2	0.7241	0.8587	0.8969
Adjusted R^2	0.6637	0.8210	0.8493
Durbin-Watson Stat	2.0422	1.9165	1.8935

Note: ***, **, * denotes significant at 1%, 5%, and 10%.

The positive coefficient (0.3855) for the first difference of *lnMSSA* indicates that in the short term, a 1% increase in South Africa's manufacturing output is associated with a 0.3855% increase in Lesotho's GDP. This result confirms the immediate spillover effects of South Africa's manufacturing sector on Lesotho's economy. Given the dependence on imports and employment ties, Lesotho's economy responds quickly to changes in South Africa's manufacturing sector. The negative coefficients for the first, second, and third lags of *lnMSSA* [D(*lnMSSA*(-1)) (-0.2210, $p < 0.01$), D(*lnMSSA*(-2)) (-0.1982, $p < 0.01$), D(*lnMSSA*(-3)) (-0.1419, $p < 0.05$):] suggest that while the immediate effect of an increase in South Africa's manufacturing output is positive, the effect dissipates over subsequent periods. This diminishing impact might be due to adjustment processes or the delayed effects of demand and supply changes, particularly for products with longer production cycles

or delayed payments for exports and imports. It could also be reflective of the short-term volatility of trade-dependent economies.

The positive short-term coefficient of *lnGFCFL* (0.0703, $p < 0.01$) indicates that a 1% increase in investment in fixed capital results in a 0.0703% increase in GDP in the same period. This short-term positive relationship is in line with economic growth theory, where increased investment in physical capital enhances production capacity and economic output. The coefficients for the lagged differences of *lnGFCFL* reveal a mixed pattern. While the first and third lags are negative and significant, the second lag is negative but insignificant. This pattern may reflect the gestation period for capital investments, where the effects on production are not immediate. For instance, the construction of infrastructure projects typically takes time before generating productive returns, leading to delayed or staggered effects on GDP.

Model Fit and Diagnostic Measures

The R-squares (0.8587) and Adjusted R-squared (0.8210) values in Table 4 indicate that the explanatory variables explain approximately 85.87% of the variation in Lesotho's GDP, confirming the strong predictive power of the ARDL model. Durbin-Watson Statistic (1.9165): The value of the Durbin-Watson statistic is close to 2, suggesting no serious issues of autocorrelation in the residuals. Similarly, Table 5 provides the results of key diagnostic tests to ensure model robustness and validity. The Jarque-Bera test for normality test statistic (2.6189) and probability (0.2700) indicate that the residuals are normally distributed. Breusch-Godfrey Serial Correlation LM Test statistic of 0.0442 and probability of 0.9569 indicate that there is no evidence of serial correlation in the residuals, which confirms the reliability of the estimates. Additionally, the test statistic (0.4519) and probability (0.9248) result for Breusch-Pagan-Godfrey test for heteroscedasticity suggest that there is no heteroscedasticity in the residuals, satisfying the homoscedasticity assumption. These diagnostic results confirm the model's robustness, ensuring that the estimated coefficients are unbiased, consistent, and efficient. The combined evidence from Tables 1 to 5 supports the validity of the modified Kaldor's First Law in the case of Lesotho in relation to her neighboring country (South Africa), demonstrating that manufacturing sector output (MSSA) in South Africa plays a crucial role in driving economic growth of Lesotho, alongside Lesotho's gross fixed capital formation and population dynamics.

Table 5: Diagnostics Test

	Model 1 ARDL (2,3,0,3)	Model 2 ARDL (1, 4, 4, 0)	Model 3 ARDL (4,0, 4, 4, 1)
Jarque-Bera Test for Normality (prob.)	3.2220 (0.1997)	2.6189 (0.2700)	1.1025 (0.5762)
Breusch-Godfrey Serial Correlation LM Test	F-statistic: 0.5057 Prob. F (2,26): 0.6089	F-statistic: 0.0442 Prob. F (2,24): 0.9569	F-Statistic: 0.7699 Prob. F (2,19): 0.4770
Breusch-Pagan-Godfrey test for heteroscedasticity	F-Statistic: 1.0826 Prob. F (11,28): 0.4090	F-Statistic: 0.4519 Prob. F (12,26): 0.9248	F-Statistic: 0.6086 Prob. F (17,21): 0.8489

Source: Computed by Authors

Conclusion

This study examined the applicability of a modified Kaldor's First Law by empirically investigating the long-run and short-run relationship between Lesotho's economic performance proxied by gross domestic product (GDPL) and South Africa's manufacturing sector performance (MSSA), along with Lesotho's investment proxied by gross fixe capital formation and population. The study covers the period 1980-2022 for which consistent data were available and uses a range of econometric techniques including descriptive statistics, correlation analysis, unit root testing, ARDL bounds testing, and ARDL regression estimation. The key findings of the study are structured as follows:

Long-run Relationships: Evidence from the ARDL bounds testing procedure confirms the existence of a long-run cointegration relationship among the variables. In particular, the results indicate that MSSA, GFCFL, and POPL significantly influence Lesotho's GDP in the long term.

Role of Manufacturing Sector (MSSA): The most notable finding is the statistically significant and positive impact of South Africa's manufacturing sector on Lesotho's GDP. This validates the modified Kaldor's First Law in the context of cross-border economic interdependence, where the industrial expansion in a coastal country (South Africa) can drive economic growth in another (Lesotho), a close LLDC.

Policy Implications: The expansion and growth of the manufacturing sector of a country is reflected in the forms of expansion of production, out-sourcing of production input, employment generation, technological advancement and innovation, export growth, and foreign direct investment outflow, amongst others. Apparently, there is the possibility harnessing the spillover benefits of South Africa's manufacturing sector for Lesotho's GDP, if deliberate policy actions are put in place. Thus, to capture these spillover benefits, the government of Lesotho should implement a range of targeted policy measures that;

- Facilitate access to South Africa's manufacturing sector outputs.
- Promote technical and vocational skills partnerships with South African manufacturing firms.
- Drive or attract investment from South African manufacturers.
- Encourage joint ventures with Basotho businesses.
- Promote bilateral agreements on trade, investment, and labour with South Africa to formalize cooperation in the manufacturing sector.

In conclusion, the study provides empirical support for deeper South Africa-Lesotho integration and cross-border industrial collaboration as strategic levers for economic growth in Lesotho. Strengthening ties with South Africa's manufacturing sector may offer a viable pathway to sustained economic development in Lesotho.

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