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Impact of Credit Constraints on Firms Growth: A Case Study of Manufacturing Sector of Pakistan

Mughees Tahir Bhalli¹
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Abstract

This study explores the impact of credit constraint on growth by using firm level data of manufacturing sector of Pakistan for the period of 1974-2010 analyzing via Generalized Method of Moments (1991) one step and two step estimation technique. Result of full sample shows that the firms in manufacturing sector for the period from 1974-2010 are not facing external financial constraints and the effect of sale to capital ratio indicates the availability of investment opportunities for the firms in the manufacturing sector of Pakistan. The results for pre and post financial sector reform era shows that firms are facing tight external financial constraints in pre financial reform era as compared to post financial reform era. Results show that growth of firms having small assets is constrained by internal finance whereas firms having medium and large assets are not constrained by internal finance. Similarly, firms' growth that is less dependent on debt finance is constrained by internal finance whereas results for the firms that are moderately and highly aggressive in financing with debt indicate that the growth of firms belonging to these groups is not constrained by internal finance. Similarly, low dividend paying firms growth is constrained by internal finance whereas high dividend paying firms' growth is not constrained by internal finance.

Keywords: Manufacturing Sector, Credit, Investment, Growth, GMM

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1. Introduction

Economic growth has always been the central focus of many researchers. Complex econometric modeling was introduced from the past and is still valid to unfold the aspects which are directly or indirectly linked to the economic growth phenomena. Economic growth and development of a country is dependent on the growth of various sectors operating within the economy. One of the most important sectors in this perspective is manufacturing sector, whose growth and investment is linked with the overall economic growth. So, by keeping in view these important linkages, it is important to focus on the factors that affect the business growth in an economy.

Investment and growth of firms in an economy are of vital importance. Pioneer works in this regard were conducted by Bernanke (1998), Bond and Meghir (1994), Fazzari, Hubbard, Glenn and Petersen (1998). They investigated the investment behavior of firms for the empirical evidence of credit constraint and developed the dynamic equilibrium model which incorporates credit market frictions in the business cycle fluctuations. Their works broaden the depth and diversity of work in this meadow. Asymmetric information causes agency cost¹ due to which investment of the firms is hampered (Stein, 2003) and firms have to rely on internally generated funds for financing available investment opportunities.

Recent literature shows a lot of hindering factors in the growth path of businesses in an economy. Firms themselves report a lot of hurdles in their growth path but all these reported factors are not equally constraining the growth of the firms. Some of these factors directly hold back the growth and some indirectly create hindrance in firms' growth path. Most important hindering factors for firms' growth are related to finance, crime and political instability (Ayyagari, Demircuc-Kunt, & Maksimovic, 2008).

The theory which points out positive relation between financial growth and economic development (Schumpeter, 1911) was verified by a lot of researcher's up till now. This phenomenon

also works at the micro level where firms need finance to grow either by generating it internally or by going for external sources of finance by considering the financial policy of the firm. Firms finance their investment projects by using various sources of finance. These sources include debt, equity and cash flow.

In other words, firms finance their investment opportunities either by using external finance or by internally generated funds. The provision of finance from the external sources (banks and capital market) depend on firms' characteristics' i.e. financial performance, risk involved and asset base of firms because of the risk averse nature of financial institutions. Access to external finance and its cost is an important hindering constraint for the growth of firms.² Financial market in Pakistan is not perfect; because of this finance is a major hurdle in the growth of firms in Pakistan (Ahmed & Naveed, 2011). Size and other characteristics were also found to be important determinants for the financial access in Pakistan.³

Literature in case of Pakistan focuses on the capital structure of firms by using five to ten years of the data and tries to find out the optimal capital structure for the firms or attempt is made by dividing firms into constraint and non-constraint on the basis of cash flow volatility.⁴ Some of the work is done by incorporating the size and age in the investment model to access their impact on investment behavior. Literature on growth of firms in the context of credit constraint is not explored much.⁵ This study tries to fill this gap in case of Pakistan by using firm level data of publicly listed firms in the manufacturing sector ranging from 1974 -2010.

First of all, models for the full sample of firms for the period from 1974 to 2010 are estimated.⁶ Secondly, the sample is further divided in to the 1974-1990 and 1991-2010 periods that help to analyze the degree of credit constraint in pre financial sector reform and post financial sector reform period respectively.⁷ Thirdly, sample is divided into textile cotton, textile synthetic, sugar, chemical, engineering and cement industries for analyzing the impact of credit constraint growth in different industries.

Lastly, this study divides the firms into three classes; low, medium and large on the basis of total assets, debt to equity ratio and dividend to equity ratio to access the sensitivity of credit constraint.

2. Literature Review

2.1. Credit Constraint and Firms' Growth

Financial constraints have different impact on the growth of firms belonging to different groups. This division is done on the basis of different characteristics of the firms. This section explains the literature in context of credit constraint and growth of firms. By classifying the firms into small and large on the basis of employees, Becchetti and Trovato (2002) estimate a sample of small Italian firms having employees between 5-10. Their results show that small and younger firms have the potential to grow and if they are financed by the external finance or having easy access to the external finance they can grow more rapidly. But the hurdle to their growth is the lack of access to external finance.

Subsidies provided by the state to firms have a positive impact on the growth of firms and these firms grow faster as compared to those which are not under the umbrella of subsidies (Becchetti & Trovato, 2002; Hyytinen & Toivanen, 2005). Becchetti and Trovato (2002) by estimating the firm level data from Finland finds the impact of public policy on growth and innovation of the firms. Financial constraints have strong adverse effect on the growth and innovation of firms (Hyytinen & Toivanen, 2005). Innovation is also correlated to the growth of the firms i.e. if the firms have made innovation in the production technology then the firms grow more rapidly. One of their most important finding is that of the impact of the public policy on the growth and innovation of the firms. Government funding to the firms which rely on the external finance improves firms' growth and innovation activities (Hyytinen & Toivanen, 2005).

Beck, Demirguc, and Maksimovic (2005) by using a survey based firm level dataset from 54 countries report the major

constraints which the firms face in their path of growth. Credit constraint is one of the important hurdles in growth of small and medium sized firms (Beck et al., 2005). It is very interesting to see that in spite of the not proper functioning of the financial system in China its economy is growing faster. Because firms in China are highly profitable, that's why they are able to finance their investment through the retained earnings, so the internal finance push their growth to move forward (Guariglia, Liu, & Song, 2008). Ownership characteristics of the firms also have an impact on the intensity of credit constraint to the growth of firms i.e. foreign firms are not much credit constraint as compared to that of the domestically private owned firms.

Growth of the state owned firms is not constraint by the internal finance because state owned firms despite of the profit have different other political and welfare motives because of this they can easily get finance from the financial institutions whereas growth of the privately owned firms is affected by the internal finance (Guariglia et al., 2008).

Growth of the privately owned firms is stunning and it is surrogated by internal finance while state owned firms have to response to the economic and political objectives due to which they are less dependent on the internal finance (Bai, Lu, & Tao, 2005). On the other hand, privately owned firms don't have too much access to that of the external finance because of many hurdles to their path like collateral, taxation and the most important is asymmetric information problem. Banks consider them risky as compared to that of the state owned enterprises (Guariglia et al., 2008; Héricourt & Poncet, 2009).

Impact of different sources of finance on the growth of the Spanish manufacturing firms indicates that small and new firms have low growth rates when they enter in the business. Because of their less access to the external finance, they heavily relay on the cash flow and short term debts. Therefore, they are more sensitive to that of the cash flow and short term debts while on the other hand firms which are old and have high growth rates are more

sensitive to that of the long term debt (Guariglia et al., 2008; Segarra & Teruel, 2009).

External finance is of vital importance for firms' growth because firm uses some of its portions in research and development activities which have positive effect on the growth of the firms. It is also witnessed that with the increase in firm size and age, their access to the external finance also increases (Moreno-Badia & Sloomakers, 2009). Access to external finance has a positive effect on the growth of the firms (Musso & Schiavo, 2008). Musso and Schiavo (2008), estimated panel data on French manufacturing firms for the period of 1996-2004. Their findings show that, because of financing constraints, newly entered firms face difficulties in accessing the external finance due to which probability of leaving the market increases. Financial constraint is positively correlated to that of the productivity of the firms in the short-run (Musso & Schiavo, 2008).

In survey of over 6,000 firms in 1992, Binks and Ennew (1996) found that lack of access to finance is one of the major hurdles in path of the firms' growth and one of the important causes of this problem is the asymmetric information whose roots are in the imperfect capital markets. Banks and other financial institutions do not have complete or perfect information about the firms due to which problems of asymmetric information arises. Younger firms which have much potential to grow face hard credit rationing while this can be eliminated by developing linkages with financial institutions and markets (Binks & Ennew, 1996). In short, younger and less profitable firms are more credit constraint as compared to that of their counterpart. Due to the imperfect capital market in the developing countries smaller firms are much more credit constrained as compared to their bigger and older counterparts. The firm's growth is affected by the credit constrained; smaller firms are more affected as compared to the bigger firms (Oliveira & Fortunato, 2006).

The impact of credit constraint on the growth of firms is different in transitional economies as compared to that of the developed economies. Hutchinson and Xavier (2006) compared the transitional with well-established economy and catch the impact of financial constraints on the growth of firms in transitional economy (Slovenia) and the established economy (Belgium). The firms in the transition economy like Slovenia are more credit constraint and the growth of the firms in this economy is much more affected as compared to that of the firms in the established market. So the growth of smaller firms in Slovenia rely on the internal cash. Overall findings of the literature show that most affected firms from the financial constraints are medium and small sized firms. This issue mostly occurs in the economies where the capital markets are not developed. Growth behavior of the firms is also found to be effected by the abrupt polices' shift in the economy (Hutchinson & Xavier, 2006).

2.2. Credit Constraint: An Impediment to Growth

Carpenter and Petersen (2002) presented the internal finance theory of growth to show the bred effect of financial constraint on the firms' growth. As in previous literature, only effects on investment was explored i.e. the work of S. M. Fazzari, Hubbard, and Petersen (2000). The main contribution of S. M. Fazzari et al. (2000) work is introducing the liquidity into the regression to catch the impact of credit constraint on firms' growth.

The major and widely discussed impediment to the growth of firms in the developing countries is credit. In the developing countries firms have lack of access to external finance especially smaller and younger firms (Ahmed & Naveed, 2011) along with that the availability and cost of finance is also a hurdle which is important to put firms on the track of growth (Binks & Ennew, 1996). Carpenter and Petersen (2002) put a milestone in this era by estimating a panel of 1600 small manufacturing UK firms and they find that the growth of the small firms in the UK are credit constrained. In other words we can say that the growth of the smaller firms in the UK is much more dependent on the internal finance. Foreign firms are not credit constraint because of their

easy access to the external market as compared to domestically owned firms because domestically owned local firms are usually small. Therefore, foreign firms are not much relying on the internal finance for their growth they will go for the external financial market for financing the potential investment opportunities are available to them (Hutchinson & Xavier, 2006).

Firms' growth has much importance not only for the individual owners of the firms but also if one will look at them as a whole in the economy because the aggregate growth of all these firms in the economy is correlated with the overall growth of the economy. From that prospective it is important for the researchers and policymakers to have a look on the growth dynamics of the firms especially to identify the main hindrance to the growth of the firms.

2.3. Credit Constraint and Firms' Growth: Theoretical Model

This section provides the theoretical framework and analytical model for the empirical investigation of credit constraint and firms' growth. In order to develop the theoretical linkages of the model with these empirical equations, study follows the base work of Carpenter & Petersen (2002).

2.3.1. Frictions in Financial Market

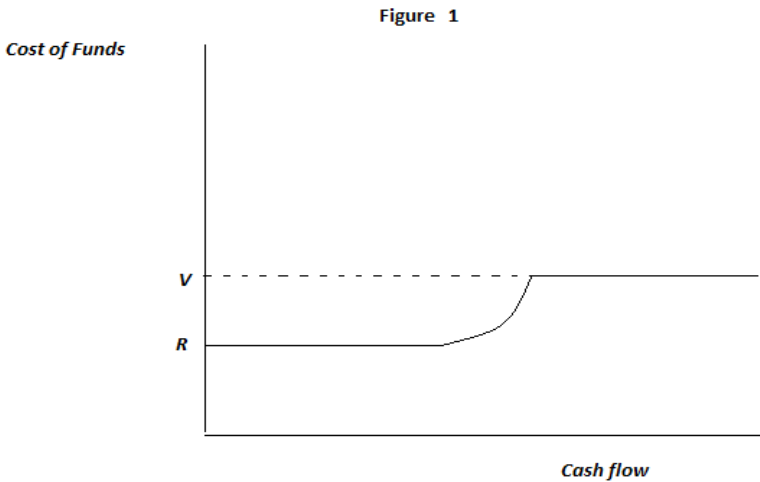
Credit rationing in a simple way can be defined as the credit constraints or the limitations in the supply of credit from the lenders side. Most of the literature available on credit rationing is focused on the incomplete or asymmetric information between debtor and lender. For example, a company is going to start a project and that particular company is aware of complete return and risk on the project. If company needs finance for availing this particular project, first option is to finance it through internally generated funds and if investment is huge and company doesn't have enough funds then management will go for an external source of finance.

Before financing, banks compute the risk of investment for the whole group of firms i.e. risk of the industry to which the firms belongs. Usually banks are not completely aware of the real risk of the project for which the company is demanding finance because of incomplete information. Financial institutions are risk averse in nature so they want return which is slightly higher than the return on the internal finance (cash flow) of the firm. If net returns of firms increases then the repayment probability⁸ of debt also increases. If for instance, banks increase its interest charges then the returns of the banks might increase while the cost of the firms on particular project decreases due to which probability of loan return decreases because firms have to pay more interest due to the increase in interest expense. Manager tries to go for the riskier projects⁹ to get more returns to compensate the high interest expenses from the banks. This causes moral hazard problem because of less or incomplete information. So, there exists some sort of incomplete information between the lenders and borrower due to which a chock is created between the cost of internal finance and external finance. This chock is financial expense which the firms bear for availing the profitable investment opportunities.

2.3.2. Firms' Growth and Internal Finance

There is a lot of work on financing constraints and their impact on the real activity of firms. The central focal of whole literature is the imperfections in the capital market. Because of imperfection in the capital market there is a chock between internal and external finance as we explained above in the theory of credit rationing. Literature suggests that this chock is due to the asymmetric information and because of this asymmetric information moral hazard and adverse selection problem occurs. Broader use of debt finance is not earmark for firms having little collateral or small firms. So, these firms are more exposed to that of the asymmetric information problem whereas larger firms have soft corner to get loans from the financial institutions because of their large asset base. The physical asset appears to be signals from firms to financial institutions for getting loans.

A lot of literature shows that financing constraints have a greater impact on the investment and growth behavior of small firms. The following figure 1 helps us to explain the main idea behind the financial hierarchy and this is then related to the asset expansion for developing dynamic equilibrium growth model for empirical investigation.



The horizontal axis in the Figure 1 shows the cash flow while the vertical axis shows the cost of funds. The points V and R on the vertical axis show sources of finance. R shows cost of internal funds which the firms bear for investing in the available investment opportunities whereas V shows the cost of equity when all the internal finance are exhausted. The supply of the finance schedule shows a standard hierarchy of financing consisting of three regions (Fazzari et al., 1988; Kuh, 1963). The horizontal line in Figure 1 shows that the supply curve of finance is constant up to the availability of internal finance (cash flow). Then there is an upward shift to the supply curve this upward cut off shows that when all the internally generated finance is eliminated than for the expansion of firms, the manager will go for the debt finance which is more costly than internally generated finance if capital market is

imperfect. So, if the firm goes for debt finance the cost of financing increases which is clearly seen from the upward shift of the finance supply curve. There are several reasons for this upward shift in the supply curve. Main reason of this increase in cost is (a) asymmetric information (b) financial distress and (c) collateral limits on the firms. The marginal cost of using debt is increasing because of the increasing financial distress with the increasing use of debt finance. This increasing use of debt finance increases the riskiness of the firms. Because of the increase in the financial distress banks demand more return on their provided debt. Due to this, marginal cost of debt increases with the use of the extra unit of debt finance. The next best alternative source of finance for firms is to issue new shares if potential investment opportunities are available. This is depicted in figure 1 the supply schedule of finance by reaching up to certain extent becomes horizontal which is showing the constant availability and cost on the externally generated funds by issuing new shares. Because of this shift, a chock between the cost of Internal and External Finance (V-R) is created which is shown in the Figure 1.

Now consider the following figure 2 which explains the demand behavior of firms in the market. This is reflected through expansion of firms. Marginal revenue expansion here after MRP (expansion)¹⁰ shows the return on the optimally utilized assets and input used by the firms for production. When revenue increases, it indicates that the firms are expanding and the return on the assets increases. MRP (exp) is composed of MPP which is marginal physical product of the firms which is then multiplied with the revenue of firms. The following figure 2 explains the expansion behavior of the small firms' horizontal axis shows the changes in assets. When the firms are expanding they will move along the MRP (exp) schedule while the vertical axis shows the MRP of the firms.

The horizontal axis in the figure 2 is the representation of the firms' asset growth. Now by combining figure 1 and figure 2 we obtained the following Figure 3 which is borrowed from the work of Carpenter and Petersen (2002) for a better understanding of the model.

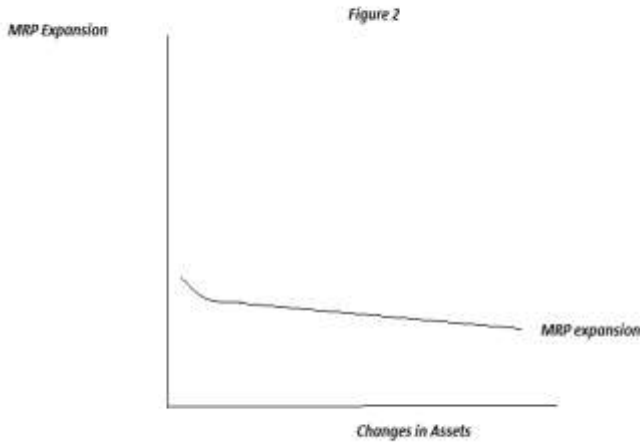
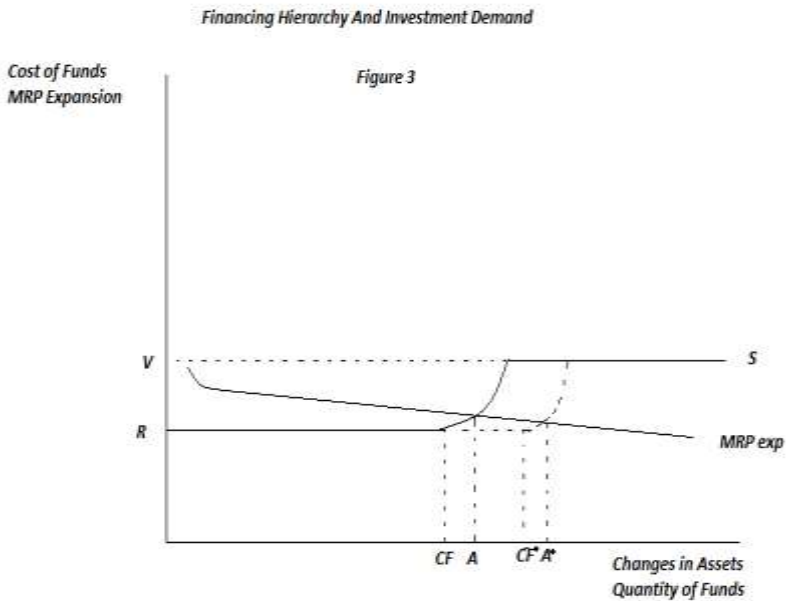


Figure 3 is a combination of both the above explained Figure 1 and Figure 2. In figure 3 the slight downward moving of the MRP (exp) is because of the competition which drives the return towards internal cost of funds.



Now look at figure 3 by considering the imperfect capital markets as shown by the vertical supply curve of the finance. This cuts the MRP schedule so at that point change in assets and cash flow becomes equal. This can be represented as follows,

$$A' - A = CF' - CF \quad (1)$$

This shows that the additional dollar increase in the internal finance will spawn the additional increase in the assets of the firms. Here this study considers that assets are composed up of total fixed assets i.e. plant and machinery of the firms which are not easily convertible in to liquid for production process. With the assumption of the imperfect financial markets this additional dollar increase in internal finance will cause approximately one unit increase in the asset expansion. It can be shown in following equation,

$$\Delta A' - \Delta A \approx \Delta CF' - \Delta CF \quad (2)$$

The leverage effect is also shown in the figure 3. With the increase in the asset growth because of the use of the internal finance the asset base of the firms increases. So the firms have more power of negotiating for getting the loans from the financial institutions to invest in the potential projects. This leverage effect is depicted in the figure 3 by the dotted line which shows shift in the supply schedule of finance.

Because of this leverage effect, with one unit increase in the internal finance there should be more than one percent increase in the asset growth. This effect can be captured as follow in equation,

$$\frac{\Delta A}{\Delta CF} \approx 1 \quad (3)$$

This should hold only if there exists one to one relationship between growth and internal finance of the firms because of leverage effect the equation 3 becomes,

$$\frac{\Delta A}{\Delta CF} \approx 1 + \lambda \quad (4)$$

λ in equation 4 shows the leverage effect. Growth can be defined as $Growth_{it} = \Delta A/A$ or we can calculate it by taking the log difference of assets. The equation, by following the work of Carpenter and Petersen (2002) used to estimate the results for impact of credit constraint on firms growth is given below.

$$Growth_{it} = Growth_{it-1} + \beta_1 \left[\frac{Sales_{it}}{K_{it-1}} \right] + \beta_2 \left[\frac{CF_{it}}{K_{it-1}} \right] + \gamma_i + \alpha_t + \varepsilon_{it} \quad (5)$$

$$Growth_{it} = Growth_{it-1} + \beta_1 Sales Growth_{it} + \beta_2 \left[\frac{CF_{it}}{K_{it-1}} \right] + \gamma_i + \alpha_t + \varepsilon_{it} \quad (6)$$

$Growth_{it}$ is the growth rate of asset of firm i at time t , γ_i represent the firm fixed effect and CF_{it}/K_{it-1} is the cash flow to capital ratio, α_t is the time specific effects and ε_{it} is the random disturbance term. Equation 5 and 6 are general forms of equation which are estimated here. The difference between the equation 5 and 6 is that of the proxy used to capture the investment opportunities of the firms. In equation 5 investment opportunities are captured through sales to capital ratio while in equation 6 investment opportunities are incorporated by including the variable of sales growth. Sales growth is calculated by taking the log of difference of the sales variable. Both of these variables are widely used in the literature to incorporate investment opportunities in the dynamic model.

3. Estimation Technique And Variables' Construction

3.1. Estimation Technique for Analysis

This study applies Generalized Method of Moments (hereafter GMM) one step and two step techniques for the estimation of dynamic investment and growth models. GMM one step and two step estimation technique are used to tackle the problem of

endogeneity which arises because of the inclusion of lag of dependent variables and individual effects. The major problem with the OLS as appeared in the literature is that the estimated coefficients are not efficient and consistent if the independent variables are assumed to be endogenous. So, to avoid these problems, this study estimates the models by using GMM one step and two step estimation technique. Brief description of estimation technique is explained below.

3.1.1. Panel Unit Root Test

The problem of unit root leads to the biased results. Problem of unit root may occur in the panel data because of large cross-sections and time periods. Before going for further analysis it is important to detect the existence of unit root in the data. There are various tests which are used to check the presence of a unit root in the panel data set.

The starting point of the panel unit root test is whether there are restrictions on the autoregressive process across the cross-section or series. Consider the following AR(1) equation for the panel

$$y_{it} = \rho_i y_{it-1} + X_{it} \delta_{it} + \varepsilon_{it} \quad (7)$$

$$i = 1, 2, 3, \dots, N$$

$$t = 1, 2, 3, \dots, T$$

whereas i represents the cross-sectional units that are observed over the time series t , X_{it} represents the independent variables in the model having fixed effect or the individual trends, while ε_{it} is the error term assumed to be normal and ρ_i represents the autoregressive coefficients. If $|\rho_i| < 1$ then y_{it} is assumed to be weakly stationary and if $|\rho_i| = 1$ then y_{it} contains a unit root.

There are many tests that are used to detect the unit root like Levin, Lin, and Chu (2002), Im, Pesaran, and Shin (2003), Maddala and Wu (1999) as the above explained tests differ in

setting the assumptions regarding autoregressive parameter ρ_i . Levin et al. (2002) assumed that $\rho_i = \rho$: implying those autoregressive parameters are common across all cross-sections while Im et al. (2003) assume that autoregressive parameters are heterogeneous across cross-sections.

This study only reports Levin et al. (2002) and Im et al. (2003) test. The results of the panel unit root test for the variables used in this study are reported in table 1.

3.1.2. J-Statistics

J-statistics or Sargan test or Hensen test is applied to check the validity of the instrumental variables used in the analysis. If there are more instruments than parameters then J statistics is used to test the validity of over identifying restrictions.

3.2. Variables' Construction

This section explains variables used for analysis. The data on variables used by this study is collected from "Financial Statement Analysis of the Joint Stock Companies" prepared by State Bank of Pakistan. This study analyzes 500 firms of manufacturing sector of Pakistan for the period from 1974-2010. Brief description, composition, calculation and standard accounting definition of the variables are given below.

3.2.1. Capital (K)

Capital includes property, plant, equipment and machinery. Capital is calculated as the expenditure on the fixed assets of the firms by deducting the depreciation. By deducting the depreciation from the fixed asset at cost we obtained the capital for the analysis. Depreciation shows wear and tear of the capital counted on annual basis.

$$\text{Capital (K)} = \text{Expenditure on fixed asset} - \text{Depreciation}$$

This is one of the important factors in determining the performance of firms. By using this in combination of other variables one can access the performance of the firm in different ways. Increase in the capital of firms indicates the increase in production capacity of firms.

3.2.2. Investment (I)

Investment is defined as the expenditure on the fixed assets. Fixed assets include plant, machinery and equipment. It is calculated by deducting the current year expenditure on fixed asset (K_{it}) from the previous year expenditure on fixed asset (K_{it-1}) and adding the depreciation. Depreciation shows wear and tear of the capital counted on annual basis. Following formula is used to calculate the investment.

$$I_{it} = K_{it} - K_{it-1} + D_{it}$$

Where I_{it} shows the investment, K_{it} is the current year fixed asset, K_{it-1} is the past year fixed asset and D_{it} is the depreciation. Investment is also an important indicator of measuring the performance and growth of companies. Higher the investment means higher the production capacity which will accelerate the profit of firms.

3.2.3. Cash Flow (CF)

It is used to explain the variability of the internal finance and as a proxy for the financial constraint of the firms. By including this variable in the regression analysis, the study adds liquidity into model to access the impact of credit constraint on firms' investment and growth. In this study, the sensitivity of cash flow to investment is given key importance. Calculation of cash flow is defined below:

$$CF = R + Depreciation$$

CF is the cash flow; R is the retention in business.

Retention in the business is obtained after deducting tax provision and dividends from the income. Cash flow is of vital importance for the firms. Higher cash flow indicates that high internal finance generated by firms which can be used as a source of investment for the potential investment opportunities. In the financing hierarchy, cash flow is the cheapest source available for the investment. Huge literature use cash flow for assessing that either the firms are financially constrained or not through investment-cash flow sensitivity.

3.2.4. Sales (*S*)

This variable is of significant importance for the firms. This shows revenue generated by the firms. The ultimate goal of the firms is to maximize the sales for their growth. The purpose to include this variable is to capture the demand side or the investment opportunities for the firms. The rationale behind this is that when sales of firms' increases in the market this gives a signal to the firms for higher expected future demand due to which the investment opportunities for the firms increases. For the sake of profit firms want to invest more to capture the demand from the market. This variable is used in place of Tobin's Q to capture the investment opportunities for the firms. A lot of studies used this variable and explored it to be an important determinant of firms' growth and investment.

3.2.5. Growth

Growth is calculated by the taking difference of investment on the physical assets like plant and machinery in logarithm form. In order to calculate the growth, this study firstly calculate investment in fixed assets and takes the difference of current and previous year investment on fixed asset in logarithm form. The following formula is used to calculate the growth.

$$Growth_{it} = \text{Log}(I_{it} - I_{it-1})$$

I_{it} shows the investment on fixed asset in current year and I_{it-1} is the investment on fixed asset in the previous year. This variable is of vital importance because it directly indicates the performance of firms either they are growing or not. In most of the studies, growth is used as dependent variable for analyzing the factors that affect growth of the firms. Carpenter and Peterson (2002) used this variable in combination of internal finance to access either the growth of small firms is constrained by internal finance or not.

3.3. Variables for Classification

The following explained variables are not used in the regression analysis but study uses these variables for the division of the firms into groups of small medium and large to access the variation in investment cash flow sensitivity and growth cash flow sensitivity across different groups on the bases of flowing explained variables.

3.3.1. Dividend to Equity

Dividend to Equity is calculated by dividing the total dividend to the shareholder's equity (Ordinary Share Capital + Surplus). Following formula is used to calculate this.

$$\text{Dividend to Equity} = \left(\frac{\text{Dividend}}{\text{Share Holders Equity}} \right)$$

Study by using dividend to equity ratio divides firms into three classes; low dividend paying, moderate dividend paying and high dividend paying firms. Low dividend to equity ratio indicates that firms are paying low dividends as percentage of equity whereas high dividend to equity ratio indicates that firms are paying high dividends as percentage of equity.

3.3.2. Debt to Equity

Debt to equity is a measure of companies' financial leverage. This ratio is obtained by dividing the firms' liabilities with that of the

shareholder equity¹¹. By dividing the firms into different classes helps us to explain how the sensitivity of the relation between investment to cash flow and growth to cash flow varies if the firms have more, less and moderate debt to equity ratio. Higher debt to equity ratio shows the aggressive behavior of the firms in financing their investment with the debt whereas low debt to equity ratio indicates less aggressive behavior of firms towards using debt. Following formula is used to calculate

$$\text{Debt to Equity Ratio} = \frac{(\text{Current Liabilities} + \text{Non Current Liabilities})}{(\text{Share Holders Equity})}$$

3.3.3. Total Assets

This is used to divide the firms into small, medium and large size firms. Total asset is obtained by adding current assets¹² and noncurrent assets¹³. A lot of studies use this variable to divide firms into small, medium and large size to access the prospect that either investment and growth of firms is homogenous across these different size groups or not.

$$\text{Total Asset} = \text{Current Asset} + \text{Non Current Asset}$$

4. Results and Discussion

Manufacturing sector in Pakistan is of vital importance because of its significant contribution in Gross Domestic Product (hereafter GDP). Manufacturing sector works as a catalyst in fostering the economic growth and development. As per 2012-2013 figures, manufacturing sector contributes 13.2% in the GDP of Pakistan and 13.8% of the total labor force is working in this sector. Both of these economic indicators well explains the importance of the manufacturing the sector in Pakistan's economy. The results estimated from the sample of 500 firms of the manufacturing sector of Pakistan for the period of 1974 - 2010 are explained below.

4.1. Credit Constraint and Firms' Growth

This section explains the results of credit constraint and growth for the full sample in case of manufacturing sector of Pakistan. Similarly, for analyzing the impact of credit constraint on firms' growth, this study, by following the literature estimates two equations 5 and 6. The main difference between the equations 5 and 6 lies in their method to incorporate the investment opportunities. In equation 6 sales growth is used to capture the investment opportunities while in equation 5 sales to capital ratio is used for this purpose.

First both equations for the full sample from 1974 - 2010 are estimated. The results obtained from the estimation are reported in Table 2. Results obtained from estimating both the equations 5 and 6 point that firms in manufacturing sector of Pakistan are not credit constraint. In other words, their growth is not constraint by the internal finance. The results of the equation 5 demonstrate that the effect of sales to capital ratio is negative indicating decline in the marginal productivity of capital. It is discovered that with 1% increase in the marginal productivity of capital there is 0.031% decline in the growth of the firms. Effect of sales growth is positive and significant that specifies the investment opportunities for the firms of manufacturing sector. The effect of sales growth indicates that 1% increase in the sales growth causes 0.59% increase in the growth of physical asset of the firms.

The effect of cash flow in case of equations 5 and 6 explored to be significant at 5% level. But the effect of cash flow for the equation 5 is negative whereas it is positive for the equation 6. In case of equation 6, results indicate that with the 1% increase in the internal finance, there is 0.26% increase in the growth of the physical assets of the firms whereas results for the equation 5 points out that with the 1% increase in the internal finance there is 0.22% decline in the growth of the physical asset of the firms.

Table 1: Panel unit Root Test

Variables	LLC Test Stat	P-value	IPS Test Stat	P-value	Conclusion
$\frac{S_{it}}{K_{it-1}}$	-13.29	0.000	-9.88	0.000	Stationary
$\frac{I_{it}}{K_{it-1}}$	-484.99	0.000	-36.80	0.000	Stationary
$\frac{CF_{it}}{K_{it-1}}$	-17.11	0.000	-22.92	0.000	Stationary
$Sales\ Growth_{it}$	-46.21	0.000	-52.52	0.000	Stationary
$Growth_{it}$	-220.92	0.000	-64.22	0.000	Stationary

Note

- LLC denotes the Levin, Lin and Chu panel unit root test while IPS is the Im, Pesaran and Shin panel unit root test.
- $(S_{it}/K_{it-1}), (I_{it}/K_{it-1}), (CF_{it}/K_{it-1})$ are Sales to capital ratio, investment to capital ratio, cash flow to capital ratio, sales growth and Growth in the investment of fixed assets.

The effect of the cash flow is lesser than one for both equations that in accordance to the hypothesis indicates that firms' growth is not constrained by internal finance. Lag of dependent variable in both equations is significant at 5% level of significance having a negative sign that indicates the convergence behavior of the firms¹⁴.

Instruments validity is tested by using the Sargan test. The results of Sargan test indicates that the instruments used in both equations are valid. Second order serial correlations among the residuals are represented by the m2 for both the equations. The null of no serial correlation for both equations is accepted by this study. This indicates that results for both equations do not encounter with the problem of serial correlation among residuals.

4.2. Empirical Investigation of Impact of Financial Reforms on Credit Constraint and Firms' Growth

This section explains the results for impact of financial sector reform on credit constraint and growth for this equation 6 is estimated and results obtained are reported below in the table

Table 2: Credit Constraint and Growth (1974-2010): Dependent Variable $Growth_{it}$

Model Using Sale to Capital Ratio for Investment Opportunities		Model Using Sales Growth for Investment Opportunities	
Explanatory Variables	Coefficients	Explanatory Variables	Coefficients
$Growth_{it-1}$	-0.4255* (0.0013)	$Growth_{it-1}$	-0.3343* (0.0025)
$\frac{S_{it}}{K_{it-1}}$	-0.0318* (-0.0062)	$\frac{CF_{it}}{K_{it-1}}$	0.2658* (0.1161)
$\frac{CF_{it}}{K_{it-1}}$	-0.2294* (0.0624)	$Sales Growth_{it}$	0.5982* (0.0729)
$m2$ (Statistics Value)	0.1466	$m2$ (Statistics Value)	0.3444
Sargan (p value)	0.1444	Sargan (p value)	0.1131

Note

- $Growth_{it-1}$ is the Growth of physical asset, it the lag of the dependent variable, (S_{it}/K_{it-1}) is Sales to Capital ratio and (CF_{it}/K_{it-1}) cash flow to capital ratio. Constant and Time dummies are included. (Not reported). Standard errors are in parenthesis.
- $m2$ is the second order serial correlation tests based on residuals asymptotically distributed as $N(0,1)$ under the null of no serial correlation.
- Sargan is the test of instruments' validity asymptotically distributed as χ^2 under the null that instrument is valid.
- Statistics significant at 1% is denoted by *.

The effect of cash flow to capital ratio is positive, significant and greater than one at 1% level of significance. In pre financial sector reform era, results show 1% increase in internal finance causes 1.26% increase in the firms' fixed assets' growth.

Results for the pre financial sector reform era indicates that with 1% increase in internal finance firms grow at a rate more than 1% because of the leverage effect. The effect of sales growth for pre financial sector reform era is significant and negative at 1% level of significance. It indicates that the firms' investment is insensitive to the sales during this time frame. The lag of dependent variable is found to be negative and significant at 1% level of significance. It is an indication of convergence of the firms.

The effect of cash flow for the post financial sector reform era discovered to be positive and significant. Result shows that 1% increase in the internal finance causes 0.63% increase in the growth of firms' fixed assets that in light of hypothesis indicates that firms' growth is not constrained by internal finance in post financial sector reform era. Highly positive and significant effect of sales growth at 1% level of significance is indication of high investment opportunities in the post financial sector reform era.

The overall results indicate that the growth of firms in the manufacturing sector of Pakistan is constrained by internal finance in pre financial reform era while it is not constrained by internal finance in post financial sector reform period. This is because of privatization, there is a monopoly break down in financial market and credit is dispersed widely and deeply because of the injected competition through the privatization of the financial institutions. Due to this, firms do not face financial constraints in post financial sector reform.

4.3. Credit Constrained and Firms' Growth: Homogeneity across Different Groups

In this section results for the prospect that either credit constrained and growth of the firms varies across different groups or not are explained. For this purpose, firstly firms are divided into groups of small, medium and large, on the basis of total assets. Secondly, firms are classified into three classes on the basis of low debt to equity ratio, moderate debt to equity ratio and high debt to equity ratio. Lastly, firms are divided into three groups of low dividend to equity ratio, moderate dividend to equity ratio and high dividend to

equity ratio. These variables are used in the literature in order to analyze that in which particular group the sensitivity of internal finance to investment and growth is different from others.

Table 3: Financial Sector Reforms, Credit Constraint and Growth

Explanatory Variables	Coefficients for Pre and Post Financial Reform	
	1974-1990	1991-2010
$Growth_{it-1}$	-0.1895* (0.0242)	-0.3076* (0.0074)
$SalesGrowth_{it}$	-0.3086* (0.0817)	0.2085* (0.0242)
$\frac{CF_{it}}{K_{it-1}}$	1.2635* (0.2826)	0.6347* (0.0685)
$m2$ (Statistics Value)	0.3491	0.1724
Sargan (p value)	0.4371	0.7029

Note

- 1974 to 1990 period is Pre Financial Reform era and 1991 to 2010 is Post Financial Reform era
- Constant and Time dummies are included. (Not reported).
- GMM two step estimates.
- Statistics significant at 1% is denoted by *.

Kashyap, Stein, and Wilcox (1995) divided the firms in low and high dividend firms according to dividend to equity ratio and analyze the response of low and high dividend paying firms. Fazzari et al. (1988) also divide the firms according to dividend to income and total assets into small, medium and large firms. Similarly, Hsiao and Tahmiscioglu (1997) divide the firms into small medium and large on the base of dividend payout ratio while Terra (2003) analyzed the sensitivity to internal finance by dividing the firms into small, large, domestic and multinational categories.

This section is further divided in to three sub sections. First section explains the results of credit constrained and growth by dividing the firms into groups of small, medium and large according to total assets while second section explains the results

for the credit constrained and growth by dividing the firms into low dividend to equity ratio, moderate dividend to equity ratio and high dividend to equity ratio and lastly the results by dividing the firms on the basis of debt to equity ratio are explained for the period of 1974-2010.

4.4. Growth and Credit Constrained In Different Size Firms

In this section results for the prospect that credit constrained and growth of the firms varies across different groups on the base of their size are explained. Study estimates equation 6 for the small, medium and large size firms and their results are reported below in the Table 4.

Result for the small Size firms show that the effect of cash flow is positive and significant at 1% level of significance. Result shows that 1% increase in the cash flow to capital ratio causes 1.97% increase in the growth of the physical assets of the firms which in the light of hypothesis shows that growth of small firms is constrained by internal finance.

The effect of sales growth for the small firms is positive and significant indicates that it causes 0.26% increase in the growth of the physical assets of the firms. This is an indication of investment opportunities of firms having small asset base or small in size. The lag of the dependent variable is negative and significant in all three groups which is an indication of adjustment cost bear by the firms. Results for the medium size firms are also reported in the Table 4.

Table 4: Firm Size and Growth (1974-2010): Dependent Variable $Growth_{it}$

Division on the Bases of Total Assets			
Explanatory Variables	Small Size Firms	Medium Size Firms	Large Size Firms
$Growth_{it-1}$	-0.3170* (0.0010)	-0.3335* (0.0005)	-0.4110* (0.0020)
$Sales\ Growth_{it}$	0.2615* (0.0922)	0.1956* (0.0242)	0.7099* (0.0945)
$\frac{CF_{it}}{K_{it-1}}$	1.9734* (0.1401)	0.3094* (0.0235)	-0.0468* (0.0327)
$m2$ (Statistics Value)	0.3592	0.0971	0.2332
$Sargan$ (p value)	0.3008	0.5069	0.1860

Note

- Constant and Time dummies are included. (Not reported).
- GMM two step estimates.
- Statistics significant at 1% is denoted by *.

Result for the medium size firms shows that the effect of cash flow is positive and significant. With the 1% increase in the internal finance, there is 0.30% increase in the growth of investment of the firms, which in light of hypothesis indicates that growth of medium size firms is not constrained by internal finance. The effect of sales growth for the firms in this group is positive and significant that is an indication of the investment opportunities for the firms in this group.

Similarly, results obtain for large size firms indicate negative and significant relation between the internal finance and investment growth of the large size firms that is an indication of non-reliance of large firms on their internal finance. This shows that growth of large size firms is not constrained by internal finance. This is due to the easier availability of external finance in case of large firms as compared to small and medium size firms. The effect of sales growth is positive and significant, indicating the presence of investment opportunities for large size firms.

To summarize, results obtained clearly show that growth of the small firms is constrained by internal finance because of low collateral value of firms in this group. While the impact of credit constrained decreases as the asset size of firms increases that is clearly shown from the results reported above. The large and medium size firms are not found to be constrained by internal finance. It is because that large and medium size firms have high collateral value. So they do not have any such constrain for getting external finance. These obtained results are similar to the findings of Carpenter and Petersen (2002).

4.5. Leverage and Credit Constrained Across Different Groups

This section of study explains the results by dividing the firms into groups of less aggressive firms, moderately aggressive and highly aggressive firms in financing their investment and growth with debt. This division is done according to debt to equity ratio. The higher ratio indicates that firms are aggressive in financing their investment and growth with debt.

4.6. Debt Financing, Growth and Credit Constraint

This section explains the result for firms' growth, credit constrained and debt financing by dividing the firms into groups of less aggressive firms, moderately aggressive and highly aggressive firms in financing their growth with debt.

Division on the basis of debt to equity into less aggressive firms, moderately aggressive and highly aggressive firms in financing with debt helps to explain that to which extent the growth of firms is constrained by internal finance in all three different classes. The high debt to equity ratio indicates high use of debt by the firms for their potential projects similarly low debt to equity of the firms indicates that firms are less dependent on the debt financing.

Table 5: Debt Financing and Growth (1974-2010): Dependent Variable $Growth_{it}$

Explanatory Variables	Division on the Bases of Debt to Equity		
	Less Aggressive Firms	Moderately Aggressive Firms	Highly Aggressive Firms
$Growth_{it-1}$	-0.3064 (0.0009)*	-0.3273 (0.0028)*	-0.4377 (0.0019)*
$Sales\ Growth_{it}$	0.4289 (0.0750)*	0.1375 (0.0724)***	1.4137 (0.0847)*
$\frac{CF_{it}}{K_{it-1}}$	1.5289 (0.1240)*	0.3754 (0.1273)*	0.1355 (0.0408)*
$m2$ (Statistics Value)	0.3736	0.0932	0.7368
Sargan (p value)	0.3581	0.5183	0.0583

Note

- Constant and Time dummies are included. (Not reported).
- GMM two step estimates.
- Statistics significant at 1%, 5% and 10% is denoted by *, ** and *** respectively in the parenthesis in bold and italic style.

The effect of cash flow to capital for less aggressive firms is positive and significant at 1% level of significance. Result shows that with the 1% increase in cash flow to capital ratio there is 1.52% increase in growth of fixed asset of the firms that in accordance to the hypothesis is indication of the financially constrained firms. These are small firms who don't have enough collateral value to get external finance that's why their growth is explored to be credit constrained. The effect of sales growth is positive and significant, shows that 1% increase in the sales growth causes 0.42% increase in the growth of firms that is an indication of investment opportunities for the firms in this group. Whereas moderately aggressive firms (having medium debt to equity ratio) show that the effect of cash flow to capital ratio is positive and significant at 1% level of significance. Result shows that with the 1% increase in internal finance there is 0.37% increase in the growth of firms, which in light of hypothesis indicates that growth of moderately aggressive firms in financing with debt is not

constrained by internal finance. The effect of sales growth for the firms in this group is also positive and significant indicating the presence of investment opportunities for the firms in this group.

The results for highly aggressive firms (having high debt to equity ratio) indicate that with the 1% increase in the coefficient of cash flow there is 0.135% increase in the growth of the firms. In light of hypothesis indicates that growth of highly aggressive firms in financing with debt is not constrained by the internal finance. The effect of sales growth is positively significant and highly sensitive as compared to their counter parts which indicate high investment opportunities for highly aggressive firms in financing with debt. These are large firms who do not have the limitation on their collateral value for obtaining loans from the financial market. That's why they are not credit constrained and can easily get the loans to invest in potential investment opportunities.

The overall results for this classification indicate that growth of the firms who are less aggressive in debt financing explored to be constrained by internal finance whereas growth of moderately and highly aggressive firms in debt financing is not found to be constrained by internal finance.

4.7. Credit Constrained and Growth: A Comparison on the Base of Dividend to Equity Ratio

This section of study explains the results obtained by dividing the firms into three groups on the basis of dividend to equity ratio. Dividend to equity ratio explains how much dividends are paid out as a percentage of equity. Three groups in which firms are divided on the basis of dividend to equity are less dividend paying firms, moderate dividend paying and high dividend paying firms as percentage of their equity. Less dividend paying firms are the firms who are paying fewer dividends as a percentage of equity as compared to moderately and high dividend paying firms.

4.8. Firms' Growth and Credit Constrained: Dividend to Equity Ratio

By following the above explained pattern, the firms are divided into less dividend paying, moderate dividend paying and high dividend paying firms on the base of dividend to equity ratio and result for credit constrained and growth are explained.

The effect of cash flow to capital ratio for less dividend paying firms found to be positive and significant at 1% level of significance and it shows that 1% increase in the internal finance causes 2.75% increase in the growth of firms. In light of hypothesis this relation indicates that growth of less dividend paying firms is constrained by internal finance. The effect of sales growth is positive and significant indicating investment opportunities for less dividend paying firms as percentage of their equity.

Table 6: Growth and Dividend to Equity Ratio (1974-2010): Dependent Variable $Growth_{it}$

Explanatory Variables	Division on the Bases of Dividend to Equity		
	Less Dividend Paying Firms	Moderate Dividend Paying Firms	High Dividend Paying Firms
$Growth_{it-1}$	-0.3360* (0.0013)	-0.5007* (0.0007)	-0.4321* (0.0011)
$Sales\ Growth_{it}$	0.1637** (0.0766)	-0.1501*** (0.0707)	1.4810 (0.0657)
$\frac{CF_{it}}{K_{it-1}}$	2.7572* (0.1069)	0.2295** (0.0548)	0.1716* (0.0466)
$m2$ (Statistics Value)	0.4462	1.0335	0.7030
Sargan (p value)	0.2279	0.1560	0.1380

Note

- Constant and Time dummies are included. (Not reported).
- GMM two step estimates. Statistics significant at 1% and 5% is denoted by * and ** respectively in the parenthesis in bold and italic.

The effect of cash flow to capital ratio explored to be positive and significant at 1% level of significance for moderate and high dividend paying firms but the sensitivity of relation between internal finance and growth is lesser than one for both moderate and high dividend paying firms that indicates that growth of firms in both groups are not constrained by internal finance. The effect of cash flow to capital ratio for moderate dividend paying firms indicates that 1% increase in cash flow coefficient causes 0.22% increase in the growth. Similarly, the effect of cash flow to capital for high dividend paying firms show that 1% increase in the cash flow to capital causes 0.17% increase in investment growth firms.

The overall result for all three groups indicates that the growth of low dividend paying firms explored to be constrained by internal finance because of this they are highly dependent on internal finance. These are the firms who are small in size and small firms' operational activities for generating profits are not financed by external financial sources because of the limitation in accessing the external finance. Due to this reason, they have to pay low dividends for the aim of utilizing these resources in profit generating activities (Fazzari et al., 1988). Whereas the growth of moderate and high dividend paying firms are not constrained by internal finance because of this there is no one to one relationship between internal finance and growth of firms for moderate and high dividend paying firms.

5. Summary and Conclusions

This study explored the impact of credit constraint on firms' growth by using firm level data of manufacturing sector of Pakistan for the period of 1974-2010. Generalized Method of Moments (1991) one step and two step estimation techniques are used due to the problem of endogeneity.

Sales to capital ratio and sales growth are used to capture the investment opportunities while cash flow is used as a proxy for internal finance. All these variables are constructed from more than

12,000 financial statements of the manufacturing sector of Pakistan.

Firstly, this study estimated the dynamic growth model for the whole manufacturing sector. Secondly, this study analyzes the data on the base of financial sector reforms in the history of Pakistan. Thirdly, this study divides the data industry-wise for industrial analysis. Lastly, growth model is estimated by dividing the firms into three different classes on the basis of total assets, debt to equity ratio and dividend to equity ratio.

Result of full sample shows that the firms in manufacturing sector for the period from 1974-2010 are not facing external financial constraints because of this effect of cash flow for the full sample found to be insignificant indicating that investment and growth of firms is not driven by their internal finance.

This study also explores the impact of financial sector reforms on firms' growth. The effect of cash flow turned out to be positive and significant in pre and post financial reform period. However, the effect of cash flow explored to be positive and highly significant during nationalization era and its intensity decreases with the decentralization of financial institutions. This indicates that firms are facing tight external financial constraint in pre financial reform era (1974-1990) as compared to post financial reform era (1991-2010).

Result for the homogeneity of firms' growth across different classes having different characteristics like size, dividend and debt indicates that sensitivity of firms' investment and growth to internal finance varies across different groups. Results show that growth of firms having small assets is constrained by internal finance because of this effect of cash flow for firms having small assets are greater than one while firms having medium and large assets are not constrained by internal finance. Similarly, firms' growth that is less dependent on debt finance is constrained by internal finance because these are the firms who do not have enough collateral value to show the financial institutions for obtaining loans, so for their growth they have to rely on their

internal finance. The effect of cash flow for firms that are moderately and highly aggressive in financing with debt is not greater than one indicating that the growth of firms belonging to these groups is not constrained by internal finance. Similarly, growth of firms that are paying low dividends is constrained by internal finance whereas growth of firms that are paying high dividends is not constrained by the internal finance.

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Footnotes

¹For more detail see Stein (2003).

²For more detail see Binks and Ennew (1996).

³See Hamna and Hamid (2011) for more detail.

⁴For more detail see Sehrish *et.al.* (2013).

⁵Hashmi (2011) concluded that firms of manufacturing sector of Pakistan are financially constraint. Firms face imperfect competition in product market and do not follow optimal investment path.

⁶See Hussain (2006) for detail regarding economic policies and their implications in different regimes. The period form 1974-1977 and 1978-1988 in Pakistan was Bhutto and Zia regime respectively. The period form 1989-1999 and 2000-2008b in Pakistan is termed as democratically regime and Musharaf era respectively.

⁷See Zaidi (2006) for detail about Pre and Post Financial Reforms.

⁸Repayment probability is the ability of firms to pay back the loans. This is linked with the net returns of the firms from the project. If the project earns positive returns than it make firms able to pay back the loans, which is demanded or taken from the financial institutions for availing the profitable investment opportunities.

⁹Higher the risk, higher the return.

¹⁰MRP (exp) it basically shows the expansion path of the firms. (Exp) stands for expansion.

¹¹ $Share\ Holder\ Equity = Ordinary\ Share\ Capital + Surplus$

¹²These include all the assets which are easily converted in liquid when needed.

¹³These are assets which include physical assets i.e. which are not easily converted in to liquid form.

¹⁴ For more detail see Carpenter Petersen (2002).