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INNOVATION AND ECONOMIC DEVELOPMENT
A Case of Small and Medium Enterprises in Pakistan

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Abstract. In various economies, the innovations are quite important for economic growth and development. Due to its significant importance for growth and development, this study empirically examines the impact of process innovation prevailing in Small and Medium Enterprises (SMEs) on economic development of Pakistan over a period of 1980-2013. The analysis reveals that both process innovation and economic development are positively related with each other.

Keywords: Process innovation, SME growth, Economic development

JEL classification: L60, O10, O31

I. INTRODUCTION

The land of Pakistan is abundant with natural resources like coal, gas, oil, and gold with a very strategic location; relatively cheap land for setting up industries with a market of around 177 million people. Being an agrarian economy, Pakistan's growth rate of GDP is about 3.6 percent during 2012-13. The agriculture sector grew by an estimated growth of 3.3 percent against a target of 4.0 percent in the same period. The large-scale manufacturing sector grew by 2.8 percent against the target of 2.5 percent. Moreover, the manufacturing sector contributes 13.2 percent in GDP along with Large Scale Manufacturing (LSM) by 13.3 percent and with involvement of SME

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sector by 7.6 percent. The services sector has 57.7 percent share in GDP in the same time period with 3.7 percent growth rate compared to 1.6 percent in 2008-09. Pakistan's total labour force is about 57.24 million out of which an estimated 3.4 million labourers are unemployed. The agriculture sector remains the predominant source of employment catering for approximately 45.1 percent of the total employment in Pakistan. The manufacturing sector employs 13.7 percent, trade 16.2 percent and services 10.8 percent in total employment respectively (*Pakistan Economic Survey*, 2012-13).

"Innovation is the process of making changes, large and small, radical and incremental, to products, processes and services that results in the introduction of something new for the organization that adds value to customers and contributes to the knowledge store of the organization" (Sullivan and Dooley, 2009).

To introduce the process innovation in SME sector of Pakistan, it requires less capital as compare to large-scale industries and there is an immense need to restructure the industrial sector. It is general presumption that those economies which are at initial stages of their development, the process innovation is more suitable for their economic revival because the product as well as incremental innovations are only possible when there is a rigorous development industrial sector (Bhalla, 1987).

In Pakistan, around 87% of industrial sector consists of small and medium enterprises and it has ample opportunities for its process innovations and development. Moreover, this sector also has effect on income distribution, tax revenue, employment and efficient utilization of resources. These enterprises are employing up to 99 persons constitute over 90 percent of all private enterprises in the industrial sector and employ nearly 78 percent of the non-agriculture labour force. They contribute over 30 percent to GDP and account 25 percent of exports of manufactured goods with sharing of 35 percent in manufacturing value added. Due to its significance, promotion of SME has become a focal point of government policies for economic revival, poverty alleviation and employment generation.

There are also some hidden and apparent obstacles in the path of growth of small and medium enterprises in Pakistan. The most important are political instability, law and order situation, financial constraints, energy crisis, taxation problems, labour issues, regulatory reforms, lack of coordination and regular information exchange mechanism among institutions, etc.

Due to importance of process innovation in SME sector, the present study empirically examines the effect of process innovation on development

of SME sector with its impact on economic development of Pakistan over a given period of time. The results reveal that both are positively related with each other and also have significant effect on economic development. To achieve these objectives, log linear regression model has been used to ensure the effects of process innovation on SME growth and its subsequent effects on economic development of Pakistan.

The rest of study is organized as: after introduction in section I, the relevant review of literature is discussed in section II. The methodology and data description is discussed in section III and discussion on results is made in section IV. Final section concludes the study with appropriate policy recommendations.

II. REVIEW OF LITERATURE

The small and medium enterprises are considered as backbone for domestic resource mobilization. Several studies have examine the need and importance of process innovation for SME sector with its significant impact on economic development either through product innovation or process innovation (Ohashi, 2007; Soriano and Dobon, 2009) to strengthen the concerned economies. With the help of new technology, innovative ideas and through hiring expertise, an entrepreneur can achieve economies of scale with the expansion of their businesses. The product innovation cannot be possible without process innovation.

Kalantaridis (1999) has analyzed innovativeness in SMEs sector in two ways. Firstly, success cases of local innovation systems at the expense of less successful areas, which are thus in greater need of policy intervention. This study aspires to address this gap in the literature by focusing on the experience of an area (Bedfordshire) characterized by low levels of innovative activity. Secondly, the search for the factors that accommodate or hinder innovation concentrated heavily at the macro-level. Consequently, any policy recommendations failed to distinguish between SMEs according to the extent and nature of their previous involvement in innovation.

Kharbanda (2000) emphasizes on cluster development for the promotion of SME sector through process innovation in India. According to his research, small and medium sector constitutes approximately 80 percent of industrial enterprises in Indian economy. India has nearly three million SMEs, which account for almost 50 per cent of industrial output and 42 percent of India's total exports. Along with SMEs significance, the author has shown main problems and their impediments with the help of process innovation. For that purpose, a conducive and appropriate policy

environment is required to promote SME sector, which will result in indigenous industrialization and self-reliance of the country.

Motohashi (2001) utilizes process innovation to up lift the performances of traditional SMEs and proposed a pro-competition policy to induce entrepreneurships and process innovation in SMEs. The government has made an amendment in SME basic Law on supporting business innovations. Plant level pattern on industrial dynamics suggests both policies for new business start-up and innovation creation in existing firm are important. There are positive effects on sale growth due to programme of the Creative Activity Laws.

Lefebvre and Lefebvre (2001) analyze the innovative capabilities of SMEs as latent determinants of export performance. They have made an analysis of empirical data from a longitudinal survey of 3,032 manufacturing SMEs over a three-year period which point out that these firms became progressively more active in foreign markets. Lefebvre and Lefebvre (2001) use Tobit and Probit model to show the impact of innovative capabilities of SMEs as a leading determinant for exports performance. The findings of the research indicate that innovative capabilities are having determinants of export performance but their relative importance vary according to the knowledge intensity of the industrial sectors in which they are actively in operations. In high knowledge industries, all technological capabilities are significantly positively related to export performance while commercial capabilities are more prominent in low-knowledge industries. However, in low, medium or high-knowledge industries, Research and Development and knowledge intensity remain among the five strongest determinants. Due to its positive link with exports performance, it may be assumed that it will lead to improve economic growth of a country because of national income identity equation ($Y = C + I + G + X - M$).

Khan (2004) examines that small enterprises are an important part of a nation's economic and social structure. On global perspective, small enterprises have acquired a significant stature in the economic development of a county. There are many successful stories in the world where an appropriate strategy has been adopted for establishment and promotion of small and medium scale industries.

Hall *et al.* (2009) empirically analyze the impact of process innovation on the productivity of SME's through structural model in Italy. They demonstrate that there is a massive need to investigate that when and how innovation can be taken place in any sector rather than indulging in any painstaking requirement for deep study about the size of business, public

policies, effect of R&D on productivity and productivity levels in different sectors. Further they explain that there are two types of innovation; product innovation and secondly, process innovation. The study is based on primary date source covering the period from 1995 to 2003.

The findings of these studies are in favour of positive impact of R&D decisions on process innovation in SMEs and variability in R&D innovation productivity relationship is much greater for Italy than for other countries as well. Another result of Hall *et al.* (2009) is that size of firm is negatively associated with the intensity of R&D. In other words, they found dual nature of R&D. The results of their study show that product innovation has positive impact on firm's labour productivity. They have emphasized on process innovation due to its higher impact on productivity level in Italy. Moreover, larger and older firms are less productive rather than innovative and modern small firms.

According to Gault (2010), there are global challenges of climate change and limited supply of energy, food and water. World consumption of water has increased and sources are gradually vanishing due to industrial and human pollution. One positive effect of these challenges is that it should be used as the principal motivator for better innovation leading to sustainable productivity growth. The financial problem led to the reduction of economic growth and contributed to other challenges faced by the humanity in 2009. Since 1989, there are drastic changes in new products, processes, practices, and markets emerged due to globalization. There have been innovations in response to the global opportunities provided by the change (Gault, 2010).

Another challenge has emerged that how innovation works, locally as well as globally, and how the changes have been occurred over the period (Gault, 2010). The knowledge of process innovation can also contribute to well-being and help the government to address the global challenges. The effect of innovation on different industrial sectors and particularly on small and medium enterprises has many dimensions. How it works for the betterment of these enterprises keeping in view the current scenario is a big challenge (Gault, 2010).

It is generally presumed that SMEs development has positive impact on economic growth of a country through employment generation. With the development of SMEs, particularly through process innovation, allocative as well as distributive efficiencies would be amplified. The production capacity of industrial units will increase which helps in expansion of the businesses. Through employment generation, income availability would increase which may assist in boosting the social standard. Ultimately consumption would

increase which has positive impact on national income through national income equation ($Y = C + I + G + X - M$). But it is one side of the coin. The other side indicates that there is no impact of SMEs development on economic growth as Cravo (2010) has highlighted in his study. There are some important factors like investment policy, external sector policies, which have greater impact on economic growth rather than SMEs development.

Cravo (2010) has analyzed the impact of strong SMEs sector on economic growth of Brazilian economy. The author examines the relationship between the Small and Medium Enterprise (SME) sector and economic growth for a panel of 508 Brazilian micro-regions for the period 1980-2004. It observes the significance of SME sector with respect to two main variables; the share of the SME employment in total employment, and the level of human capital in the SME sector.

This proposition does not fit for all the countries as the experience in other countries (Bangladesh and China) shows that there is positive correlation between SME sector and economic growth. A study, conducted by Institute of Cost & Management Accountants of Pakistan (ICMAP) and Federation of Pakistan Chambers of Commerce & Industry (FPCCI) in 2000, explains that SMEs are the starting point for the development in countries which are in transition and making struggle their best for industrialization. SMEs are one of the potential sources of employment generation, investment and aliened economic activities. The management of SME is easier than the large-scale industries. Less capital is required for start up the SME business. The authors have concluded that SMEs have positive correlation with economic growth.

Keeping in view the above studies, some propositions can be developed about the relationships between process innovation and SMEs growth. Moreover, the relationship between SME growth and economic development can also be developed due to its positive effects on economic development as it has been derived from previous studies like Gault (2010), Motohashi (2001) and Khan (2004).

Through domestic resource mobilization, the government can reduce its dependency on donor agencies. To promote the SMEs in Pakistan, Government of Pakistan has formulated SME Policy Task Force in 2004 and they recommended that private sector led economic growth strategy should be primarily based on SME development.

In spite of all the efforts by the Government of Pakistan, there is still an ample space for improvement in utilizing domestic potential resources

through process innovation for restoring economic strength of the country. In Pakistan, around 60 percent of total population is living in rural areas and they are busy in small businesses like fruit production, fishing, garments, knitting and handmade embroideries, primary education, crops cultivation, production, sugarcane, dates production, ginning, wood and many other areas which are the basic startups for many people.

III. METHODOLOGICAL FRAMEWORK

To measure the effects of process innovation on the performance of SMEs and the effects of SME performance on economic development, log linear regression model has been used for both equations. To estimate the regression parameters, a software, Eviews, has been used. Two regression equations have been constructed. To know the effects of process innovation on SMEs growth, following econometric equation has been constructed.

$$SMEG = \alpha_1 + \alpha_2 GRPC + \alpha_3 PEDUG + \alpha_4 VXGDP + \alpha_5 PAN + \alpha_6 TMT + \alpha_7 HTEX + U \quad (1)$$

Where

SMEG : Share of Small and Medium Enterprises in GDP

GRPC : GDP Growth rate per capita

PEDUG : Public Expenditure on education as percentage of GDP

VXGDP : Value of exports as percentage of GDP

PAN : Patent Application for non-residents

TMT : Trademark Applications total

HTEX : High Tech Exports

Apparently, there is positive correlation between GDP growth rate per capita and share of SMEs in GDP because due to increase in GDP per capita, the people will demand more money for speculation. Due to increase in demand for speculation, investment will amplify and development in SMEs sector would increase. Similarly, public expenditure on education as a percentage of GDP will have positive impact on growth in small and medium enterprises. More application for patents and trademarks indicates that more and more enterprises are transforming their businesses through process innovation. High tech exports are also one of the strongest indicators for the adoption of modern technology and the companies are indulging themselves in process innovation. The results of the model are described in Table 1. To

see the effects of SMEs sector on GDP growth, following regression equation has been constructed:

$$GDPG = \alpha + \beta_1 SMEG + \beta_2 PAN + \beta_3 INF + \beta_4 HTEX + \beta_5 PEDUG + \varepsilon \qquad (2)$$

Where

GDPG : Growth rate of GDP

SMEG : Share of Small and Medium Enterprises in GDP

PAN : Patent Application for non-residents

INF : Inflation

HTEX : High-Tech Exports

PEDUG : Public Expenditure on education as percentage of GDP

There are many studies like Khan (2004), Lefebvre and Lefebvre (2001), Gault (2010) and Motohashi (2001) which are in favour of positive correlation between growth in small and medium enterprises and GDP growth rate but in case of Pakistan either this positive correlation exists or not. Similarly, inflation has negative relation with GDP growth rate. The detailed empirical results are shown in Tables 1 and 2 respectively.

DATA DESCRIPTION

To see the impact of process innovation on the growth of small and medium enterprises and its subsequent effect on economic development, an econometric model has been developed. The period of analysis consists of 1980 to 2013. Following Milbergs (2005), three main measures for the process innovations have been taken in this research study; number of patent applicants (either residents or non-residents), number of trademark applicants (either residents or non-residents), and high-tech exports and high-tech exports as percentage of manufacturing exports. To measure the performance of SMEs sector, SMEs growth is taken as a benchmark indicator. As far as economic performance is concerned, two economic parameters have been selected: growth in real GDP per capita and growth in GDP as referred by Todaro and Smith (2009).

The lack of availability of the data, especially in developing countries and most particularly on small and medium enterprises and measurement of innovation, has made this analysis in fix. Main economic and social variables, selected for the analysis, are share of SME in GDP, inflation, value of exports as percentage of GDP, value of imports as percentage of GDP, public expenditure on education as percentage of GDP, openness index have

been selected. To measure the process innovation, patent applications (residents or nonresidents), trademark applications (direct nonresident or resident), high-technology exports (current US $) and high-technology exports (% of manufactured exports) are selected.

The data have been collected from different national and international sources. Macroeconomic parameters like GDP growth rate per capita, GDP growth rate, inflation rate, value of exports as percentage of GDP, value of imports as percentage of GDP and value of trade balance as percentage of GDP have been collected from *Asian Development Outlook* 2013, *Pakistan Economic Survey* (various issues) published by Ministry of Finance, Government of Pakistan and *Key Indicators* 2013. There are certain missing values in the data for 1995 and 1997 which have been generated through indirect method (average method). The data gaps were filled up by estimating average values for a given series (Maddala, 1977, pp. 201-207).

IV. RESULTS AND DISCUSSION

Table 1 shows empirical results in relation to process innovations and SME sector performance. All the coefficients are significant at conventional level.

TABLE 1

Process Innovation and SME Performance
Dependent Variable: *SMEG*

Variable	Coefficient	*t*-statistic
GRPC	–0.007105	–0.258851
VXGDP	1.578543	5.710506
PAN	–0.217501	–1.633265
HTEX	0.077719	2.314998
TMT	–0.164899	–1.615111
PEDUG	0.313898	2.391682
C	–1.164903	–2.131014
R-squared	0.66	D.W. stat 1.95
F-statistic	7.70	Prob (F-statistic) 0.0012

For instance, if there is improvement in volume of exports as a percentage of GDP then SMEs sector will show significant improvement. The *t*-stat for *VXGDP* is highly significant with the *t*-stat 5.71. This result

shows that if Pakistan will focus on exports then there is possibility to restore the economic strengths with the assistance of SMEs improvement. Another significant result is in favour of positive relationship between patent applications (which is a measure of innovation) and share of Small and Medium Enterprises in GDP. Though the *t*-stat is merely insignificant but it indicates positive correlation between the two variables (*SMEG* and *PAN*).

High tech exports are showing positive relation with share of Small and Medium Enterprises in GDP which means that exports led growth hypothesis can be applied for the betterment of the country through SMEs development. GDP per capita is significantly affecting the SMEs growth. As it has been seen in the regression results that value of *t*-stat for *GRPC* is 0.25 which indicates insignificant impact on *SMEG*.

Another interesting result is that *PEDUG* (Public Expenditure on education as percentage of GDP) has shown significant impact on share of SME in GDP which rationalizes that an improvement in the public expenditure on education can amplify the share of SME in GDP. The *t*-stat (2.39) indicates high significance level of *PEDUG* on *SMEG* (share of small and medium enterprises in GDP).

The results of effects of share in SME growth on GDP growth are presented in Table 2 and all the coefficients are significant at conventional level.

TABLE 2

SME Growth and GDP Growth
Dependent Variable: *GDPG*

Variable	Coefficient	*t*-statistic
SMEG	–0.67984	–1.104493
PAN	–1.245869	–2.472914
INF	–0.402485	–2.114113
HTEX	0.011525	0.091766
TMT	0.746764	1.44176
PEDUG	0.869062	1.776991
C	4.257471	2.579145
R-squared	0.693	D.W. statistic 2.010
F-statistic	2.810	Prob (F-statistic) 0.030

One of the highest impacts on GDP growth rate has been observed through *PEDUG*. The public expenditure on education as a percentage of GDP (*PEDUG*) has significant impact with a significant *t*-stat (1.77) value.

It is a general perception that inflation has negative effect on the GDP per capita because due to increase in inflation, the purchasing power of the people decreases. Their demand reduces the consumption which results in overall declines in GDP. Keeping in view the national income identity equation, consumption has direct relation with GDP. As there is decrease in consumption, GDP would also decrease and GDP per capita would also diminish.

High tech exports have positive relation with GDP growth but represents insignificant impact on GDP with *t*-stat (0.09). This result indicates that there is a lot of potential in the external sector to be explored. Due to lack of technological advancement in the country, the proportion of high tech export is very minimal, which can be amplified through process innovation. In other words if there is an improvement in high tech exports, it can drastically transform the economic strengths of the country through self reliance and optimal utilization of domestic potential resources. It is suggested that the government of Pakistan should concentrate on manufacturing of value added goods and high tech exports.

TABLE 3

Summary Statistics

	GRPC	*VXGDP*	*PAN*	*HTEX*	*TMT*	*PEDUG*	*SMEG*
Mean	2.3950	13.5975	1009.400	74464578	8436.400	2.40250	4.84500
Median	2.1500	13.4500	1063.500	22377494	7073.000	2.45000	5.00000
Maximum	7.9000	15.9000	1647.000	2.75E+08	14895.000	2.80000	5.60000
Minimum	–1.0000	12.5000	502.000	1627511	3173.000	1.70000	4.10000
Std. Dev.	2.1999	0.8411	339.979	92046797	3974.239	0.31974	0.51039
Skewness	0.8867	1.1591	–0.0177	0.889576	0.5787	–0.61115	–0.10276
Kurtosis	3.3293	4.1241	1.9710	2.265483	1.7925	2.26744	1.44539
Jarque-Bera	2.7114	5.5316	0.8834	3.087415	2.3313	1.69223	2.04921
Probability	0.2578	0.0629	0.6430	0.213588	0.3117	0.42908	0.35894
Sum	47.9000	271.9500	20188.00	1.4999	168728.00	48.05000	96.90000
Sum Sq. Dev.	91.9495	13.44237	2196133	1.6111	3.0000	1.94238	4.94950
Observations	34	34	34	34	34	34	34

Pakistan is a developing economy where patent applications of local residents are very small as compared to non-residents. Though the *t*-stat (2.47) of *PAN* (which is a measure of innovation) is significant and indicates its impact on GDP growth, Pakistan still requires awareness for promoting innovation output factors (Patents). D.W.-stat (2.01) shows that there is no autocorrelation in the analysis. Future researches can explore the impact of patents on the developing economies like Pakistan and suggest the strategies for the effectiveness of innovation output factors. Summary statistics are given in Table 3.

V. CONCLUSION AND POLICY RECOMMENDATIONS

Pakistan is a land of natural resources but due to mismanagement and lack of introduction of modern technology and innovation, its economy is weakening. To restore the economic strengths, it is inevitable to introduce process innovation in different small and medium sectors like in food, ceramics, leather and agriculture sector. These sectors have the potential due to less elastic goods. The government must fulfill the prerequisites of manufacturing like the provision of utilities at cheaper rates and secondly, these sectors require less investment as compared to produce at large scale. Chinese investors can play an active role to attain the benefits of these potential sectors.

This study is an attempt to explore the effects of process innovation on Small and Medium Enterprises (SMEs) and to investigate the effects of strong SMEs on economic development in Pakistan. To achieve these objectives, log linear regression models have been developed to ensure the effects of process innovation on SMEs growth and its subsequent effects on economic development in Pakistan.

One of the significant results is in favour of positive correlation between process innovation and SMEs growth. The estimates show that there is positive impact of process innovation on SME growth. With an improvement in the process innovation, there would be an increase in SME growth, which indicates that economic activities would revive in the country. Braunerhjelm (2010) also supports this concept. It is also observed that there is direct impact of innovation on economic development. The direct link has also been proved from the study of Fagerberg *et al.* (2009). They have channelized the effects of high technology through process innovation on economic development.

Another important result is in favour of positive correlation between education and GDP per capita. In developing countries like Pakistan,

government is spending very little amount (less than 2% of GDP) on education. For economic development in the country, there is an immense need to focus on education improvement. There are certain other factors, which are causing to affect the growth in GDP like inflation, openness and volume of exports as percentage of GDP. In this research, education is a significant variable which plays an important role for the growth of share of SMEs in GDP as well as for economic development.

In Pakistan, innovation is at its infancy stage and more particularly, in small and medium enterprises. This research indicates that *PAN* (Patent Application for Nonresident) and *TMT* (Trademark Total) are two main variables which show positive and significant impacts on SME growth as well as for economic development. The *t*-stat of *PAN* (2.47) and *TMT* (1.44) explain their significance levels at 5% respectively and explicate that they are one of the important variables for the economic development of developing countries like Pakistan. The researchers may explore the impact of different type of innovation on the performance of different sectors in future.

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