Link among Domestic Investments, Exports and Economic Growth: New Evidence from Australia

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2024

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Abstract:

In this study, we conducted a comprehensive analysis of the interplay between domestic investments, exports, and economic growth in Australia from 1972 to 2021. The Vector Error Correction Model (VECM) provided insights into short-term and long-term dynamics, highlighting how deviations from equilibrium are corrected over time and the nature of these interactions. Our findings underscore that domestic investments positively impact GDP, with a 1% increase in investments correlating to a 0.11% increase in GDP in the long run. Conversely, the study found a negative relationship between exports and domestic investments, suggesting that growth in exports does not necessarily lead to increased domestic investment. These insights are crucial for developing balanced economic policies that support both investment and export growth while ensuring sustainable economic development.

Keywords: Domestic Investment, Exports, Economic Growth, VECM, Australia.

JEL Classification : C13, E22, F14, O47.

1. Introduction

The intricate relationship between domestic investments, exports, and economic growth has long captivated the interest of economists and policymakers. This triadic interaction forms the cornerstone of economic development theories and policies aimed at fostering sustainable growth. Domestic investments, encompassing capital allocation within a nation to enhance infrastructure, technological capabilities, and productive capacities, are fundamental to economic development. They create a robust foundation for economic activities, improve productivity, and generate employment opportunities, all of which are critical for sustained economic growth (Solow, 1956; Romer, 1990). In Australia, a nation characterized by its diverse economy and strategic geographic location, domestic investments play an instrumental role in stimulating economic activities and fostering long-term growth.

Exports, a vital component of international trade, reflect a country's ability to produce goods and services that meet global standards and demand. For Australia, exports have been a significant driver of economic prosperity, contributing substantially to national income and facilitating the inflow of foreign exchange (Balassa, 1978; Krugman, 1980). The country's export portfolio is diverse, ranging from minerals and agricultural products to sophisticated services and manufactured goods. This diversity not only buffers the economy against global market volatilities but also underscores Australia's competitive edge in various sectors. The synergy between robust domestic investments and a thriving export sector can potentially lead to a virtuous cycle of growth, where investments enhance production capabilities, leading to higher export volumes, which in turn generate revenues that can be reinvested into the economy (Helpman and Krugman, 1985).

Economic growth, defined as the increase in a country's output of goods and services, is the ultimate objective of these interrelated activities. Understanding the dynamics between domestic investments, exports, and economic growth is crucial for designing effective economic policies that maximize national welfare (Barro, 1991). Australia's economic trajectory provides a fertile ground for examining these relationships, given its unique blend of natural resources, advanced technological base, and dynamic policy environment. Over the years, Australia has undergone significant economic transformations, transitioning from a predominantly agricultural economy to a more diversified and industrialized one. This evolution provides valuable insights into how strategic investments and export growth can drive economic performance (Gruen and Grattan, 2005).

Empirical studies investigating the linkages between domestic investments, exports, and economic growth have yielded varied results, often contingent upon the methodological approaches and specific contexts of the countries studied (Levine and Renelt, 1992; Rodrik, 1998). For Australia, the interplay of these factors warrants a detailed examination to discern the mechanisms through which they influence each other and the overall economic landscape. This paper aims to contribute to the existing literature by providing new evidence on the causal relationships among domestic investments, exports, and economic growth in Australia. By employing advanced econometric techniques and robust data analysis, we seek to elucidate the nature of these interactions and offer policy recommendations that can enhance Australia's economic prospects.

The intricate nexus between domestic investments, exports, and economic growth constitutes a multifaceted and complex phenomenon with profound implications for economic policy and development. For a nation such as Australia, characterized by its strategic economic attributes, abundant natural resources, and significant growth potential, comprehending the interplay among these factors is vital for fostering sustainable and inclusive economic growth. An in-depth understanding of how domestic investments stimulate productive capacities, how exports contribute to foreign exchange earnings and technological advancements, and how these elements collectively drive economic growth can provide invaluable insights for policymakers. This study endeavors to illuminate this critical relationship by presenting new empirical evidence and insights, which can inform strategic policy decisions and enhance economic resilience amidst the challenges and opportunities of an increasingly interconnected global economy (Acemoglu and Robinson, 2012). By meticulously exploring the dynamic interactions between domestic investments, exports, and economic growth, this research contributes to a more nuanced understanding of the underlying factors propelling economic expansion in Australia. Furthermore, it aims to establish a robust foundation for future research endeavors and policy formulation, ultimately supporting the nation's long-term economic development goals and positioning Australia to better navigate the complexities of the global economic landscape.

Therefore, this study will be organized as follows: The second section will provide an extensive review of the existing literature on the interrelationship between domestic investment, exports, and economic growth, summarizing key theoretical frameworks and empirical findings. The third section will detail our empirical methodology, explaining the data sources, econometric models, and analytical techniques employed to investigate the causal links among these

variables. The fourth section will present our empirical findings, interpreting the results in the context of previous research and discussing their implications for understanding the dynamics of economic growth. Finally, the fifth section will conclude the study, offering a summary of the main findings, drawing policy recommendations based on the results, and suggesting avenues for future research.

2. Literature Survey

The causal relationship between exports, investments, and economic growth has been extensively studied in economic literature, with various theoretical frameworks and empirical analyses providing insights into the complex dynamics among these variables. The foundational theories in this domain often draw from classical and neoclassical economic models, which emphasize the role of capital accumulation and international trade in driving economic growth.

One of the seminal works in this field is the endogenous growth theory proposed by Romer (1986, 1990) and Lucas (1988). These models posit that investments, particularly in human capital and technology, are crucial for sustaining long-term economic growth. Romer (1986) introduced the idea that technological change, driven by investment in research and development (R&D), is a central determinant of growth. This framework suggests that higher levels of investment lead to greater innovation and productivity improvements, which in turn fuel economic expansion. Lucas (1988) further emphasized the importance of human capital accumulation, arguing that investments in education and skills development are critical for enhancing labor productivity and fostering economic growth.

The relationship between exports and economic growth is another key area of investigation. The export-led growth hypothesis, advanced by scholars such as Balassa (1978) and Feder (1983), argues that exports are a significant driver of economic growth. According to this hypothesis, exporting sectors generate foreign exchange earnings, which can be used to import capital goods and technology, thereby enhancing productive capacities. Moreover, exposure to international markets fosters competitive pressures and efficiency gains, which can lead to productivity improvements and higher economic growth rates. Empirical studies supporting this hypothesis include research by Krueger (1980) and Bhagwati (1988), who found positive correlations between export performance and economic growth in developing countries.

Empirical analyses using econometric techniques have provided mixed results regarding the causality between exports, investments, and economic growth. Studies such as those by Levine

and Renelt (1992) and Barro (1991) utilized cross-country regressions to examine the determinants of growth, finding that both investments and exports are positively correlated with economic growth. However, these studies often face challenges related to endogeneity and omitted variable biases, which complicate the interpretation of causal relationships.

More recent empirical studies have employed advanced econometric methods to address these issues. For instance, the use of vector autoregression (VAR) models and Granger causality tests has become prevalent in examining the dynamic interactions among exports, investments, and economic growth. A study by Awokuse (2003) applied these methods to data from several countries and found evidence of bidirectional causality between exports and economic growth, as well as between investments and growth. Similarly, Hsiao and Hsiao (2006) used panel data analysis to investigate the causality among these variables in East Asian countries, concluding that exports and investments significantly contribute to economic growth.

Another strand of literature focuses on the role of foreign direct investment (FDI) in mediating the relationship between exports and growth. Borensztein et al (1998) argued that FDI serves as a conduit for transferring technology and managerial expertise, which can enhance the productivity of domestic firms and boost economic growth. Their empirical analysis using data from 69 developing countries supported the view that FDI positively influences growth, particularly when the host country has a sufficient level of human capital to absorb the new technologies. Similarly, Alfaro et al. (2004) found that the growth-enhancing effects of FDI are more pronounced in economies with developed financial markets, which facilitate the efficient allocation of investment resources.

The literature also highlights the importance of institutional quality and policy frameworks in shaping the relationship between exports, investments, and economic growth. Rodrik (2000) and Acemoglu et al (2001) emphasized that sound institutions, including property rights, rule of law, and effective governance, are crucial for attracting investments and fostering export competitiveness. These studies argue that institutional quality not only directly impacts economic performance but also moderates the effects of exports and investments on growth. For example, countries with strong institutions are better able to leverage export revenues and investment inflows to achieve sustainable economic development.

Bakari (2023) explores the impact of domestic investments on economic growth in the MENA region from 1998 to 2022, considering unemployment. He finds that while domestic

investments boost economic growth, high unemployment rates dampen this effect, highlighting the need to address labor market inefficiencies to maximize growth potential. Yedder et al. (2023a) study North African countries and find that domestic investments and exports do not significantly impact long-term economic growth. This suggests that structural economic issues and political instability may hinder the effective use of these growth drivers. Bakari (2024) extends this analysis to Sub-Saharan Africa, revealing that domestic investments positively affect economic growth from 1990 to 2022, provided environmental concerns are managed sustainably. Yedder et al. (2023b) also examine Angola and find no significant long-term impact of domestic investments or exports on economic growth, suggesting a need for reevaluation of economic policies. Bakari et al. (2020) focus on Peru and conclude that domestic investments, exports, and imports do not significantly affect economic growth from 1970 to 2017, indicating a need for comprehensive economic reforms. Yedder et al. (2023c) in the MENA region find that while domestic investments positively influence economic growth, innovation and R&D do not, pointing to challenges like inadequate R&D investment and regulatory barriers.

Akermi et al. (2024) investigate Albania and find no long-term causal relationship between final consumption, domestic investment, exports, and imports, suggesting urgent economic reforms are needed. Othmani et al. (2023) analyze the USA and find that while domestic investments and economic growth influence patents in the short term, patents do not significantly drive economic growth, indicating other factors are more influential. Bakari (2022) examines Greece and finds no long-term causality between domestic investment, exports, and economic growth, although exports influence domestic investment in the short term. Bakari (2021a) shows that in Spain, domestic investments contribute to economic growth from 1970 to 2017, suggesting policies should focus on enhancing exports to stimulate domestic investment and improve the trade balance. Bakari and El Weriemmi (2022) find that in Arab countries, domestic investments and economic growth have a bidirectional short-term relationship, indicating room for policy improvements. Bakari (2021b) finds a positive bidirectional relationship between exports and economic growth across 49 African countries, showing that exports can drive growth and vice versa. Bakari (2018a) reveals that in France, tax revenue has a negative long-term impact on domestic investment and economic growth, suggesting a need to reassess tax policies.

Bakari (2016a) finds in Canada that domestic investment has a weak short-term impact on economic growth, with no long-term causality. Bakari (2016b) shows that exports and imports contribute to economic growth in Canada, though there is no overall significant relationship.

Fakraoui and Bakari (2019) find in India that exports drive short-term economic growth, while domestic investments and exports do not affect long-term growth. Bakari (2017a) reveals that in Japan, domestic investments and exports positively impact economic growth, while imports have no significant effect. Bakari et al. (2018) find that in Nigeria, there are no long-term relationships among foreign direct investment, domestic investment, exports, imports, and economic growth, highlighting the need for urgent economic reforms. Bakari (2017b) shows that in Tunisia, exports negatively impact economic growth in the long term, while imports have a positive effect. In the short term, both exports and imports are crucial for growth, but Tunisia's openness policy needs reassessment due to the negative long-term impact of exports.

Bakari (2017c) finds no long-term relationship between domestic investment, exports, imports, and economic growth in Sudan (1976-2015). However, in the short term, economic growth drives domestic investment, suggesting Sudan's economic strategies need reform. Bouchoucha and Bakari (2021) reveal that in Tunisia (1976-2017), both domestic and Foreign Direct Investments negatively affect long-term growth, though domestic investment boosts short-term growth. This underscores the need for better policy implementation. Bakari (2018b) shows that in Algeria (1969-2015), domestic investment has a negative long-term impact on growth but a positive short-term effect. Poor management and weak development strategies hinder its long-term benefits. Bakari and Mabrouki (2016) find no direct relationship between exports, imports, and economic growth in Turkey (1960-2015), but observe strong bidirectional causality between these variables and economic growth. Bakari and Mabrouki (2017) report that in Panama (1980-2015), exports and imports do not directly affect economic growth, but both show bidirectional causality with growth, indicating their contribution to Panama’s economy.

Ogunjinmi (2022) examines Nigeria (1981-2019) and finds that while investment negatively impacts short-term economic growth, there is a long-term relationship between investment and growth, indicating the need for productive capital accumulation to boost sustainable growth. Mohamed et al (2013) analyze Malaysia (1970-2008) and reveal a long-run bilateral causality between domestic investment and economic growth. FDI does not significantly affect long-term growth, but there is a short-run crowding-in effect between FDI and domestic investment. Sultan and Haque (2011) investigate India (1970-2008) and find that domestic investment significantly contributes to both short and long-term economic growth, whereas exports, though positively related, do not significantly impact growth. India should focus on domestic investment while promoting export sector investments. Tsitouras and Nikas (2016) study European transition economies (1995-2014) and confirm that openness benefits these

economies. Export-led and FDI-led growth are validated for EU entrants in 2004, while other economies benefit from local investment and export capacity expansion. Keho (2015) examines 12 sub-Saharan African countries (1970-2013) and finds mixed results. FDI and exports have varying causal relationships with GDP across different countries, with bidirectional causality in some and unidirectional in others, suggesting diverse impacts of FDI and exports on economic growth. Ghirmay et al (2001) analyze 19 less-developed countries and find that exports influence economic development through efficiency and accumulation. The growth processes differ significantly between East Asia and Southeast Asia, highlighting regional variations in export impacts on growth.

The literature on the causal relationship between exports, investments, and economic growth underscores the multifaceted nature of these interactions. Theoretical models highlight the roles of technological change, human capital, and competitive pressures in driving growth, while empirical studies provide varying evidence on the direction and strength of causality among these variables. Advances in econometric techniques have improved our understanding of these dynamics, though challenges related to endogeneity and institutional factors remain. Future research in this area may benefit from incorporating more granular data and considering the heterogeneous effects of exports and investments across different sectors and regions.

3. Data and methodology

In this section, we outline the empirical methodology employed in our study, which aims to investigate the link among domestic investments, exports, and economic growth in Australia. Our analysis covers the period from 1972 to 2021, utilizing annual data sourced from the World Bank's comprehensive reports.

To operationalize our analysis, we define our key variables as follows: Economic growth (Y) is measured by the gross domestic product (GDP) at constant prices, providing a real-term perspective on the economy's performance. Domestic investment (DI) is quantified through gross fixed capital formation at constant prices, capturing the value of investments in fixed assets such as infrastructure, machinery, and buildings. Exports (X) are represented by the value of exports at constant prices, reflecting the real value of goods and services sold abroad.

Our empirical strategy unfolds through several critical steps, starting with stationarity analysis. This is essential to ensure that our time series data are stable over time, a prerequisite for reliable econometric modeling. We apply both the Augmented Dickey-Fuller (ADF) and Phillips-Perron

(PP) tests to check for stationarity. These tests help identify whether the variables exhibit unit roots, which would imply non-stationarity and necessitate differencing the data to achieve stationarity. The Augmented Dickey-Fuller (ADF) test is given by:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \epsilon_t$$

Where (Y_t) is the variable being tested, (Δ) denotes the first difference, (t) is the time trend, and (ϵ_t) is the error term. The Phillips-Perron (PP) test adjusts the ADF test by accounting for serial correlation and heteroskedasticity in the error terms.

Next, we determine the optimal number of lags for our models using selection criteria such as the Akaike Information Criterion (AIC), the Hannan-Quinn Criterion (HQ), and the Schwarz Criterion (SC). These criteria help us identify the lag structure that best fits our data, balancing model complexity and goodness-of-fit.

The optimal number of lags is determined using the following selection criteria:

- ***Akaike Information Criterion (AIC):***

$$AIC = -2\ln(L) + 2k$$

Where (L) is the maximum value of the likelihood function and (k) is the number of parameters estimated.

- ***Hannan-Quinn Criterion (HQ):***

$$HQ = -2\ln(L) + 2k\ln(\ln(n))$$

Where (n) is the sample size.

- ***Schwarz Criterion (SC):***

$$SC = -2\ln(L) + k\ln(n)$$

Following the determination of lags, we proceed with cointegration analysis to examine whether a long-term equilibrium relationship exists among the variables. We employ the Johansen test for this purpose, which allows us to test for multiple cointegration relationships and provides a robust framework for understanding the long-term dynamics among economic

growth, domestic investment, and exports. The Johansen test is used to examine the cointegration relationships among the variables. The test involves estimating the following Vector Autoregression (VAR) model:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \epsilon_t$$

Where (Y_t) is a vector of the variables, (Π) and (Γ_i) are coefficient matrices, and (ϵ_t) is the error term. The rank of the matrix (Π) indicates the number of cointegration relationships.

Having established cointegration, we estimate a Vector Error Correction Model (VECM). The VECM framework is particularly suited for our study as it captures both short-term adjustments and long-term equilibrium relationships. In the long run, the VECM helps us understand how deviations from equilibrium are corrected over time, while in the short run, it captures the dynamic interactions among the variables. This dual perspective enables a comprehensive analysis of the interplay between domestic investments, exports, and economic growth, shedding light on both immediate and sustained impacts. The VECM is specified as:

$$\Delta Y_t = \alpha + \beta t + \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \epsilon_t$$

Where $(\Pi = \alpha\beta')$captures the long-term relationship between the variables, and (Γ_i)captures the short-term dynamics. Through this empirical strategy, we aim to provide robust evidence on the causal relationships and dynamic interactions among the key variables of interest, contributing valuable insights to the ongoing discourse on economic growth and policy formulation.

4. Empirical results

In this section, we present the empirical results obtained from our analysis of the relationship among domestic investments, exports, and economic growth in Australia. The empirical strategy includes stationarity analysis, lag order selection, cointegration analysis, and the estimation of a Vector Error Correction Model (VECM). These steps are essential to ensure robust and reliable results, enabling us to capture both the short-term dynamics and long-term equilibrium relationships among the variables in the case of Australia.

4.1.Stationarity analysis

To begin with, we perform stationarity analysis using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to determine whether our time series data are stationary. The results, presented in Table 1, indicate that the variables are non-stationary at their levels but become stationary after taking their first differences, as evidenced by significant t-statistics at the 1% level.

Table n°1: Results of Unit root tests

PP Test				
	At Level			
		Ln (Y)	**Ln (DI)**	**Ln (X)**
With Constant	t-Statistic	-0.7837	-0.8165	-0.9907
	Prob.	0.8148	0.8055	0.7496
With Constant & Trend	t-Statistic	-1.1280	-1.4398	-0.7878
	Prob.	0.9136	0.8364	0.9597
Without Constant & Trend	t-Statistic	13.5794	4.3093	5.9602
	Prob.	1.0000	1.0000	1.0000
	At First Difference			
		Ln (Y)	**Ln (DI)**	**Ln (X)**
With Constant	t-Statistic	-6.1075***	-5.6544***	-4.6779***
	Prob.	0.0000	0.0000	0.0004
With Constant & Trend	t-Statistic	-6.1204***	-5.6120***	-4.7244***
	Prob.	0.0000	0.0001	0.0021
Without Constant & Trend	t-Statistic	-1.7412*	-4.3717***	-2.8398***
	Prob.	0.0774	0.0000	0.0054
ADF Test				
	At Level			
		Ln (Y)	**Ln (DI)**	**Ln (X)**
With Constant	t-Statistic	-0.7978	-0.8211	-1.0621
	Prob.	0.8108	0.8041	0.7234
With Constant & Trend	t-Statistic	-1.1280	-1.4398	-0.4318
	Prob.	0.9136	0.8364	0.9835
Without Constant & Trend	t-Statistic	14.0809	4.4602	3.3261
	Prob.	1.0000	1.0000	0.9996
At First Difference				
		Ln (Y)	**Ln (DI)**	**Ln (X)**
With Constant	t-Statistic	-6.1403***	-5.7329***	-4.7285***
	Prob.	0.0000	0.0000	0.0003
With Constant & Trend	t-Statistic	-6.1536***	-5.7138***	-4.7889***
	Prob.	0.0000	0.0001	0.0017

Without Constant & Trend	t-Statistic	-0.8254***	-4.4269***	-2.9898***
	Prob.	0.3528	0.0000	0.0036
Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%.				

The stationarity of the time series data is a prerequisite for meaningful econometric analysis. To this end, we perform unit root tests using the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) methods on the logarithms of GDP 'Ln (Y)', domestic investments 'Ln (DI)', and exports 'Ln (X)'. At the level, the PP test results reveal that the t-statistics for 'Ln (Y)', 'Ln (DI)', and 'Ln (X)' are -0.7837, -0.8165, and -0.9907, respectively, with corresponding p-values of 0.8148, 0.8055, and 0.7496 when a constant is included. This indicates that we cannot reject the null hypothesis of a unit root at conventional significance levels, suggesting non-stationarity. When both constant and trend are included, the t-statistics are -1.1280, -1.4398, and -0.7878 with p-values of 0.9136, 0.8364, and 0.9597, respectively, further confirming non-stationarity. Without a constant and trend, the t-statistics are significantly higher, indicating the presence of unit roots.

At first differences, the PP test results change significantly. For 'Ln (Y)', the t-statistic is -6.1075 with a p-value of 0.0000, for 'Ln (DI)', it is -5.6544 with a p-value of 0.0000, and for 'Ln (X)', it is -4.6779 with a p-value of 0.0004, all significant at the 1% level. This suggests that the series become stationary after first differencing. Similar patterns are observed in the ADF test results, with t-statistics of -0.7978, -0.8211, and -1.0621 for 'Ln (Y)', 'Ln (DI)', and 'Ln (X)' at levels (with p-values of 0.8108, 0.8041, and 0.7234). At first differences, the ADF t-statistics are -6.1403, -5.7329, and -4.7285 for 'Ln (Y)', 'Ln (DI)', and 'Ln (X)', respectively, all significant at the 1% level, thus confirming stationarity after first differencing.

4.2.Lag order selection criteria

Selecting the appropriate lag length is critical for accurate model estimation. Table 2 presents the lag order selection criteria for the VAR model. The criteria used include the sequential modified LR test statistic (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn information criterion (HQ).

Table n°2: Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
1	298.1887	NA	6.95e-10	-12.57342	-12.21564*	-12.43939
2	310.5483	21.49507*	6.03e-10*	-12.71949*	-12.00394	-12.45144*
3	319.4180	14.26854	6.13e-10	-12.71382	-11.64049	-12.31175
**** indicates lag order selected by the criterion***						
LR: sequential modified LR test statistic (each test at 5% level)						

FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The results indicate that a lag length of 2 is optimal. The LR, FPE, AIC, SC, and HQ all point to this lag length as providing the best fit. Specifically, the AIC value of -12.71949, SC value of -12.00394, and HQ value of -12.45144 at lag 2 are lower compared to other lag lengths, indicating better model performance.

4.3.Cointegration analysis

To investigate the long-term relationships among 'Ln (Y)', 'Ln (DI)', and 'Ln (X)', we perform the Johansen cointegration test. The results of the trace test, presented in Table 3, indicate three cointegrating equations at the 0.05 level. The null hypothesis of no cointegration is rejected as the trace statistics of 65.25745, 31.26553, and 11.44614 for 'none', 'at most 1', and 'at most 2' cointegrating equations are all significant with corresponding p-values of 0.0000, 0.0001, and 0.0007, respectively.

Table n°3 : Johansen Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.514819	65.25745	29.79707	0.0000
At most 1 *	0.344062	31.26553	15.49471	0.0001
At most 2 *	0.216148	11.44614	3.841466	0.0007
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level				
**** denotes rejection of the hypothesis at the 0.05 level***				
*****MacKinnon-Haug-Michelis (1999) p-values***				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.514819	33.99192	21.13162	0.0005
At most 1 *	0.344062	19.81939	14.26460	0.0060
At most 2 *	0.216148	11.44614	3.841466	0.0007
Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level				
**** denotes rejection of the hypothesis at the 0.05 level***				
*****MacKinnon-Haug-Michelis (1999) p-values***				

Similarly, the maximum eigenvalue test also identifies three cointegrating equations. The maximum eigenvalue statistics of 33.99192, 19.81939, and 11.44614 exceed their critical values, with p-values of 0.0005, 0.0060, and 0.0007, respectively. These results confirm the presence of a stable long-term relationship among domestic investments, exports, and economic growth in Australia.

4.4.Estimation of VECM

Finally, we estimate the Vector Error Correction Model (VECM) to capture both the short-term and long-term dynamics among the variables. The long-run and short-run estimates, presented in Tables 4 and 5 respectively, provide insights into the adjustments towards equilibrium and the dynamic interactions between domestic investments, exports, and economic growth.

Table n°4 : Estimation of VECM in the long run

Vector Error Correction Estimates in the Long Run			
	Ln (Y)	**Ln (DI)**	**Ln (X)**
Ln (Y)		8.778071**	4.066234***
		(1.06662)	(0.78764)
		[-8.22978]	[-5.16253]
Ln (DI)	0.113920***		-0.463226***
	(0.03064)		(0.19462)
	[-3.71834]		[2.38021]
Ln (X)	0.245928	-2.158772**	
	(0.04412) ***	(0.37952)	
	[-5.57412]	[5.68812]	
ECT	-0.388956***	0.520384**	-1.354351***
C	-0.013726***	0.120492**	0.055815***
Standard errors in ( ) & t-statistics in [ ]			
ECT: Error Correction Term			
Notes: (**)Significant at the 5% and (***) Significant at the 1%.			

The Vector Error Correction Model (VECM) is an advanced econometric tool used to analyze both long-term equilibrium relationships and short-term dynamics among time series variables. In this study, the VECM helps us understand the interdependencies between GDP ‘Ln (Y)’, domestic investments ‘Ln (DI)’, and exports ‘Ln (X)’ in Australia. The model captures how these variables interact over time, adjusting to both immediate changes and long-term trends. Table 4 presents the long-run coefficients of the VECM, which reveal significant relationships among the variables. These coefficients indicate how one variable influence another over the long term, holding other factors constant.

The coefficient of ‘Ln (DI)’ in the ‘Ln (Y)’ equation is 0.113920, significant at the 1% level. This means that a 1% increase in domestic investments is associated with an approximate 0.11% increase in GDP in the long run. This positive relationship suggests that domestic investments play a crucial role in boosting Australia's economic output. As businesses and the government invest more within the country, economic activities expand, leading to higher GDP.

Conversely, the coefficient of ‘Ln (Y)’ in the ‘Ln (DI)’ equation is 8.778071, significant at the

5% level. This implies that a 1% increase in GDP results in an 8.78% increase in domestic investments over the long term. This strong positive impact indicates that as the economy grows, the level of domestic investments rises significantly. A thriving economy often encourages more investment, as higher GDP typically signals better business opportunities and increased profitability for investors.

The coefficient of 'Ln (X)' in the 'Ln (DI)' equation is -2.158772, significant at the 5% level. This indicates a negative relationship between exports and domestic investments. Specifically, a 1% increase in exports is associated with a 2.16% decrease in domestic investments in the long run. This inverse relationship might be explained by the possibility that resources and capital are diverted towards boosting exports at the expense of domestic investments. Alternatively, it might reflect a structural aspect of the economy where sectors focused on exports do not necessarily reinvest domestically at the same rate as they generate income from abroad.

These long-run relationships highlight the complex interplay between GDP, domestic investments, and exports in Australia. The significant positive relationships between GDP and domestic investments underscore their mutual reinforcement—economic growth spurs investments, which in turn further propel growth. On the other hand, the negative relationship between exports and domestic investments suggests a potential trade-off where boosting exports may sometimes come at the cost of lower domestic investments. Understanding these dynamics is crucial for policymakers aiming to balance between promoting exports and ensuring sufficient domestic investment to sustain long-term economic growth.

Table n°5: Estimation of VECM in the short run

VEC Granger Causality/Block Exogeneity Wald Tests			
Dependent variable : Ln (Y)			
Excluded	Chi-sq	df	Prob.
Ln (DI)	0.553635	1	0.4568
Ln (X)	13.59757	1	0.0002
All	15.64213	2	0.0004
Dependent variable : Ln (DI)			
Excluded	Chi-sq	df	Prob.
Ln (Y)	6.877179	1	0.0087
Ln (X)	8.419651	1	0.0037
All	9.822581	2	0.0074
Dependent variable : Ln (X)			
Excluded	Chi-sq	df	Prob.

Ln (Y)	0.143815	1	0.7045
Ln (DI)	0.008463	1	0.9267
All	0.250603	2	0.8822

In the short run, the dynamics among GDP ‘Ln (Y)’, domestic investments ‘Ln (DI)’, and exports ‘Ln (X)’ are explored using VEC Granger causality/block exogeneity Wald tests, as detailed in Table 5. These tests help determine if changes in one variable can predict changes in another, indicating a causal link in the short-term fluctuations of these variables.

For the dependent variable ‘Ln (Y)’, excluding ‘Ln (X)’ yields a Chi-square statistic of 13.59757 with a p-value of 0.0002. This very low p-value indicates that exports Granger-cause GDP, meaning changes in export levels can be used to predict short-term changes in GDP. This finding underscores the critical role of exports in influencing Australia's economic performance in the short run. It suggests that fluctuations in export activity have immediate and significant effects on the country's economic output.

When domestic investments ‘Ln (DI)’ are the dependent variable, both GDP ‘Ln (Y)’ and exports ‘Ln (X)’ show significant results. Excluding GDP from the model results in a Chi-square statistic of 6.877179 with a p-value of 0.0087 and excluding exports results in a Chi-square statistic of 8.419651 with a p-value of 0.0037. Both p-values are below the 0.05 threshold, indicating that both GDP and exports Granger-cause domestic investments. This suggests a bidirectional causality: not only does GDP influence domestic investments, but domestic investments also affect GDP. Additionally, exports impact domestic investments, highlighting the interconnectedness of these variables and suggesting that increases in export activities can lead to higher domestic investments.

For the dependent variable ‘Ln (X)’, excluding GDP ‘Ln (Y)’ yields a Chi-square statistic of 0.143815 with a p-value of 0.7045, and excluding domestic investments ‘Ln (DI)’ results in a Chi-square statistic of 0.008463 with a p-value of 0.9267. These high p-values indicate that neither GDP nor domestic investments Granger-cause exports in the short run. In other words, short-term changes in GDP or domestic investments do not predict changes in export levels. This finding suggests that export levels are determined by factors beyond immediate domestic economic conditions, such as international market conditions, exchange rates, or foreign demand.

The short-run dynamics highlight several important points. First, the significant impact of exports on GDP indicates that short-term variations in export levels can predict changes in

economic output, underscoring the importance of export activities in driving economic performance. Second, the mutual influence between GDP and domestic investments suggests that economic growth stimulates investment activities, which in turn can further boost GDP, emphasizing a reinforcing cycle between investment and economic growth. Third, the significant effect of exports on domestic investments highlights the role of international trade in shaping domestic investment decisions, as an increase in exports can lead to higher domestic investments due to improved business confidence and increased capital inflows. Lastly, the absence of short-run causality from GDP and domestic investments to exports implies that export levels are influenced by factors beyond immediate domestic economic conditions, suggesting that policies aimed at boosting exports should focus on enhancing international competitiveness and responding to global market dynamics.

5. Conclusions and recommendations

In this study, we have rigorously examined the interplay among domestic investments, exports, and economic growth in Australia from 1972 to 2021, utilizing a robust methodological framework to provide insights into these critical economic relationships. Our investigation began with the foundational step of analyzing the stationarity of the data for gross domestic product (GDP), domestic investments, and exports. Through stationarity tests such as the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, we established that while the individual time series were non-stationary at their levels, they achieved stationarity after first differencing. This finding was essential for ensuring the reliability of our subsequent analyses and for correctly applying time series econometric methods.

With the data appropriately transformed, we proceeded to determine the optimal lag length for our Vector Autoregression (VAR) model. This step was guided by selection criteria including the Akaike Information Criterion (AIC), Hannan-Quinn Criterion (HQ), and Schwarz Criterion (SC). Our results indicated that a lag length of 2 was optimal, allowing us to capture the dynamics of the relationships among the variables without overfitting the model. Cointegration analysis, performed using the Johansen test, revealed the presence of a long-term equilibrium relationship among domestic investments, exports, and economic growth. Both the trace test and the maximum eigenvalue test identified three cointegrating equations, signifying a stable long-term relationship among the variables. This finding underscores the existence of an enduring equilibrium that governs the interactions between domestic investments, exports, and economic growth in Australia. To delve deeper into both the short-term and long-term

dynamics, we employed a Vector Error Correction Model (VECM). This model facilitated our understanding of how deviations from the long-term equilibrium are corrected over time and highlighted the dynamic interactions among the variables in the short run. The results from the VECM provided valuable insights into the nature of these relationships, revealing significant patterns and feedback mechanisms.

Our study contributes to the existing literature by offering a nuanced analysis of the interactions among domestic investments, exports, and economic growth, with a specific focus on Australia. While previous research has explored these relationships in various contexts, our study adds a significant dimension by concentrating on Australia—a country with a distinctive economic profile and export dynamics. The comprehensive dataset covering several decades, combined with advanced econometric techniques, enhances the robustness and validity of our findings.

The results of our analysis offer several important insights. Firstly, domestic investments exert a positive and significant impact on economic growth. Specifically, a 1% increase in domestic investments correlates with approximately a 0.11% increase in GDP in the long run. This highlights the critical role of investment in infrastructure and capital formation in driving economic expansion. Conversely, GDP has a pronounced effect on domestic investments, with a 1% increase in GDP leading to an 8.78% increase in domestic investments. This strong positive relationship indicates that economic growth stimulates further investments, reinforcing the feedback loop between economic performance and capital formation.

Interestingly, our study also reveals a negative relationship between exports and domestic investments. A 1% increase in exports is associated with a 2.16% decrease in domestic investments. This finding suggests that while exports are a vital component of economic performance, the allocation of resources to export-oriented sectors may not always translate into equivalent domestic investment. This structural aspect of the economy warrants careful consideration in policy formulation to ensure that the growth of the export sector does not come at the expense of domestic capital formation.

In the short run, exports have a significant impact on GDP, indicating that fluctuations in export levels can predict short-term variations in economic growth. This finding underscores the importance of export activity for Australia's immediate economic performance. Additionally, the short-term dynamics reveal interactions between domestic investments and exports, although these relationships are less pronounced than those observed in the long term. This

highlights the necessity of adopting a comprehensive perspective that considers both short-term and long-term dynamics when designing economic policies.

5.1.Recommendations

Based on the findings of this study, several recommendations can be made to policymakers, business leaders, and researchers concerned with the economic growth of Australia. First and foremost, it is crucial to emphasize the importance of domestic investments in fostering economic growth. Given the significant positive impact of domestic investments on GDP, policymakers should prioritize strategies that encourage and facilitate increased investment in key sectors such as infrastructure, technology, and human capital. Initiatives that provide incentives for private sector investments, streamline regulatory processes, and enhance access to capital can contribute to a more robust and sustainable economic expansion.

Furthermore, while exports play a vital role in driving economic performance, the observed negative relationship between exports and domestic investments suggests that a more balanced approach is needed. It is advisable for policymakers to design strategies that ensure the growth of the export sector does not undermine domestic investment efforts. This could involve creating policies that promote diversification of export markets and industries, thereby reducing the dependency on specific sectors and enhancing the overall resilience of the economy. Additionally, fostering partnerships between domestic investors and export-oriented businesses could help align interests and promote synergistic growth.

In terms of short-term economic performance, the significant impact of exports on GDP highlights the need for continuous monitoring of global market trends and trade policies. Business leaders should remain agile and adapt to changing international trade conditions to leverage export opportunities effectively. Moreover, investing in innovation and improving the competitiveness of Australian products and services in global markets can strengthen export performance and contribute positively to economic growth.

5.2.Limitations

Despite the robustness of our analysis, there are several limitations that must be acknowledged. First, the study is constrained by the availability and quality of historical data. Although the dataset spans several decades, the accuracy and completeness of historical economic data can influence the results. Data limitations may affect the precision of the econometric models and

the interpretation of findings. Future research could benefit from incorporating more granular and up-to-date data to enhance the accuracy of the analysis.

Additionally, our study focuses on the Australian context, which may limit the generalizability of the findings to other countries with different economic structures and dynamics. The unique characteristics of the Australian economy, such as its reliance on specific export sectors and investment patterns, may not be applicable to other national contexts. Comparative studies involving multiple countries could provide broader insights and validate the applicability of our findings in diverse economic settings.

Another limitation is the scope of the variables considered. While our study examines domestic investments, exports, and GDP, other factors such as exchange rates, global economic conditions, and domestic policy changes could also influence the relationships under investigation. Future research should explore additional variables and incorporate a more comprehensive set of economic indicators to provide a more holistic view of the factors affecting economic growth.

5.3.Future Research Directions

To build on the findings of this study and address its limitations, several avenues for future research are recommended. One potential direction is to extend the analysis to include a broader range of economic variables and indicators. Incorporating factors such as exchange rates, inflation, and interest rates could provide a more nuanced understanding of the interactions among domestic investments, exports, and economic growth. Additionally, examining the impact of global economic conditions and trade policies on these relationships could offer valuable insights into the external factors influencing Australia’s economic performance.

Another avenue for future research is to conduct comparative studies involving multiple countries. By analyzing the interactions among domestic investments, exports, and economic growth across different national contexts, researchers can identify common patterns and divergences. Such comparative studies can help validate the findings of this research and provide a more generalizable understanding of the economic dynamics at play.

Moreover, investigating the sectoral and regional variations within Australia could yield valuable insights. Understanding how different sectors and regions contribute to economic growth and investment patterns can help tailor policies to specific needs and conditions. For

example, analyzing the impact of domestic investments and exports on regional economic development could provide targeted recommendations for promoting balanced growth across various parts of the country.

Finally, exploring the role of innovation and technological advancements in shaping the relationships among domestic investments, exports, and economic growth presents a promising research direction. Investigating how technological progress and innovation influence investment decisions, export performance, and economic growth could shed light on the evolving dynamics of the modern economy and inform future policy decisions.

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