

Impact of Industrial Sector on GDP (Pakistan Case)

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Abstract

This study is an attempt to investigate the relationship between economic growth and different components of industrial sector of the economy of Pakistan. For this purpose the secondary data for 61 years from 1950 to 2010 is used. The first step in the empirical analysis involves testing the time series characteristics of the data series using ADF tests. Simple linear regression and time series techniques are applied to estimate the relationships. All the variables used in this study are stationary in their first differences. Regarding the hypotheses of the study it is concluded that the entire hypothesis has a positive impact on GDP, partially accepted. Because in simple linear regression all the components of industrial sector show a positive relationship with GDP except mining and quarrying sector that not only shows the negative relationship but also gives an insignificant result. All other results are statistically significant and consistent in simple linear regression.

Introduction

Background

The economy of Pakistan is the 47th largest in the world in nominal terms and the 25th in the world in terms of purchasing power parity (PPP). The economy of Pakistan can broadly be divided into three sectors: agricultural, industrial and services sectors. The agricultural sector contributes around 21 percent, industrial 19 percent, and services sector 53 percent in GDP. Pakistan has a semi-industrialized economy which encompasses textiles, chemical, food processing, agriculture and other industries. In 1947 when Pakistan came into existence its industrial sector was very limited, but as time passed this sector of economy flourished. Today Pakistan ranks 41st in the World and 55th Worldwide in factory output and industrial sector accounts for about 26 percent of GDP. The share of industrial

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sector in the Country's GDP has increased by 0.40 percentage point in the outgoing fiscal and that of agriculture and services sector has slightly declined according to the latest official survey report.(Wikipedia, Economy of Pakistan 2010).

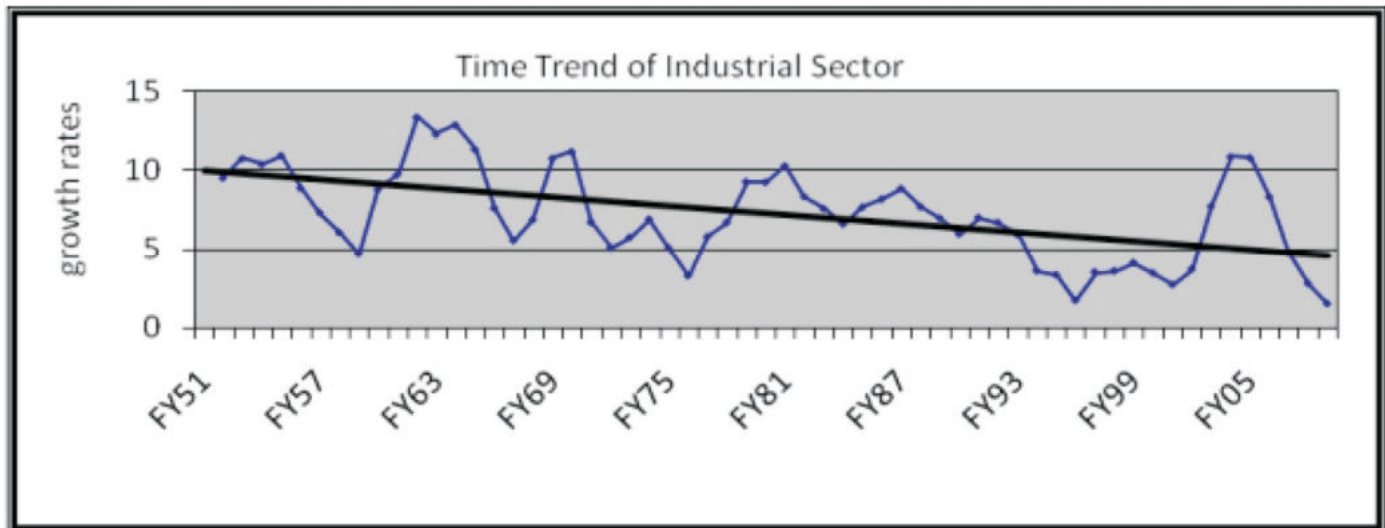
Pakistan's major industries included cement, fertilizers, edible oil, sugar, steel, tobacco, chemicals, machinery, food processing, textile and apparel manufacturing. Cotton textile production and manufacturing are Pakistan's largest industries accounting for about 64 percent of total export and account for 40 percent of employed labor force. The contribution of traditional products such as textile and fibers, leather, food and tobacco, are the major industries in terms of their contribution to value addition of 43.2 percent in 1998 and 38.8 percent in 2007. The shares of these industries dominate the whole industrial sector.

At the ground level the SMEs and the large firms are equally ignorant and careless about their role in environmental degradation in Pakistan. This is essentially due to poor institutional capacity and little emphasis on environment in fiscal policy and insufficient allocation of funds for environmental protection of forestry, biodiversity, water and sanitation. The Mid Term Development Framework (MTDF: 2005-10) has laid down the long term objective of sustainable economic growth without environmental degradation (GOP, 2005). Its real success would depend on how effectively the environmental laws cover the National Environmental Quality Standards (NEQS) and whether or not the violators of the laws are made to pay for damaging the environment.

While the government of Pakistan needs to promote the industry in the Country, and simultaneously is a custodian of environmental protection, there is a need for national environmental legislation on the leather industry; local laws could be introduced to curb the growing tannery effluent problem. In fact, certain industrial areas are suffering greater environmental damage and would benefit from local legislation. For example, in Karachi, the Korangi Industrial Area has the largest number of tanneries working in the leather sector and is the most polluted area with "open drains and effluents being discharged without treatment.

In recent years the Country has seen rapid growth in industries such as apparel, textile and cement and services (such as telecommunication, transportations, advertising, and finance). Strong state involvement persists in services especially in transport, communication and life insurance, while they account for well over half of Pakistan's GDP and substantial employment.

(Wikipedia, Economy of Pakistan 2010)



Definition of GDP

“GDP measures the total output produced within a Country's borders whether produced by that Country's own firms or not during a specific time period that is usually one year.”

The gross domestic product (GDP) is the godfather of the indicator world. As an aggregate measure of total economic production for a Country, GDP represents the market value of all goods and services produced by the economy during the period measured, including personal consumption, government purchases, private inventories, paid-in construction costs and the foreign trade balance (exports are added, imports are subtracted). (www.investopedia.com 2011)

Importance of Industrial Sector

The credit goes to industrialization which has dethroned the poverty and has made the people of developed countries like US, UK, Canada, Germany and Japan to enjoy a higher standard of living. This is the reason the wave of industrialization has also entered into the Far Eastern countries, known as “Newly Industrializing Countries” (NICs). It has been a



desire on our part to start and perpetuate the process of industrialization. The importance of industrialization for our Country is obvious from the following reasons:-Increase in employment opportunities, Increase in output and incomes, Agriculture development, Development of allied and related sectors and Attainment of internal and external economies, Industrialization brings social and economic changes, Industrialization will reduce BOP deficit, The increased saving and investment, Increase government revenues and Defense requirements.(www.scribd.com 2011)

Components of Pakistan Industrial Sector

The components of Pakistan's industrial sector are as follows:

- Mining and quarrying
- Fuel extraction industry
- Manufacturing
- Construction
- Electricity, gas and water supply

Mining and Quarrying

Mining is the extraction of raw materials from the Earth's crust, usually from an ore body, vein or (coal) seam. Mining produces three types of mineral body commodities - metals, industrial minerals and fuels - that all countries find essential for maintaining and improving their standards of living. Mining is basic to the human way of living, as essentially everything we use in modern society (that does not come from a plant) is a product of mining sector.

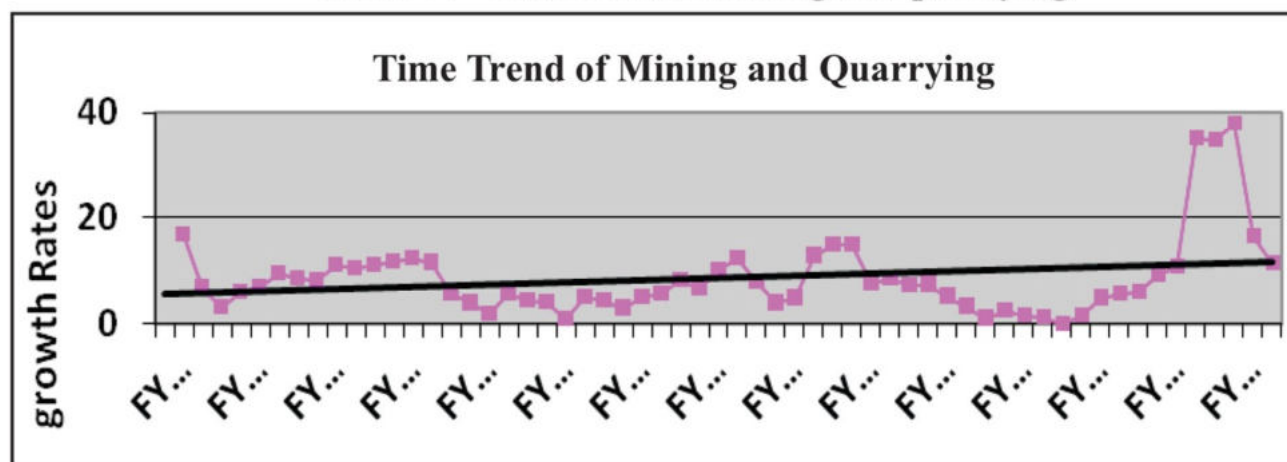
However, the direct and indirect contribution that the mining industry makes to human prosperity is often not as well recognized, as it should be. Minerals are also unique in the sense of their non-renewable profile, as minerals deposited are finite, either physically or economically. This implies a special concern about their exploitation, and consumption in a way that could prevent or mitigate their scarcity or unavailability for future generations. (Umer Sheraz 2010 ; Mining Futures: Beyond the Headlines)

Pakistan has a widely varied geological framework, ranging from pre-Cambrian that includes a number of zones hosting several metallic minerals, industrial minerals, precious

and semi- precious stones. The mining and quarrying sector is estimated to grow by 0.4 percent in 2010-2011 as against 2.2 percent in the last year. (Economic Survey 2010-2011) Important minerals found in Pakistan are gypsum, limestone, chromites, iron ore, rock, salt, silver, gold, precious stones, gems, marble, copper, coal, graphite, sulphur, fire clay, silica. The ministry of Petroleum of Natural Resources formulates and implements petroleum, gas and mining policies. All minerals except petroleum and nuclear minerals are constitutionally owned by the Provinces. Federal govt.'s role is to provide geological data, assist in provincial coordination, and to facilitate foreign investment in the mining sector. It also finances mineral projects. The govt. remains keen to attract foreign operations, including joint ventures. (Wikipedia 2010, Industry of Pakistan)

The main Pakistan mining operation, Saindak Metal Limited, is state owned and produces copper, gold, silver, blister copper that is exported. In November 2002, it was leased for ten years to a China firm under a US \$ 350 million. The Pakistan Mineral Development Corporation (PMDC) has four coal mines (10 percent of the Country's coal deposits), four salt mines/ quarries (45 percent of total production) and silica sand quarry.(www.wto.org 2010)

Chart-2- Time trend of mining and quarrying



Regulatory Authority (OGRA) started regulating the oil and gas sector in March 2002. Pakistan is also a major producer of Bituminous coal, sub-bituminous, coal and lignite. Low sulfur coal was recently reported to have been found at the Baluchistan near Quetta as well. Pakistan produced about 45 tons of Uranium in 2006 and has recently used some in its own nuclear power and weapons. Baghalchur (a small town in Dera Ghazi Khan District, Punjab, Pakistan) is the site of abandoned Uranium mines now being used as a nuclear dump. Several Pakistani environmentalist groups are bitterly opposed to the nuclear dump being used. Pakistan Atomic Energy Commission (PAEC) have asked the government to invest in better techniques in the disposal of nuclear waste materials. Sindh's Thar Desert and Neyveli (in Pakistan) lignite mines will also be expanded soon for industrial usage. Special measures are being employed to reduce the resulting fly ash, carbon footprint and sulphur fume emission problems after it is burnt.(www.sidepad.com 2011)

Manufacturing

The manufacturing sector of any Country bears significant importance. Globalization, and in particular, enhanced exports are generally believed to benefit developing countries. Manufacturing is the second largest sector of the economy of Pakistan after agriculture. The sector is dominated by textile, oil and gas, cement and automobile sectors in terms of assets size and credit allocation. Cotton textile production and apparel manufacturing are Pakistan's largest industries accounting for about 64 percent of total export. State involvement in manufacturing remains substantial, especially in heavy engineering and steel. Govt. intervention in manufacturing remains targeted at protecting infant industries through tariffs and domestic support measures, including various tax concessions. The edible oil manufacturing industry is protected by relatively high specific tariff.(Iffat Ara 2004)

The manufacturing sector can be categorized into two sub-groups:

A-Large- scale manufacturing (LSM)

B- Small and medium enterprise (SME).

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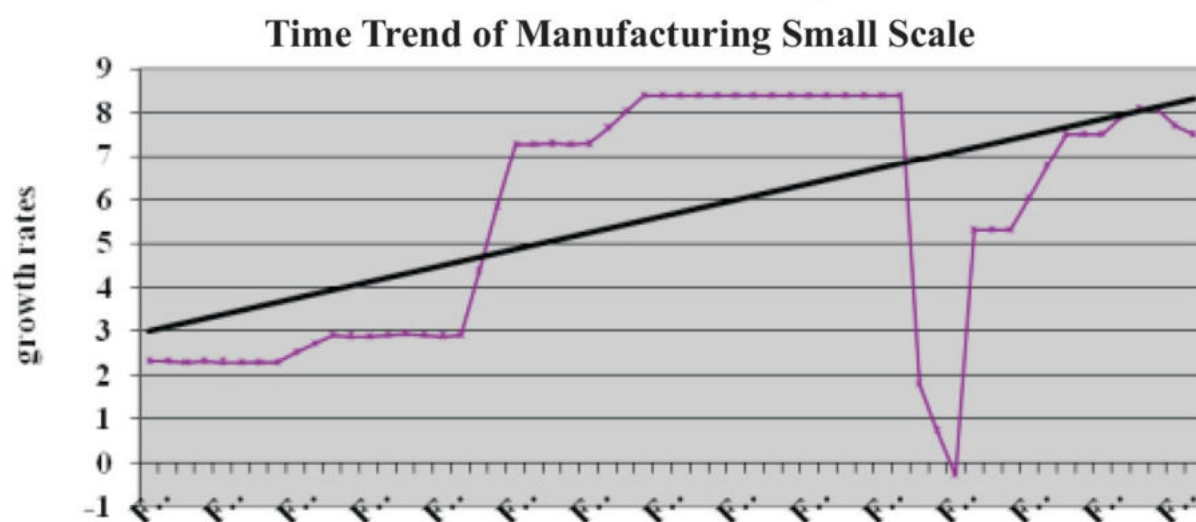
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The SMEs are the backbone of economic growth of a developing Country. Due to their sheer number, size and nature of operation, this sector of economy promotes endogenous source of growth and strengthens the infrastructure for accelerated economic expansion and development. The potential of SMEs to promote domestic- led growth in new and existing industries and to strengthen the resilience of the economy in a competitive and challenging environment are inarguable. Deposit their heterogeneity; SMEs are generally concentrated in selected activities such as: (i) Metal working, (ii) Furniture, (iii) Agro-based, (iv) Sports goods, (v) Fisheries, (vi) Poultry (vii) Gems and Jewelry and (viii) Food and Catering. In Pakistan the significant role of SMEs is clearly indicated by research and statistic. According to more recent estimates, SMEs contribute 40 percent to GDP. Significance of their role in economic development is endorsed by the fact that, in 2009-2010, a period in which real GDP of Pakistan grew by 3.8 percent, the small scale sector provided much support to overall pattern and grew by 7.5 percent. Hence, it is clear that in time of economic downturn, SMEs outperform large enterprises, providing much support to overall economic growth. (Economic survey of Pakistan; 2010-2011)

Pakistan's micro- enterprises also face many binding constraints in entry and growth phases. At the entry stage these are: (i) Fixed Capital (ii) Working Capital (iii) Recovery of credit given to customers. (iv) Access to product design. (v) Access to tools, equipments raw materials: particularly for the units in small towns. (vi) Access to markets: inadequate demand; more for units in small towns. (vii) Skilled labor. (viii) Taxes. (ix) Transport and communication facilities, and (x) Government regulations. In the growth phase the constraints change and so do their importance.(www.scribd.com 2011)

Chart -5- Time trend of manufacturing small-scale

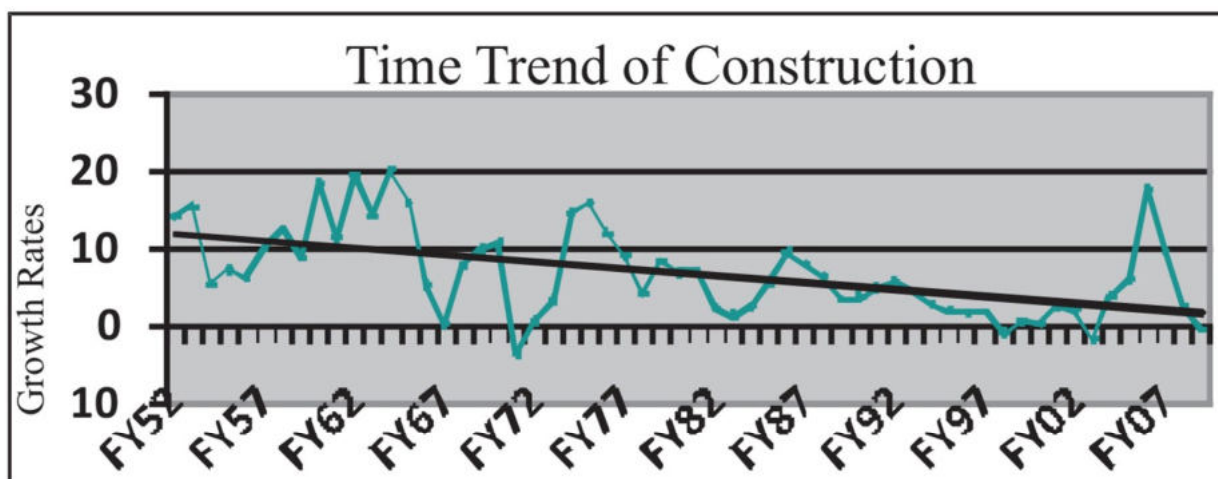


Construction

Construction sector includes hospitals, schools, townships, offices and other buildings; urban infrastructure (including water supply, sewerage, drainage); highways, roads, airports, railways, ports, power systems; irrigation and agriculture systems; telecommunication etc. It deals with all economic activities directed to the creation, renovation, repair or extension of fixed assets in the form of buildings, land improvement of engineering nature. Construction and engineering services industry play an important role in the economic uplift and development of the Country. Unfortunately construction sector is one of the most neglected sectors in Pakistan. Although the construction sector has only 2.3 percent share in GDP, its share of employed labor force is disproportionately large at 6.1 percent in 2007. (Raza Ali Khan 2008)

After the devastating 2005 Kashmir earthquake, the cost construction in Pakistan increased by 30 to 50 percent due to the implementation of new building code. The price of cement has increased by 50 percent and govt. banned export of cement. The higher demand for construction workers is also reflected in a continued double-digit rise in their wages since FY2005 (Wikipedia 2009.)

Chart-6-Time trend of construction



Electricity, Gas and Water Supply:

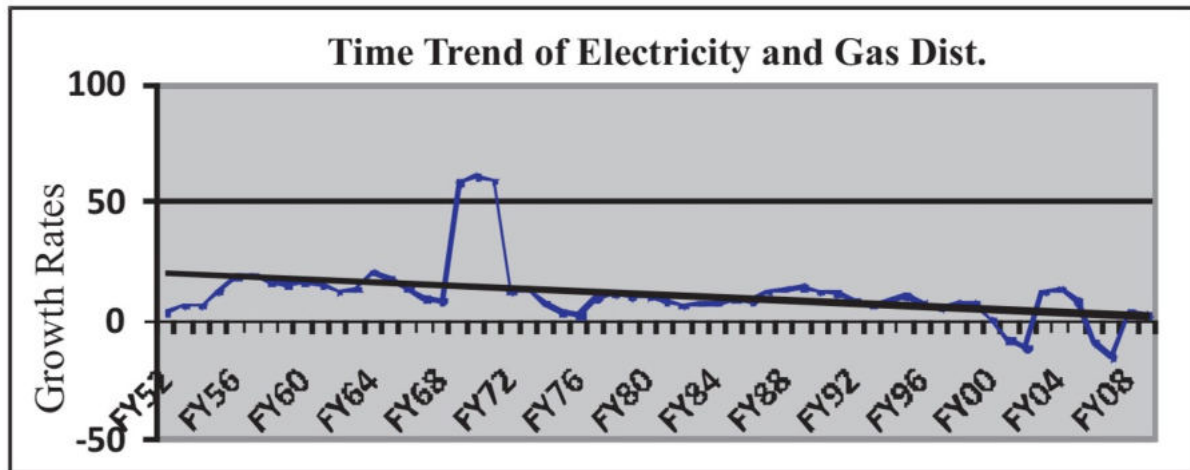
Pakistan has extensive energy resources including fairly sizable natural gas reserves, some proven oil reserves, coal (Pakistan has the fourth largest coal reserve in the world) and a large hydropower potential. However the exploration of energy resources has been slow

due to a shortage of capital and domestic political constraints. Domestic petroleum production totals only about half the Country's oil needs, and the need to import oil has contributed to Pakistan's trade deficits and past shortages of foreign exchange. The current govt. has announced that privatization in a gas and oil sector is a priority, as is the substitution of indigenous gas for imported oil, especially in the production of power. Pakistan is the world leader in the use of compressed natural gas (CNG) for personal automobiles.(Wikipedia 2011).

Today Pakistan is facing serious energy crises. Despite consequent rising demand of energy, no worthwhile steps have been taken to install new capacity for generation of the required energy sources. Now, the demand exceeds supply and hence "Load shedding" is a common phenomenon through frequent power shutdown. There is a shortfall of about 3000 to 4000NM per day by 2010. The shortage is badly affecting industry, commerce and daily life of people. The Govt. is understandably engaged in a vigorous effort to expand the Nation's power generation capacity through building of dams and inviting foreign investors for establishing thermal units in the Country. Pakistan is also working to expand the use of wind turbines. Pakistan Alternative Energy Development Board (AEDB) recently approved New Park Energy Phase 1, a 400-MN wind project near Port Qasim. (Noor-Ul-Haq 2006).

The Regulatory function of petroleum industry including Liquid Petroleum Gas (LPG), and Compressed Natural Gas (CNG) activities and petroleum product pricing functions were transferred to OGRA in March 2006. Pakistan is constructing several regional gas pipelines, e.g. Iran- Pakistan- India, Turkmenistan- Afghanistan- Pakistan, and Qatar- Pakistan. Moreover, subsidy on gas was given on fertilizer industry and on chemical plants. This has changed with the National Drinking Water Policy (NDWP), the National Sanitation Policy (NSP) and the Clean Drinking Water for all programmes, which were prepared by the Ministry of environment as integral parts of the Medium Term Development Framework (MTDF) 2005-2010. A major shift of sector responsibility took place under the 2001 Local Government Ordinance.(Internship report on Sui Gas 2009)

Chart -7-Time trend of electricity, gas and water supply



Finally, the characteristics of industrial sector of Pakistan indicate that it has rather fixed share of specific industries for the last several years. Economy is growing relatively steady on an average around 7 percent. The reasons for slow and fluctuating growth were political, economic and financial shocks. On the other hand the share of relatively medium or high level of technology products remains low or decreasing over the time. Although the govt. intended to expedite the process of reforms, structural changes and integration, due to political instability and war on terrorism by the western powers in the region the progress remained inconsistent during last several years, especially after the event of nine-eleven.(Tariq 2009)

The main objective of the study is to estimate the impact of growth in industrial sector on GDP growth; further, to suggest policy recommendation for the improvement of the sector based on the findings of the study. The study is planned to analyze the impact of industrial sector on GDP. This study includes five sections. The first section explains brief introduction about topic, objective, and organization of study. The second section presents the review of existing literature; the third chapter discusses the methodology used in the paper; the fourth gives the results and finally the fifth section concludes the Paper and gives suggestions.

Literature review

Sabir and Ahmed (1993) studied the impact of structural adjustment policies on TFP, using quarterly national income and gross domestic product data for the period 1959-1992, and concluded that, although the average growth in overall economy has declined from GDP



and residential and non-residential investment. Results showed that residential investment causes, but is not caused by GDP, while non-residential investment does not cause, but is caused by GDP. They concluded that housing leads and other types of investment lag the business cycle.

Tse and Ganesan (1997) also used the same econometric technique (Granger causality test) to determine the causal relationship between construction flows and GDP using quarterly Hong Kong data from 1983 to 1989. They found that the GDP leads the construction flow and not vice versa.

Sabir and Ahmed (2002) studied the impact of structural adjustment policies on TFP, and concluded that, although the average growth in overall TFP of the overall economy has declined from 2.8 percent in the pre-reform period (1973-88) to 0.7 percent, in the post-reform period (1988-2002), in the manufacturing sector it declined from 5.9 percent to 1.9 percent, respectively during these two periods.

Hoque and Musa (2002) found that during the period between 1994 and 2001 the IPOs of Dhaka Stock Exchange (DSE) were largely underpriced at 285.21 percent. At the same period the degree of underpricing in Malaysia was 46.44 percent.

IMF (2002) had computed TFP of the overall economy of Pakistan for the period 1961-2001. The findings indicate that, on an average, TFP experienced negative growth in the 1960s, positive in the 1970s and 1980s. However, in the 1990s the growth declined to just 0.6 percent per annum.

Pasha et. al (2002) pointed out that the growth of TFP of the manufacturing sector shows a persistent declining trend during 1973-98; the average annual growth rate of TFP declined from 9.4 percent during 1968-83 to meager 1.4 percent during 1993-98 per annum, the contribution of TFP in overall economic growth that was 55 percent during 1968-83 declined to as low as 16 percent. They further concluded that human capital has played a leading role in the growth of TFP of manufacturing sector; of the 4.6 percent annum growth of TFP during 1973-98,



Wizarat (2002) computed total factor production (TFP) of the large scale manufacturing sector for the period 1951-91. Her results show an increase in TFP trend. Moreover, she found that the contribution of TFP to economic growth has been negative (-27 percent), on the average, during the period 1955-91. According to her study economic growth was largely driven by capital (88 percent) and labor (40 percent).

Ghosh and Maji (2003) examined the efficiency of working capital of the Indian cement companies from 1992-1993 to 2001-2002. For measuring the efficiency of working capital management, performance, utilization, and overall efficiency indices were calculated instead of using some common working capital management ratios. Setting industry norms as target-efficiency levels of the individual firms, they also tested the speed of achieving that target level of efficiency by an individual firm during the period of study. It was found that the Indian Cement Industry as a whole did not perform remarkably well in this period.

Eljeljly and Abuzar (2004) empirically examined the linkage of profitability, as indicated by the current ratio and cash cycle. They studied a sample of Saudi Arabian companies covering the years 1996 to 2000. They find a significant inverse relationship between company profitability and liquidity, while a direct strong relationship was identified between company size and profitability.

Iffat Ara (2004) assessed the competitiveness of manufacturing sector of Pakistan by comparing the trend in the growth of factor and non-factor input prices with that of export price and also looked at the trend in the growth of productivity. She found that over the period 1972-73 to 2002-2003, both the factor and non-factor prices have grown at a rate higher than that of general price level as well as of export price. She further suggests that even though the growth in productivity is offsetting the negative impact of the growth in input factor prices, the growth in productivity itself depicts a declining trend, especially for the most recent period, 1999-03. Shah and Sana (2006) used a very small sample of 7 oil and gas sector firms to investigate this relationship for the period 2001-2005. The results suggested that managers could generate positive return for the shareholders by effectively managing the working capital.

Lazaaridis and Tryfonidis (2006) investigated the relationship of corporate profitability and working capital management for firms listed at Athens Stock Exchange. They reported that there is statistically significant relationship between profitability measured by gross operating profit and the Cash Conversion Cycle. Furthermore, Managers can create profit by correctly handling the individual components of working capital to an optimal level.

Rehman (2006) investigated the impact of working capital management on the profitability of 94 Pakistani firms listed at Islamabad Stock Exchange (ISE) for the period 1999-2004, and studied the impact of the different variables of working capital management including Average Collection Period, Inventory Turnover in Days, Average Payment Period and Cash Conversion Cycle on the Net Operating Profitability of firms. It is found that there is a strong negative relationship between working capital ratios and profitability of firms.

Padachi (2006) has examined the trends in working capital management and its impact on firm's performance for 58 Mauritian small manufacturing firms from 1998 to 2003. He explained that a well designed and implemented working capital management is expected to contribute positively to the creation of a firm's value. The results indicated that high investment in inventories and receivables is associated with low profitability and also showed an increasing trend in the short term component of working capital financing.

Islam, Ali and Ahmed (2006) investigate the behavior of initial public offerings of the Dhaka Stock Exchange during the period 1995-2005. They studied 117 companies and found the 102 IPOs were underpriced, 13 overpriced while only 2 were accurately priced. Rehman and Nasr (2007) analyzed profitability and working capital management performance of only 94 firms listed on Karachi Stock Exchange for the period 1999-2004 only by using Ordinary Least Square and Generalized Least Square. Their findings of study suggested that there exists a negative relationship between working capital management measures and profitability.

Afza and Nazir (2007) investigated the relationship between aggressive and conservative working capital policies for a large sample of 205 firms in 17 sectors listed on Karachi Stock Exchange during 1998-2005. They found a negative relationship between the profitability measures of firms and the degree of aggressiveness of working capital investment and financing policies.

Least Square Method For (Regression)

Least squares or **ordinary least square (OLS)** is a mathematical optimization technique which, when given a series of measured data, attempts to find a function which closely approximates the data (a "best fit"). It attempts to minimize the sum of the squares of the ordinate differences (called residuals) between points generated by the function and corresponding points in the data. Specifically, it is called least mean squares (LMS) when the number of measured data is 1 and the gradient descent method is used to minimize the squared residual. LMS is known to minimize the expectation of the squared residual, with the smallest operations (per iteration). But it requires a large number of iterations to converge.

Mathematical Presentation Of Model

To test the relationship between gross domestic product and different components of the industrial sector, the following model is used:

$$gGDP = f(gIND, gMQ, gMANF, gMNLS, gMNSS, gCON, gEGD, \varepsilon)$$

gGDP : Growth of Gross Domestic Product

gMQ: Growth of Mining and Quarrying.

gMANF: Growth of manufacturing sector. gMNLS: Growth of large-scale manufacturing sector.

gMNSS: Growth of small and medium enterprises sector.

gCON: Growth of construction industry.

gEGD: Growth of electricity, gas and water supply sector.

ε : Error term. 3.4- Model Specifications

$$gGDP = \beta_0 + \beta_1 (gIND) + \beta_2 (gMQ) + \beta_3 (gMANF) + \beta_4 (gMNLS) + \beta_5 (gMNSS) + \beta_6 (gCON) + \beta_7 (gEGD) + \varepsilon$$

Data Analysis and Discussions

This section includes descriptive as well as quantitative analysis and the results of these two types of analysis are discussed in this section.

Quantitative Analysis

For analysis of data a certain method is used in this study: that is regression. Initially



M. Shahbaz and N. Aamir (2007) analyzed the direct foreign investment and income distribution for Pakistan for period 1970-2005. Their study is a pioneering effort regarding a Country case like Pakistan. They used a modern technique in finding the order of integration for running actors. They used ARDL bounds approach and error correction method (ECM). Their findings reveal that increased FDI in Pakistan worsens income distribution because it is focused towards capital intensive industrial and services sectors of urban localities.

K.M.Yousaf Tariq (2008) used the data from 1990 to 2007 and find that trade liberalization reforms since 1998 have not changed the composition of exports of Pakistan's manufacturing sector.

Khan Ali Raza (2008) investigates the role of construction sector in economic growth by using co-integration and Granger casualty test and finds that there is a strong causal relationship between the aggregate economy and the construction sector of Pakistan. He used annual data for construction sector and economic GDP of Pakistan from 1950 to 2005. Rehman A. et al (2008) analyzed the working capital management and corporate performance of manufacturing sector in Pakistan. They used panel data from 1998 to 2007 and conclude that firms in Pakistan are following conservative working capital management policy and the firms are needed to concentrate on improving their collection and payment policy.

Usman, (2008) investigated the impact of oil price and exchange rate volatility on economic growth in Nigeria on the basis of quarterly data from 1986Q1 to 2007Q4. He analyzed the time series properties of the data by examining the nature of causality among the variables. Furthermore, he applied Johansen VAR-based co-integration technique and vector error correlation model. The result showed unidirectional causality from oil prices to real GDP and bidirectional causality from real exchange rate to real GDP and vice versa.

Afza and Nazir (2009) investigated the working capital management efficiency of cement sector of Pakistan for the period 1988-2008. Findings of the study indicate that the cement sector as a whole did perform well during the study period.

Samreen, Khalid and Aslam (2009) investigated the potential impact of coal on electricity generation and economic growth of Pakistan. They used secondary data from 1995 to 2007 and applied OLS technique attributed to Carl Friedrich Gauss. The result showed that coal is a more efficient estimator than other energy resources; there is positive relation between electricity generation and coal.

Khuram Khan et. Al (2009) examined the effect of corporate governance on a firm's performance. Their research had been carried out on the Tobacco industry of Pakistan and focused on three aspects, namely, ownership concentration, CEO duality and Board's Independence. They had used data from three listed companies of the Tobacco industry, namely, Pakistan Tobacco, Lakson Tobacco and Khyber Tobacco for the period 2004-2008.

IO Chhappra and NA Naqui (2009) investigated the relationship between the Working Capital Management (WCM) and firm's profitability in the textile sector of Pakistan. They selected a sample size of 55 textile companies in Pakistan for a period of six years, from 2003 to 2008 and used correlation, regression analyses and ANOVA Test. Their results showed a strong positive significant relationship between WCM and firm's profitability and a significant negative relationship between debt used by the firm and its profitability in Pakistan's textile sector.

Udah, Enang B (2009) investigate the causal and long-run relationship between electricity supply, industrialization and economic development in Nigeria from 1970-2008. To achieve this, he used time series data and employed the Granger Causality test and the ARDL bounds test approach to co-integration proposed by Pesaran et al (2001). The Granger Causality results showed that there is a feedback relationship between GDP per capita and electricity supply, and no causal link in the case of industrial output and GDP per capita.

Bedi-uz-Zaman, M.Farooq and Sami Ullah (2009) investigate the sectoral oil consumption and economic growth in Pakistan for the period of 1972-2008. They used different time series techniques, the result showed that major sectors of oil consumption (transportation, power generation and industry) are positively contributing.

Methodology and Data

This section discusses the methodologies that are employed to meet the objectives of the study. The variables used in this study of impact of industrial sector on GDP include growth of gross domestic product (gGDP), dependent variable, and growth of industrial sector (gIND), growth of mining and quarrying (gMQ), growth of manufacturing (gMANF), growth of manufacturing large –scale (gMNLS), growth of manufacturing small- scale (gMNSS), growth of construction (gCONS), growth of electricity, gas and water supply distribution (gEGD) as independent variables.

The sample period covers time series data from 1950 to 2010. All the relevant data is obtained from Economic Survey of Pakistan, Pakistan Bureau of Statistics and State Bank of Pakistan. Many economic time series are non-stationary at levels. One way of getting interesting information about the stationarity of time series is to plot the original series and making correlogram at both levels and first difference. The second, most rigorous way is to use the Augmented Dickey Fuller (ADF) which is the wider version of the standard Dickey Fuller (DF). This test is employed to verify the presence of unit root in the series.

Implication Of Stationary And Non-Stationary Time Series

As we begin to develop models for time series, we want to know whether the underlying stochastic process that generated the series can be assumed to be invariant with respect to time. If the characteristics of stochastic process change over time, i.e., if the process is non-stationary, it will often be difficult to represent the time series over past and future intervals of time by a simple algebraic model---the random walk with drift is an example of non-stationary process for which a simple forecasting model can be constructed. By contrast, if the stochastic process is fixed in time, i.e., if it is stationary then one can model the process via an equation with fixed coefficients that can be estimated from past data. Observing the results of Unit-Root Test in the result section, it is clear that all the data series are stationary at same level. So when data series are stationary, we can use the Ordinary Least Square Method to regress the series to get results. The method of ordinary least squares is attributed to Carl Friedrich Gauss, a German mathematician. Under certain assumptions, the method of least squares has some very attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis (Damodar, Gujarati and Sangeetha, 4th ed).



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ε : Error term.

3.4- Model Specifications

$$gGDP = \beta_0 + \beta_1 (gIND) + \beta_2 (gMQ) + \beta_3 (gMANF) + \beta_4 (gMNLS) + \beta_5 (gMNSS) + \beta_6 (gCON) + \beta_7 (gEGD) + \varepsilon$$

Data Analysis and Discussions

This section includes descriptive as well as quantitative analysis and the results of these two types of analysis are discussed in this section.

regression is used to check the impact of different independent variables on the dependent variable and also to test significance of this impact.

Results and Discussion

Analysis Of Results Of Unit Root

To test the stationary we have used ADF test because DF test is based only on AR (1) process while ADF test extra lagged terms of dependent variable in order to eliminate auto-correlation. In table (4.1) I tested the null hypothesis of unit root against the alternative of stationary at level or first difference. The augmented Dickey-Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger is the rejection of the hypothesis, that there is unit root, at some level of confidence. In one example, with three lags, a value of -3.17 constituted rejections at the p-value of 10 percent. Results show that all the variables are stationary at level when order of integration is I (1) and intercept & trend are considered. OLS estimation technique is applied to calculate the results.

Table 4.1 ADF Test Results of Industrial Sector Components and GDP.

Variables	Level		First Difference	
	Intercept and Trend	Order of Integration	Intercept and Trend	Order of Integration
gIND	-4.94* (-4.13)	I(1)	-7.67* (-4.13)	I(0)
gMQ	-3.84** (-3.50)	I(1)	-7.55* (-4.13)	I(0)
gMANF	-5.04* (-4.13)	I(1)	-7.73 (-4.13)	I(0)
gMNLS	-4.78* (-4.13)	I(1)	-7.84* (-4.13)	I(0)
gMNSS	-3.26*** (-3.17)	I(1)	-7.91* (-4.13)	I(0)
gCONS	-4.31*** (-4.13)	I(1)	-6.54* (-4.13)	I(0)
gEGD	-5.00* (-4.13)	I(1)	-7.24* (-4.13)	I(0)
gGDP	-3.33*** (-3.17)	I(1)	-7.03* (-4.13)	I(0)

Note: * denotes the rejection of the null hypothesis at 1 percent level of significance, ** denotes the rejection of the null

hypothesis at 5 percent level of significance and *** at 10 percent level of significance. Values in parenthesis are Mac Kinnon critical values for rejection of hypothesis of a unit root.

Legend: - gMQ is growth in mining and Quarrying, gMANF is growth in manufacturing, gMNLS is growth in manufacturing large scale, gCONS is growth in construction and gEGD stands for growth in electricity and gas distribution.

Analysis of Results of Regression

Simple linear regression technique is used to analyze the impact of different determinants one by one. However, the results have been shown in table 4.2. It is also used here to avoid the issue of co-integration to the maximum extent.

Table 4.2:- Results of regression by using model equation

	gMQ	gMANF	gMNLS	gMNSS	gCON	gEGD	Overall gIND
Constant	5.08 (17.73)	2.18 (3.94)	2.25 (3.67)	4.19 (9.35)	4.09 (9.80)	4.20 (9.84)	2.60 (4.35)
GGDP	-0.01 (-0.93)	0.20 (5.19)	0.17 (4.66)	0.06 (1.94)	0.06 (2.43)	0.04 (2.07)	0.16 (4.17)
R ²	0.01	0.31	0.27	0.060	0.09	0.07	0.23

Regressions estimated using data for 1950-2010. Number of observations is 59 after adjusting endpoints. T values are given below the coefficient estimate in each cell. There is a positive relation between growth in GDP and Industrial Sector. The R- square value of about 0.22 which means 22 percent of the variation in GDP growth is explained by the growth in industrial sector.

There is a negative relationship between growth in mining and quarrying sector and GDP. The R-square value of about 0.014 means that 1 percent of the variation in GDP growth is explained by the growth in mining and quarrying sector. There is a positive relation between GDP growth and growth in manufacturing sector. The R- square values of about 0.31 means that 31 percent of the variation in a GDP Growth is explained by the growth in manufacturing sector. There is a positive relationship between GDP growth and growth in large-scale manufacturing. The R-square value of 0.27 states

that 27 percent of the variation in GDP growth is explained by the growth in large-scale manufacturing. There is a positive relationship between growth in small- scale manufacturing and GDP. The R-square value of 0.06 shows that 6 percent of the variation in GDP growth is explained by the growth in small- scale manufacturing. There is a positive relationship between growth in construction sector and growth in GDP. The R-square value of about 0.09 states that 9 percent of the variation in GDP growth is explained by the growth in construction sector. There is a positive relationship between electricity, gas and water supply sector and GDP growth. The R-square value of about 0.07 shows that 7 percent of the variation in a GDP growth is explained by the increase in growth in electricity, gas and water supply sector.

Conclusion and Recommendation

This paper is an attempt to investigate the relationship between economic growth and different components of industrial sector of the economy of Pakistan. Secondary data for 61 years from 1950 to 2010 was used for this purpose. The first step in the empirical analysis involves testing the time series characteristics of the data series using ADF tests. Simple linear regression and time series techniques are applied to estimate the relationships. All the variables used in this study are stationary in their first differences.

Regarding the hypotheses of the study it is concluded that the entire hypothesis has a positive impact on GDP partially accepted. Because, in simple linear regression all the components of industrial sector show a positive relationship with GDP except mining and quarrying sector which not only shows the negative relationship but also gives an insignificant result. All other results are statistically significant and consistent in simple linear regression.

Recommendations

I wish to suggest the following steps in order to improve the industrial output: Small firms are generally inefficient and have to be made efficient through proper policy support and guidance. Small industry needs to be made buoyant and progressive partner in the development process. The best way to do so is to establish strong small-large links in production, wherever feasible. Large- Small links may not get established automatically, they are to be developed with Government policy support.



There is need for Pakistan industrial sector to focus on: (a) develop of new products; (b) import replacements; (c) export goods; and (d) goods with growing demand. It would be appropriate to put the scarce national resources, in particular, capital to use for the production of new products rather than duplicate lines of production that are being carried on, even with inefficiency.

To achieve higher growth, special incentives may be provided for setting up of industries for the manufacture of international quality. A system to transfer technology to industry for commercialization is needed; so too, promote export centers for industrial development. The government of Pakistan has to secure continuous flow of Gas and Electricity to business without frequent load shedding. Government investment is required in improving Pakistani infrastructure within the Country. Government should develop a reasonable infrastructure and other ancillary facilities.

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