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Determinants of Industrial Sector Growth in Pakistan

GLOBAL ECONOMICS REVIEW

Abstract *A strong industrial sector shows greater economic growth. To find industrial growth, this study hereby made an attempt. Time series data is used. Data is obtained from the years 1984 to 2018. The stationarity of the series is checked through Augmented Dickey-Fuller (ADF). Moreover, the ARDL approach is used to check short and long-run estimation of the model, estimating the determinants of the industrial sector growth in Pakistan. A long-run positive and significant associations between External debt (% of GDP), GDP (Annual Growth), FDI, Remittances (% of GDP) is identified, while trade has a negative effect on industrial growth. The factor remittances have an insignificant but positive influence on the industrial sector growth.*

Key Words: Industrial Growth, ARDL, ADF, Economic Growth

Introduction

The economic growth and development of a country are based on the rate of GDP. The high rate of GDP positively influences the growth of any economy. GDP hereby consists of three major sectors in which industrialization is the major sector that contributes to the GDP. The contribution of industrial sectors to the total GDP of Pakistan in the year 2014-15 was 20.30 percent. The sub-sectors of the industrial sector of Pakistan are such as large scale manufacturing, Mining and quarrying, manufacturing small scale construction, and electricity and gas distribution. As per the statistics of the State Bank of Pakistan, the industrial sector has greater contributions to the GDP of the country; hence this study aims to find out the factors which are influencing the industrial sector output growth.

The industrial sector is linked with the productions of several good produce in the country. The literature intends that a strong industrial sector has greater economic growth in the country; hence for the development of the country, it's important to

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enhance the performance of this sector. In the same way, industrialization is the second-largest individual sector in the economy (Hussain, 2005).

It has been shown by the empirical literature that factors such as trade policies, globalization and many other factors greatly influence industrial performance. Trade enhances the market structure hence support industrial marketing, while globalization has a positive impact on the growth of the industrial sector (Dreher, 2006). Dutta and Ahmed (2004) analyzed the association amid trade policies and growth of the industrial sector in Pakistan. Ilyas, Ahmad, Afzal, and Mahmood (2010) explored the causes of value-added in production in Pakistan. The price level of the total productivity of investment factors and commercial openness has been used as determinants of the added value of the manufacturing industry. The commercial opening was insignificant. Iqbal and Ramzan (2013) studied the effect of the services, manufacturing and agricultural sectors on the annual gross national development of Pakistan. Singh and Kaur (2014) examined in the Indian economy, the service sector growth. So, after the agriculture sector, the industrial sector is the backbone of the economy, which comprised in the above literature? So to achieve high-level industrial growth, its necessary to implement high-performance macroeconomic policies like ensuring the supply of good quality raw material with specialized and skilled labor. Hence it concluded that the industrial sector enhances the growth of the economy through the provision of a new market, which eliminates unemployment and as well as market shortages. There are many factors which are needed to be analyzed for the growth and development of this sector; hence this study aim to determine such factors which influence the industrial sector.

Literature Review

Many empirical studies examined different factors as determinants of industrial growth.

Afzal (2007) used the 45 years of data ranging from 1960 to 2005. Real per capita GDP use to measure economic growth, gross investment for capital, further they divided the capital into two groups' public and private sector investment, trade is peroxide by the sum of exports and imports as the percentage of GDP Official aid and FDI (foreign direct investment) also used in this study. The model is estimated by the Ordinary Least Square method (OLS); the impact of globalization varies from nation to nation and region to region because it depends upon the political, economic and social development and, for instance, the macroeconomic policies. Underdeveloped countries suffer from globalization because it has an adverse influence on the development of the economic sector.

Muhammad and Butt (2013) examined the growth of the agricultural sector. In their study, they use financial growth as the independent variable. For this purpose, they used the Cobb Douglas production function within the presence of financial development. They used the period over 1971-2011; in addition, the model is estimated by the Auto Regressive Distributive Lag (ARDL) model. Resulted that there exits association among the model. The association is long-run. And further confirms that financial development, capital and labour help to boosts the agriculture production level in Pakistan.

Saqib, Masnoon, and Rafique (2013) investigated the impression of FDI on economic expansion in Pakistan. They used FDI with other supporting indicators are domestic investment, trade and debt, and data are taken from the period from 1981-2010 from WDI. OLS is used to examine the effect of FDI on economic growth in Pakistan. Outcomes specify that economic performance in Pakistan is adversely influencing due to foreign

investment, whereas its internal investment has promoted its economy. Furthermore, the nation's inflation, trade and debt have established to hurt its GDP.

To measure the manufacturing sectors performance in Nigeria, Sola et al. (2013) used the Solow Growth model. In their study, to find the determinants of manufacturing sectors, they used panel data for the year 1980 to 2008. He estimated the model through OLS, known as the method of ordinary least square. They concluded the main determinants of the manufacturing sectors. The variable such as imports, exports, capacity utilization and investment etc., are considered the main indicators. They suggested to the government of Nigeria to enhance their export. They further suggested that the enhancement of export could eliminate too many macroeconomic and microeconomic problems such as unemployment and shortages in the local market. Enhancement of exports could search for new markets, and access to the market is important for innovations and invention in the manufacturing sectors.

Otalu and Andrew (2015) conducted a research study to determine industrial sector growth determinants. They concluded that the variable such as capital, exchange rate, capacity utilization, electricity generations and exchange rates have a significant impact on industrial growth. They further concluded that impact is positive while attainments of education, inflation rates have a negative effect on the industrial sector output. In their study, they use CPI as inflation rates.

Similarly, Mohsen et al. (2015) conducted a research study using the time series data. They used the data from the year 1980 to 2010. They took industrial output as the dependent variable. TJohansen cointegration and Granger causality test for estimation of the model using the time series data was applied. They concluded on the basis of empirical findings that the variables such as exports of manufacturing, population growth rate, gross fixed capital formations and agricultural output positively affected the industrial output. They further concluded that the variable used as Oil prices opt a negative impact.

In order to assess the determinants of creative industries development, Martinaitytė and Kregždaitė (2015) conducted a research study. In their study, the time-series data from the year 2003-2013. They defined the creative industries in their study. According to them, creative industries consist of the area of overlap between commerce, culture and science and technology.

Shah, Haq, and Farooq (2015) analyzed the impression of agriculture trades macroeconomic presentation of Pakistan. For this purpose, they used the GDP (GDP) with agriculture and non-agriculture exports for Pakistan from 1972 to 2008. The model is estimated by the Johansen cointegration econometrics model, and results indicate that agriculture exports have a negative while non- agriculture exports have an optimistic impression on the growth of the economic sector in Pakistan. Results recommended that Pakistan based on the structural fluctuations in the agriculture sector by exchanging into the value-added products. Firstly, according to the Keynesian argument, exports growth increased by the help exchange multiplier in the short run. Secondly, a higher level of foreign exchange obtained boosts the level of exports. Thirdly, the export sector creates positive externalities, like efficient management, improved production techniques, boosts the level of technical skills and improve product design that leads to improving economic development. The status of agricultural exports in the expansion of Pakistan is essential; an enormous figure of literature is present on the role of exports in economic expansion. Either cross-sectional or time-series data used in these

studies with different conclusions. The previous work, for instance, (Balassa 1978; Kormendi & Meguire, 1985; Michaely, 1977) investigated the association among exports and economic development by employing a simple correlation coefficient procedure. The work of this research shows that exports growth positively interrelated with economic expansion. On the other side (Balassa, 1978; Ram, 1987; Vohra, 2001) explored the association between economic evolution and growth of exports by employing regression techniques as concluded that the impact of exports is optimistic about the development of the economic sector.

Gilani (2015) conducted a research study. In his study, he analyzed cultivated production in Pakistan. He uses exports and imports as the independent variable. To examine the influence of imports and exports, secondary data is used on agricultural production for 30 years for the period 1980-2010 taken from the economic survey of Pakistan. Granger causality results indicate that there exits causality in the model. Further, they confirmed that an increase in productivity that leads to boosts the level of exports.

Malik (2015) examined the influence of FDI on the economic expansion of Pakistan from 2008 to 2013. They suggested that the government should shield industries that would advantage of the country's economic situation and take compact steps to upsurge domestic investment and FDI. Investors boost up the economy through the utilization of resources. The stability of exchange rates attract investors and stabilize the market structure, also enhance profit margin. The government should stabilize the exchange rate to attract and invites new investors. More educated labor fetching due to higher FDI inflows and substitute the outdated technology.

Hence the empirical review of the above literate indicated that lots of work had been done in the scope to assess determinants of the industrial sector output. The review of literature hereby indicates different factors as determinants of industrial sector growth. The view of the literature also indicates the research often used time-series yearly data. Hence this study opts to use the selective variables as determinants of industrial growth and the suggested techniques as discussed.

Data Sources and Variable Description

Time series data is used in this research study. Data obtained from 1984 to 2018 is used in this research. The Source of the data collection is secondary data obtained from world development indicators, United Nations Organizations and from International Financial Statistics and IFS-CD ROM.

Table 1. Variables Description

Variables	Definition	Description Measurement	
Dependent Variable			
Industrial Value added	The share of the industrial sector based on value added to the total Gross Domestic output (as %)	Industry, annual value-added growth	%IND

Independent Variable (Focused)				GDP.
Independent Variables (Controlled)				KOF
GDP	It measured as a constant price of the domestic currency, which identifies real growth. GDP growth rate is the annual percentage change in GDP measured in local currency at 2010 constant prices.	GDP growth	annual %	GDP
External Stocks	The sum of long-term and private unsecured public debt is known as an external dent. Short-term debt includes all payables, which initially expire for a year or less, and interest is not amortized over long-term debt.	External debt stocks	(% of GNI.)	EDEBT
Remittances	It's the personal transfers of cash and compensation of the employee.	Personal remittances received	% of GDP	REM
Trade	It is measured as the exports percentage out of the level of GDP.	Trade	% of GDP.	Trade
Foreign Direct Investment	FDI is taken US currency.	FDI	% of GDP	FDI

Data Methodology

Stationarity of Data

Unit Root is the best test to check the stationarity of the series hence used in this research study (Engle and Granger 1987). Augmented Dickey-Fuller (ADF) analyzes the order of integration of the data series used in this research which is a standard unit root test.

Co-Integration Test

After checking for the stationarity of the series, Johansen-Juselius procedure is the best test for a long-run relationship. Johansen (1988) and Johansen-Juselius (1992, 1999) defeated the problem of spurious correlation. If the two or more series moves in the same direction together in the long-run, hence the difference between them is stationary even for possible equilibrium relationships even if the series themselves are trended.

ECM model is used when the order of the variable integrations remains the same. The ECM is one of the best models in the sense that it estimates both long-run and short-run effects. However, what these collaborative integration technologies require is that they require all variables integration in a similar order. If the variables do not have the same level of integration, then the model of delay of the autoregressive distribution (ARDL) also deals with a single Cointegration analysis and introduces (Pesaran, Shin, & Smith, 2001), originally extended by (Pesaran & Smith, 1995).

Econometric Model

$$IND_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta IND_{t-1} + \sum_{i=0}^{p} \alpha_2 \Delta KOF_{t-1} + \sum_{i=0}^{p} \alpha_3 \Delta EDEBT_{t-1}$$

$$+ \sum_{i=0}^{p} \alpha_4 \Delta GDPG_{t-1} + \sum_{i=0}^{p} \alpha_5 \Delta TRADE_{t-1} + \sum_{i=0}^{p} \alpha_6 \Delta REM_{t-1} + \alpha_7 IND_{t-1}$$

$$+ \alpha_8 KOF_{t-1} + \alpha_9 EDEBT_{t-1} + \alpha_9 GDPG_{t-1} + \alpha_{10} \Delta TRADE_{t-1}$$

$$+ \alpha_{11} REM_{t-1} \tag{1}$$

Results and Discussion

According to Table2, some variables are stationary at the level which is industrial value-added GDP growth rate some are stationary at first difference, which are External Debt, FDI, Trade and Remittances. The mixture orders of integration in the model hereby suggest the estimations by the Auto Regressive Distributive Lag Model (ARDL) as discussed above. ARDL is the best model in the sense that it provides detail long-run and short-run estimations with model speed adjustments.

Table 2. Augment Dickey-Fuller Test

Variables	Level	1st difference	Results
EDEBT	0.698	0.0007***	I (1)
GDP. Growth	0.0301**		I (0)
FDI	0.8765	0.0021***	I (1)
TRADE	0.190	0.0001***	I (1)
REM	0.8587	0.0002***	I (1)
IND	0.0021**		I (0)

*Note: *** indicates significance level 1%, ** indicates significance level 5%, and * indicated significance level 1%*

Now we are bound to use the ARDL-bond test for the estimations of verifications of long-run estimations as follows:

Table 3. Bound Test (ARDL)

Test Statistic	Value	K
F-statistic	6.701	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
5%	2.93	3.99
1%	4.01	4.98

As the test statistics values are greater than 1 % and 5% significant level; hence the result of the ARDL bound test herby signified that there exists a long-run association amongst the variable used in the model. Further, the short-run estimates are representing in table-4, and long-run estimates are representing in table-5, respectively. Table-4 represents the short-run results of the ARDL model. According to table-4, that represents the sort run results of ARDL. The result hereby concluded that the variables such as external debt, per capita GDP and FDI negatively affecting the industrial sector growth. The results are significant. Does the negative sign mean the indirect relationship that further explains that in the short-run, any increase in the level of external debt in Pakistan leads to a decrease in the industrial growth of Pakistan? Following the results also indicates that in the short run, per capita GDP also decrease the level of industrial growth in Pakistan.

Table 4. ARDL Short-Run Estimates

Variable	Coefficient	Stdev	t-Stats	Prob.
Dl(IND(-1))	1.014**	0.385	2.635	0.020
Dl(IND(-2))	0.225	0.229	0.983	0.342
Dl(EDEBT)	0.203	0.200	1.014	0.328
Dl(EDEBT(-1))	-0.057	0.281	-0.202	0.843
Dl(EDEBT(-2))	-0.327*	0.163	-2.010	0.064
Dl(GDPG)	1.051**	0.369	2.847	0.013
Dl(GDPG(-1))	-1.923***	0.463	-4.155	0.001
Dl(GDPG(-2))	-0.813*	0.438	-1.855	0.085
Dl(REM)	-2.197	0.659	-3.331	0.005
Dl(REM(-1))	-1.156	1.079	-1.071	0.302
Dl(REM(-2))	-0.789	0.765	-1.032	0.320
Dl(KOF)	2.06*	1.447	3.256	0.0284
Dl(KOF(-1))	-3.16**	-1.431	0.7092	0.156
	4.11	0.376	3.256	0.353
Dl(TRADE)	-0.091	0.226	-0.400	0.695
Dl(T)	-1.225**	0.312	-3.928	0.002

*Note: *** indicates significance level 1%, ** indicates significance level 5%, and * indicated significance level 1%*

Further, the long-run results and association of the exogenous indicators are discussed in table-5.

Table 5. ARDL Long-Run Estimates

Variable	Coefficient	Stdev	t-Stats	Prob.
ECM(-1)	-1.984***	0.607	-5.003	0.0001
EDEBT	0.350*	0.193	1.001	0.080
GDPG	1.934***	0.200	8.008	0.001
REM	0.880	0.499	1.671	0.171
KOF	0.990**	0.265	4.093	0.002
TRADE	-0.203**	0.085	-2.613	0.020
C	-48.331**	19.089	-2.901	0.034
@TREND	-0.431**	0.118	-4.07	0.000

Model	Diagnostics
R-squared	0.89
Adjusted R-squared	0.800
F-statistic	7.901
Prob(F-statistic)	0.001
Durbin-Watson	2.413
LM-test	0.480
Heteroskedasticity Test	0.809

Note: *** indicates significance level 1%, ** indicates significance level 5%, and * indicated significance level 1%

The presence of the autocorrelations and Heteroscedasticity in the model and data is checked. The LM test is applied for checking such a problem. The LM resulted that there is no autocorrelation and there is no Heteroscedasticity in the model also according to the ARCH test, so according to these tests model is good.

Hence the result of Autoregressive Distributive (ARDL) hereby indicates that there exist long-term relationships between determinants used with industrial sector growth. A positive long-term and significant impact of the determinates such as the External debt (% of GDP), GDP (Annual Growth), FDI, Remittances (% of GDP) on the industrial growth is hereby indicated by the results while trade has an adverse effect over the industrial sector growth. It is also to be noted that the impact of the variable remittances is positive but insignificant.

The results are supported by the literature as, according to (Nazish et al., 2013; Singh & Kaur, 2014), a strongly positive and significant linkage between the GDP and growth of the industrial sector.

While we are talking about model diagnostics, we check an R2 and Adjusted R2 value, which is, respectively, almost 89% and 80%. This means that the independent variables 89% explained the dependent variable, which is good, and according to Durbin, Watson value is 2.40, more than 1.96 specify that the model is good.

Conclusion

Empirical studies explore the influence of economic factor on the industrial and services sector of Pakistan. Time series data is used in this study. Data from the year 1984 to 2018 is used. To check the stationarity ADF test is used. Some of the variables are resulted as stationary at the level. Many of the variables are stationary at the first difference. The ARDL approach is used for short and long run estimation. A long-run association between the dependent and independent variable is determined. The result was also significant.

In long-run, the External debt (% of GDP), GDP (Annual Growth), FDI, Remittances (% of GDP) showed a significant and positive association with industrial sector growth value added (% of GDP). Trade showed a negative and significant effect on industrial sector growth. It is also to be noted that the impact of the variable remittances is insignificant.

But in the short-run, the variables such as external debt, per capita GDP and FDI negatively affected the industrial sector growth. The results are significant. Which intend that any increase in the level of external debt in Pakistan that leads to a decrease in the industrial growth of Pakistan in the short-run? Following the results also indicates that in the short run, per capita GDP also decrease the level of industrial growth in Pakistan.

References

Ahmad, M. (2015). Role of waqf in sustainable economic development and poverty alleviation: Bangladesh perspective. JL Pol'y & Globalization, 42, 118.

Balassa, B. (1978). Exports and economic growth: further evidence. Journal of development economics, 5(2), 181- 189.

Choudhury, R., Panda, S., & Singh, D. (2012). Emergence and dissemination of antibiotic resistance: a global problem. Indian journal of medical microbiology, 30(4), 384.

Collier, P., Hoeffler, A., & Collier, P. (2002). Aid, policy, and growth in post-conflict societies: The World Bank.

Dutta, D., & Ahmed, N. (2004). Trade liberalization and industrial growth in Pakistan: a cointegration analysis. Applied Economics, 36(13), 1421-1429.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: journal of the Econometric Society, 251- 276.

Frankel, J. A., & Romer, D. H. (1999). Does trade cause growth?

American economic review, 89(3), 379-399.

Gilani, S. W. (2015). The impact of agricultural imports and exports on agricultural productivity. Journal of Economics and Sustainable Development, 6, 109-116.

Hansen, B. E., & Phillips, P. C. (1990). Estimation and inference in models of cointegration: A simulation study. Advances in Econometrics, 8(1989), 225-248.

Hussain, I. (2005). Education, employment and economic development in Pakistan. Education Reform in Pakistan: Building for the Future, 33-45.

Ilyas, M., Ahmad, H. K., Afzal, M., & Mahmood, T. (2010). Determinants of manufacturing value added in Pakistan: An application of bounds testing approach to cointegration. Pakistan Economic Social Review 209-223.

Johansen, S. (1988). Statistical analysis of cointegration vectors. Journal of economic dynamics control, 12(2-3), 231-254. Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration— with applications to the demand for money. Oxford Bulletin of

Economics statistics, 52(2), 169-210.

Jain, D., Nair, K.S. and Jain, V. (2015) Factors affecting GDP (Manufacturing, Services, Industry): An Indian perspective. Annual Research Journal of Symbiosis Centre for Management Studies Pune, Vol. 3, pp. 38-56.

Kathuria,V., Raj, R.S.N. and Sen, K. (2010) Human Capital and Manufacturing Productivity Growth in India. International Conference on: Science, Technology and Economy: Human Capital and Development (Annual Conference of IASSI & Knowledge Forum Hosted by IIT Bombay. http://fgks.in/images/pdf/papers/136. 3. Martinaitytė, E. and Kregždaitė, R. (2015) The factors of creative industries development in now a day's stage. Economics and Sociology, Vol. 8(1), pp. 55-70.

Kormendi, R. C., & Meguire, P. G. (1985). Macroeconomic determinants of growth: cross-country evidence. Journal of Monetary economics, 16(2), 141-163.

Malik, K. (2015). Impact of foreign direct investment on economic growth of Pakistan. American Journal of Business and Management, 4(4), 190-202.

Michaely, M. (1977). Exports and growth: an empirical investigation. Journal of development economics, 4(1), 49-53.

Mohsen, A.S.,Chua,S.Y. and Sab, CNC (2015) Determinants of industrial output in Syria. Economic Structures, Vol.4 (19),pp.1-12. DOI: 10.1186/s40008-015-0030-7.

Muhammad, M. S. M. S. S., & Butt, S. (2013). Effect offinancial development on agricultural growth in Pakistan: New extensions from bounds test to level relationships and Granger causality tests. Economics, 40(8), 707-728.

Otalu, J.A. and Andrew, K.S. (2015) an assessment of the determinants of industrial sector growth in Nigeria. Journal of Research in Business and Management, Vol. 3(7), pp: 01-09

Nazish, A. R., Iqbal, A., & Ramzan, M. (2013). Impact of agriculture, manufacturing and service industry on the GDP growth of Pakistan. Interdisciplinary Journal of Contemporary Research in Business, 5(4), 727-734.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

Pesaran, M. H., & Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels. Journal of econometrics 68(1), 79-113.

Pingali, P. (2007). Agricultural growth and economic development: a view through the globalization lens. Agricultural Economics, 37, 1-12.

Ram, S. (1987). A model of innovation resistance. ACR North American Advances.

Saqib, N., Masnoon, M., & Rafique, N. (2013). Impact of foreign direct investment on economic growth of Pakistan. Advances in Management & Applied Economics, 3(1), 35- 45.

Shah, S. W. A., Haq, M., & Farooq, R. (2015). Agricultural export and economic growth: A case study of Pakistan. Public Policy and Administration Research, 5(8), 88-96.

Singh, M., & Kaur, K. (2014). India's services sector and its determinants: An empirical investigation. Journal of Economics development Studies, 2(2), 385-406.

Sola et al.(2013) Manufacturing performance in Nigeria: Implication for sustainable development, Asian Economic and Financial Review, Vol. 3(9), pp.1195-1213

Umer, F., & Alam, S. (2013). Effect of openness to trade and FDI on industrial sector growth: A case study for Pakistan. Romanian Economic Journal, 16(48), 179-198.

Uz-Zaman, K., & Aman, Q. (2007). Globalization and economic development in Pakistan. Indian Journal of Economics and Business, 6(2), 257.

Vohra, R. (2001). Export and economic growth: Further time series evidence from less-developed countries. International Advances in Economic Research, 7(3), 345-350.