Journal of Infrastructure, Policy and Development 2024, 8(15), 9371.
https://doi.org/10.24294/jipd9371

Article

The impact of investment in the manufacturing and processing industry on economic growth in Vietnam

Nguyen The Khang

University of Finance-Marketing, Ho Chi Minh 700000, Vietnam; nguyenthekhang@ufm.edu.vn

CITATION

Khang NT. (2024). The impact of investment in the manufacturing and processing industry on economic growth in Vietnam. Journal of Infrastructure, Policy and Development. 8(15): 9371. https://doi.org/10.24294/jipd9371

ARTICLE INFO

Received: 28 September 2024
Accepted: 25 November 2024
Available online: 12 December 2024

Abstract: This study considers the relationship between investment in the manufacturing and processing industries and economic growth in Vietnam. This study applies an autoregressive distributed lag (ARDL) model to reassess the long- and short-term relationships between industrial investment and economic growth from 1998 to 2023. It has been found that in both the long and short term, investments in this sector have a positive and significant effect on economic growth. The results further show that labor negatively affects growth in the long run, but is favorable in the short run. The verdict for the role of exports is that more evidence is required before any conclusive analysis can be conducted. Reinvestment in the manufacturing and processing industries for further economic growth is evident in the foregoing analysis. On the other hand, this research provides insight into the optimization of the utilization of resources and future sustainability by the government.

Keywords: manufacturing; economic growth; investment; ARDL; GDP
JEL Classification Codes: O11; O47; O53; O25

1. Introduction

In the past two decades, the industrial sector has become one of Vietnam's economic growth motors. The sector grew exceptionally well after Vietnam initiated its economic reforms and market liberalization; since then, it has played a prominent role in the Gross Domestic Product (GDP) structure and employment creation by millions of jobs for the labor force.

According to the General Statistics Office (GSO, 2000–2023), Vietnam is a country where the industrial sector has grown at a breakneck speed since joining the World Trade Organization (WTO) in 2007. The sector's share of GDP, which was approximately 12% in 2000, was around 18% by 2023. The industrial production value, which was only 20 billion USD in 2000, crossed 300 billion USD by 2023. This growth indicates the increasing importance of this sector in the national economic structure.

The industrial sector is one of the most important contributors to Vietnamese economic growth. Over the period 2000–2023, real GDP has been growing at an average annual rate of about 6.5%, with the industrial sector accounting for about 30% of GDP by 2023. Manifestly, this is an elucidation of the importance of the sector in economic development and its position as a prime driver of Vietnam's exports.

In 2000, the value of the industrial sector's exports was approximately USD 15 billion; however, by 2023, it had boomed to approximately USD 250 billion, constituting more than 80% of the country's total export turnover. This rise has given Vietnam, which has experienced a consistent trade surplus over the years, good support toward its macroeconomic stability. Most of this value lies in the subsectors of food processing, textiles, and manufacturing electronic products. In 2000, the workforce in this sector was roughly 3 million, and as of 2023, it had increased to almost 10 million, thereby making a significant contribution to unemployment reduction and raising workers' incomes.

Following the achievement of numerous significant milestones, the industrial sector is currently facing many challenges. Regional countries are experiencing tough competition pressure to improve the quality of products and induce more investment in manufacturing technology in the country. However, due to strong governmental policy support and a global trend in the reallocation of supply chains, the industrial sector of Vietnam will continue to grow, contributing significantly to the economy in the near future.

In the last period, Vietnam implemented its policies of incentives for investments, structural modifications, and technical assistance, and has drawn considerable domestic and foreign investments in its industries. However, the impact of these investments on economic growth has not been specifically analyzed in detail, especially considering the growing volatility of the global economy.

This study attempts to answer the question "What has been the contribution of investment in the manufacturing and processing industry to Vietnam's GDP growth?". Not only does this research problem carry that weight, it also bears the imminence of being a matter of strategy for effective economic development in the future.

2. Theoretical review

2.1. Investment

Investment is the process of committing personal resources towards an expected future monetary outcome that is not solely dependent on luck but also a coincidence of some risks that could lead to different possibilities for the individual. In other words, investment is the commitment of current resources, such as time, money, and effort, to obtain more resources in the future (Ulanchuk et al., 2017). This is commonly referred to as passive income.

The manufacturing and processing fields are a branch of the construction industry that includes businesses that produce goods by processing raw materials or other inputs. This can be done by physical, chemical, or mechanical means to develop new products intended for use as an end product or for export trade. These are the economic behaviors at a broader production level that rely heavily on progress in technology, science, and engineering to elevate item quality and fulfill the needs concerning progression. The conversion of materials from agriculture, forestry, or fisheries to mining or minerals and processed items is typically completed. It also includes changing the product design, developing an existing product, or restoring damaged products as part of this production and processing process.

These are not only limited to the organizations of enterprises, factories, or workshops using both machinery and manual labor to produce goods but also include households that produce handcrafted products at home for sale in markets (such as clothing and food, which also fall into the manufacturing and processing industry). This sector also involves businesses and households that provide services related to material processing, maintenance, and machinery installation, although they do not directly produce such goods.

The creation of tangible wealth is the foundation for the economy and society contributed by none other than the industrial subsector of manufacturing and processing; it develops material wealth for the country. This sector also has maximum integration and interconnection with the other two sectors of the economy, namely, agriculture and services. This integration can be classified into supply and value chains. A chain of activities is conducted in a certain manner for the product to develop, which is basically the realization of an idea into a particular product, where its value increases at every step.

Investment in the manufacturing and processing sectors is the prudent deployment of resources towards the acquisition of appropriate machinery, technology, and infrastructure to add production capacity and efficiency in processing and competitiveness. This investment is influenced by various internal and external factors as well as the specific demands of the market (Fisher, 1999).

2.2. Economic growth

The economy decides how rationally they can satisfy their wants, given the scarcities. This measurement is most frequently applied to determine how adequately a nation is using its limited resources through economic growth. People access income and alterations in asset value; enterprises look at profits and market share (Han et al., 2020).

According to Friman and Hyytiä (2022), economic growth is considered a great narrative in our time. In view of the fact that it begets wealth and is a panacea for every social evil, it has become a general objective of political policy over vast areas of the globe in recent decades. Economic production increase is termed economic growth since it is quantified through gross domestic product increase. However, GDP increase comes with more consumption of resources and growing environmental stress, and this well-founded research is ample in that growth is neither magic dust nor intrinsically related to well-being (Schmelzer, 2015).

Concern over the contribution made by the industry towards the economic development of any given country has attracted the attention of many writers, analysts, economists, and policymakers. Several leading theories on industrial growth are discussed herein, with the greatest care. This paper concentrates on two main theories: one of the very first development theories, the Lewis model, and a new growth theory.

The Lewis model is special because it reflects the concept of a dual-sector economy. These are the rural or traditional sector and industrial or urban sector, respectively (Gonciarz et al., 2019). Combining the available resources attracts both sectors to try and integrate their available resources to realize production, thus contributing towards economic growth for the nation’s economic growth. According to this theory, the population of the rural or traditional sector is high relative to production and the resources upon which they depend. Labor attracts marginal productivity in the traditional sector, which may be practically zero. This implies that a large proportion of workers are unemployed or underemployed. Therefore, the rural sector is regarded as a reservoir of labor for which the industrial sector can dump labor without output loss. Labor force population is another contributing factor caused by low mortality rates compared to high birth rate availability of surplus labor from a number of simple labor tasks and the emancipation of female labor from previous captive work markets by capitalists by providing a labor market that benefits have the ability to maintain wages down (Furwanti et al., 2021). However, the theoretical model of neoclassical growth theory, according to which economic development depends on the exogenously competitive improvement of technology, which also conflicts directly with convergence's free trade, has allowed room for searching for a substitute model that could explain the endogenous growth of the economy.

The endogenous growth theory measures economic growth within a system, typically a country. It puts much weight on the system of production, on-the-job training, and developing new technologies for the world market because they have been vital reasons. Endogenous theory seeks to show how nations can tap into the globalization process to identify complimentary activities such as skills, training, and legal frameworks that enable them to survive and benefit from multinational corporations within their political and economic boundaries (Kenneth et al 2023).

3. Empirical review

Therefore, the study is a review of investment in the manufacturing and processing industry and its impact on economic growth in Vietnam. A review of recent studies conducted worldwide and in Vietnam reveals that most studies assess the impact or look at the role of industrial output in economic growth and other macroeconomic variables.

Ogundipe (2022) analyzed the impact of the Nigerian manufacturing sector on economic growth from 1981–2018 to, using the Ordinary Least Squares (OLS) regression method. This shows that capital, labor, foreign direct investment, and manufacturing output have a positive and significant relationship with GDP growth. Saad and Ali (2023) examine the impact of private sector investment in manufacturing on economic growth and unemployment in Iraq from 2004 to 2021. Econometric models and tests were used to determine the impact of the ARDL model. The study found a cointegrated relationship between private sector investment in manufacturing, GDP, and unemployment. In addition, there is a long-term equilibrium relationship between manufacturing output and GDP, which is significantly positive.

Behun et al. (2018) investigated industrialization with the degree of relationship with GDP; most of the sector has a cyclical trend in the majority of European Union countries; it varies directly with the mentioned productions and sales that immediately reflect whether GDP can rise or decrease. Al-Maktof (2018) analyzed the role of the manufacturing sector in economic growth in the Kingdom of Saudi Arabia over a period of nearly 26 years, from 1990 to 2015. During the research, it was established that the manufacturing sector had a favorable impact on economic growth in the Kingdom.

The role played by the manufacturing industry in economic growth is examined in the cross-sectional time series analysis of 14 Arab countries by Ismail (2021), covering the period from 2004 to 2018. The 14 countries are the UAE, Bahrain, Algeria, Saudi Arabia, Iraq, Oman, Qatar, Kuwait, Jordan, Tunisia, Lebanon, Egypt, Morocco, and Yemen. Labor productivity within the manufacturing sector and the share of manufactured products in the value of exports, together with economic growth dynamics, proved to be inseparable. Equally, it has been argued that the development of strategic manufacturing industries forms the backbone of any national economy. Further, the study submits that new technologies, although capital-intensive, enhance labor productivity and, therefore, output.

These studies cast the industrial sector as the epicenter of the economic growth experienced by countries. However, previous studies in Vietnam and globally have focused on investigating how various types of capital, including foreign direct investment, public investment, and private investment, influence growth. Far less attention has been paid to assessing how the attraction of investments to a particular sector, especially the manufacturing and processing industry, impacts economic growth. It is this identified research gap that calls for evidence for Vietnam to enrich the repository of knowledge in this subject area and to serve as a reference by policymakers in the times to come.

The above, investment in the manufacturing and processing industries is a major determinant, following in the same line of the works of other previous researchers who based their studies on the effects of investment on economic growth. The present study introduces a research model based on the work of Meka'a et al. (2024). This study examines the influence of investments in basic public infrastructure on economic growth in Cameroon. The elasticities of various types of infrastructure were compared for their contributions toward economic growth and private investment. The generalized method of moments was used to show that investments in the energy sector were the most significant contributing factors to economic growth. The results further indicate that investments in specific infrastructure do not have a uniform effect on growth and private investment behavior, with an apparent crowding-out effect between the telecommunications sector and private investment behavior. Macroeconomic performance in Cameroon was positively influenced by investments in energy-related, road, and telecommunication-related infrastructures.

To avoid biased regression outcomes and concurrently ensure adequate variables in the model for post-regression testing, this study follows the approach of labor as a control variable, following the model specification of Meka'a et al. (2024), and exports, adopted from the study of Mostofa et al. (2022).

4. Methodology

The ex post facto study design is appropriate for quantitative methods and is the research design selected for this study. The variables used in the research model and regression method are based on the research models of Meka'a et al. (2024) and Mostofa et al. (2022). This study investigates the impact of investment in the industrial manufacturing sector on Vietnam's economic growth using two control variables: labor and exports included in the research model.

In this study, the independent variables are MAN, LAB, and EXP, which are related to the dependent variable GDP. The study will be conducted in Vietnam, and the data to be analyzed will be from 1998 to 2023, based on **Table 1**.

Table 1. Description of variables.

Acronyms	Description	Sources
GDP	Gross domestic product (% of Growth)	https://aric.adb.org/macroindicators
MAN	Investment capital in Manufacturing and processing industry (% of GDP)	Statistical yearbook of Vietnam (2000–2023)
LAB	Labor force participation (% of Population)	https://databank.worldbank.org
EXP	Exports of goods and services (% of GDP)	https://databank.worldbank.org

Source: author's compilation.

The model for this study is

$$GDP_t = \beta_0 + \beta_1 MAN_t + \beta_2 LAB_t + \beta_3 EXP_t + \varepsilon_t \quad (1)$$

In the present study, following the work of Pesaran et al. (1996), and further advanced by Pesaran et al. (2001) and Im et al. (2003), the author has used the ARDL cointegration approach. The ARDL model is an unrestricted dynamic model in which the dependent variable is expressed as a function of its lagged values and other independent variables. Many researchers use this approach based on the study of macroeconomic variables in relation to GDP.

ARDL methodology is a general-to-specific approach with various appealing properties. It bypasses the issue of the order of integration, is appropriate for both large- and small-scale samples, does not demand that the variables share the same order of lag, and provides unbiased estimates, even for some of the explanatory variables being endogenous (Adom et al., 2018). This bound testing in the ARDL analysis nurtures the long-term equilibrium relationship by using the dynamic error correction model. In such a case, the ARDL estimates that are re-specified provide short- and long-run coefficients as well as an estimate of the speed of adjustment far more in touch with reality.

The quantitative ARDL procedure is conducted according to the following steps: first, by the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn (HQ), the lag order of the variables in the ARDL model is set; second, from the correlogram analysis method, the stationarity of the variables is checked, where the variables are not of the same order of integration and none of the variables are stationary at I(2); third, cointegration is tested among the variables by the bound test procedure evaluating the F-Bounds Test statistics to assert long-term relationships I(1) and I(0) critical bounds. If it is greater than these critical bounds, I(1) and I(0), a long-term relationship is established. Finally, as follows from that, the ECM will be worked out by the model:

$$DGDP_t = \beta_0 + \sum_{i=>1} \beta_1 DGDP_{t-i} + \sum_i \beta_2 DMAN_{t-i} + \sum_i \beta_3 DLAB_{t-i} + \sum_i \beta_4 DEXP_{t-i} + \psi ECM_{t-i} + \varepsilon_{2t} \quad (2)$$

This is an error-correction model. The value of ψ indicates how fast we converge to the long-term equilibrium after a shock has occurred. When this parameter of the ECM self-correcting mechanism is negative and statistically significant, it shows that the variable under consideration, GDP in this case, has a self-correcting property that makes it return to its equilibrium value if, at any point, it diverges from the long-term equilibrium.

Step four, involves estimating the ARDL model using the lag orders obtained to determine the long-and short-term relationships in the model. The last and final step is the computation of the short-term effects of the variables using the (ECM) on the ARDL approach following the method of Engle and Granger (1987), according to the cointegration model.

Equation (1) The ARDL regression equation for this study is as follows:

$$DGDP_t = \beta_0 + \sum_{i=>1} \beta_1 DGDP_{t-i} + \sum_i \beta_2 DMAN_{t-i} + \sum_i \beta_3 DLAB_{t-i} + \sum_i \beta_4 DEXP_{t-i} + \lambda_1 GDP_{t-1} + \lambda_2 MAN_{t-1} + \lambda_3 LAB_{t-1} + \lambda_4 EXP_{t-1} + \varepsilon_{it} \quad (3)$$

where: The model for evaluating the long-term impact is

$$GDP_t = \beta_0 + \lambda_1 GDP_{t-1} + \lambda_2 MAN_{t-1} + \lambda_3 LAB_{t-1} + \lambda_4 EXP_{t-1} + \varepsilon_{1t} \quad (4)$$

And the model for the short-term is:

$$DGDP_t = \beta_0 + \sum_{i=>1} \beta_1 DGDP_{t-i} + \sum_i \beta_2 DMAN_{t-i} + \sum_i \beta_3 DLAB_{t-i} + \sum_i \beta_4 DEXP_{t-i} + \varepsilon_{2t} \quad (5)$$

Finally, to check the consistency of the regression results, the study carried out diagnostic tests such as the Variance Inflation Factor (VIF), Normality Test, Breusch-Godfrey Serial Correlation LM Test, Heteroskedasticity Test, Ramsey RESET Test, and Cumulative Sum (CUSUM) (Hair et al., 2006).

5. Empirical analysis

This section presents the data, the results of the regression analysis, and the interpretation of the findings.

5.1. Descriptive statistics of variables

Table 2 descriptive statistics of the study variables, which embody the nature and attributes of the variables under consideration. It tabulates for each variable the mean, median, minimum and maximum values, standard deviation, and *P* value of Jarque-Bera statistic for testing normality distribution of variables.

Table 2. Descriptive statistics.

	GDP	MAN	LAB	EXP
Mean	6.457692	7.262692	74.44512	68.72962
Median	6.786000	7.285000	74.02500	67.26000
Maximum	8.464000	11.31000	77.20000	93.85000
Minimum	2.552000	3.920000	71.41000	44.85000
Std. Dev.	1.497840	1.658401	1.819596	13.96683
Jarque-Bera	5.491377	0.064435	2.306624	1.350569
Probability	0.064204	0.968296	0.315590	0.509012
Observations	26	26	26	26

Source: own processing from Eviews 12.

Both the mean and median depict measures of the central tendency of the data. The GDP ranges from 2.5% to 8.4% for its minimum and maximum values. The *P*-

value of the Jarque-Bera statistic for all variables is greater than 0.05, indicating that the distribution of variables is normal.

5.2. Correlation analysis

As shown in **Table 3**, the independent variables LAB and EXP and the dependent variable GDP have negative correlations, with values of −0.044187 and −0.186407, respectively. Only MAN, valued at 0.529590, has a positive correlation with GDP. This means that the effects of the independent variables on the dependent variable are balanced. Weak correlations between the independent variables are shown in **Table 3**. According to Mukaka (2012), applying the rule of thumb for variable pairing relationship strength, the model's independent variables exhibit a modest correlation with one another because none exceeds 0.70; hence, multicollinearity is avoided and estimations can be undertaken. In addition, after estimating the equation, I check for variance inflation factors (VIF) to check the multicollinearity of coefficients.

Table 3. Correlation coefficients of variables.

	GDP	MAN	LAB	EXP
GDP	1.000000	0.529590	−0.044187	−0.186407
MAN	0.529590	1.000000	0.264480	0.033442
LAB	−0.044187	0.264480	1.000000	0.129800
EXP	−0.186407	0.033442	0.129800	1.000000

Source: own processing from Eviews 12.

5.3. Optimal lag selection and stationarity tests of variables

The study first tests for stationarity after determining the lag order of the variables in the model using the AIC, SC, and HQ criteria. Comparing these criteria, the lag length to consider in this model was found to be two, based on the information provided by the above results of lag selection shown in **Table 4**.

Table 4. Optimal lag selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−222.2502	NA	1813.231	18.85418	19.05052	18.90627
1	−163.8340	92.49234	54.20366	15.31950	16.30121	15.57994
2	−141.7228	27.63892*	37.06064*	14.81023*	16.57732*	15.27904*

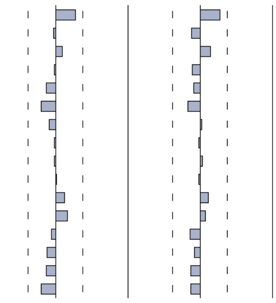
Source: own processing from Eviews 12.

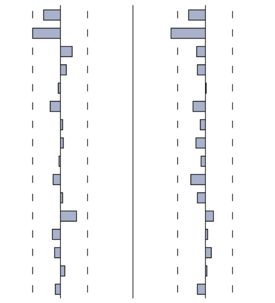
While working with the ARDL bounds testing model, the stationarity test of the variables must first be carried out as a mandatory condition for checking the degree of integration of the observed data series. A Correlogram Analysis method was used to check the stationarity of the variables. As shown in **Table 5**, the variables GDP and MAN are of order I(0), being stationary at level, whereas the rest of the two variables are of order I(1). These are the properties of the variables that make the regression model using the ARDL technique suitable.

Table 5. Stationarity test results of variables.

Variables — **I(0)** | **I(1)**

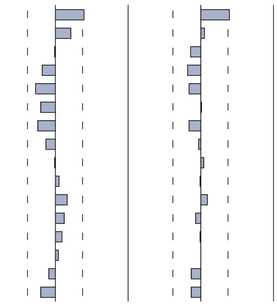
GDP

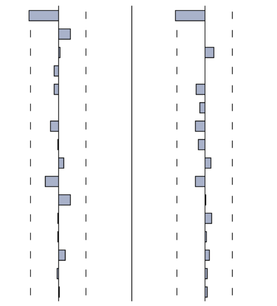
I(0): 

I(1): 

Lag	I(0) AC	I(0) PAC	I(0) Q-Stat	I(0) Prob	I(1) AC	I(1) PAC	I(1) Q-Stat	I(1) Prob
1	0.292	0.292	2.4884	0.115	-0.236	-0.236	1.5659	0.211
2	-0.025	-0.121	2.5073	0.285	-0.401	-0.484	6.2899	0.043
3	0.090	0.148	2.7651	0.429	0.169	-0.118	7.1703	0.067
4	-0.020	-0.112	2.7778	0.596	0.089	-0.112	7.4268	0.115
5	-0.137	-0.086	3.4242	0.635	-0.030	0.021	7.4568	0.189
6	-0.207	-0.178	4.9801	0.546	-0.144	-0.164	8.1920	0.224
7	-0.088	0.026	5.2763	0.626	0.039	-0.069	8.2481	0.311
8	-0.021	-0.018	5.2947	0.726	0.044	-0.134	8.3247	0.402
9	-0.011	0.034	5.2998	0.807	-0.017	-0.054	8.3375	0.501
10	0.011	-0.018	5.3052	0.870	-0.105	-0.209	8.8368	0.548
11	0.128	0.116	6.1023	0.866	0.039	-0.110	8.9104	0.630
12	0.178	0.075	7.7555	0.804	0.234	0.120	11.751	0.466
13	-0.052	-0.142	7.9047	0.850	-0.115	0.033	12.491	0.488
14	-0.120	-0.078	8.7720	0.845	-0.080	0.089	12.879	0.536
15	-0.127	-0.137	9.8347	0.830	0.072	0.027	13.226	0.585
16	-0.207	-0.124	12.940	0.677	-0.068	-0.113	13.572	0.631

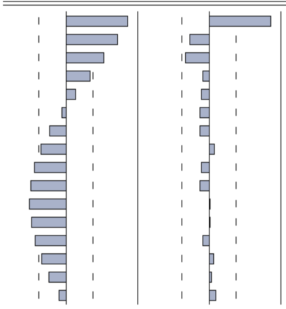
MAN

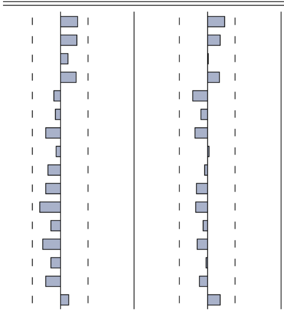
I(0): 

I(1): 

Lag	I(0) AC	I(0) PAC	I(0) Q-Stat	I(0) Prob	I(1) AC	I(1) PAC	I(1) Q-Stat	I(1) Prob
1	0.412	0.412	4.9321	0.026	-0.418	-0.418	4.9075	0.027
2	0.224	0.065	6.4475	0.040	0.176	0.002	5.8142	0.055
3	-0.003	-0.140	6.4478	0.092	0.032	0.129	5.8465	0.119
4	-0.185	-0.188	7.5772	0.108	-0.053	0.006	5.9374	0.204
5	-0.284	-0.157	10.364	0.066	-0.051	-0.118	6.0262	0.304
6	-0.207	0.009	11.918	0.064	0.005	-0.073	6.0271	0.420
7	-0.251	-0.156	14.323	0.046	-0.110	-0.126	6.4846	0.484
8	-0.137	-0.032	15.086	0.058	-0.006	-0.094	6.4859	0.593
9	-0.008	0.041	15.088	0.089	0.080	0.087	6.7577	0.662
10	0.058	-0.004	15.240	0.124	-0.185	-0.125	8.2975	0.600
11	0.180	0.098	16.815	0.113	0.170	0.019	9.6940	0.558
12	0.132	-0.067	17.724	0.124	-0.003	0.092	9.6945	0.643
13	0.095	-0.007	18.225	0.149	-0.008	0.030	9.6977	0.718
14	0.049	0.006	18.370	0.190	0.101	0.073	10.330	0.738
15	-0.095	-0.130	18.971	0.215	-0.011	0.040	10.337	0.798
16	-0.213	-0.130	22.272	0.135	0.018	0.040	10.363	0.847

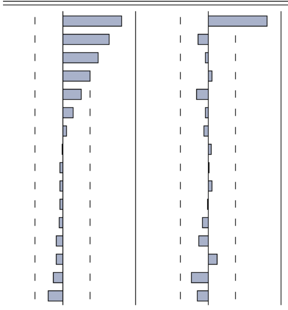
LAB

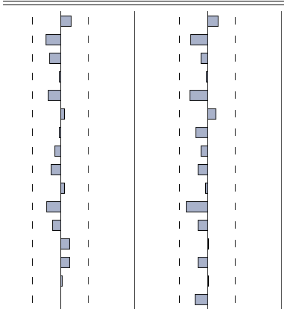
I(0): 

I(1): 

Lag	I(0) AC	I(0) PAC	I(0) Q-Stat	I(0) Prob	I(1) AC	I(1) PAC	I(1) Q-Stat	I(1) Prob
1	0.898	0.898	23.493	0.000	0.250	0.250	1.7628	0.184
2	0.753	-0.279	40.688	0.000	0.233	0.182	3.3619	0.186
3	0.554	-0.340	50.396	0.000	0.111	0.019	3.7399	0.291
4	0.349	-0.087	54.419	0.000	0.224	0.171	5.3515	0.253
5	0.143	-0.107	55.124	0.000	-0.082	-0.207	5.5791	0.349
6	-0.053	-0.139	55.226	0.000	-0.068	-0.096	5.7423	0.453
7	-0.232	-0.131	57.284	0.000	-0.210	-0.173	7.4000	0.388
8	-0.357	0.077	62.426	0.000	-0.053	0.031	7.5101	0.483
9	-0.451	-0.108	71.143	0.000	-0.170	-0.040	8.7276	0.463
10	-0.510	-0.130	82.976	0.000	-0.211	-0.150	10.730	0.379
11	-0.526	0.022	96.389	0.000	-0.291	-0.159	14.823	0.191
12	-0.499	0.024	109.35	0.000	-0.138	-0.056	15.817	0.200
13	-0.445	-0.083	120.43	0.000	-0.241	-0.142	19.076	0.121
14	-0.350	0.073	127.87	0.000	-0.129	-0.009	20.092	0.127
15	-0.240	0.035	131.68	0.000	-0.201	-0.113	22.831	0.088
16	-0.102	0.092	132.43	0.000	0.120	0.182	23.913	0.091

EXP

I(0): 

I(1): 

Lag	I(0) AC	I(0) PAC	I(0) Q-Stat	I(0) Prob	I(1) AC	I(1) PAC	I(1) Q-Stat	I(1) Prob
1	0.840	0.840	20.535	0.000	0.155	0.155	0.6789	0.410
2	0.664	-0.140	33.907	0.000	-0.200	-0.230	1.8525	0.396
3	0.506	-0.040	42.027	0.000	-0.154	-0.087	2.5832	0.460
4	0.398	0.058	47.261	0.000	-0.011	-0.015	2.5872	0.629
5	0.270	-0.161	49.791	0.000	-0.176	-0.242	3.6369	0.603
6	0.155	-0.036	50.668	0.000	0.053	0.117	3.7365	0.712
7	0.051	-0.055	50.767	0.000	-0.019	-0.159	3.7500	0.808
8	-0.006	0.045	50.769	0.000	-0.078	-0.085	3.9945	0.858
9	-0.039	0.010	50.833	0.000	-0.127	-0.123	4.6720	0.862
10	-0.038	0.058	50.900	0.000	0.050	-0.028	4.7851	0.905
11	-0.036	-0.004	50.963	0.000	-0.193	-0.303	6.5883	0.831
12	-0.048	-0.082	51.083	0.000	-0.110	-0.136	7.2216	0.843
13	-0.094	-0.126	51.575	0.000	0.129	0.015	8.1571	0.833
14	-0.089	0.125	52.057	0.000	0.133	-0.135	9.2405	0.815
15	-0.133	-0.232	53.224	0.000	0.026	0.024	9.2873	0.862
16	-0.211	-0.155	56.450	0.000	0.006	-0.169	9.2896	0.901

Source: own processing from Eviews 12.

5.4. Bound test for cointegration

Having determined the optimal lag length and tested for variable stationarity, the study now undertakes bound testing for long-term relationship assessment between GDP and its independent variables, as shown in **Table 6**.

Table 6. Bound test results.

***F*-bounds test**		**Null hypothesis: no levels relationship**		
Test statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic	14.28199	10%	2.72	3.77
k	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

Source: own processing from Eviews 12.

From **Table 6**, the calculated *F*-statistic value (14.28199) is above the upper-bound critical values at the 90%, 95%, and 99% confidence levels, which are 3.77, 4.35 and 5.61, respectively. Thus, it can be confirmed that there is cointegration or long-term relationship between the dependent variable economic growth (GDP) and the independent variables MAN, LAB, and EXP. The following section estimates the relationships between the variables in the long and short run.

5.5. ARDL model estimation

The ARDL model estimates the long-run and short-run relationships between the dependent variable, GDP, and independent variables. The long- and short-run elasticities are captured by the coefficients of the independent variables in **Table 7**.

Table 7. Estimation results.

Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
The dependent variable: GDP. Long-Term Estimation Results				
MAN	0.604603	0.103805	5.824437	0.0001
LAB	−0.227888	0.069777	−3.265958	0.0061
EXP	−0.016311	0.010865	−1.501317	0.1572
The dependent variable: D (GDP). Short-Term Estimation Results				
C	34.89051	4.187122	8.332813	0.0000
D (GDP (−1))	0.466669	0.133254	3.502099	0.0039
D (MAN)	0.411531	0.108047	3.808834	0.0022
D (LAB)	0.157980	0.233469	0.676666	0.5105
D (LAB (−1))	0.789267	0.293524	2.688939	0.0186
D (EXP)	0.027634	0.048189	0.573463	0.5761
D (EXP (−1))	0.091268	0.044643	2.044414	0.0617
CointEq (−1) *	−1.746467	0.208280	−8.385185	0.0000

Source: own processing from Eviews 12.

To enhance the reliability of the estimation results, six diagnostic tests were performed, with the outcomes detailed in **Tables 8** and **9**.

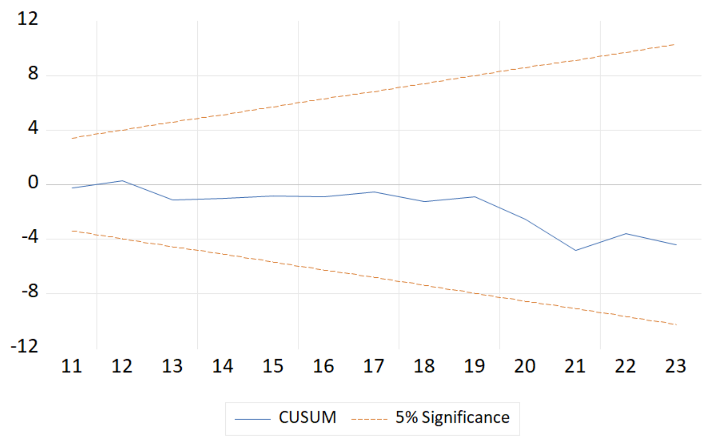
Table 8. Diagnostic test results.

No	Tests	*P*-value	Results
1	Normality test	0.5778	Normal distribution
2	Breusch-Godfrey Serial Correlation LM Test	0.1613	No autocorrelation
3	Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.7192	No heteroscedasticity detected
4	Ramsey Reset Test	0.1103	No need for additional variables

Source: own processing from Eviews 12.

Table 9. Variance inflation factor (VIF) and CUSUM test results.

Variables	Coefficient Variances	Centered VIF
GDP (−1)	0.033345	2.229187
GDP (−2)	0.022546	1.447645
MAN	0.030792	1.754583
MAN (−1)	0.031867	2.129396
LAB	0.075767	7.698357
LAB (−1)	0.216634	9.667100
LAB (−2)	0.131676	8.093307
EXP01	0.003314	6.908453
EXP (−1)	0.006761	9.204701
EXP (−2)	0.003091	8.005604



Source: own processing from Eviews 12.

All entered VIF values are below comparable results for the long-term model without multicollinearity, as defined by Hair et al. (2006). No clear indication points of CUSUM test instability or major changes in the model over the period tested the line well within the testing boundary. Overall, the CUSUM plot indicates that the time regression model for this study is time-stable.

5.6. Discussion of research findings

Long-term estimation results: Investment in the manufacturing and processing industries, with a statistically significant level of 1 percent (Prob. = 0.0001) and a value of 0.604603, indicating that in the long run, investment in this sector impacts GDP. Labor in the economy, with a value of −0.227888 and a statistically significant level of 1 percent (Prob. = 0.0061), suggesting that labor has an inverse relationship with GDP in the long run. This may be due to the challenges of labor productivity or a suboptimal labor structure. With a *P*-value of 0.1572, exports have a coefficient of −0.016311, which is not statistically significant.

Short-term estimation results: The coefficient of the lagged GDP variable (GDP (−1)) is 0.466669, significant at the 1% level (Prob. = 0.0039) shows that past GDP is positively related to current GDP in the short run. It has a coefficient of 0.411531, with a 1% probability level (Prob. = 0.0022) for value added in manufacturing and processing activities, which means that investment in this sector has a robust and positive impact on GDP in a short period. The variable D(LAB)) has a coefficient of 0.157980 and is not statistically significant (Prob. = 0.5105) states that labor does not have a notable impact in the short term. Meanwhile, the coefficient for D (LAB (−1)) is 0.789267 at the significant value of Prob. = 0.0186 shows that the lagged labor variable affects GDP positively and meaningfully—an indication that there exists a more long-lasting impact of labor on GDP. In the case of exports, no data underpin the assessment. The long-term adjustment coefficient, CointEq (−1), has a value of −1.746467 with 1% statistical significance (Prob. = 0.0000). Such negative and significant coefficients show a strong force that drives GDP back to its equilibrium path if there is a deviation of GDP from long-term equilibrium, and this force acts at an extremely high speed.

Overall conclusion: Investment in the manufacturing and processing sectors is a significant driver of economic growth over both short and long periods. Labor has a negative effect on GDP in the long-term horizon; nonetheless, the variable for labor in the short-term is positively inclined. Exports do not reverberate the significant effects on GDP; thus, a probe into the relationship between the two may be appropriate. This econometric model is of immense utility in understanding the role played by different factors in Vietnam's economic growth.

6. Policy implications

The specific policy implications that the Vietnamese government may consider in view of the above results on the impact of investment in the manufacturing and processing industries on Vietnam's economic growth are as follows:

First, we upgrade investment in the manufacturing sector. The findings reveal that investment in the manufacturing sector has a robust and positive influence on GDP, both in the short and long run. The manufacturing sector should be encouraged and supported by the government through tax breaks, financial assistance, and infrastructure facilities. Second, the development of supporting industries will help raise the level of efficiency and competition in the manufacturing sector, which is why this has to be done.

Second, the quality and structure of the workforce must be improved. Since long-term labor adversely affects GDP, the Government has to concentrate on improving the quality of labor by introducing vocational programs, education, and developing skills. This will help increase labor productivity and reduce its negative impact on the economy as a whole. Reassessing labor structures implies a shift of workers to higher-productivity sectors and facilitates the shift through flexible labor policies.

Third, we reconsider the export strategy. This is because the results show that exports do not have significant effects on GDP, probably due to the low added value of exports. The government must concentrate more on increasing the added value of its export products, diversifying its export markets, and enhancing product quality. Barriers should also be considered, as well as enhancing the competitiveness of export businesses, to make trade activities more effective.

Furthermore, the fact that the long-term adjustment coefficient is negative and significant points to the need for measures of macroeconomic stabilization. The Government of Vietnam needs to maintain proper fiscal and monetary policies that will support the economy in holding an equilibrium and quick recovery after any shock impact.

Conflict of interest: The author declares no conflict of interest.

References

Adom, P.K., Kwakwa, P.A., & Amankwaa, A. (2018). The long-run effects of economic, demographic, and political indices on actual and potential CO2 emissions. Journal of Environmental Management, 516-526. https://doi.org/10.1016/j.jenvman.2018.04.090

Al-Maktof, A. M. (2018). The role of the manufacturing industry in economic growth in Saudi Arabia. Journal of Administrative and Economic Research, 9 (1), 530-547.

Behun, M., Gavurova B., Tkacova A., & Kotaskova A. (2018). The impact of the manufacturing industry on the economic cycle of European Union Countries. Journal of Competitiveness, 10 (1), 23 - 39. https://doi.org/10.7441/joc.2018.01.02

Engle, R., & Granger, C. (1987). Cointegration and Error Correction: Representation, Estimation and Testing. Econometrica, 55, 251-276. http://dx.doi.org/10.2307/1913236

Fisher, I. (1999). The theory of interest. Macmillan.

Friman, A., & Hyytiä, N. (2022). The economic and welfare effects of food waste reduction on a food-production-driven rural region. Sustainability, 14(6), 3632.

Furwanti, R., Hardiyono, H., & Lestari, D. M. (2021). Towards Understanding Economic Growth in Indonesia: Reinterpretation Of Lewis Model In Improving Lingving Standars of Agricultural Sector Workforce Evidence From Indonesia. Jurnal Sosial Ekonomi Pertanian, 17(1), 61-68.

Gonciarz, W., Walencka, M., Moran, A. P., Hinc, K., Obuchowski, M., & Chmiela, M. (2019). Upregulation of MUC5AC production and deposition of Lewis determinants by Helicobacter pylori facilitate gastric tissue colonization and the maintenance of infection. Journal of Biomedical Science, 26(1), 1-12.

GSO (General Statistics Office of Vietnam) (2000-2023). Vietnam Statistical Yearbook 2022. Hanoi: Statistical Publishing House.

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (2006). Multivariate data analysis. Prentice-Hall, International, Inc

Han, J., Heshmati, A., & Rashidghalam, M. (2020). Circular economy business models with a focus on servitization. Sustainability, 12(21), 8799. https://doi.org/10.3390/su12218799

Im, K.S., Pesaran, M.H., & Shin, Y. (2003) Testing for Unit Roots in Heterogeneous Panels. Journal of Econometrics, 115, 53-74. https://doi.org/10.1016/S0304-4076(03)00092-7

Ismail, M. J. (2021). The impact of the manufacturing sector on economic growth in the Arab countries, Arab Monetary Fund. Economic Studies, No. 90.

Kenneth, U.O., Gibson, L.D., & Saviour, M.E. (2023). On the Manufacturing Sector Performance and Nigeria's Economic Growth. International Journal of Social Sciences, 5(1), 79-103

Meka'a, C. B., Fotso, S.R., & Guemdjo, K. B. R. (2024). Investments in basic public infrastructure and their effects on economic growth in a developing country: The case of Cameroon. Heliyon, 10, e26504. https://doi.org/10.1016/j.heliyon.2024.e26504

Mostofa, M.H., Hossain, B.M.S., & Sayem, M. A. (2022). Determining the Impact of Economic Factors to the Gross Domestic Product in Bangladesh. International Journal of Economics and Financial Issues, 12(1), 37-40.

Mukaka, M.M. (2012). Statistics Corner: A guide to appropriate use of Correlation coefficient in medical research. Malawi Medical Journal, 24(3), 69-71.

Ogundipe, M. (2022). The impact of manufacturing sector on economic growth in Nigeria. Retrieved from https://orcid.org/0000-0002-0530-0702. DOI: https://doi.org/10.21203/rs.3.rs-2203096/v1, 1-16.

Pesaran, M. H., Y. Shin., & R. Smith (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, pp. 289-326.

Pesaran, M.H., Shin, Y., & Smith, R.J. (1996). Testing for the 'Existence of a Long-Run Relationship. Faculty of Economics, University of Cambridge, Cambridge.

Saad, A.U.H., & Ali, D.K. A.H (2023). The Impact of Private Sector Investment in the Manufacturing Industry on Growth and Unemployment in Iraq for the Period 2004-2021. Economics, 12(3), 83-92, doi: 10.11648/j.eco.20231203.11

Schmelzer, M. (2015). The growth paradigm: history, hegemony, and the contested making of economic growth Manship. Ecological Economics, 118, 262-271.

Ulanchuk, V., Zharun, O., Sokolyuk, S., & Tkachuk, S. (2017). Investment needs assessment of Ukrainian agricultural enterprises. Investment Management and Financial Innovations, 14(1), 181–190. https://doi.org/10.21511/imfi.14(1-1). 2017.04