DRIVERS OF FIRMS' GROWTH:

A CASE STUDY OF PAKISTANI SOFTWARE FIRMS

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ABSTRACT

This study identified the drivers of firm's growth such as research & development (R&D), absorptive capacity, knowledge management, networks, access to finance, internationalisation and so forth. This empirical paper analyse the Pakistani software industry and provided contribution to research related to micro analysis of small software firms using cross sectional data techniques. Based on a face to face interview of 69 software firms, this study found that firm size, access to finance, internationalisation (exporting and outward FDI), business improvement methods, and knowledge management have a positive impact on the firm's labour productivity growth. In comparison, firm undertaking R&D and absorptive capacity showed negative association with labour productivity growth. In summary, this empirical study suggests that high sunk costs, low investment in knowledge-based assets and shortage of skills generally affect the labour productivity of these software firms.

Keywords: Absorptive capacity, Innovation, Labour Productivity, R&D, SMEs.

INTRODUCTION:

In the literature, researchers have investigated two different views on the role of small & medium enterprises in developing countries. First, there is view that SMEs have a positive impact on an economy, for example, SMEs provide jobs, reduce the poverty level and make significant contribution to national income (Moktan, 2007). In comparison, some researchers (Beck and Kunt *et al*. 2005) state that SMEs provides poor quality jobs, are not innovative and that their financial constraints may affect their performance. These two different arguments from the literature motivated this research study to investigate the following research questions: Why are SMEs less productive? What are the drivers of firm growth? What type of resources can make SMEs more productive? To answer these questions this research paper is informed by an extensive literature survey and an empirical analysis.

Previous studies (Harris and Trainor, 1995) were limited in approach to analyse the determinants of labour productivity growth and showed a research gap at micro level analysis of software firms. These software firms are mainly comprises SMEs and have higher innovation abilities because of qualified IT professionals and better organisation capabilities (Matusik and Heeley, 2005). Furthermore, these knowledge intensive firms have a strong linkages with other sectors of the economy such as banking sector, airline industry, and the manufacturing sector, which improve the productivity of all firms, whether small or large firms (Westhead, 1997). However, the growth of this knowledge intensive sector requires investment in organisation capabilities such as to improve management and innovation abilities and human capital (De and Dutta, 2007). In addition, knowledge-based view of firm suggests that 'investment in knowledge-based assets (R&D, skills and networks) would improve the firm's performance (Harris, 2008).

This paper has been divided into 4 sections; section 2 discusses the literature examples on firm characteristics including long term obstacles to the success of their business. Section 2.1 provides discussion on drivers of firm's growth such as: absorptive capacity, R&D, access to finance, internationalisation and so forth. Section 3 present research methodology and empirical analysis (factor and regression analysis). Lastly, section 4 discusses the conclusion and policy implications, limitation of this empirical study.

LITERATURE REVIEW:

(I) FIRM CHARACTERISTICS:

Heshmati (2001) identified important determinants of firm growth such as firm size, age, ownership and capital structure, R&D and human capital. For example, Aw (2002) investigated the link between firm size and productivity on Taiwanese manufacturing firms. Aw (2002) found that firm grows because of their high productivity; in particular, smaller firms can have higher productivity if sunk costs of entry and exit are low which will strengthen their market selection process. Higher sunk costs lower the firm productivity, efficiency and firms are subject to less market selection (Farinas and Ruano, 2004). Furthermore, firm age and productivity (total factor productivity) have a positive relationship because older firms have experience in production and have already been exposed to competition from other firms. However, some researchers stated that firm age and productivity can have a negative relationship, if old firms fail to invest in existing or emerging technologies (Nichter and Goldmark, 2009).

In contrast, some researchers identified long term obstacles to the success of their businesses such as poor infrastructure development, low quality of labour force, lack of e-commerce and poor law and order situation and so forth (Reddy, 2007). These obstacles not only affect small firms but also large ones and have a negative impact on their firm productivity. For instance, Bezic *et al.* (2010) investigated the long term obstacles and their negative impact on firm's internationalisation such as: transport, customer regulations, availability of suitable premises, obtaining finance. Overall, these long term obstacle are more sever in developing countries than in developed countries (Mambula, 2002). However, the aim of this research is to focus on micro level issues to SMEs rather than macro level.

ABSORPTIVE CAPACITY:

The resource based view of firm suggests that a firm should invest in intangible assets (e.g., R&D, IPRs, skills) to improve firm productivity growth (Harris, 2008). Harris (2008) stated that a related concept which is closely linked to intangible assets is known as absorptive capacity. This absorptive capacity refers to the "process of internalising external knowledge" (Harris and Li, 2006). In addition, Cohen and Levinthal (1990) introduced the concept of absorptive capacity first time as referring to "firm ability to recognise, assimilate, and apply new scientific information for the purpose of innovation and new product development".

Furthermore, most of researchers argued that absorptive capacity is a multidimensional construct and identified proxies for measuring absorptive capacity and its association to firm innovation performance such as i) R&D; ii) licensing; iii) networks and; iv) knowledge driven acquisitions (Fosfuri and Tribo, 2008; Matusik and Heeley, 2005). These researchers argued that firms having high absorptive capacity would have competitive advantage than firms with a low level of absorptive capacity. Additionally, a number of researchers empirically tested whether investment in R&D increases a firm's absorptive capacity and found that R&D as an important antecedent for measuring absorptive capacity (Koch and Strotman, 2008; Leahy and Neary, 2004). However, SMEs cannot afford to invest in R&D due to resource constraints and forming strong collaboration such as intra- and inter-firm relations, and university-industry linkages may increase firm absorptive capacity (George and Zahra, 2002). Interestingly, Moreno and Casillas (2007) stated that SMEs have potential growth because of their slack resources (*e.g.,* surplus labour). These idle resources (human or physical) provides SMEs flexibility related to strategic decisions and grow SMEs faster than large firms. However, these examples of literature were not specifically focuses on the services sector (IT). This motivated the research question as to whether software firms have high absorptive capacity and what expected link with firm's labour productivity growth. The hypothesis is as follow:

H1: Higher absorptive capacity has a positive impact on firm's labour productivity growth.

FIRM UNDERTAKING R&D:

This sub-section discusses R&D as a proxy of absorptive capacity and its relationship with firm's innovation and productivity growth. From the perspective of input resources, one of the most common indicators used to measure firm innovation performance is firm R&D expenditure (Domingo and Borras, 2007). In particular, R&D intensity (*i.e.,* R&D spending as a proportion of the total sales turnover) and innovation output (product/process innovation) improve the firm profitability and long term growth (Harris and Trainor, 1995).

Nevertheless, R&D performs two major functions: it generates new knowledge through product/process innovation and increases the firm's absorptive capacity (Kinoshita, 2001). According to Cohen and Levinthal (1990), a firm must invest its own R&D in order to obtain benefits from output of its competitors. Likewise, Kinoshita's (2001) study on panel data analysis of Czech manufacturing firms found that the learning effect of R&D (*i.e.,* absorptive capacity) is more important than the innovative effect of R&D in explaining the productivity growth of a firm. Kinoshita (2001) finding clearly indicate that firm's should engage in R&D for higher absorptive capacity and firm performance. Similarly, Griffith *et al.* (2004) provided econometric evidence related to two faces of R&D for 12 OECD countries through panel data analysis. Their study suggests that R&D improves firm productivity (TFP) through innovation and indirect effect of technology transfer. The overall conclusion emerges from the literature that firm being engaged in R&D has a positive impact on firm's performance. The proposed hypotheses are derived from the literature is as follow:

H2: R&D undertaking has a positive relationship with firm labour productivity growth and innovative performance.

KNOWLEDGE MANAGEMENT :

Previous studies on R&D discussed whether R&D generates new knowledge and a firm with new

knowledge could enhance its productivity (Harris and Trainor, 2008). However, managing knowledge is always challenging for firms whether small or large and an effective way of managing knowledge increases firm's performance (Sparrow, 2001). Sparrow (2001) conducted a qualitative research on knowledge management in SMEs and suggested that 'appreciation of individuals and shared understanding', 'effective knowledge base and system', 'integrated and contextualised action needed for knowledge projects', and 'effective learning process' are the major components of knowledge management and these could enhance the success of firms.

Further, Fathian *et al.* (2007) study based on 26 Iranian SMEs suggested that tacit knowledge (*i.e.,* non-codified, exist in mental model) is important resource for a firm's competitive advantage and if this knowledge was properly utilised and transferred throughout the organisation, this could lead to better firm performance. Furthermore, Salojarvi *et al.* (2005) conducted research on 108 Finnish SMEs and examined whether there was positive relationship between knowledge management and sustainable sales growth. According to Salojarvi *et al.* (2005) SMEs could improve their financial performance and competitive advantage by using more conscious and systematic approach to knowledge management. Additionally, they argued that firms with better knowledge-based assets who utilised these appropriately could achieve higher firm's growth. In summary, the empirical studies showed knowledge management have a positive impact on firm's labour productivity growth. The following hypothesis is to be tested:

H3: Knowledge management has a positive impact on the firm's labour productivity growth.

ORGANISATIONAL CULTURE, LEADERSHIP AND BUSINESS IMPROVEMENT METHODS:

Organisational culture is an important resource for a firm's sustained competitive advantage and for superior financial performance (Barney, 1986). According to Barney (1986), three conditions are necessary for a firm to achieve sustained competitive advantage. First culture must be valuable (add financial values to the firm), second it must be rare and third culture must be imperfectly imitable. Kogberg and Chusmir (1987) defined organisation culture as "system of shared values and beliefs that produces norms and behaviour and establish an organisational way of life". Further, Cameron and Quinn (1999) identified four types of organisation cultures, these include, clan (teamwork), adhocracy (entrepreneurship), market driven culture (external maintenance with need for stability and control) and hierarchy (order and regulations). However, small firm's hierarchical structure is not well established because of an informal culture (*e.g.,* without specialised departments such as HR, marketing) and the leadership style is not administrative which obstructs the growth of small and medium enterprises (Cameron and Quinn, 1999).

On the other hand, Mathew (2007) examined the relationship between organisational culture and productivity and with quality in a study of 464 Indian software firms. The organisation culture was measured through 8 factors (e.g., goals, customer focus, integrity) which have a significant influence on productivity and positive impact on the firm quality. Furthermore, McAdam *et al.* (2010) developed a model for UK SME innovation. They argue that 'people and culture', 'leadership', 'total quality continuous improvement', 'knowledge and information', 'product and process' improve the organisational innovation implementation. They conducted a postal survey of 395 UK SMEs, and found that these variables (culture, leadership, total quality improvement programs) are connected with each other and have significant relationship with firm performance. Similarly, Morris and Pavett (1992) examined a study of cross-cultural management styles (leadership, motivation, communication, decision making and controlling) between USA and Mexican firms and their impact on firm's labour productivity. Their findings suggest that firms with more democratic style of leadership would have higher labour productivity compared to authoritative type of leadership. This clearly suggests that in democratic style of leadership employees are more focused on organisation goals and they feel sense of ownership when there is open communication between employees and management.

In contrast, Chapman and Khawaldeh (2002) examined the link between total quality management (*i.e.* business improvement methods) and labour productivity for Jordanian manufacturing firms. They developed a conceptual framework which measured the elements of total quality management: i) employee participation; ii) education and training; iii) organisation communication; iii) customer focus;

iv) scientific approaches to decision making; v) scientific methods for quality control; vi) organisational commitment to quality and continuous improvement; vii) statistical methods for quality control and; viii) unity of purpose. These elements were shown to have a positive impact on firm labour productivity for high TQM firms using multiple regression analysis (Chapman and Khawaldeh, 2002). Examples from the literature clearly indicates that firm with open culture, democratic style of leadership, quality improvement programs have a significant impact on the firm's productivity. We proposed to draw our next hypotheses as follow:

H4: Organisational culture, leadership and business improvement methods have a positive impact on firm labour productivity growth.

FIRM LIFE – CYCLE AND STRATEGIC RESOURCES:

Churchill and Lewis (1983) developed lifecycle stage model for SMEs development, resource availability and growth. Stage I -Existence: in this stage the main problems of the business are obtaining customers and delivering the product and services. Stage II – Survival: the company has developed sufficient customers, products/services. Stage III – Success: the decision facing owners at this stage whether to expand or keep the company stable. Stage IV – Take off: the key problem for firm that how to grow rapidly and how to finance that growth. Stage V - Resource Maturity: challenges at this stage are, first to consolidate after growth and second, to retain the advantages of small size including flexibility. On the other hand, Jones (2009) identified crises stages for SMEs growth. In other words, firms face crisis at every stage of lifecycle which must be resolved to avoid the collapse of the business. For instance, a firm at start up stage requires funds and cost control and pricing for their products/services to boost sales volume. Similarly, a firm at survival stage may face challenges such as hiring new professional managers, technological innovations, workforce diversity, market regulations and so forth.

In contrast, Miles and Snow *et al.* (1978) referred to the organisation strategies for maintaining effective performance. They developed a general model called 'adaptive cycle' which was based on certain strategies to provide solution to the organisational problems (*e.g.,* entrepreneurial, engineering and administrative).Their research identified three strategic types of organisations: defenders, analysers and prospectors. The defender strategy emphasis on efficiency and cost reduction to maintain existing markets; Analysers – focus on maintaining and growing existing markets while seeking out new markets to sustain and increase growth; prospectors – a focus on finding and exploiting new product and market opportunities to drive growth (Miles *et al.* 1978). In addition, the fourth strategy called 'Reactor' states that some organisations do not have clear strategy to react to market changes. Overall, their model suggests that organisations adjust to their environments by pursuing these strategies for better firm performance (profitability). In summary, SMEs lifecycle stage model apparently suggest that firms are more likely to have higher labour productivity, if firms manage their crises effectively. Nevertheless, firms with better strategies such as defenders, analysers and prospector could improve the firm's labour productivity growth. The hypotheses are as follow:

H5: Firm lifecycle and strategic resources have a positive impact on firm's labour productivity growth.

ACCESS TO FINANCE:

The resource based view (RBV) suggests that lack of financial, human, organisational resources and capabilities reduce the firm performance (Dundas, 2006). Dundas conducted a panel data analysis of Irish firms and found that lack of access to finance is a major constraint to the firm performance. Further, Wiklund and Shepherd (2005) stated that access to credit is important resource for firm performance and they have empirically tested that small business performance is positively influenced by external financing facility available to firms. Furthermore, a number of researchers stated that access to credit is a major constrain to the growth of SMEs (Abor and Biekpe, 2007; Beck and Kunt, 2006). They argued that SMEs are deprived of formal credit (borrowing from banks and other financial institutions) and mostly depend upon informal credit (i.e. borrowing from friends and family members) which cannot fulfil their needs for survival.

Abor and Biekpe (2007) investigated the positive relationship between firm age, size, asset tangibility (firm fixed assets divided by total assets) and the bank debt ratio (bank debt to total assets). The larger the firm size in terms of its employees and tangible assets the more access to finance is usually available. When a successful firm grows over time it requires more capital to finance growth and the firm must turn to external financial resources such as borrowing from banks; access to finance may improve the firm long term productivity (Badia and Slootmaekers, 2009). The above literature shows that lack access to finance might affect the growth of SMEs; and requires more research to investigate the relationship between access to finance and labour productivity growth. This motivated the researcher to develop a hypothesis which is to be tested on software firms.

H6: Access to finance has positive association with the firm labour productivity growth.

FDI AND INTERNATIONALISATION:

Smallbone (2005) argued that the potential benefits of FDI (foreign direct investment) are to improve knowledge and innovation transfer, human capital development and increasing employment in domestic economy. These potential benefits of FDI are important for host countries where financial constraints act as major barrier to the growth of SMEs. Furthermore, Harris and Robinson (2004) identified three types of FDI spillovers such as intra-industry spillovers (through demonstration effect, competition and labour market), inter-industry spillovers (forward/backward linkages) and agglomeration effects (geographical proximity). These spillovers effects (knowledge & technology) have a positive impact on firm's productivity growth (Harris and Robinson, 2004). Similarly, Adamou and Sasidharan (2007) discussed the role of foreign direct investment and its impact on domestic firm's growth. Foreign direct investment effect the growth of firms in two ways: first, foreign firms bring positive changes to firm growth through demonstration effect (new technology/products), labour turnover to foreign firm with better wage, forward and backward linkages and learning by exporting of domestic firms. Secondly, negative effects such as reverse labour turnover, high average cost force domestic firms to decline, and foreign firms reluctant to establish linkages with local firms and therefore bring their own suppliers (Adamou and Sasidharan, 2007).

In contrast, internationalisation is divided into two categories exporting and outward foreign direct investment (Lu and Beamish, 2006). Delgado *et al.* (2002) examined the relationship between total factor productivity and exporting through panel data analysis of 10,595 Spanish manufacturing firms. They found that productivity was higher for exporting firms than non exporting firms. Similarly, Wagner (2007) stated that exporting firms have higher labour productivity growth and that firms involved in international markets face intense competition and require better innovative products and services. On the other hand, Moen *et al.* (2004) discussed small software firms and their internationalisation. They stated that software firms have internet-based communication and they may quickly enter the international market by establishing a local subsidiary in an international market (2004). These small software firms have strong linkages with other multinational firms and have psychological, operational, organisational advantages over other types of firm's (Moen et al. 2004). In summary, we identified from the literature examples that less research is undertaken related to software industry; therefore, so we developed our hypotheses to investigate the relationship between inward FDI, internationalisation (export and outward FDI) and labour productivity growth.

H7: Inward FDI has a significant effect on firm labour productivity growth.

H8: Internationalisation (exporting and outward FDI) has a positive relationship with the firm labour productivity growth.

RESEARCH METHODOLOGY:

A field survey was undertaken in two regions of Pakistan *i.e.* Islamabad and Rawalpindi district during April-may, 2012. 150 firms were randomly selected from the list of 200 firms for face-to-face interviews of owner-managers using structured questionnaire.[i] Firms were contacted through emails and phone calls for appointment and only 69 firms responded (46%) for interviews. Of the total, 65 firms were interviewed in Islamabad and the remaining 4 in Rawalpindi. Further, 8 firms refused to

provide only financial information.

DISCUSSION OF EMPIRICAL RESULTS:

Table 1 shows that only 11.6% of firms sought finance in the past 3 years and the rest never applied for external finance during this period: only 20.3% undertook R&D. Firms were asked about the shared capital owned by foreign company/companies in their business; and nearly 25% have foreign ownership. The non-availability of firm level data related to IT sector overall and to other sectors (*i.e.*, financial, business, textiles, chemical) of the economy is one of the limitations in being able to compare over results on foreign ownership. Finally most of the firms (81.2%) are exporting to international markets (predominantly exporting to USA, UK and middle east) and while the remaining firms are selling their products just locally (*i.e.,* Pakistan).

Table 1: Firm characteristics (figures are in percentages)

Characteristics	Yes	No
Sought finance in the past 3-years	11.6	88.4
Business engaged in R&D	20.3	79.7
Foreign ownership	24.6	75.4
Engaged in exports	81.2	18.8

n=69

FACTOR ANALYSIS OF BUSINESS AND MANAGEMENT VARIABLES:

In order to measure the business and management variables, initial information was collected on Likert scale (1= strongly agree to 5 = strongly disagree); such as 'lifecycle', 'strategic focus', 'leadership', 'culture', 'business improvement methods', 'knowledge incorporation and acquisition', 'absorptive capacity', and 'long term obstacles'. Firms replies were recoded for each statement as '2 = strongly agree', '1 = agree', '0 = neutral', '-1 = disagree' and '-2 = strongly disagree'. For extracting core information principal component factor analysis has been used. Principal component factor analysis reduces the number of variables and examines the structure relationship between variables. These factors are extracted based on Kaiser Criterion (Kaiser, 1960); which suggest that retain those factors with Eigen values equal or greater than one.

Table 2 provides information on the factor analysis of 'lifecycle' of the business. Two factors are extracted: factor 1 connected to the firm survival problem and factor 2 linked with expansion in the business. For improved correlation between the variable and each factor, variance maximising orthogonal (factors are uncorrelated with each other) is used. In Table 2 factor 1 & 2 shows higher factor loadings (shown in bold italic values); these factor loadings represent correlation of a variable with a factor. The first question has higher factor loading which is 0.8987; this suggest that business with a problem of obtaining customers would be likely to have more survival problems. The second statement with factor loading -0.8830 implies that businesses with sufficient customers and their higher customer satisfaction would be less likely to have survival problems. Similarly, the last three questions are positively related to factor 2 (expanding the business). Additionally, the column labelled as 'uniqueness' measures the variance of variable that is not connected with other variables in the factor model. This is with first variable which has uniqueness value og 0.1716; and states that the variable is not shared by 17.61% with other variables in the factor model. In order to test the appropriateness of factor model the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.4948.[ii] Furthermore, Table 10 shows the factor analysis of firm absorptive capacity. Six principal component factors are retained and these are labelled as 'sharing knowledge', 'job knowledge', 'internal knowledge', 'external knowledge', 'linkages', and 'innovation'. For a better correlation between these variables and factors, variance maximising orthogonal rotation is used. Factor 1 (positive correlation with sharing knowledge) implies that managing employees, knowledge incorporation and management role could improve the firm's knowledge sharing across the organisation.

Table 2: Questions Relating to the Lifecycle of the Business

	Factor1 Survive	Factor2 Expand	Uniqueness
The main problem of the business are obtaining customers and delivering the products and services	0.8987		0.1716
The company has now developed sufficient customers, and satisfies them sufficiently with its products and services	-0.8830		0.2169
The decisions facing owners at this stage is whether to expand or keep the firm stable and profitable, providing a base for alternative owners activities		0.8436	0.2706
The key problems facing business how to grow rapidly and how to finance growth		0.4677	0.6603
Challenges are to consolidate and control financial gains brought on by rapid growth, and to retain the advantage of small size, including flexibility		0.6780	0.5330
Overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.4948**			

Table 3: Questions relating to the Strategic focus of the business

	Factor 1	Uniqueness
	New ideas	
The company has narrow range of products and markets	-0.5233	0.7262
The company continually searchers for new markets opportunities	0.5264	0.7229
Company watch their competitors closely for new ideas, and then rapidly adopt those which appear to be the most promising	0.7579	0.4256
Organisation makes changes until forced to do so by environmental pressures	-0.6006	0.6393
Overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.5871**		

Table 4: Questions relating to the firm leadership abilities

	Factor1 Creativity	Factor2 Goals	Factor3 Motivation	Uniqueness
The senior management team make a point 'being seen' around the organisation			0.8629	0.2336
Management fosters creative thinking and innovation in the company	0.6568			0.5093
Our top managers like to try new ways of doing things	0.7559			0.4148
Management spend adequate time planning change	0.6126			0.6052
If the company is performing well, change is still priority	0.7251			0.4184
The organisation is working to clear organisation plan		0.8492		0.2638
Management encourage everyone in the organisation to come with new ideas			0.7190	0.2880
The management team take time to think constructively/creatively about the future		0.7596		0.3866
Overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is 0.5146				

Table 5: Questions relating to the organisational culture

	Factor1 Openness	Factor2 Learning	Factor3 Change	Factor4 Performance	Uniqueness
There is strong team spirit at all levels of the organisation		0.5338	0.5334		0.2957
The culture in this organisation promotes change			0.8033		0.3058
Two way communication happens at all levels of the organisation	0.7286				0.3129
There is clear organisational structure which everyone understands		*0.7720*			0.3537
There are clearly defined roles and responsibilities		*0.8382*			0.2674
The structure of the organisation facilitates change			*0.7739*		0.3098
The organisation is not bureaucratic	0.7704				0.2861
There is feeling of openness in the organisation	0.8447				0.1577
Overall, employees have access to all the resources needed to get the job done		*0.5379*			0.4464
Employees are involved in setting and agreeing performance targets				0.7691	0.3690
Everyone in the company has good grasp off how the organisation is performing				0.6601	0.4123
Employees get useful feedback about their work				0.5348	0.3857
Overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.6846**					

Table 6: Questions related to the 'Business Improvements Methods'

	Factor1 Total Quality	Uniqueness
The organisation has formal/inform total quality continuous improvement programme	*0.7645*	0.4155
Responsibilities for the TQ/CI programme are clearly defined	*0.8727*	0.2384
Successful TQ/CI problem solving teams are spread throughout the organisation	*0.9108*	0.1704
The programme is adequately resourced	*0.8875*	0.2124
There is clearly defined reward and recognition scheme for TC/CI activity	*0.8075*	0.3480
Greater that 50% of the workforce are involved in TQ/CI	*0.6403*	0.5900
The TQ/CI programme is used to improve processes	*0.7730*	0.4025
The TQ/CI programme has clear goals, objectives, and measure of success	*0.8904*	0.2072
A number of quality improvements have been achieved from this program	*0.8758*	0.2330
a Overall Kaiser-Meyer-Olkin measure of sample adequacy is 0.8947		

Table 7: Questions related to internal and external knowledge process (Knowledge Incorporation)

	Factor 1 Knowledge Incorporation 1	Factor 2 Knowledge Incorporation 1	Uniqueness
Everyone is in possession of the information/knowledge necessary to do their job		*0.8802*	0.1922
Employees knowledge (i.e. tacit knowledge) is managed and captured effectively		*0.7434*	0.2759
Efforts are made to share information/knowledge across the organisation	*0.6464*		0.4483
Lessons learned from daily experiences and projects are captured and disseminated	*0.7125*		0.4806
New knowledge is effectively incorporated within the process and routines within the organisation	*0.8534*		0.2708
Active management of information/knowledge produces a range of business benefits	*0.6367*		0.4821
Overall Kaiser-Meyer-Olkin measure of sampling adequacy is 0.6780			

Table 8:Questions relating to knowledge acquisition

	Factor1 Knowledge acquisition1	Factor2 Knowledge acquisition2	Factor3 Knowledge acquisition3	Factor4 Knowledge acquisition4	Uniqueness
We conduct frequent market research so that we are aware of customer needs	0.7744				0.2965
Licensing is a method we often use to obtain information/knowledge or technology	0.8124				0.3033
We developed new products/services in collaboration with other firms				0.9123	0.1488
We are aware of information/technology being developed by our competitors			-0.7247		0.2176
We have become information/technology supplier to other firms in the sector			0.7816		0.1831
We usually go outside private sector bodies (consultants) to find out fresh opportunities for introducing new products		0.7300			0.2961
We usually go outside public sector bodies (universities) to find out fresh opportunities for introducing new products		0.8328			0.2679
aOverall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.5349**					

Table 9: Long term obstacles to the success of their business

	Factor 1 Recruitment	Factor 2 Skills shortage	Factor 3 Staff	Factor4 Competition	Factor 5 Taxation	Factor 6 Regulation	Factor 7 Finance	Uniqueness
Economy	-0.6916							0.4580
Obtaining finance	-0.4015							0.3658
Taxation					0.7495			0.3183
Recruiting staff	0.7277							0.4519
Keeping staff			0.7678					0.3655
Transport issue			0.6874					0.3883
Regulations							0.7489	0.3231
Keeping up with new technology		0.7186						0.3332
Availability/cost of suitable premises						0.4480		0.3359
Competition in the market			0.7017					0.3023
Shortage of managerial skills/expertise			-0.5276					0.2832
Shortage of skills generally		0.7634						0.3054
Lack of financial understanding							-0.8874	0.1913
Crime and security					0.6539			0.3566
Others (political/energy crisis)				0.7435				0.2507
Overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is 0.4600								

Table 10:Questions relating to firm absorptive capacity

	Factor 1 Sharing knowledge	Factor 2 Job knowledge	Factor 3 Internal knowledge	Factor 4 External knowledge	Factor 5 Linkages	Factor 6 Innovation	Uniqueness
Everyone is in possession of information/knowledge necessary to do their job		0.8508					0.2485
Knowledge employees hold in their head (tacit) is managed and captured effectively	0.6196						0.2597
Efforts are made to share information/knowledge across the organization			0.5968				0.2589
Lessons learned from daily experiences and projects are captured and disseminated			0.8810				0.1815

New knowledge is effectively incorporated within process and routines within the organization	0.5967						0.2722
Active management of information/knowledge produces a range of business benefits	0.8666						0.1906
We conduct frequent market research so that we are aware of customer needs				0.6530			0.3527
Licensing is a method we often use to obtain information/knowledge or technology				0.7959			0.3232
We have developed new products/services in collaboration with other firms						0.6131	0.2975
We are well aware of the information/technology being developed by our competitors				0.6339			0.3063
We have become an information/technology supplier to other firms in the sector						0.8320	0.1693
We usually go outside private sector (consultants) to find out about fresh opportunities for introducing new products/services					0.7481		0.2366
We usually go outside public sector (Universities) to find out about fresh opportunities for introducing new products/services					0.8219		0.2338
Overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is 0.5146							

Table 11 Regression analysis of determinants of ΔLP stepwise (using OLS method)

Δ log labour productivity (dependent)	Coefficients	t-value
Log labour productivity in 2009	-0.4295***	-6.80
R&D undertaking	-0.3804**	-2.33
Access to finance	0.2450**	2.15
Size (11-20; employees)	0.7934***	3.64
Size (31-80; employees)	0.4005**	2.05
Δ log exports	0.1417***	3.33
Outward FDI	0.3866**	2.17
Inward FDI	0.3347	1.62
Strategic focus (ideas)	0.1103	1.38
BIM (quality improvement)	0.1856*	1.73
Knowledge incorporation 1	0.2628**	2.12
Knowledge incorporation 2	0.3466**	2.66
Knowledge acquisition 1	1.6481**	2.13
Knowledge acquisition 3	0.9215***	3.00
Knowledge acquisition 4	-0.6674***	-3.50
Absorptive capacity (sharing knowledge)	-0.6179***	-3.69
Absorptive capacity (external knowledge)	-2.0762**	-2.49
Obstacle (keeping staff)	0.1995	1.57
Obstacles (taxation)	0.1964**	2.09
Obstacles (lack of financial understanding)	0.0881	1.59
Obstacles (shortage of skills)	-0.2225**	-3.0
Constant	2.9690***	4.33

*/**/*** indicates significant at 10/5/1% levels

N = 60 R-squared = 0.7425

Ramsey Reset test value F = 2.34; significant level F = 0.0899

Regression Analysis:

Sections 3 introduce stepwise multiple regression using ordinary least squares method. Multiple

regression analysis is important when many other independent variables simultaneously affect dependent variable. Furthermore, the stepwise approach includes only significant results (probability values) in the model by choosing *P*-values ≤ 0.15 and ignoring insignificant results when *P*-values $\geq$ 0.2. In correlation matrix we observed that multicollineairty is not a problem, as in most of the cases correlation between variables are lower than 0.5.The list could be provided upon request.

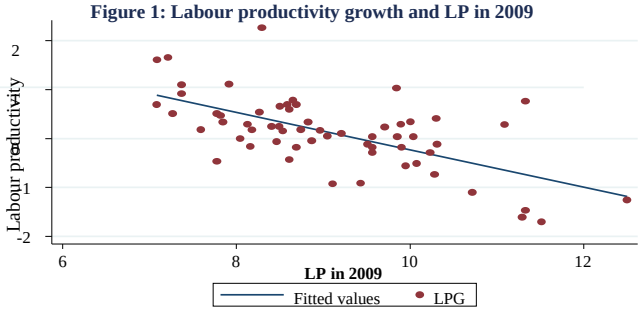
Empirical Results:

Stepwise multiple regression analysis is used to investigate the relationship between labour productivity growth[iii] and drivers of firm growth (see Table 11 for detail). The ordinary least squares results (OLS) are presented in Table 11 based on stepwise multiple regression approach to analyse the determinants of labour productivity growth. The robust standard error method is used to eliminate the effects of hetroskedasticity. In the regression analysis the model confronted an issue of endogeneity (*i.e.,* simultaneity) due to limited data. Table 11 provides information on multiple regression analysis between firm labour productivity growth (as dependent) and drivers of firm growth. In this mode two variables are dropped (employee's knowledge and internal knowledge) due to multicollinearity problem. Of the 60 observations (8 firms refused to provide financial information and 1 firm very recently started exporting). The R-squared value which is 0.7425 and this shows that approximately 74% of variation in labour productivity growth is explained by the model. The Ramsey reset test accepted the null hypothesis and shows that the model is adequately satisfied without functional form of misspecification error.

With a 100% increase in the elasticity of labour productivity in 2009, the firm labour productivity growth fell by nearly 43%. This shows that those firms had higher labour productivity in 2009 experienced lower labour productivity growth (see figure 1). Overall, this finding suggests that higher sunk costs (non-recoverable fixed costs) reduce the firm labour productivity growth. This outcome supports the literature finding of Farinas and Ruano's (2004) that large sunk costs reduce the firm productivity. Firms undertaking R&D (all dummy variables need to be converted using e^β-1) has nearly 32% lower labour productivity growth. This negative outcome has rejected the prior expectation of positive relationship between firm undertaking R&D and labour productivity growth based on previous empirical studies (*e.g.,* Griffith *et al*. 2004). In this study only few firms (n=14) undertook R&D and this implies that these software firms have resource constraint. In other words, this finding suggest that those firms undertook R&D devotes significant resources to this activity, while they are engage in innovative practices, such that they become resource constrained and productivity temporarily suffers. Later on firms may reduce spending on R&D after obtaining the benefits of such innovative activity and that productivity recovers. However, this requires data on several points in time to see the relationship between undertaking R&D and productivity. This indicates the limitation of the study and suggests future research.Firm access to credit has approximately 28% higher labour productivity growth. This supports the initial hypothesis and suggests that firms require external finance to boost their labour productivity. However, most of the software firms (over 75%) are relying on internal sources of finance which are not sufficient to undertake R&D projects. Studies (Abor and Biekpe, 2007) on access to finance whether that lack of financial constrain the firm performance.

Interestingly, small firms have higher labour productivity compared to large or medium size firms. This suggests that these small firms are less capital or intermediate intensive and have higher technical and efficiency levels. This finding supports the argument of Moreno and Casillas (2007), that small firms have higher productivity due to their internal flexibility. Small firms are flexible in terms of their less centralised decision making, low formal production channels compared to large firms. This organisational flexibility provides an edge to SMEs despite their lack of resources. In contrast, firm internationalisation (exporting and outward FDI) has a positive impact on firm labour productivity growth. This positive outcome confirms the finding of Delgado *et al*. (2002) that firm exporting and productivity have a positive relationship. In summary, firms exports and outward FDI suggest that these software firms have to improve their internationalisation activities search new international markets and selling more innovative products and services.

Figure 1: Labour productivity growth and LP in 2009



The positive relationship between business improvement and labour productivity growth supports the empirical finding of Chapman and Khawaldeh (2002) and prior expectation. This outcome suggests that a firm with better quality standards would be likely to have higher labour productivity growth. Additionally, the model (see Table 11) shows strong relationship between firm knowledge management and labour productivity growth. In particular, a higher proportion (over 90%) of labour productivity growth rise by firm knowledge acquisition abilities. Overall this finding suggest that these software firms have better knowledge management capabilities and have higher labour productivity growth. Nonetheless, the negative relationship between knowledge acquisition-4 and labour productivity growth suggest that these software firms have weak linkages to other firms related to development of new product and services (see factor analysis of knowledge acquisition).

The negative association between absorptive capacity and labour productivity growth rejected the prior expectation. In summary these software firms have poor absorptive capacity, which suggest that firms require more investment on knowledge based assets. Previous empirical studies (Harris and Li, 2006) found that undertaking R&D improves the firm absorptive capacity; but these software firms have lower R&D related capabilities. Similarly these local software firms have poor networks with other firms and research institutes which reduce the firm absorptive capacity. Finally, a long term obstacle to the success of their business such as 'shortage of skills generally' reduce the labour productivity growth by 22%.This suggest that shortage of skills generally affect the firm labour productivity growth. This negative outcome supports the initial hypothesis and literature finding of Reddy (2007). Surprisingly, the model found taxation as an obstacle having positive impact on firm labour productivity growth. This finding suggests the other way around, that firms with higher productivity (*i.e.* profitability) are more vulnerable to the taxation.

CONCLUSION:

This paper investigated the relationship between drivers of firm's growth and labour productivity. We found that firms with higher sunk costs had lower labour productivity. The negative association between firms undertaking R&D and labour productivity growth suggested that these software firms had resource constraint. The positive relationship between access to finance, firm's size, internationalisation, knowledge management and labour productivity growth supported our hypotheses from the literature. In comparsion, the negative relationship between absorptive capacity and labour productivity growth implied that these small software firms require to invest in knowledge based assets and rejected our prior hypothesis.

This paper contributed to the knowledge in terms of micro analysis of small software firms of Pakistan. The results cannot be generalized to other parts of the word due to its limited scope in terms of country specific characteristics (e.g., govt policies).

These software firms require more incentives from public sector organisations to reduce their sunk costs. For instance, costs of suitable premises, overall country energy crisis could be resolved on an urgent basis to boost up their labour productivity growth. Similarly, for radical innovations public and private sector organisations should encourage the IT industry by providing R&D grants, subsidies/incentives to local software firms for higher productivity and innovation output. The positive relationship between access to finance and labour productivity suggest that software firms should have access to external finance with lower interest's rates by means of less bureaucratic channels. In summary, these software firms should improve their investment in intangible assets (*e.g.,* R&D, networks, and human capital) for better productivity and innovation performance. Policy makers should consider the need for such knowledge based assets and must involve public and private sector organisations to boost their productivity.

Additionally, suggestions for future research would be to investigate the relationship between drivers of firm growth and innovation performance. The survey analysis could be extended to other parts of country such as

Karachi and Lahore for resolving causality.

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[i] The list was obtained from Pakistan Software Export Board (PSEB). In the list 50 firms were not purely in involved in software business. These firms were excluded for interview. In questionnaire information was obtained on firm sales, age, number of employees, R&D, business and management factors (*e.g.*, lifecycle, strategic focus, knowledge management, culture, leadership, business improvement methods) using 5-Likert scale.

ii Similarly, the factor analysis extracted core information from variables such as 'strategic focus', 'leadership', 'organisational-culture', 'business improvement methods', 'knowledge incorporation', 'knowledge acquisition' (See tables from 3 to 8). Table 9 provides on factor analysis of long-term obstacles to the success of their business. Seven principal components are extracted and labelled 'recruitment', 'skills of employees', 'staff issues', 'competition', 'taxation', 'regulations' and 'finance'. Column 1 shows the list of 15 obstacles which are subdivided into seven factors (shown in bold italic values) (See Table 9 for details).

2. Labour productivity growth is measured by log (sales/employees in 2011) – log(sales/employees in 2009). For firm size, five dummies used (employees between, 1-10, 11-20, 21-30, 31-80,81-500); change in exports calculated as log (exports in 2011/exports in 2009).Similarly, firm age, access to finance, R&D outward/inward FDI dummy variables have been used.