THE ECONOMIC JOURNAL OF NEPAL, Vol. 43, No. 1 & 2, January - June, 2020, (Issue No. 153) © Cedecon-TU
DOI: https://doi.org/10.3126/ejon.v43i1-2.48026

An Assessment of the Impact of Industries on Economic Growth in Nepal: An Empirical Analysis

Mukti Bahadur Khatri[1]

Abstract

Industrial sector is considered as the most potential sector of an economy to achieve and sustain the economic development of any nation. So, this study examines analytically assessing the impact of industries on economic growth in Nepal based on secondary data and used Johansen Co-integration, Vector Auto Regression (VAR), Vector Error Correction Model (VECM) and Granger Causality test regarding Ordinary Least Squares (OLS) regression analysis to investigate the relative changes in the position of the total industries, total investment, and real GDP between the time period 1989 and 2019 of Nepal. According to OLS and VAR results, there is a significant and positive relationship between real gross domestic product (RGDP) with investment but insignificant and inverse relationship of total industries with RGDP of Nepal. It implies that RGDP is mostly influenced by investment. Accordingly, Johansen co-integration rank tests indicate that there exists a co-integration relationship among total industry and investment with RGDP of Nepal and VECM tests also indicate the long-run relationships of these variables. However, there is a Granger-causality existing between investment with GDP and total industries and others have no causality.

Keywords: *Industry, RGDP, Economic growth, Investment, Regression, Co-integration.*

Introduction

Generally, sustained economic development depends upon the ground of industrial development. That's why industry is regarded as the potential sector of an economy, which can mobilize limited resources as their potential capacity and creates various forms of utilities. Industry has also a significant role in the process of transformation i.e. raw materials are transformed in the form of final goods.

1 **Mr. Khatri** is a Lecturer in Economics at Trichandra Multiple Campus, Ghantaghar, Tribhuvan University, Kathmandu, Nepal. Email: muktikc01@gmail.com/mukti.khatri@trc.tu.edu.np

Therefore, industries play a significant role in the economic development in Nepal by stimulating private sectors and entrepreneurial skills along with joint effort of public, private, and cooperative sectors. At the same time, it is also acting as incubators for developing domestic enterprises into large corporations. However, the contribution of this sector to the Nepalese economy is still relatively small i.e. below 10 percent (only 6.5 percent in FY 2018/19) of the GDP. In recognition of this, the government of Nepal and the Provincial government have put priority on developing this sector by implementing different policies like Industrial Policy - 2067, Foreign Investment Policy - 2071, National Intellectual Property Policy – 2067, and Industrial Enterprises Act - 2073.

Industrial development in Nepal has been affected by the constant change in political systems from the historical time period. Thus its development started rather late in Nepal. However, it progressed with the establishment of the Industrial Council in 1936 A.D. Similarly, the process of planned industrialization started with the launching of the First Five- Year Plan in 1956 A. D. Gradually, a number of SMEs and large scale industries such as cigarette, sugar, cotton, cement, bricks, and paper industries were established in the public sector. But, the overall process of industrialization is quiet in its infant phase. Average contribution of industrial sectors to real GDP in the last ten years is equal to 6.85 percent and its growth is only 3.4 percent (MoF, 2020).

There have been many researches that examine the role of industries on the growth and local resource utilization in the global context. But in the Nepalese context, there have been a few researches that examine the role of industries on the economic growth of Nepal. Bringing growth in industrial production is imperative for happy and prosperous Nepal. Neither import substitution nor export promotion is possible in the absence of growth of industrial production. The huge trade deficit of Nepal cannot be reduced either. In this regard, the development of the industrial sector is very much necessary to reorient the economy towards the path of prosperity. It is vibrant to give high priority to Nepalese labor, traditional skill, and raw material based investments to promote home industries for achieving national economic growth as per the spirit of the new constitution of Nepal through industrial growth.

Objectives of the Study

The general objective of the study is to consider the significance of industries in the economy of Nepal. The specific objective of the study is to identify the contribution of industries of Nepal to RGDP.

Review of Literature

Attiah (2019) examines the role of manufacturing and service sectors in economic development in the period (1950-2015) by using raw data of 10 advanced and 40 developing countries. The study said that manufacturing has played a key role in the economic development of developing countries. The experience of countries like India,

which invested in services and the failure of industrialization in Africa and Latin America have led to uncertainty about the effectiveness of manufacturing to foster development. However, the share of manufacturing of GDP is positively related to economic growth acceleration and this effect is more well-defined for the poorer countries. On the other hand, no such effects were found for services. Therefore, manufacturing is especially important in periods of accelerated growth and at the same time services also play a role in growth accelerations, but less than manufacturing.

Elizabethrani (2019) said that enterprises give significant advantages to the economy, such as, work age, production of goods and services, equivalent salary conveyance in the entire economy. Service segment contributes 60 percent of the Indian GDP while agriculture gives around 14 percent of GDP and remains covered by industry. Industrialization believes a crucial job in the economic development of creating nations. So, the industrial sector is the leading segment that is producing employment at a quicker pace than their populace is developing. Also, it will draw surplus work from agriculture to it, along with improving farm profitability as well. Hence, this study is highlighting the contribution of industries in the economic development of India.

Behun et al. (2018) focused to identify the relationship between manufacturing and GDP, which represents the economic cycle in the countries of European Union (EU). The manufacturing industry is a key sector in many national economies and is concerned in creating sustainable economic growth. In addition, it is a sector sensitive to internal and external impacts in fluctuations in the economic cycle and copying its development or even outperforming the development of economic cycles. The time series of selected indicators of the manufacturing industry and GDP from the Euro stat database from Q1 2000-Q4 2016 of 296 with a quarterly periodicity from 22 EU countries (including the United Kingdom) were used for analysis. The results show that the processing industry is a sector with significant cyclical behavior. In most countries, production and sales in the manufacturing industry behaved as simultaneous indicators, changes in production as well as sales almost immediately reflected in the growth and decline in GDP.

Khatri (2018) found that the industrial sector is to be a more significant sector contributing a great role in wide and sustaining economic growth along with development in Nepal even in reality it has less contribution than its potential capacity in the past.

Su and Yao (2016) examined the role of the manufacturing sector by taking advantage of a large dataset that covers internationally comparable information. They found that the manufacturing sector is permeated with three important characteristics. First, for middle-income economies, manufacturing helps to develop services, instead of the others. Similarly, a decline in the manufacturing sector growth rate will negatively affect the growth rate of the services sector, in both the short-run and long-run. Second, they confirm that manufacturing development not only promotes the incentives of savings but also accelerates the pace of technological accumulation. Third, an increased share of the manufacturing sector in middle-income economies can boost the utilization of

human capital and economic foundations. Finally, the manufacturing sector is still the key engine of economic growth for middle-income economies.

Farayibi (2015) examined the role of entrepreneurship in economic growth in Nigeria by using econometric analysis. Findings of this study confirm the significance of entrepreneurs as good drivers of economic growth. According to results, credit to SMEs is statistically significant in the determination of economic growth, implying that increase in entrepreneurial financing has a significant effect on economic growth in Nigeria.

Ajmair (2014) investigated the relationship between economic growth and different components of the industrial sector of the economy of Pakistan and used the secondary data for 61 years from 1950 to 2010 and tested the time series data by using ADF tests. Simple linear regression is applied after time series techniques to estimate the relationships. All the variables used in this study are stationary in I(1). This study concluded that the entire hypothesis has a positive impact on GDP, partially accepted. In simple linear regression all the components of the industrial sector show a positive relationship with GDP except the mining and quarrying sector that not only shows the negative relationship but also an insignificant one. All other outcomes are statistically significant and consistent.

Hussin and Yik (2012) recently China and India have achieved spectacular economic growth along with rapid increase in GDP per capita. This study examines the contribution of economic sectors i.e. agricultural, manufacturing and services sectors to economic growth in both countries by using time series data from 1978 to 2007. In this study, ADF unit-root test shows that the time series data are stationary at first difference. Similarly, correlation analysis indicates that each economic sector has a strong, positive, and significant linear relationship with economic growth in both countries. In addition, the results of multiple regression analysis show that agriculture, manufacturing, and service sectors have positive relationships with GDP per capita in both countries. However, the role of economic sectors to economic growth differs in China and India. Manufacturing sector contributes the highest to economic growth of China while the services sector is the highest contributor to economic growth of India.

Szirmai (2012) examined the rise of manufacturing in developing countries in the period 1950–2005 and used new data on structural change in a sample of 67 developing and 21 advanced economies. It is found in the theoretical and empirical evidence that industrialization acts as an engine of growth in developing countries and attempts to quantify different aspects. The statistical evidence is not completely straightforward. The manufacturing sector has been important for growth in developing countries, but some expectations of the 'Engine of Growth' hypothesis. This study has more general historical evidence supporting the industrialization hypothesis.

Tregenna (2008) analyzed the relationships between the manufacturing and service sectors regarding the rest of the domestic economy based on the analysis of input-output tables and employment trends. The study found that manufacturing is particularly

important as it is a source of demand for the service sectors as well as the rest of the economy through its strong backward linkages which suggests that a decline in manufacturing could negatively affect future growth.

Stel et al. (2005) explained that entrepreneurial movement is generally assumed to be an important aspect of industries most encouraging to innovative activity and uncontrolled competition. The study investigates whether total entrepreneurial activity influences GDP growth for a sample of 36 countries. Similarly, the study tests whether this influence depends on the level of economic development measured as per capita GDP. By incorporating the growth competitiveness index, adjustment is made for a range of alternative explanations for achieving economic growth. The study found that economic growth is affected by entrepreneurial activity by growing entrepreneurs and owners/managers of young businesses, whereas this effect depends upon the level of per capita income. The study recommended that entrepreneurship plays a different role in countries in different stages of economic progress.

So, this study has made three contributions. First, it extends the literature by providing insights into the relationship amongst industries and the economy of Nepal. Second, the study contributes to developing a better understanding of the effects of industry forces in emerging industries development like in Nepal whose structure and institutional characteristics are different from other economies. Hence, it is worthwhile to examine whether industries in Nepal respond to economic activities differently. Finally, it may pave the way towards extending the investigation and promotion to the development of large scale industry in Nepal.

Data and Methodology

The theoretical approach for studying the relationship between the industries and economic growth provided by the development theory and followed by the ex-post facto research i.e. (Attiah, 2019), (Ajmair, 2014), and (Hussin & Yik, 2012), which is used to describe the relationship of industries and economic growth of Nepal.

Data for the Study

The study used secondary sources of data collected from industrial statistics, Department of Industry, Ministry of Industry, Commerce and Supplies and Ministry of Finance from 1989 to 2019 for a total of 31 annual observations (Appendix -1).

Tools and Methods of Data Analysis

The study compromises yearly observations of variables. The data collected is categorized; tabulated, processed, and analyzed using different methods. Descriptive statistics such as frequency, mean, standard deviation, maximum, minimum, skewness, and kurtosis were used to provide summary information about the distribution, variability, and central tendency of a variable. The model building for this approach involves regression analysis regarding ADF, Co-integration, VAR, VECM, and Granger causality

test based on above mentioned ex-post facto research. The study also employs graphs to obtain the relationship between macroeconomic variables (RGDP) and the industries.

Model Specification

In this section, this study turns to a more systematic analysis of the summary statistics using regression analysis. Therefore, we can run regressions of the form:

$$GDP_t = f(\text{industries}) \text{ i.e. } RGDP_t = a + b_1 X_{1t} + b_2 X_{2t} + \ldots\ldots + e_t \ldots\ldots\ldots\ldots\ldots \text{(i)}$$

Where, $RGDP_t$ = Real GDP of Nepal from 1989 to 2019 AD

X_{1t} = Number of industries from 1989 to 2019 AD

X_{2t} = Total investment from 1989 to 2019 AD

e_t = Error

And, b_1, b_2 and b_3 are coefficients

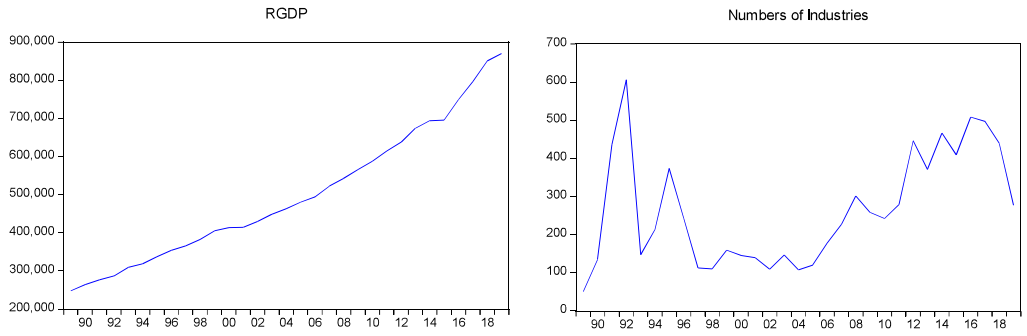
Hence, the study used a simple OLS regression to estimate with standard errors for a given time period.

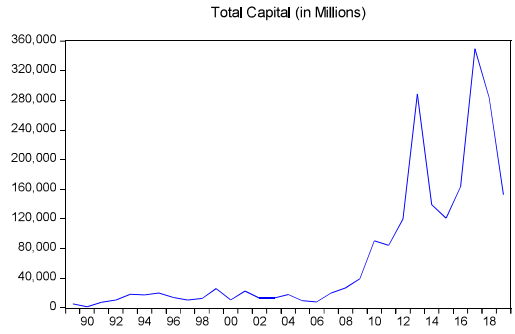
Results and Discussions

Graphical Test of Concerned Variables

A graphical presentation of the data is usually the first step in the analysis of any time series. So, on the basis of EViews software diagrams of concerned variables are derived. The process of transformation of log data is mentioned in methodology. The reflections of these graphs seem to be 'trending' upward, albeit with fluctuations.

Figure 1: Visual Plot of Level Data LNRGDP, LNTNI and LNTINV

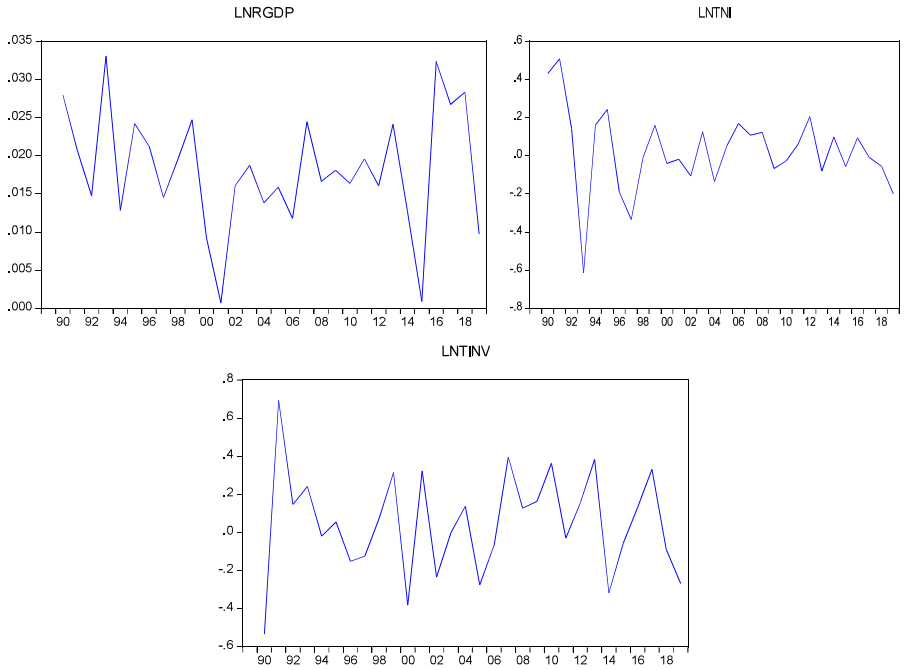




Source: Derivation of Author

The values of concerned variables like economic growth (i.e. RGDP), total number of industries, and total investment are derived as a path of time series variables (Figure-1) have been increasing. It is showing an upward trend, suggesting that the mean of these variables is changing. So, it implies that these series / variables are not stationary. On the contrary, the first difference of log value of concerned variables like economic growth (i.e. RGDP), total number of industries and total investment are termed as LNRGDP, LNTNI, and LNTINV in the Figure-2 where the ΔLNRGDP (dlRGDP) and other time series over the period of study have been fluctuating and that is not showing a trend, suggesting that the mean of these variables is not changing. So it suggests that these series are stationary.

Figure 2: Visual Plot of First Difference of LNRGDP, LNTNI and LNTINV



Source: Derivation of Author

Summary Statistics

The summary report of mean, median, standard deviation, maximum, minimum, skewness, kurtosis, Jarque-Bera, probability, and sum of squares of deviation explains synopsis about the distribution, variability, and central tendency of a variable.

Table 1: Summary Statistics of LNRGDP, LNTNI, and LNTINV

Variables	LNRGDP	LNTNI	LNTINV
Mean	0.0182	0.0247	0.0489
Median	0.0173	0.0209	0.0654
Maximum	0.0330	0.5091	0.6934
Minimum	0.0006	-0.6151	-0.5335
Std. Dev.	0.0078	0.2126	0.2714
Skewness	-0.2126	-0.4709	0.0265
Kurtosis	2.9970	4.8433	2.8027
Jarque-Bera	0.2261	5.3561	0.0521
Probability	0.8930	0.0686	0.9742
Sum	0.5460	0.7434	1.4678
Sum Sq. Dev.	0.0017	1.3111	2.1364

Source: Construction of Author.

According to the Table 1 the mean and median of LNRGDP is almost the same but values of others are quite different. The standard deviations indicate that LNTINV is highly volatile while LNRGDP is less volatile. The largest and lowest values are 0.6934 and --0.6151. The variable LNTINV shows positive skewness indicating the higher probability of very large positive economic growth. While variables show negatively skewed indicating that they have a larger number of high values even if not extreme and lower numbers of small values but are more extreme. Similarly, the kurtosis shows that it is platykurtic (fat or short tailed) with lower than normal kurtosis (i.e. $K > 3$) which means that there is a higher probability than usual for extreme values (very good or very bad growths) to occur. The combination of these presents the normal distribution of the variable as indicated by the J-B test of normality.

Correlation Matrix

The correlation matrix of Table 2 shows that there is moderate positive correlation between the LNRGDP and other variables. It implies that RGDP is directly affected by the number of industries and investment.

Table 2: Correlation Matrix of LNRGDP, LNTNI, and LNTINV

Variables	LNRGDP	LNTNI	LNTINV
LNRGDP	1.0000	-	-
LNTNI	0.0224	1.0000	-
LNTINV	0.2142	0.0928	1.0000

Source: Construction of Author.

The table 2 displays the correlation of concerned variables for the sample period 1989 to 2019. The concerned variables LNRGDP, LNTNI and LNTINV denoted the first difference of log value of RGDP, total industries, and total investment.

Co-integration

A linear combination of log of RGDP (LNRGDP), total number of industries (LNTNI), and total investment on industries (LNTINV) can be stationary despite being individually non-stationary. Co-integration of two (or more) time series suggests that there is a long-run relationship between them. So, it was employed to examine the dynamic relationship between economic growth (LNRGDP) and other two variables.

Augmented Dickey Fuller Test

Augmented Dickey Fuller test (ADF Test) is a common statistical test used to test whether a given time series is stationary or not.

Table 3: Augmented Dickey-Fuller Test

For Level Data				
Variables	**Intercept** (Tc)		**Intercept + Trend** (Tct)	
	t-Statistics	**P-Values***	**t-Statistics**	**P-Values***
LNRGDP	- 0.5787	0.8610	- 2.6429	0.2655
LNTNI	- 1.8694	0.3406	- 3.1840	0.1066
LNTINV	- 1.3064	0.6134	- 2.7329	0.2315
For First Difference				
LNRGDP	- 5.5649	0.0001	- 5.4608	0.0006
LNTNI	- 4.9201	0.0004	- 4.8291	0.0029
LNTINV	- 7.5604	0.0000	- 7.4277	0.0000

Source: Construction of Author. *MacKinnon (1996) one-sided p-values.

Note: Test critical values: For 1% level (-3.6998), 5% level (-2.9762) and 10% level (-2.6274). Here, significant at the 1 percent level.

Table 3 results of the first difference, the absolute calculated value of 't' is more than the absolute value of t at 1 percent, 5 percent, and 10 percent in both cases with intercept as well as with trend and intercept. So, the null Hypothesis is rejected at 1 percent, 5 percent, and 10 percent. It implies that there is no Unit Root problem (i.e. they are stationary). Similarly, p-values of first difference are also significant. On the contrary ADF results of level in both cases with intercept as well as with trend and intercept shows a Unit Root Problems.

Vector Auto Regression (VAR)

Vector Autoregressive (VAR) model agrees to the response or inverse causality among the independent and dependent variables via their own past values. In the general VAR model, no exogenous variables required as it assumes all the variables endogenous (Shrestha & Bhatta, 2017). Here, the VAR models of those six variables using first difference data with two lags represented as follows:

Table 4: Vector Auto Regression of LNRGDP, LNTNI and LNTINV

Sample (Adjusted): 1992 - 2019

Included observations: 28 after adjustments

t-statistics in [ ]

Variables	LNRGDP	LNTNI	LNTINV
LNRGDP(-1)	-0.180586	0.569938	-1.213855
	[-0.76795]	[0.12296]	[-0.17882]
LNRGDP(-2)	-0.205153	-2.498600	-3.495607
	[-0.93577]	[-0.57820]	[-0.55236]
LNTNI(-1)	0.003105	-0.079434	0.304591*
	[0.36437]	[-0.47289]	[1.23820]
LNTNI(-2)	-0.003859	-0.449376*	0.073200
	[-0.47537]	[-2.80845]	[0.31238]
LNTINV(-1)	0.010940*	0.144007	-0.220673
	[1.29595]	[0.86542]	[-0.90556]
LNTINV(-2)	0.001562	-0.137703	-0.069308
	[0.22119]	[-0.98894]	[-0.33989]
C	0.023855	0.042719	0.146406
	[4.02555]	[0.36572]	[0.85588]
R-squared	0.131859	0.357191	0.118991
Adj. R-squared	-0.116181	0.173531	-0.132726
Sum sq. resids	0.001461	0.567548	1.217188
S.E. Equation	0.008340	0.164396	0.240752
F-statistic	0.531603	1.944849	0.472717
Log likelihood	98.32392	14.85059	4.168977
Akaike AIC	-6.523137	-0.560757	0.202216
Schwarz SC	-6.190086	-0.227705	0.535267
Mean dependent	0.017763	-0.007037	0.046712
S.D. dependent	0.007894	0.180833	0.226207

Determinant resid covariance	3.34E-08	Akaike informa. Criterion	-7.201500
Log likelihood	121.8210	Schwarz criterion	-6.202347
Determinant resid covariance (dof adj.)		7.91E-08	

Source: Construction of Author. *Significant coefficients.

The VAR estimation in both the first and second year lag change in LNRGDP is insignificant. Similarly, the first year lag change in LNTINV is significant while second year lag is insignificant and positively affects the RGDP. Similarly, first and second year lag changes in LNTNI are insignificant. It means universally industries and their output have significant impact on economic growth due to the nature of resource utilization. Therefore, RGDP is positively affected by total investment of industries in both one and two year lag while RGDP is inversely affected by total number of industries in two year lag.

Johansen Test for Co-integration

Engle and Granger (1987) determined that a linear combination of two or more non-stationary time series may be stationary and suggests that there is a long-run or equilibrium relationship between them if they are co-integrated. Therefore, a linear combination of RGDP, total industries, and total investment time series can be stationary despite being individually non-stationary. So, it was employed to examine the dynamic relationship between these three variables. For this study, the Johansen (1991) Co-integration test is used by using EViews - 9 software since it has been shown to have a good finite model. Therefore, the Johansen (1991) procedure is based on a vector error correction model (VECM) to test for at least one long run relationship between the variables. For the VECM, we first determine the order of integration of the variables, making use of Augmented Dickey-Fuller tests mentioned in above.

Table 5: Johansen Test for Co-integration

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 critical value**	**Prob.****
None *	0.7561	72.2561	29.7970	0.0000
At most 1 *	0.4448	32.7468	15.4947	0.0001
At most 2 *	0.4406	16.2687	3.84146	0.0001
Trace test indicates 3 co-integrating eq^{n} (s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.				

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.7561	39.5093	21.1316	0.0001
At most 1 *	0.4448	16.4780	14.2646	0.0220
At most 2 *	0.4406	16.2687	3.8414	0.0001
Max-eigenvalue test indicates 3 co-integrating eq^{n} (s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.				

Source: Construction of author.

Table 5 shows that the critical values of both trace and maximum Eigenvalue tests reject the null hypothesis at 5 percent level of significance and indicate 3 co-integrating equations. MacKinnon p-values of both tests are significant. Therefore, the long-run equilibrium, relationship between RGDP, industries and investment time series can be established despite being individually non-stationary. However, according to ADF test, they are stationary at first difference i.e. I(1).

Vector Error Correction Model (VECM)

VECM is a suitable estimation technique if a set of given variables (RGDP, investment, and industries) are found to have three co-integrating vectors which adjusts to both short run changes in these variables and deviations from long run equilibrium. This VECM describes a dynamic model that is how derivations from that long-run relationship affect the changes on them in the next period.

Table 6: Vector Error Correction Estimates

Long-run Co-integration Estimates		
Coefficients	**Estimates**	**t- Statistics**
ϕ	0.0001	-
β_1 **(LNTNIt)**	0.1279*	7.5592
β_2 **(LNTINVt)**	-0.0479*	-3.9122
Short-run ECM Estimates		
α_{LNRGDP}	0.0798	0.3896
α_{LNTNI}	-17.7189*	-5.9103
α_{LNTINV}	9.5283*	1.5863

Source: Construction of author. *Significant coefficient

Therefore, the long-run relationships mentioned in table-6 indicate that the impact of industries is about 0.1279 percent to RGDP of Nepal and about – 0.0479 percent impact of investment. So, the effect of investment on RGDP is negative and negligible.

Similarly, total industries have a positive impact on RGDP. It implies that one percent increases in the number of industries may cause the increase in RGDP by 0.1279 percent over the long run relationships. On the contrary, 1 percent increases in the investment may cause the decrease in RGDP by 0.0479 percent over the long run relationships. All the coefficients of the co-integration equation are significant.

The short-run equilibrium coefficient of ECM (αs) indicates that investment is assistance in correcting the disequilibrium of RGDP of Nepal whereas total industries have not. The coefficient for investment is 9.52 and it is significant indicating a significant level of control of the investment over RGDP both in the short and long-run. Similarly, the coefficient for the industries is -17.7189 but significant.

Granger Causality Tests

Granger causality is an econometric tool to examine causality between two variables in a time series. It is closely related to the idea of cause and effect, although it isn't exactly the same. A variable X is causal to next variable Y if X is the cause of Y or Y is the cause of X.

Table 7: Pairwise Granger Causality Tests

Null Hypotheses	Observation	F-Statistic	Prob.
LNTNI does not Granger Cause LNRGDP	28	0.2746	0.7623
LNRGDP does not Granger Cause LNTNI		0.4069	0.6704
LNTINV does not Granger Cause LNRGDP	28	1.1141	0.3453
LNRGDP does not Granger Cause LNTINV		0.1397	0.8703
LNTINV does not Granger Cause LNTNI	28	2.0025	0.1579
LNTNI does not Granger Cause LNTINV		0.8722	0.4314

Source: Construction of Author.

Table 7 shows the main results obtained from the Pairwise Granger-causality analysis where six pairs of variables are considered as economic indicators. The results show that there is causality existing between investment with RGDP and industries while others have no causality.

Regression Analysis

A linear combination of industries of Nepal, total investment and real GDP in study period time series can be stationary in the face of being individually stationary as mentioned in the above ADF test. For this purpose EG test is used to test for co-integration. Co-integration of two (or more) time series suggests that there is a long-run

or equilibrium relationship between them. So, it was employed to examine the dynamic relationship between real GDP, investment, and industries. The following steps were followed in this regard:

Table 8: Regression Statistics of LNRGDP, LNTNI, and LNTINV

Regression Model: LNRGDP = 4.6839* - 0.0662 LNTNI +0.2560*** LNTINV + 0.0753**			
R-squared	0.7845	Mean dependent variable	5.6716
Adjusted R-squared	0.7692	S.D. dependent variable	0.1567
S.E. of regression	0.0753	Akaike info criterion	- 2.2426
Sum squared residual	0.1588	Schwarz criterion	-2.1038
Log likelihood	37.7606	Hannan-Quinn criteria	-2.1973
F-statistic	50.9947	Durbin-Watson statistic	0.8648
Prob. (F-statistic)	0.0000		

Source: Construction of author. ***Significant at the 1-percent level

The Table 8 shows that the overall model is significant as Prob. (F-Statistic) is equal to 0.0000. However, 78.46 percent of total variation is explained by the model. Similarly, D-W Statistics is equal to 0.865. Similarly, Standard Error of Estimate Regression (SEE) i.e. 0.075311is lower than Standard Deviation of dependent variable i.e. 0.1567, implies that less errors in above computed coefficients. Thus, the estimates of the model are reliable and should be taken with goodness of fit.

The estimated co-integration relationship of the equation shows that total investment has a significant and positive relationship with the RGDP while total industries have insignificant and inverse relationship with RGDP. So, this finding implies that industrial activities of Nepal have diverse impacts on RGDP and the positive relationship causes increase in investment, increases RGDP and thereby increases economic growth within a country. The reason is that an increase in investment increases the internal production along with internal capital investment and that increases economic growth (RGDP).

On the contrary, industrial activities in Nepal have no effective impact on RGDP through the number of industries and the inverse relationship causes an increase in the number of industries and decreases RGDP. It means an increase in the number of industries increases demand for foreign goods/services causes inflation and affects real income.

Conclusion

There are various determinants driving RGDP. This process has historically engaged the minds of economists for thousands of years since Kautilya (Chanakya) up to now to solve the problems of industrial sectors to promote economic growth. Therefore, this

study was focused on the contribution of industries in the economic growth of Nepal. On the basis of 31 years observations, there is a significant and positive relationship between RGDP and investment but insignificant and inverse relationship of total industries with RGDP of Nepal. It implies that RGDP is mostly influenced by investment. Similarly, the VAR estimates of the I(I) data, also implies these results with high adjusted R^2 values, significant F-stat among others. It means RGDP is positively affected by total investment and inversely affected total industries. The Johansen co-integration rank tests indicate that there exists a co-integration relationship among these variables. Similarly, the VECM tests indicate the long-run relationships of total industry and investment with RGDP of Nepal as well as their impact on RGDP is small whereas total industry has a positive effect on RGDP and investment has negative impact. On the other hand, the short-run equilibrium exists between investment and total industries whereas total industry has inversely affected RGDP and investment has positive impact. Finally, the results of Pairwise Granger-causality shows that there is a causality existing between investment with RGDP and total industries and others have no Granger-causality.

References

Ajmair, M. (2014). Impact of the industrial sector on GDP. *European Journal of Contemporary Economics and Management*, Vol.1 No.1. Doi: 10.19044/elp. v1no1a8. Retrieved from http://dx.doi.org/10.19044/elp.v1no1a8.

Attiah, E. (2019). The role of manufacturing and service sectors in economic growth: An empirical study of developing countries. *European Research Studies Journal,* Volume XXII, Issue 1, pp. 112-127.

Ayyagari, M., Demirguc-Kunt, A. & Maksimovic, V. (2011). Small vs. young firms across the World contribution to employment, job creation & growth. *The World Bank Policy Research Working Paper,* 5631. Retrieved from http://econ.worldbank.org. pdf.

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,* Vol. 10, Issue 1, pp. 23 – 39. ISSN 1804-171X (Print), ISSN 1804-1728 (On-line), DOI: 10.7441/joc.2018.01.02.

Elizabethrani, R. (2019). Contribution of industries in the economic development of India and recommendations of new industrial policies. *Shanlax International Journal of Economics*, 7 (4), pp. 57–65.

Engle, R. F. & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation and testing. *Econometrica,* 55 (2):251-76.

Farayibi, A. O. (2015). Entrepreneurship as a driver of economic growth: Evidence from enterprise development in Nigeria. *Center for Allied Research & Economic Development*, Ibadan, Nigeria. Online at https://mpra.ub.uni-muenchen.de/74591/.

Gujarati, D (2003). *Econometrics*. Singapore: McGraw-Hill.

Hussin, F. & Yik, S. Y. (2012). The contribution of economic sectors to economic growth:

The cases of China and India. *Research in Applied Economics*, Vol. 4, No. 4. ISSN 1948-5433. doi:10.5296/rae.v4i4.2879. Retrieved from https://www.researchgate.net/publication/259453683.

Johansen, S. (1991). Estimation and hypothesis testing of co-integration vectors in Gaussian vector autoregressive models, *Econometrica,* Vol. 59 (6), 1551-80.

Khatri, M. B. (2018). Industrial development in Nepal: Problems and prospects. *The Economic Journal of Nepal,* 41 (3 and 4), pp. 25-40.

MoF (Ministry of Finance) (2019). Economic Survey - 2018/19 FY. Government of Nepal, Ministry of Finance. Kathmandu.

MoICS (Ministry of Industry, Commerce and Supplies) (2075 B.S.). *Industrial Statistics, 2075 B.S.* Government of Nepal, Ministry of Industry, Commerce & Supplies, Kathmandu.

MoICD (Ministry of Industry, Commerce and Supplies) (1992). *Nepal Industrial Policy -, 1992*. Government of Nepal, Ministry of Industry, Commerce & Supplies, Kathmandu.

Ogbo, A. & Nwachukwu, A. C. (2012). The role of entrepreneurship in economic development:The Nigerian perspective. *European Journal of Business and Management*, Vol.4, No.8, Page 95-105. Retrieved from www.iiste.org.

Shrestha, M. B. & Bhatta, G. R. (2017). Selecting appropriate methodological framework for time series data analysis. *NRB Working Paper, No. 36*, Research Department, Nepal Rastra Bank, Kathmandu, Nepal.

Stel, A. V.; Carree, M.; & Thurik, R. (2005). The effect of entrepreneurial activity on national economic growth. *Discussion Papers Entrepreneurship, Growth and Public Policy.* Max Planck Institute for Research, Germany.

Su, D. & Yao, Y. (2016). Manufacturing as the key engine of economic growth for middle income economies. *ADBI Working Paper*, No. 573. Asian Development Bank Institute, Tokyo.Available:http://www.adb.org/publications/manufacturing-key-engine-economic - growthmiddle-income-economies/.

Syal, S. (2015). Role of MSMEs in the growth of the Indian economy. *Global Journal of Commerce and Management Perspective,* 4 (5), Page: 40-43, ISSN: 2319-7285. Global Institute for Research and Education.

Szirmai, A. (2012). Industrialization as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, 23, Page 406–420. doi:10.1016/ j. strueco. 2011.01.005.

Tregenna, F. (2008). The contribution of manufacturing and services to employment creation and growth in South Africa. *South African Journal of Economics* Vol. 76:S2. Economic Society of South Africa. Published by Blackwell Publishing.

Appendix – I
RGDP, Total Number of Industries and Capital Investments

Years	RGDP	Grades of Industries			Total no. of Industries	Total Capital (in millions)
		Small	Medium	Large		
1989	247491.0	10	29	11	50	5,197.47
1990	263955.0	126	9	0	135	1,521.29
1991	276875.0	405	27	4	436	7,510.54
1992	286449.0	567	30	9	606	10,541.97
1993	309115.0	92	39	16	147	18,347.67
1994	318407.0	127	69	17	213	17,543.31
1995	336681.0	248	102	23	373	19,902.27
1996	353586.0	138	83	21	242	14,032.46
1997	365592.0	34	58	20	112	10,531.68
1998	382348.0	25	63	22	110	12,546.50
1999	404746.0	42	88	29	159	25,908.36
2000	413428.0	73	53	19	145	10,766.61
2001	414092.0	49	62	28	139	22,661.64
2002	429699.0	47	38	24	109	13,203.46
2003	448654.0	89	38	19	146	13,163.41
2004	463165.0	64	33	10	107	18,003.13
2005	480435.0	68	37	15	120	9,527.85
2006	493651.0	132	32	13	177	8,123.68
2007	522260.0	159	44	24	227	20,126.36
2008	542652.0	194	73	34	301	26,961.36
2009	565759.0	152	58	48	258	39,245.35
2010	587534.0	157	48	37	242	90,415.58
2011	614637.0	174	42	62	278	84,307.39
2012	637771.0	235	99	112	446	119,601.13
2013	674227.0	223	76	72	371	288,637.65
2014	694269.0	294	79	93	466	138,751.27
2015	695688.0	261	72	76	409	121,007.22
2016	749550.0	331	82	95	508	162,952.01
2017	797146.0	343	78	76	497	349,611.23
2018	850928.0	265	91	83	439	283,352.61
2019	870245.0	96	123	58	277	152,625.28

Source: Department of Industry, Ministry of Industry, Commerce and Supplies, Government of Nepal, 2020.