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Factors Affecting Public Investment in Manufacturing Sector of Pakistan

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Abstract

Public Investment in manufacturing sector has emerged as one of the most active part all over the world. In Pakistan public investment had made a significant contribution in different sectors and has played a fundamental role in the financial system of the country. This study has been an attempt to identify the factors, which affect public investment in manufacturing sector significantly in Pakistan. The data used in this study are from 1981 to 2014. Descriptive as well as quantitative techniques are applied to derive the results and advance statistical software E-views are used. In time-series analysis there always remains a suspicion about spurious relationship. This research study is also based on time-series data, that's why before going to estimate the model, the data are tested by applying Augmented Dickey Fuller (ADF), but the data used in the study did not show any sign of spurious relationship. In order to capture the effect of various factors affecting public investment in manufacturing sector, the investment accelerator model is used and regressed through NLS and ARIMA model. The regression results shows that the variables Value-added in large-scale manufacturing sector (V_m), and Lagged Public Investment in Large-Scale Manufacturing Sector ($I_{gm}(-1)$), Index of Price of Capital (I_{pk}), Change in Domestic Credit available to Public Sector (ΔD_{cp}) and dummy (D_{ps}) for political stability and favorable economic conditions of the country plays a significant role in public investment in manufacturing sector. The study recommends that the government should create a sufficient demand by increasing domestic purchasing power, by export expansion, by import substitutions through assets redistribution. The study also found that stable political condition also necessary for the rapid economic and investment growth.

Keywords: public investment, manufacturing sector, NLS and Arima model, investment accelerator model.

1. Introduction

When expenditure on goods and services falls during a recession a lot of the decline is usually due to a drop in investment spending. Economists study investment to better understand fluctuation in the economy's output of goods and services. Investment plays two roles in macroeconomics. First because it is a large and the most volatile component of spending, sharp changes in investment can have a major impact on aggregate demand. This in turn affects the output and employment. In addition, investment leads to capital accumulation. Adding to the stock of buildings and equipments increases the nation's potential output and promotes economic

growth in the long run. Thus investment plays a dual role, affecting short-run output through its impact on aggregate demand and influencing long-run growth the impact of capital formation on potential output and aggregate supply.

Public Investment over the years has been the only consistent variable contributing to the economic growth of nations. The role of capital stock in boosting the development in countries like Korea, China, Malaysia and many others, proves the premises adopted by the investment theorists. Empirical economics has come very close in identifying the broad determinants that play the major role in the entire process of providing the optimal impetus to the economy. Unfortunately, the impact of public investment and foreign direct investment on growth remains more contentious in empirical than theoretical studies, while some of the studies observe a positive impact of public investment on economic growth, other detect a negative relationship between these two variables. The controversy has arisen partially due to data, insufficiency in either cross countries or time series investigation. Developed countries are expected to have a higher level of human capital and hence benefited more from public investment than developing countries.

Public Investment has a composite bundle of capital stock, know-how and technology and can augment the existing stock of knowledge in the recipient economy through labor training, skill acquisition and diffusion and the introduction of alternative management practices and organizational arrangements. However the Neo-classical growth model promotes economic growth by increasing the volume of investment and its efficiency. In the endogenous growth model public investment raises economic growth by generating technological diffusion from developed world to the host country.

The important factor that underlines the need to reformulate public investment theories in the developing country context is the existence of a debt overhang in many countries, which has often been cited as a factor inhibiting private investment. The possibility that confiscatory future taxation will be used to finance future service may need to be reflected in the specification of private investment behavior. The large role of the public capital stock suggests the need to incorporate complementary and substitutability relationship between public and private capital in to private investment decision. The relationship between public and private investment takes on greater importance in the developing world than in industrial countries because of the large role played by the government in the overall process of capital formation. On the one hand, public sector investment can crowd out private investment expenditure if it uses scarce physical and financial resources that would otherwise be available to the private sector. The financing of public sector investment whether through taxes, issuance of debt instruments, or inflation, can reduce the resources available to the private sector and thus depress private investment activity. Moreover, the public sector may produce marketable output that competes with private output. On the other hand, public investment to maintain or expand infrastructure and the provision of public goods is likely to be complementary to private investment. Public investment can enhance the prospects for private investment by raising the productivity of capital. Of course, the empirical relevance of phenomena such as these will differ across countries and at different points in time. However, existing studies of private investment in developing countries have not always taken them into account, even where they seem clearly relevant; and to the context they have done so, it has undertaken in an adhoc fashion, by adding new variable to a regression that specifies investment as a linear function of explanatory variables suggested by the theories described above, rather than reformulating the theory and estimating the revised model of investment.

In under-developed countries, the analysis of this (public investment) highly volatile component of GNP is extremely difficult not only from demand side but also from supply side. In developing countries the sources of investible funds include not only domestic savings but also foreign resources. The sources of domestic saving (voluntary savings, compulsory savings, deficit financing and export) are limited and it is difficult to mobilize them in the desired channel especially in the private sector. As regards foreign capital inflow, it is determined by highly volatile non-economic factors and as such cannot be predicted with any degree of accuracy (Shamshad, 2009).

In most of the studies, undertaken both in the developed and the developing countries, public investment functions have been estimated only for the fixed assets, i.e. expenditure on capital equipment, machinery and structures. Some of the studies also distinguished between capital equipment, machinery and structures, while most of the studies do not. This study will examine investment in manufacturing sector only. The study confines to Gross Fixed Investment in

manufacturing economic activities by public sector of Pakistan economy, and its determinants in this activity will be observed and analyzed. Theories have been developed to analyze investment behavior; however, the empirical studies show that none of these theories is universally true. Therefore, it is difficult to specify the variables, which are universally accepted as the determinants of public investment. In fact the nationalization of industries in seventies shook the roots of structure of investment and crowding out effect took place. Political structure of Pakistan has been changing with time, which makes it even difficult to identify the determinant of public investment (Ahmed, 2009).

1.2. Objective of the study

The objectives of the present study are to analyze observe the public investment behavior in Manufacturing sector in Pakistan.

Public Investment is highly volatile, it is quite difficult to analyze and forecast this component of gross national product (GNP). It is affected by a multitude of economic variables, which assume varying degree of importance in different situations, particularly in different phases of the business cycle. Investment, particularly public investment is very sensitive to non-economic variables such as war, political instability and other disturbance inside and outside the economy. Obviously, the effect of these variables on investment behavior is extremely difficult to predict. Public sector investment is mainly determined by the state, keeping in view the social, political and economic priorities as well as financial constraints.

2. Literature review

Resek (1966) studied the investment behavior of thirteen industrial groups of United States of America, applying a fixed lag distribution for all variables, concluded that the ratio of interest and stock price were most significant. However factors such as change in output and the debt capacity were less significant and this significance was not present for all industries. Replacement investment being proportional to the overall capital stock has been captured by the regression intercept. Data used was quarterly ranging from 1953 to 1962. Resek before using a fixed lag distribution for independent variables acquired the weights attributed to lags from an investment expenditure regression made on capital.

Jorgenson and Stephenson (1969) determined the public investment in manufacturing sector of the United States of America and found that only significant factor is the output. The major determinants which were tried in the model included change in output (taken on current prices), capital stock and the prices of capital service provision. The variable capital stock was included to capture the replacement investment. Researcher have tried to use seasonally adjusted quarterly data from 1948 (3rd quarter) to 1960 (4th quarter).

Hickman (1985) studied investment behavior of manufacturing sector in the United States of America. He used conventional variables such as the overall output, capital stock, output prices and the prevalent wage rate. After observing a sample, ranges from 1949 to 1960, he compared alternative specifications and finally reduced his emphasis to a prototype of accelerator model.

Bhaskar and Glyn (1995) found that declining profitability in the 1960s and 1970s accounted for a major part of the investment hold back in manufacturing sectors of Germany and Japan, and also depressed investment in the United States of America. Glyn estimated for twelve OECD countries for two time periods from 1960 to 1973 and from 1973 to 1992 and concluded that a three percent higher profit share is associated with approximately one percent growth of the capital stock.

Constantan (1973) had analyzed the effect of public investment on economic growth. In the study, the main objective was to analyze the relationship between export, import, foreign capital inflow and the rate of domestic growth. The analysis was based on two-gap model and a complete Harrod-Domar model was used. On the basis of empirical analysis and found that there is strong relationship between public investment and the growth of domestic product, in the post world war. But the study did not found any significant relationship between the inflow of foreign capital and the rate of growth of domestic product.

Amjad (1976) using pooled data for the period of 1962-1970 analyzed the investment behavior of manufacturing sector. Dividing the time period in to two; he took data of thirty nine (39) firms for the period 1962-1965 and data of further ninety four (94) firms for the period of 1966-1970. In the later case profit factor seemed to be only significant variables. Then re-specifying

model the researcher included two additional variables; price of output and sales. Both variables remained significant for the period of 1961-1965, however, for the period 1965-1970, both stood statistically insignificant.

Zaren (1991), attempts to identify the factors which had played significant role in determining private and public investment in manufacturing sector of Pakistan. Several models have been estimated by applying Ordinary Least Square (OLS) or AR (1) techniques using annual data for the period of 1962-1963 to 1988-1989. The first conclusion that the researcher had drawn was that, the naïve accelerator and flexible accelerator model of Junankar and the Neo-classical model of Jorgenson and Jorgenson-Stephenson are unable to explain the behavior of private and public investment in Pakistan.

However, the Rowley-Trivedi flexible accelerator model and the Keynesian model appear to have reasonable empirical performance. Secondly the results indicate that qualitative factors like government policies (towards nationalization etc) and the political stabilization are the two most prominent determinants of public investment in the manufacturing sector.

3. Description of Data and derivation of the Model

3.1. Data Analysis and Description

The data used in this research study are based on annual figures because quarterly data for most of the variables are not available from any source in case of Pakistan. The time period of the study data is from 1981 to 2014, because data prior to 1981 at constant price are unavailable. There is no direct source to complete data; therefore data are collected from Economic Surveys, Federal Bureau of Statistics, State Bank of Pakistan, Agriculture Development Bank of Pakistan (ZTBL), Cooperatives and Commercial Banks, International Financial Statistics (IFS), Pakistan Institute of Development Economics (PIDE), World Development Report (WDR), National Accounts of Pakistan and from different surveys and reports.

All the variables used in the estimation for all investment function are taken as real and at constant prices. The price index of capital good has been calculated by dividing the value of gross fixed capital formation at current price by corresponding value at constant prices.

3.2. Derivation of the Model and its Justification

White (September, 1956) has worked on this approach, which is more or less an extension of Keynes work. The optimal level of capital stock is determined and then the actual stock adjusted according to that stock. The demand for capital would depend on the present value and the internal rate of return. Lower rate of interest would imply greater levels of investment and vice versa. Hence the demand for capital is negatively associated with the rate of interest.

A natural starting point of discussion of investment is the rationale of the Present Value (PV) criterion and its implication for the determinants of investment. Thus, by reducing current income, the owners can increase future by investing the firms retained earnings. The investment rule, that the firm should maximize its present value by investing in any projects with positive returns. In order to maximize its present value the firm should invest in all projects that have a $(PV > 0)$. The present value ranking depends on the market rate of the interest – the rate at which earning can be reinvested.

Keynes also stressed the importance of expectations in determining investment since it is the expectation that determines the rate of return and thereby any change in expectation would shift the Marginal Efficiency of Capital (MEC). Due to frequent changes in expectation the investment behavior shows wide fluctuations. The Keynesian theory explains investment function with respect to the interest rate. It relates the marginal efficiency of capital (m) with the real rate of interest (r). The marginal efficiency of capital is defined as that rate of discount which equates the present value of net returns to the cost of capital. It declines with an increase in the price of capital and increases with the price of output as well as the quantity of output.

$$m = m(P_k, K, P_Q, Q) \quad 3.1$$

m = marginal efficiency of capital

P_k = price of capital

K = capital

P_Q = price of output

Q = output

The optimal capital stock can be expressed as a function of (r), (Pk), (PQ) and Q
 $K^* = K(r, P_k, P_Q, Q)$ 3.2

Hence

$$PQ = f(Q)$$

So the optimal capital stock function equation becomes

$$K^* = K(r, P_k, f(Q), Q) \tag{3.2(a)}$$

Increase in output leads to increase in the level of desired capital stock, hence the partial derivative of (K^*) with respect to (Q) shall be positive. However the partial derivative of (K^*) with to the price of output shall be negative. The combined effect of these two variables shall be indeterminate. Hence

$$dK^* / dQ = (\partial K^* / \partial Q) + (\partial K^* / \partial P_k)(\partial P_k / \partial Q) \tag{3.3}$$

$$dK^* / dQ = (\partial K^* / \partial Q) + (\partial K^* / \partial P_k) f'(Q) \tag{3.3(a)}$$

This equation can be rewritten as

$$K^* = h(r, P_k, Q) \tag{3.3(b)}$$

Expressing the function in linear form gives

$$K^* = \alpha_0 + \alpha_1 r_t + \alpha_2 P_{kt} + \alpha_3 Q_t \tag{3.3(c)}$$

Where,

$$\alpha_1 < 0, \alpha_2 < 0, \alpha_3 > 0$$

Net investment can be written as

$$NI_t = \alpha_1 r_t + \alpha_2 P_{kt} + \alpha_3 Q_t - \alpha_1 r_{t-1} + \alpha_2 P_{kt-1} + \alpha_3 Q_{t-1} \tag{3.4}$$

Depreciation is proportional to the capital stock in the previous period

$$D_t = \delta K_{t-1} = \delta \alpha_0 + \delta \alpha_1 r_{t-1} + \delta \alpha_2 P_{kt-1} + \delta \alpha_3 Q_{t-1} \tag{3.5}$$

Gross investment equals net investment and depreciation therefore

$$I_t = \delta \alpha_0 + \alpha_1 r_t + \alpha_2 P_{kt} - \alpha_1 (1 - \delta) r_{t-1} - \alpha_2 (1 - \delta) P_{kt-1} + \alpha_3 (Q_t - Q_{t-1}) \tag{3.6}$$

$$I_t = \alpha_0 + \alpha_1 r_t + \beta_1 r_{t-1} + \beta_2 P_{kt-1} + \alpha_3 \Delta Q_t \tag{3.7}$$

$$\alpha_1 < 0, \beta_1 > 0, \beta_2 > 0, \alpha_3 > 0$$

It is an accelerator model as it shows the relationship between the level of net investment and growth rate of output.

3.3. Model for Public Investment in Large-scale Manufacturing Sector

Investment in public sector industries is financed by number of sources: like government grants, government direct investment through budget, loan and advances (budgetary and non-budgetary) and sponsors own equity. The function of public investment in manufacturing (large-scale) is as follows:

$$Igm = f(Vm, Igm(-1), Ipk, Dps) \tag{3.8}$$

The corresponding regression/econometric equation of the above given function is given below:

$$I_{gmt} = \beta_0 + \beta_1 Vm_t + \beta_2 Igm_{(-1)t} + \beta_3 Ipk_t + \beta_4 D_{ps} + \epsilon_{gmt} \tag{3.8(a)}$$

Where, the expected sign of the coefficient are;

$$\beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 > 0$$

Here the variables used are;

Igm = Public Investment in Large-Scale Manufacturing Sector

Vm = Value-Added in Large-Scale Manufacturing Sector

Igm = Lag Value Public Investment in Large-Scale Manufacturing Sector

Ipk = Index of Price of Capital

Dps = Dummy Variable for Political Stability, (D=1 if the observation belongs to political stability period, and (D=0, Otherwise)

4. Results and Discussions

4.1. Applying the Unit Root Test

Firstly, to search for the most suitable regression techniques and model to analyze truly the picture of the data depend upon the stationarity of the data that are checked through unit root tests. As this research study consist on the time series data, most suffers from non-stationarity. Therefore, the unit root test ADF is applied to check the stationarity of the data. The variables show their stationarity at level as shown in the table 4.1.

The ADF unit root test is chosen for the stationarity of data the Augmented Dickey Fuller is best in the case of large samples. The best estimator chosen to test significance is the comparison of the ADF test value and the critical value selected at 0.05% or 95% confidence interval. The ADF tests applied on all the variables to check stationarity. The variables show the stationarity at level form (with and with-out trends). The results are incorporated in table

Table 4.1: The unit root test results

Variables in Full form	Proxy for Variable	Augmented Dickey Fuller	Critical Value (ADF)
Public Investment in Large-Scale Manufacturing Sector	Log(Igm)	-3.84	-2.967
Value-Added in Large-Scale Manufacturing Sector	Log(Vm)	-5.65	-2.967
Lag Value Public Investment in Large-Scale Manufacturing Sector	Log(Igm (-1))	-4.98	-2.967
Index of Price of Capital	Log(Ipk)	-5.21	-2.967
Dummy Variable for Political Stability	Log(Dps)	-4.72	-2.971
Change in Domestic Credit	Log (ΔDcp)	-6.71	-2.971

4.2. PUBLIC INVESTMENT IN LARGE-SCALE MANUFACTURING SECTOR

Public sector investment in Large-Scale Manufacturing sector is very essential for the country and plays an important role in the Gross Domestic Product. The investment in large-scale manufacturing sector has been analyzed in terms of Value-added in large-scale manufacturing sector (Vm), and Lagged Public Investment in Large-Scale Manufacturing Sector (Igm(-1)), Index of Price of Capital (Ipk), Change in Domestic Credit available to Public Sector (ΔDcp) and dummy (Dps) for political stability and favorable economic conditions of the country. The regression result of the estimated function for Public Investment in Large-Scale Manufacturing Sector is reported in below table 4.2.

Table: 4.2. Regression Results of Public Investment in Large-Scale Manufacturing Sector as Dependent Variable are (The variables are taken in their logarithmic form):

Variables	Coefficient	Std.Error	t-statistics	Prob.
Constant	2.025491	0.513866	3.999915	0.0005
Log (Vm)	0.050692	0.013229	3.831880	0.0002
Log (Igm(-1))	0.073417	0.017573	4.177726	0.0000
Log (Ipk)	-0.066982	0.025419	-2.627621	0.0002

Log (ΔDcp)	0.125472	0.016857	7.443139	0.0000
Log (Dps)	0.193383	0.032415	5.965874	0.0000
R-squared	0.943781		Durbin-Watson stat	1.897688
Adjusted R-squared	0.930995		Prob(F-statistic)	0.000000

The result in table 4.2 shows that the overall model are significant having the R-squared value is (0.94) and the Durban-Watson value is (1.89), both are very close to the desired values. The coefficient values of Value-Added in Large-Scale Manufacturing Sector and Lagged Public Investment in Large-Scale Manufacturing Sector are statistically significant having positive signs. On the basis of this, it can conclude that these two are the major determinant of Public Investment in Large-Scale Manufacturing Sector. The Dummy variable for stable political and economic condition is highly significant, explaining that a stable government with sound economic policies and implementation will play keen role an increasing the level Investment in Large-Scale Manufacturing Sector. The coefficient value of Value-Added in Large-Scale Manufacturing is (0.05) and that of Lagged Public Investment in Large-Scale Manufacturing is (0.073). One percent increase in these variables will increase the outcome in Public Investment Large-Scale Manufacturing Sector by five (05) and Seven (07) percent. The coefficient of Change in Domestic Credit available to Public Sector is (0.12), which means that one percent increase in credit available will bring twelve (12) percent increase in public investment in Large-Scale Manufacturing Sector. Similarly, the result also shows that Index of Price of Capital is negative effect on private investment in Large-Scale Manufacturing Sector. Index of Price of Capital can also be used as opportunity cost of capital. So, the key factors which seem to have a strong role in determining the private investment in this sector include the price level of capital goods, capital stock and the output level.

The autonomous investment is also positive and statistically significant, means that it has playing an important role in Public Investment in Large-Scale Manufacturing Sector.

Conclusion & Recommendations

The research study has been an attempt to identify the factors, that affect domestic investment significantly and which can be used as policy variables to get the desired results for public investment or capital formation, and in determining the investment behavior in Pakistan. The results reveal that demand is the most important determinant of investment activity, employing that the ‘accelerator model’ explains the investment behavior quite significantly. The result shows that the level of output and costs are quite important in determining the investment behavior in any country.

In addition to these, a number of factors such as credit availability, profitability, government policies, capital stock held by the public manufacturing sector also have significant impact on domestic physical capital formation or investment. The level of political stability and favorable economic condition of a country and their possible effects towards government policies are also captured through dummy variable. The result indicates that this qualitative factor is considered as the important determinant of public investment in manufacturing sector of Pakistan. The private investment declined sharply during early 1970’s and remained very low till early 1980’s due to nationalization policy and the lack of confidence among business community resulting from uncertain political condition and unfavorable economic conditions. After this period, through the process of privatization the private investment regained some strength due to visible tendency towards political stability and inclination towards encouragement of private sector.

Public investment in Large-Scale Manufacturing sector increased significantly during later years in 1990’s and early twentieth century. But there is need of further research to find out the factors which turn out to be relatively more important determinants for investment in Large-Scale Manufacturing sector. The most important factor is the political and economic condition of a country as well as the government policies of investment in public Large-Scale Manufacturing sector. Value-added in large-scale manufacturing sector and previous Investment decision also affect the investment level in this category. By increasing domestic purchasing power, export expansion and import substitutions through assets redistribution the fruitful outcome from public

investment in manufacturing sector may be increased more significantly. But all these policies may be difficult to implement in that they have other impacts on the domestic economy. Export expansion and import substitution may be quite desirable for increasing demand. Government should take into consideration not only the conditions in domestic economy but also the international economy and finally the assets redistribution may be difficult politically.

In addition to these pricing and credit policies also seem to be quite important. A democratic political system and its stability are also the necessary conditions to convince the business community that the government's industrial policy is based on nation's aspirations rather than being derived from some temporary motives of a dictator. Although the nation at present is experiencing a positive change in our politics, there is a lot more to be done to realize a mature democracy and political stability in the country. A businessman is primarily interested in maximizing his expected profits with the minimum risk. In the absence of political stability the businessman cannot predict future and he would remain quite uncertain of the outcomes of his business adventure. Under such uncertain conditions the businessman would avoid risk that would affect the investment severely and negatively.

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УДК 33

**Факторы, влияющие на государственные инвестиции
в производственном секторе Пакистана**

Гюльзар Али

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Аннотация. Государственные инвестиции в производственный сектор набирают обороты во всем мире. В Пакистане государственные инвестиции внесли существенный вклад в различные секторы экономики и играют основополагающую роль в финансовой системе страны. В этом исследовании была предпринята попытка выявить факторы, наиболее значительно влияющие на государственные инвестиции в производственном секторе в Пакистане. В исследовании использованы данные за период с 1981 по 2014 годы. При анализе временных рядов всегда остается подозрение о фиктивных отношениях. Это исследование также основывается на данных временных рядов, поэтому перед началом процесса оценки модели, данные проверяются путем применения дополненной модели Дики-Фуллера (ADF), но данные, использованные в исследовании, не свидетельствуют ни о каких фиктивных отношениях. Для того чтобы отследить влияние различных факторов на государственные инвестиции в производственном секторе, используется модель акселератора инвестиционного процесса, и регрессируется через модели NLS и Arima. Исследование рекомендует правительству создать достаточно спроса за счет увеличения покупательной способности внутри страны путем расширения экспорта, а также замещения импорта через перераспределение активов. Исследование показало, что стабильные политические условия также необходимы для быстрого экономического и инвестиционного роста.

Ключевые слова: государственные инвестиции, производственный сектор, и NLS Arima модели, модель акселератора инвестиционного процесса.