

EFFECTS OF AGGLOMERATION ON THE FORMATION AND SCALE OF OPERATIONS
OF NEW FIRMS

By

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Abstract

New firm formation is an important determinant of economic and regional development. Agglomeration has been highlighted as one of the main factors enhancing formation and scale of operations of new firms in the industrial organization literature. This study has estimated a model which determines the effect of local conditions on new firm formation and scale of operations for the manufacturing sector in Punjab, Pakistan using data from the Directory of Industries (DOI). The findings of the study reveal that agglomeration through localization and urbanization has a strong impact on the formation of new firms and their scale of operations.

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1. Introduction

The formation of new firms is an important characteristic of a growing economy. Entrepreneurial growth, which is what birth of new establishments is often referred to as, is known to foster regional development. There are various determinants of new firm formation which have been investigated in the existing literature. Among these, agglomeration has gained considerable attention and has been identified as an important factor in the creation of new firms particularly in developed countries.

There are positive externalities which accrue to firms that locate in an agglomerated region. Marshall (1920) identified three externalities/ benefits to firms of locating in geographically concentrated area: labor pooling, knowledge spillovers and specialized inputs all of which entice entrepreneurs to locate in concentrated areas. Marshallian's externalities highlight the benefits that the firms from the same industry can derive by locating close to each other. Jacob (1969) emphasized the benefits to firms by locating in an agglomerated area that accrues to firms from the presence of diverse labor force. Firms located close to each other will be able to lower cost through input sharing, labor pooling, by attaining maintenance services through mutual contracts; all of which will lead to effective use of resources. The reduction in cost will make competition stronger and will drive inefficient firms out of market. Moreover, agglomeration allows firms to benefit from vertical integration resulting from production of the products at different stages in different firms.

Localization and urbanization are the two principle forces of agglomeration that affect the formation of new firms as well as their scale of operations. A range of measures for agglomeration have been discussed and applied in existing literature and the most commonly

used are the Ellison and Glaesar index, Herfindahl index and the Industrial Concentration index. In Pakistan, the determinants of agglomeration have been examined by Burki and Khan (2010). Using the Ellison and Glaesar index computed at the district level, they find that industrial concentration is a prominent characteristic of all districts of Punjab but is more apparent in the urbanized areas of the province.

This paper empirically analyzes the relationship between agglomeration and the formation of new firms as well as their scale of operations, at a district level. The aim of the study is to analyze two questions: one does the presence of similar manufacturing activity in a district foster new firm formation and two, does a concentration of different industries lead to entry of new firms into a particular district. The specification used in this study is adopted from Rosenthal and Strange (2010), and has been used to estimate the effects of agglomeration on the arrival and scale of operations at a district level in the manufacturing industry for 2008 with the socio-economic characteristics and industrial controls by employing a firm level data from the Directory of Industries (2010 and 2006) and Multiple Indicator Cluster Survey (MICS).

The present study contributes to the existing literature by analyzing the relationship between agglomeration and arrival as well as agglomeration and scale of operations for manufacturing firms of Punjab, Pakistan. There has been little research, looking at the effect of agglomeration on formation of new firms in Pakistan. The focus of this study is to analyze the effects of agglomeration on new establishments and scale of operations in Punjab, by incorporating a new technique to measure agglomeration (localization and urbanization) which has not been used for Pakistan. The study also presents maps illustrating the geographical concentration of firms and new firms in the clustered regions.

The findings indicate that firms derive benefits by locating in agglomerated regions which induce new firms to enter in agglomerated regions to gain benefits of agglomeration. Localization has a significant and positive impact on new firm formation and this holds at all levels of localization. In addition, new firm formation is higher in areas where urbanization is present on a medium scale. The scale of operations of new entrants increases where larger or medium scale firms belonging to the same industry are present. The scale of operations also tends to increase in an area where there is urbanization at the medium scale. It has also been found that average income has a significant and positive impact on arrival as well as scale of operations.

The organization of the paper is as follows. Section 2 explains the related literature and section 3 highlights the theoretical framework. The data set employed for empirical estimation has been discussed in section 4. Section 5 presents the model to be estimated while Section 6 reveals the findings obtained from the estimations. The conclusions are discussed in Section 7.

2. Literature Review

The concentration of industrial activity has gained a significant amount of attention in recent academic research. Agglomeration, which has been defined as the presence of different economic units within the same geographical location which allows them to extract some benefit from each other of industries, has been observed in different economies of the world and particularly in the United States where the entertainment industry of Los Angeles and Silicon Valley (Sorenson & Audia, 2000) are prominent examples. In Pakistan, most academics have focused on the concentration of firms in Punjab with particular reference to the sports industry in Sialkot and textile industry in Faisalabad.

In the research, there are different determinants of agglomeration. According to Marshall (1920) agglomeration occurs as a result of three key reasons. Firstly, firms agglomerate near supplier or customers to save shipping costs; secondly, labor pooling benefits can be extracted which allows labor to be used effectively and skills to be shared by different firms; thirdly, the rate of innovation can be increased through knowledge spillovers.

Several studies have analyzed determinants of agglomeration by using different proxies for the three determinants mentioned above. Labor market pooling, transport costs, input sharing, knowledge spillovers and natural advantage have been used to explain variations in agglomeration. Findings from Rosenthal and Strange (2001) reveal that all of these factors play a role in inducing industries to agglomerate, varying from industry to industry and depending upon the product in production. However, labor pooling has been highlighted as an important variable in determining geographic concentration of industries and their findings reveal that agglomeration is positively affected by labor pooling and input sharing.

Agglomeration in this study will be examined by analyzing the two main forces of agglomeration which are urbanization and localization. Localization is described as the benefits occurring to firms by locating in a specific region within a specific industry. These benefits can also be referred to as benefits that are external to the firm, but internal to the industry and knowledge spillover, input sharing and labor pooling are major benefits to a firm from localization. Firms belonging to the same industry are more likely to use similar inputs and by localization these inputs can be shared or the contracts can be formalized mutually. Labor pooling allows firms to use specialized labor forces and avoid labor shortages. Moreover, specialized services can be obtained more efficiently at lower rates which include services from banks and repair and maintenance (Parr, 2002). Knowledge spillovers are a component of

localization economies through which firms share information regarding products in production, production process, innovations, existing and new technology, marketing agenda, research and development (Parr, 2002). There are several examples of localization economies in the world including the semiconductor industry of Silicon Valley.

The second aspect of agglomeration is urbanization which benefits firms located close to each other regardless of the type of industry they belong to. These benefits include presence of diversified suppliers, specialized labor and suppliers, and diversity in production (Bosma, Stel & Suddle, 2006). Market mechanisms are important and play a major role in urbanized economies (Parr, 2002).

Another important factor in the formation of new establishment in a particular area is market demand. The presence of higher demand in particular region positively affects firm birth as there will be more profits for firms by selling more products. The presence of a large population in a region also positively affects birth as larger population leads to a higher demand. According to Otsuka (2008) there are various location factors affecting formation of new establishments in a particular region, which are, market demand, agglomeration, market condition and factor cost.

Lastly, agglomeration regarded as localization and urbanization has an impact on a firm's birth decision in a particular region due to benefits from spatial proximity. According to Sorenson and Audia (2000) new entrepreneurial activity is likely to take place where geographic concentration exists. Localization enables new firms to take advantage from learning process of old firms. New firms enter as they can visualize developed market, existing suppliers, and availability of factor of production at lower cost (Bosma et al., 2006). The existing specialized

labor and inputs can be used which result in higher productivity and higher profit. New firms can visualize existing demand and forecast future demand. There is also a greater probability of getting benefits of innovations. Urbanization improves the working of markets and firms by providing market mechanisms, transportation facilities, infrastructure, community facilities which make certain areas more attractive for new firms to enter. Presence of different industries facilitates production, as one firm may be a supplier to another firm and different firms can mutually produce the same product in different stages.

Besides the factors discussed above, the existing literature identifies some other determinants of new establishments including regional characteristics. Regional unemployment is one such factor influencing new establishments because an increase in unemployment due to workers losing their jobs is likely to positively affect future entrepreneurs. These workers might not want to move from a particular area due to social ties and end up in starting their own business. However, higher unemployment may also lead to a fall in regional income and hence, less demand for products which deters firms to enter. Firm entry is also affected by personal or household wealth present in an area since it affects capital that is available to entrepreneurs. Government policies also attract new firms in a particular area through government spending on local infrastructure and direct assistance to firms (Reynolds, Storey & Westhead, 1994).

The agglomeration and organization relationship has been analyzed for several countries such as the United States and Japan. Ota and Fujita (1993) analyzed the location decision firms make for their front and back offices and which is dependent on communication technologies available. Optimally front offices should be located in main part of cities (who communicate with other firms and back offices) whereas back offices should be located in the suburbs (who communicate with front office only) and this is possible when communication cost is low. They

analyze the spatial organization of firms in cities and how benefits (lower price of land by locating in suburbs) can be extracted by locating in different areas and taking advantage of communication technologies.

Existing entrepreneurs also create an environment leading to future entrepreneurs. Helsley and Strange (2002) estimated input sharing and growth and found that innovation in the past is likely to result in the creation of new inputs which can be shared by existing entrepreneurs and which lead to increase in growth measured by increase in entrepreneurial activity (future entrepreneurs). These inputs are first produced by entrepreneurs and then used by others to create their final output. The probability of innovation occurring is determined by the distance between entrepreneurs and inputs, the closer the two the more chances of innovation and hence more growth. This implies that concentration of inputs and entrepreneurs leads to growth measured by the entry of new entrepreneurs.

Glaeser and Kerr (2009) use U.S data and find that entrepreneurship in a specific city is determined by demographics, natural cost advantages and agglomeration factors specific to location. Agglomeration is incorporated by customer and supplier strength, labor market strength, technology spillovers and entrepreneurial culture (Marshallian's three factors). With industry and city level fixed effects, labor and suppliers (Marshall's determinants of agglomeration) strongly impacts entrepreneurship and are the main drivers of new firm formation.

Delgado, Porter and Stern (2010) examine the relationship between agglomeration and growth rate of entrepreneurship at regional level in two time periods 1991-1994 and 2002-2005 for United States. The initial level of startup activity, industry specialization, cluster

specialization and related economic activity is used to explain growth in startup activity with industry and region controls. Their findings reveal that agglomeration is associated with growth in new firm formation and scale of operations by reducing barriers to entry, but it also leads to competition for resources.

Rosenthal and Strange (2010) employ a geographic approach to examine the effect of agglomeration (urbanization and localization) on new firm arrival and scale of their operations at small, medium and large establishment levels for 2007 for manufacturing, wholesale trade, fire and services industries. They found that urbanization significantly affects arrival and scale of operations in small establishments in manufacturing industries, while localization affects arrival and scale of operations in medium establishments within the manufacturing industries.

Otsuka (2008) uses Japanese data to determine the influence of regional characteristics on new firm formation in Japan for 1980-1990, taking into account three location characteristics: market demand, agglomeration economies and factor cost and market conditions for manufacturing and service industries. Their findings reveal that characteristics affecting birth varies from industry to industry. They also found that agglomeration, market access, road transportation availability, labor density, presence of highways and lower labor cost are very likely to influence birth in manufacturing industry. Finally the findings reveal that localization and urbanization positively and significantly affects new birth in manufacturing industry.

The limitations of existing studies are that the existing research is conducted on developed countries and lacks focus on developing countries. The other limitation is that there is little literature that distinguishes between new independent firms and new subsidiary of existing firms. The endogeneity between agglomeration and entry has not been acknowledged in most of

the literature. There is lack of research focusing industries other manufacturing and services. Literature identifies that for analyzing the relation between agglomeration and entry a detailed data set is required. The cost of agglomeration and competition has not been incorporated in literature. The relation between arrival and agglomeration are likely to hold for developing countries as there is weak contract enforcement, the markets are not developed, there are financial constraints for firms and by locating in agglomerated areas the research and development is more likely to take place. Government policies also attract new firms in a particular area through government spending on local infrastructure and direct assistance to firms. In developing countries, there is less support to firms from government. There can be several reasons due to which there is less probability of firm's entering in agglomerated areas in developing countries such inadequate infrastructure which may raise congestion cost and reduces the benefits of agglomeration.

3. Theoretical framework

According to Marshall (1920) the benefits to the firms from clustering are knowledge spillovers, sharing of specialized inputs and of new production techniques, and labor pooling. Jacobs (1969) believed that the presence of diverse employment in a particular region increases the chances of innovation taking place in an area thereby resulting in the creation of new products. Several studies have investigated the importance of these benefits and the determinants of agglomeration. These benefits from agglomeration include the production of specialized inputs, diversity in production, specialized suppliers and labor, increase in innovation and low transport cost. Soubeyran and Thisse (1998) laid special emphasis on knowledge spillovers (one

of the benefit's firms derive from agglomeration). The benefits of knowledge spillovers can accrue to firms in the same industry and also to firms in different industries.

The theoretical framework used in this study has been taken from Soubeyran and Thisse (1998). The model assumes price to be equal in all districts (locales) and firms chose to maximize profit. Firms are attracted to areas that have a greater stock of knowledge. There are D districts, with $d \in D = \{1, \dots, i\}$, each district has fixed labor force represented as L_d in district d , earning positive wages. The district has initial level of knowledge represented as $K_d \geq 0$ which has been accumulated by workers over the years. There are entrepreneurs who can start a new firm by acquiring capital k_d at interest rate r , hiring labor in a particular district and can sell its product at price p . Knowledge has been accumulated by labor, which makes districts attractive since firms attain benefits from the existing knowledge base. The cost function of a firm in a particular district is given as:

$$C_d(q_d, w_d, K_d) = w_d \ell(K_d) q_d + r k(q_d) \quad (1)$$

where q_d is output, w_d is wage, and K_d is initial stock of knowledge in a district d . The labor coefficient (ℓ) represents knowledge of workers that has been acquired through knowledge spillovers. The capital $k(q_d)$ required by a new firm is the same across districts.

The profit function of a firm by locating in a particular district d is defined as:

$$\Pi_d(q_d, w_d, K_d) = p q_d - C_d(q_d, w_d, K_d) \quad (2)$$

The profit of a firm by locating in a particular district is affected by initial stock of knowledge and differentiating profit function by K_d shows how profit is affected by knowledge which is given as:

$$\frac{\partial \hat{\Pi}_d}{\partial K_d} = -w_d \hat{q}_d \ell'(S_d) > 0 \quad (3)$$

The first order condition indicates that profit increases with increase in stock of knowledge.

Positive production by firms can be shown as:

$$\hat{q}_d = (K')^{-1}\{[p - w_d \ell(K_d)]/r\} \quad (4)$$

By combining (2) and (4) value function can be derived as:

$$\hat{\Pi}_d = \Pi_d[\hat{q}_d(w_d, K_d, r, p), w_d, K_d] = \hat{\Pi}_d(w_d, K_d, r, p) \quad (5)$$

which can also be summarized as:

$$\hat{\Pi}_d = r\lambda(\hat{q}_d), \quad (6)$$

Equation 6 represents the maximum profit firms can derive by locating in a district d . There are firms which are initially located in the district d and due to presence of these firms workers have acquired skills through knowledge spillovers. The districts having more knowledge have more chance of firm entering.

Assuming positive production function and positive wage, full employment can be written as:

$$n_d \hat{q}_d \ell(K_d) = L_d \quad (7)$$

Manipulating equation 7 will allow us to determine the number of firms in the district d which can be represented as:

$$n_d = L_d / \hat{q}_d \ell(K_d) \quad (8)$$

Equation (7) and equality of profits between districts imply that $r\lambda(\hat{q}_d) = r\lambda(\hat{q}_e)$ where $d, e \in I$ and I represents districts where new firms will be established. This indicates that output produced by firms is same across districts in equilibrium. Hence, equilibrium output can be stated as:

$$\hat{q}(I) = \sum_{d \in D} L_d v(K_d) \quad (9)$$

where v is strictly increasing

Combining (8) and (9) gives the distribution of firms in equilibrium:

$$n_d(I) = \frac{L_d v(K_d)}{\sum_{e \in I} L_e v(K_e)}, \quad d \in I \quad (10)$$

Equation (10) states that the higher number of workers or the higher knowledge spillovers present in a district attracts a higher number of firms to enter in a particular district. The empirical analysis in this study will analyze how the density of employment within a particular industry and overall employment in a district will effect arrival and its scale of operations.

4. Data Source and Descriptive Statistics

The analysis has been carried out for the province of Punjab, Pakistan, by using data from the Directory of Industries (DOI) 2010 and 2006. The Directory of industries has been collected for three time periods 2002, 2006 and 2010 and the data taken from it includes information on the year of establishment, employment levels of firms and district.

The Directory of Industries data set is a firm level data and has more than 18,000 firms in a particular year. This is a representative data set conducted by Government of Punjab, for the

manufacturing industry in Punjab. The study takes the whole population and does not exclude any firm from the analysis.

The Directory of Industries (DOI) 2010 has been used to measure arrival of firm and the scale of their operations and DOI 2006 has been used to measure local conditions (localization and urbanization). Socio-economic characteristics at district level controls are incorporated using the Multiple Indicator Cluster Survey (MICS) dataset for the period of 2003-2004.

Table 1.a reports count of new establishments (arrival) and scale of operations of new establishments. There are 312 new firms in 2008 in the manufacturing industry, employing 10,501 employees. The table shows that localization and urbanization is higher in large scale firms followed by medium scale.

Table 1.b reports the count of new establishments, scale of operations of new establishments and average localization in 2008 according to industries within manufacturing industry. The data shows that the highest numbers of new entrants are within the food, textile, plastic and metal industries. The table also shows that the new firms have entered in areas that have a higher average localization.

Table 1.a: Count of New Establishments and Scale of operations of new establishments with average localization and urbanization at aggregated and disaggregated levels.

Total New Establishments (Arrival)	312.0000
Total Workers at New Establishments (Scale of Operations)	10501.0000
District/industry pairs with > 0 arrivals	105.0000
District/industry pairs with 0 arrivals	983.0000
<u>Avg Emp in OWN Industry within District (Localization)</u>	
All Size Estab	24819.5582
Small-Estab (< 10 workers)	1286.0000
Med-Estab (10 to 49 workers)	5042.4710

Large-Estab (50 or more workers)	18491.0900
<u>Avg Emp in ALL Industries Within District (Urbanization)</u>	
All Size Estab	139634.2000
Small-Estab (< 10 workers)	10283.6200
Med-Estab (10 to 49 workers)	34292.6200
Large-Estab (50 or more workers)	95057.9400

Table 1.b: Count of New Establishments and Scale of Operations of New Establishments for 2008 and Average Localization for 2006 of each industry for the manufacturing industry in Punjab

Industries	New firms	Scale of operations of new firms	Average Localization
Meat, Fruit, Vegetables, Oil & Fats	15.0000	425.0000	358.8824
Dairy Products	1.0000	200.0000	158.5588
Grain Mill Products & Animal Feeds	52.0000	919.0000	383.6471
Other Food Products Including Sugar & Tea	75.0000	2724.0000	2033.4710
Beverages	8.0000	452.0000	259.8824
Tobacco Products	0.0000	0.0000	44.3235
Textile Spinning, Weaving & Finishing	19.0000	519.0000	9613.8240
Other Textiles	11.0000	358.0000	2002.6470
Wearing Apparel	12.0000	1038.0000	2462.412
Tanning & Dressing of Leather	1.0000	15.0000	301.6765
Footwear	2.0000	26.0000	267.5000
Products of Wood	2.0000	27.0000	111.4118
Paper & Paper Products	1.0000	45.0000	178.3529
Refined Petroleum Products	3.0000	80.0000	103.2941
Basic Chemicals	4.0000	104.0000	201.8235
Other Chemical Products	10.0000	506.0000	358.0588
Rubber Products	1.0000	14.0000	43.6764
Plastic Products	21.0000	341.0000	295.2647
Glass & Glass Products	1.0000	200.0000	115.0882
Non-Metallic Mineral Products	5.0000	447.0000	518.000
Metal Products	21.0000	605.0000	700.9118
Special-Purpose Machinery	2.0000	35.0000	286.7941
Domestic Appliances	12.0000	161.0000	585.4412
Electric Motors/Generators/Transformers	0.0000	0.0000	222.8529
Electricity Distribution & Control Apparatus	5.0000	264.0000	509.7353
Electric Lamps & Lighting Equipment	0.0000	0.0000	113.8529
Medical Precision Instruments	11.0000	353.0000	1014.559
Bodies for Motor Vehicles & Trailers	0.0000	0.0000	1.9705
Parts & Accessories for Motor Vehicles	13.0000	538.0000	423.2647

Mapping Some Districts and Industries

The paper attempts to investigate the effects of agglomeration on the formation of new firms and their scale of operations in the manufacturing industry. A graphical illustration has been presented in this section. Industrial clusters are assumed to be widely present in Punjab although the extent of this agglomeration varies between districts as well as within industries.

The maps show the geographic distribution of manufacturers in the districts of Punjab, as represented by the red markers. New firms are represented by yellow markers and the maps show that new firms enter in areas where there is already a certain degree of industrial concentration. This can be observed in Sports and Food industry as well as for Lahore and Gujranwala districts. In figure 5 and 6 red and pink colors show the intensity of concentration, red markers represent high concentration while the pink markers indicate low concentration (area with more than 30 firms).

Figure 1: Location of manufacturing firms in Gujranwala district of Punjab, Pakistan

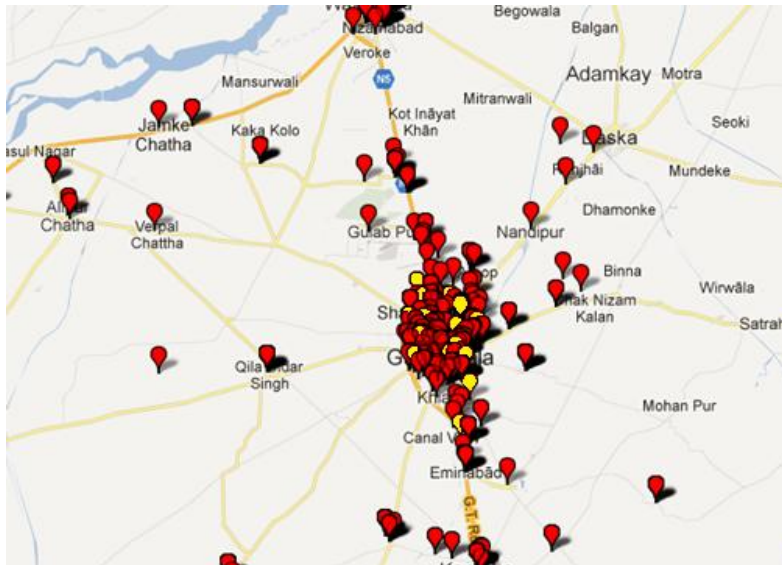


Figure 2: Location of manufacturing firms in Lahore district of Punjab, Pakistan

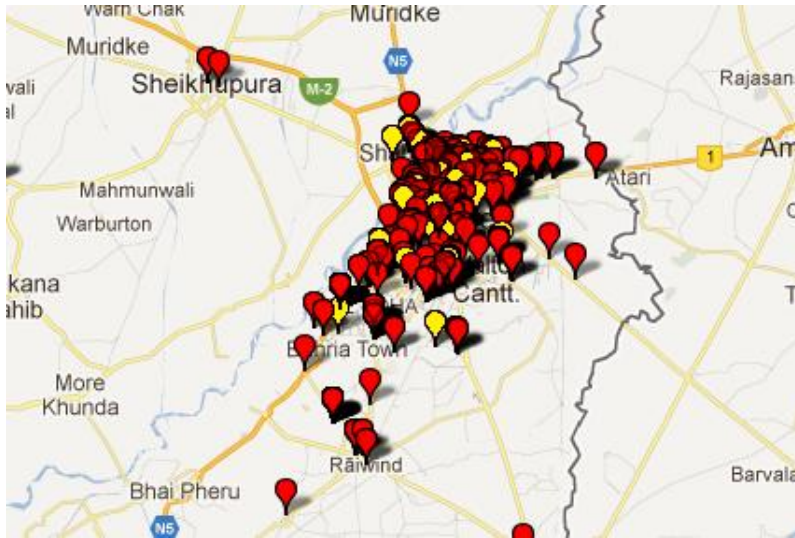


Figure 3: Location of manufacturing firms from Food industry Punjab, Pakistan

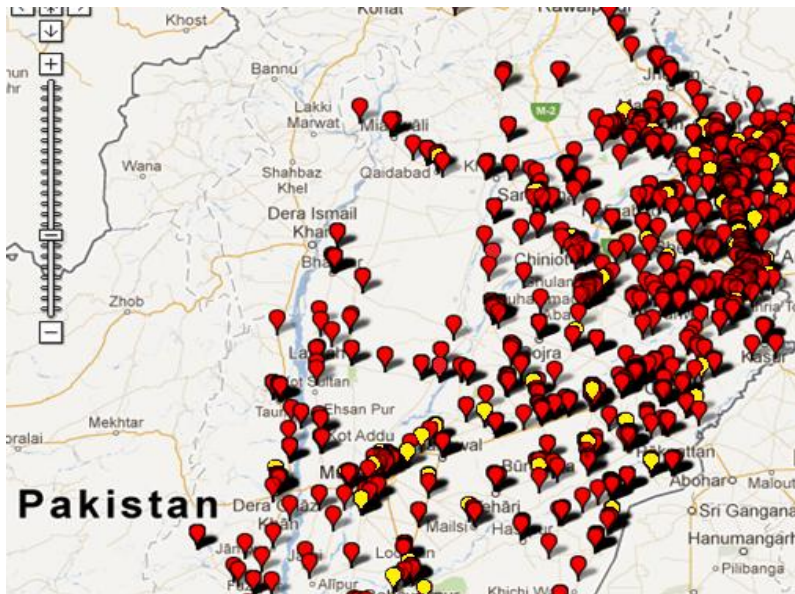


Figure 4: Location of manufacturing firms from Sports industry in Punjab, Pakistan

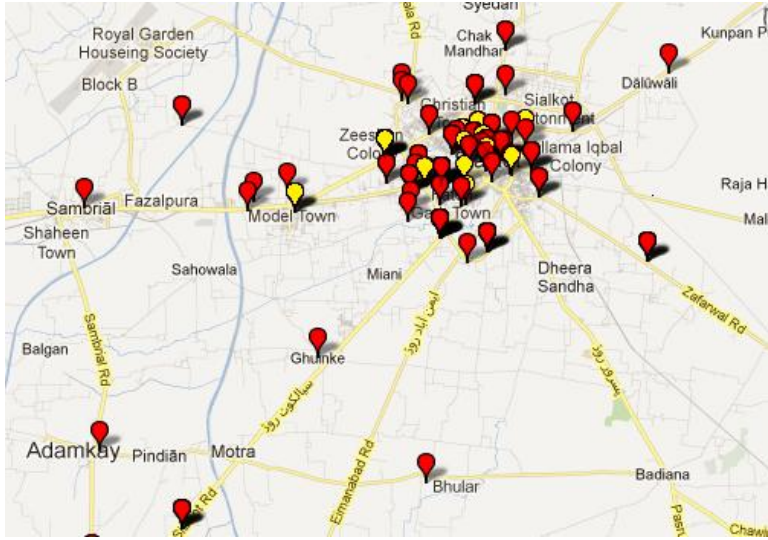


Figure 5: Location of manufacturing firms in Lahore district of Punjab, Pakistan

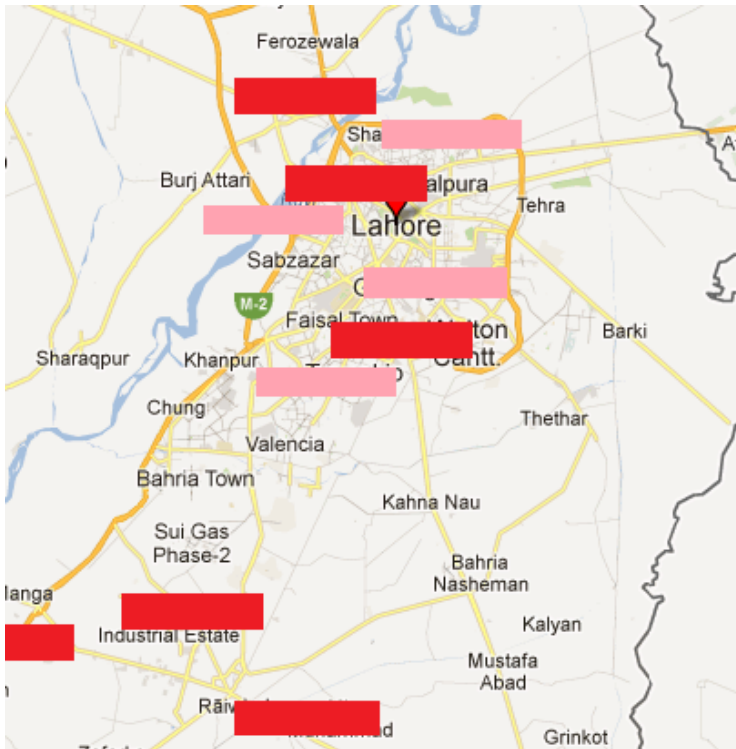
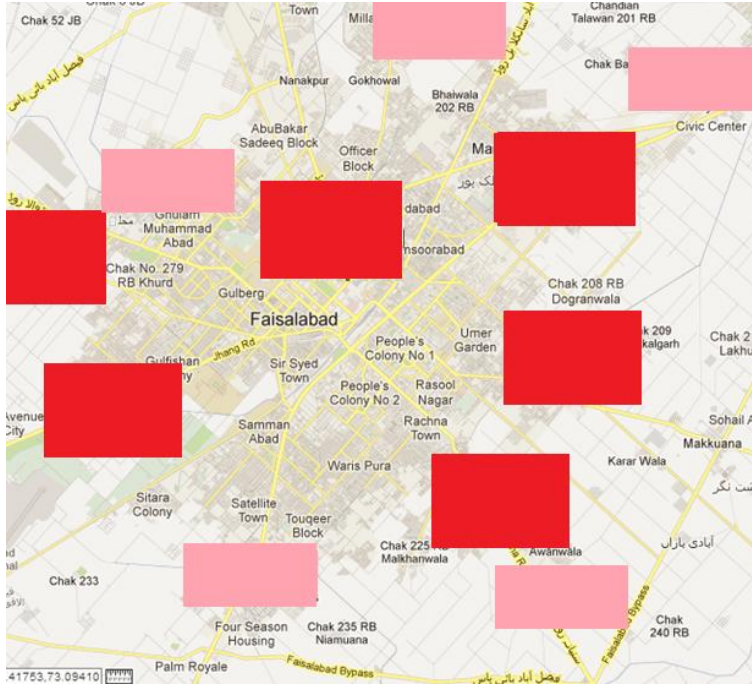


Figure 6: Location of manufacturing firms in Faisalabad district of Punjab, Pakistan



5. Empirical Specification

The study investigates whether industrial agglomeration in a particular district affects formation and scale of operations of new firms in the manufacturing industries in Punjab. In other words, it examines how the birth of new establishment is affected by local environment. Local environment is measured by agglomeration forces (urbanization and localization) and the socio-economic indicators of a district. This study uses the empirical specification of Rosenthal and Strange (2010). The following equations have been empirically estimated by using a Tobit model:

$$\begin{aligned}
 Arrival_{id} = A_{id} = & \beta_0 + \beta_1 localization_{id} + \beta_2 urbanization_d + \\
 & \beta_3 X_d + \beta_4 i + \beta_5 sp + \varepsilon_{a,id}
 \end{aligned} \tag{11}$$

$$Scale\ of\ operation_{id} = E_{id} = \alpha_0 + \alpha_1 localization_{id} + \alpha_2 urbanization_d + \alpha_3 X_d + \alpha_{4i} + \alpha_{5sp} + \varepsilon_{e,id} \quad (12)$$

where ε_b and ε_e are error terms, β_{4i} and α_{4i} are industry fixed effects and X_d are socio-economic factors of a particular district. The equation (11) explains arrival (A_{id}) in industry (i) and district (d) is affected by localization, urbanization and socio-economic characteristics of the district with industry fixed effects and sub-provincial fixed effects. Similarly, equation (12) has the same interpretation with dependent variable taken as scale of operations of arrival (E_{id}).

The first dependant variable, *Arrival*, has been computed using the year of establishment. The firms for which the reporting year of establishment is 2008 are regarded as new entrants. Then aggregating these firms for specific industry and district will give *Arrival* (A_{id}) in industry (i) and district (d). Secondly, to analyze the scale of operations of new establishments, the employment level of new firms has been used.

Urbanization has been measured by the level of employment in the existing establishments within a particular district. This allows us to study how the presence of different kind of industries leads to new firm formation in a specific area. The measure of localization, on the other hand, has been constructed by aggregating employment in each industry for every district and allows us to examine how the presence of the same industry leads to new firm formation in a specific area.

Localization and urbanization are measured at three levels of establishments: small establishments, medium establishments and large establishments. Small establishments are limited to firms with less than 10 workers, medium establishments are restricted to employment

between 10 to 49 workers and large establishments are characterized as employment with 50 or more workers.

In order to account for socio-economic factors (X_d) that have an effect on birth of new establishment, district level controls have been incorporated. These include the average age of population, percent population male, average income, unemployment rate, percent of population with primary education, percent of population with secondary education and the percentage of population with more than secondary education.

Industry and sub-provisional region fixed effects have also been incorporated to account for industry characteristics and region effects that might impact new firm formation in a specific industry and district. Industry fixed effects are incorporated as there are industry specific factors due to which there is more arrival in these industries such as a low barriers to entry. Innovation, technological shift over, new input introduced etc might be the factors which affect entry within a specific industry.

This relationship is tested in several ways such as measuring local conditions in two time periods, incorporating district fixed effects, and by estimating the relationship using sub-sample.

Hypotheses

The relationship between new firm formation and scale of operations of new firms with agglomeration that is to be tested is depicted in the following hypotheses:

Hypothesis 1: Agglomeration through its two forces, localization and urbanization, leads to an increase in the number of firms entering into Punjab's manufacturing sector.

Hypothesis 2: Agglomeration through its two forces, localization and urbanization, increases the scale of operations of new firms in Punjab's manufacturing sector.

The presence of firms belonging to the same industry and the presence of firms from all industries will allow firms to take benefits of agglomeration from each other in the form of knowledge spillovers, input sharing, specialized suppliers; maintenance services which are the benefits that will attract new firms into a particular district. The concentration of firms in a district will attract more new firms i.e. a positive relation exists between the two. Agglomeration also affects the scale of operations of these new entrants in a positive way. Existing studies suggest that agglomeration (measured as localization and urbanization) has a significant impact on arrival and the scale of operations of new entrants. It has also been identified that agglomeration has the strongest impact on arrival in the manufacturing industry relative to services. (Otsuka, 2008; Rosenthal & Strange, 2010; Delgado et al., 2010; Bosma et al., 2006; Figueiredo, O., Guimaraes, P., & Woodward, D, 2009). A model testing such a relationship has not been developed for Pakistan.

6. Results

Table 2 and Table 3 report the marginal effects for the arrival and scale of operations model with same local conditions (independent variables). The coefficients of the local activity measure the effect of adding additional workers to local environment at a given establishment size. The variables have been scaled by million. Estimations have been carried out by analyzing localization and urbanization at an aggregated and a disaggregated level (disaggregation is done by establishment size). The variables of interest have been scaled.

Agglomeration Results for Arrival

Table 2 report the results for the arrival model estimated for the manufacturing industry in Punjab. This model incorporates the local environment in two time periods separately. The first section measures the local conditions in 2006 while the other measures the local conditions in 2004. Three types of estimations have been carried out: the first estimation incorporates localization and urbanization at an aggregated level; the second estimation disaggregates localization into three levels whereas urbanization is incorporated at an aggregated level; the third estimation incorporates localization and urbanization at a disaggregated level.

The aggregated level analysis shows that localization has a positive and significant relation with arrival. The addition of workers to the local environment within a particular industry increases arrival. Adding million workers to a particular industry in a district increases new firms to enter in a particular district within industry by 7 units. However, urbanization at the aggregated level has no significant relation with arrival.

The analysis in which localization is at a disaggregated level and urbanization is at an aggregated level, it can be seen that localization has a positive and significant relation with arrival in the manufacturing industry at small scale. This indicates that adding additional workers to the local environment at small scale has a positive relation with arrival.

Furthermore, the analysis incorporating localization and urbanization at disaggregated levels reveal that localization has a positive relation with arrival at all levels, indicating that the new firms benefit from the presence of employment in the same industry. An increase of million workers in a particular industry at small scale increases new firms to increase by 10300 units. In addition, an increase of million workers at medium and large scale increases new firms by 3570

and 457 respectively. This may be attributed to the externalities arising from labor pooling, knowledge spillovers and input sharing. The relation of localization is greater at small scale as compared to medium and large scale. This relationship also holds for the United States data (Rosenthal and Strange, 2010).

Column 3 show results of the analysis of urbanization taken at the disaggregated level. Urbanization is shown to have a positive and significant relation with arrival at the medium scale. This shows that the new firms enter in an area where employment from different industries is present at the medium scale level, thus, increasing diverse activity at medium scale increases new firms by 1440. However, urbanization at large scale has a negative correlation and while urbanization at small scale has no significant relation. Increasing activity at large scale by million workers decreases new firms by 412 units.

The results indicate that localization at all levels is positive and significant and the magnitude is larger at small scale followed by medium and large scale. Rosenthal & Strange (2010) found that localization has a significant relation at medium scale only. Urbanization has a positive relation with arrival and scale of operation at medium scale in Punjab, Pakistan. However, United States experience positive relation of urbanization at small scale with arrival and scale of operations (Rosenthal & Strange, 2010). The magnitudes are higher for the United States (Rosenthal & Strange, 2010) as compared to Pakistan. The other variables are either insignificant or have the wrong signs.

In addition to localization and urbanization, socio-economic controls at a district level, industry fixed effects and sub-provisional controls have also been incorporated. Socio-economic controls reveal that the average income of population in a district has a significant and positive

relation with arrival. This is consistent with the expectation that the higher income will encourage greater investment and fewer capital constraints. The average age of population has a negative relation with arrival and this might be because risk taking/ entrepreneurial behavior is less commonly observed in the older population. The remaining controls at district level are insignificant.

Sub-provincial region dummies are also incorporated to control for a range of factors that operate at the sub-provincial level and that might impact arrival. Sub-provincial region controls are significant at an aggregated level only and Southern Punjab (1%) and Central Punjab (5%) positively experiences arrival as compared to northern Punjab.

The results continue to hold when the local environment is measured in 2004 as shown in Column 4, 5 and 6 of Table 2. These results indicate that the relationship between agglomeration and arrival is consistent even if values of local conditions are lagged.

Agglomeration Results for Scale of Operations

Table 3 shows the results for the scale of operations model. Localization has a positive and significant relation with scale of operations at an aggregated level showing that an increase in employment by million workers of a particular industry causes the scale of operations of new firms to increase by 202 units. Urbanization has no significant relation with the scale of operations.

Localization disaggregated at the three establishment levels has a positive and significant relation with the scale of operations. Increase in employment of same industry at small, medium and large scale increases scale of operation by 215000, 14900 and 23900 respectively. This

reveals that the scale of operations of new firms increases as the employment of an industry in a district increases. This can be because new firms can benefit from the presence of skilled labour within existing firms. Urbanization continues to have no significant relation. Localization and urbanization at the three establishment scales reveal that localization at the medium and the large scale is associated with the increase in scale of operations, whereas localization at the small scale has no significant relation. The relation of urbanization (at medium scale) with scale of operations indicate that as the employment in medium scale firms in a district increases by million workers, scale of operations of new firms increases by 66700. This shows that a district that is more urbanized (referred as the more the activity or the more the employment in all industries) will witness a higher scale of operations of new firms. Urbanization at large scale is seen to have negative relation with scale of operations. Scale of operation of new firms decreases with increase in employment at large scale in a district.

The estimations have also been carried out by incorporating local activity at 2004 and the results are consistent with those for 2006. The results indicate that localization and urbanization have a positive relation with scale of operations of new firms at the medium and large scale.

The socio-economic characteristics of a district reveal that the average income of a district has a positive relation with the scale of operations of new firms as expected and it has the same result as arrival. The higher the income in a district the higher the scale of operations at which the new firms can operate. The percentage of male population has a negative relation with scale of operations and this relation is not consistent in all estimations. Sub-provincial region controls are significantly present at aggregated level only and southern Punjab (1%) and central Punjab (5%) experience higher scale of operations of arrival as compared to northern Punjab.

Robustness of the Effect of agglomeration on Arrival and Scale of Operations

Table 4 presents the result of a model employing district fixed effects. In these estimations socio-economic and sub-provisional regions controls are dropped. This estimation analyzes the relation of localization with arrival and scale of operations of new firms. The results indicate that localization has a positive and significant relation with arrival and scale of operations of new firms. Localization at all levels has a positive relation with arrival and localization at medium and large scale has a significant relation with the scale of operations. The results are consistent with the earlier findings of this study. This relationship also continues to hold when local conditions are measured for 2004.

The analysis has also been carried out for the sub-sample of data by selecting few industries; the industries selected were exporting industries and the results are presented in table 5 and table 6. The arrival model results shown in Table 5 are consistent with earlier findings except that localization at medium scale no longer has a significant relation. The scale of operations model (Table 6) also shows that localization at small scale is positively significant and localization at medium scale has no significant impact. Urbanization at small scale has a significantly negative relation.

Table 7 presents the robust standard errors and Tobit estimates for arrival and scale of operations by incorporating local condition (agglomeration) in 2006. The results are consistent with the earlier findings of the study. However, the significance of urbanization at medium scale and average age of population has increased.

Table 8 presents the results estimated by OLS by using log-log specification. The results for localization at an aggregated and disaggregated level are same, while urbanization at aggregated

level is negatively and significantly correlated with arrival (which was not significant in previous analysis). Urbanization at small scale is positively correlated with arrival as it was not significant in previous estimations. Urbanization at medium scale is no longer significant.

In order to incorporate the cost of agglomeration, localization square has been included as regressors with other variables as well. The results are presented in table 9 which shows that localization square is negatively correlated with arrival and scale of operations. This shows that as cost of agglomeration increases arrival and scale of operation decreases.

Diversity of industries in a particular area is also incorporated by using Herfindahl Index. The model has been estimated by using OLS and tobit specification. Tobit estimation results indicate that Herfindahl Index has a negative relation with arrival and scale of operation. However, this result is not consistent across different specifications.

Discussion

The concentration of economic activity enhances growth and productivity (Rosenthal & Strange, 2001). According to Sorenson and Audia (2000) new entrepreneurial activity is more likely to take place in areas where agglomeration is present. The study analyzes the impact of local conditions (concentration of firms) of a particular district on formation and scale of operations of new firms.

This paper finds that localization has a positive relation with arrival and scale of operations and this can be due to several reasons. Localization allows new firms to derive the benefits by locating close to similar firms. Knowledge spillovers, input sharing and labor pooling

are often cited as the benefits that accrue as a result of localization. It has been found that the presence of localization at all levels lead to formation of new firms.

The presence of small and medium scale firms of the same industry is likely to allow new firms to derive the benefits of labor pooling and input sharing. The results also indicate that localization at a large scale has a positive relation which can be attributed to the reason that large scale firms generate greater benefits of knowledge spillovers as research and development and innovation are more likely to take place in large scale firms and the new firms can benefit from their research. The new technology present within the large scale firm can also be adopted by the new firms or the new production technique can be used by the new firms.

There are several benefits to the firms from locating in an urbanized area such as the presence of a diverse labor mix (area having firms from different industries is referred to as urbanization). Any geographical area that has a diverse labor force due to the presence of diverse industries allows firms to share ideas, create new products and increases the chances of innovation. It has been found that the presence of employment from the different industries of medium scale within a particular district fosters arrival and scale of operations of new establishments.

The relation between arrival and urbanization at the medium scale can be attributed to the fact that the new firms can initiate contracts at lower cost. The new entrepreneurs can develop contacts with the existing employers at the medium scale while these contacts might be difficult to initiate with the large scale firms. The presence of the medium scale firms allows for a greater opportunity to availing mutually beneficial services such as repair and maintenance.

The presence of the large scale firms have a negative relation with new firms as large scale firms tend to enjoy the benefits of lower costs (through economies of scale) and might thereby be able to erect barriers to entry for new firms. The new firms do not enter in an area where the large scale firms are operating as the new firms have a signal that survival in the presence of large firms is difficult because of the lower cost advantage to large firms. The large firms also have the advantage of internal sourcing.

The findings of this study also reveal average income as an important factor of a district enhancing or promoting the new establishments in an area, since higher income in a district imply that a higher level of resources are available for the new entrepreneurs to start their own businesses. The study included fixed effects in order to control for other factors that might impact the two variables. In order to address the problem of causality the study lagged local conditions.

The findings of this study are consistent with international evidence (Helsley and Strange, 2002; Otsuka, 2008; Bosma et al., 2006; Figueiredo et al,2009; Rosenthal and Strange, 2010). The impact of agglomeration on new establishments and scale of their operations is evident in this empirical analysis of the manufacturing sector. The limitation of the study is that the analysis cannot be performed at a less aggregated level than the district. This is because data on area characteristics is not available for a narrower geographical division.

This research could be performed in the future if data at the town level or city level was available. Another avenue for future research is to evaluate the impact of agglomeration or local conditions for other sectors such as the service industry. Lastly, a distinction could be made between new firms that are set up as independent plants and those that are subsidiary plants.

Table 2: Marginal effects of Tobit estimation; analyzing the impact of agglomeration on Firm Arrival for the manufacturing industry in Punjab

	Arrival					
	2006			2004		
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Localization</u>						
Aggregated Localization	7.0000***			6.9800**		
Localization at Small Scale		15500.0000***	10300.0000**		15500.0000***	10300.0000**
Localization at Medium Scale		3130.0000	3570.0000*		3170.0000	3630.0000*
Localization at Large Scale		198.0000	457.0000*		169.0000	431.0000
<u>Urbanization</u>						
Aggregated Urbanization	311.0000	298.0000		317.0000	304.0000	
Urbanization at Small Scale			-343.0000			-383.0000
Urbanization at Medium Scale			1440.0000*			1480.0000*
Urbanization at Large Scale			-412.0000**			-415.0000**
<u>Socio-economic characteristics of a district</u>						
Average age of pop	-0.0036	-0.0034	-0.0034*	-0.0036	-0.0034	-0.0035*
Percent male pop	-0.0052	-0.0055	-0.0014	-0.0052	-0.0055	-0.0014
Average income	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Unemployment rate	0.0015	0.0013	0.0014	0.0015	0.0013	0.0015
Percent pop with primary edu	-0.0029	-0.0019	-0.0014	-0.0023	-0.0019	-0.0015
Percent pop with secondary edu	0.0011	0.0001	0.0004	0.0010	0.0000	0.0004
Percent pop with higher edu	-0.0013	-0.0007	-0.0015	-0.0013	-0.0008	-0.0015
_CONST	0.2892	0.3027	0.1055	0.2906	0.3020	0.1024
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sub-provincial regions	Yes	Yes	Yes	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 3: Marginal effects of Tobit estimation; analyzing the impact of agglomeration on Scale of Operations for the manufacturing industry in Punjab

	Scale of operations					
	2006			2004		
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Localization</u>						
Aggregated Localization	202.0000***			201.0000***		
Localization at Small Scale		294000.0000*	215000.0000		294000.0000*	215000.0000
Localization at Medium Scale		148000.0000*	14900.0000**		150000.0000*	150000.0000**
Localization at Large Scale		16600.0000*	23900.0000**		15500.0000	22800.0000**
<u>Urbanization</u>						
Aggregated Urbanization	17.2000	16.7000		17.3000	17.0000	
Urbanization at Small Scale			-31700.0000			-33500.0000
Urbanization at Medium Scale			66700.0000**			68600.0000**
Urbanization at Large Scale			-14000.0000**			-14.2000**
<u>Socio-economic characteristics of a district</u>						
Average age of pop	-0.0905	-0.0939	-0.0992	-0.0922	-0.0958	-0.1038
Percent male pop	-0.2514**	-0.2852**	-0.1163	-0.2520**	-0.2852**	-0.1125
Average income	0.0011***	0.0011**	0.0017***	0.0011***	0.0011**	0.0017***
Unemployment rate	0.0140	0.0106	0.0307	0.0143	0.0111	0.0337
Percent pop with prim. educ.	-0.0204	-0.0206	-0.0313	-0.019	-0.0198	-0.0313
Percent pop with sec. educ.	-0.1090	-0.1234	-0.0408	-0.1117	-0.1264	-0.0413
Percent pop with higher educ.	0.0140	0.0214	-0.0364	0.0155	0.0226	-0.0366
_CONST	12.9305**	14.6778**	6.3864	12.9873**	14.6984**	6.2527
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sub-provincial regions	Yes	Yes	Yes	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 4: Marginal effects of Tobit estimation; analyzing the impact of agglomeration on Firm Arrival and Scale of operations for the manufacturing industry in Punjab with District fixed effect.

	Arrival		Scale of operations	
	2006	2004	2006	2004
	(1)	(2)	(3)	(4)
<u>Localization</u>				
Localization at Small Scale	377.0000***	384.0000***	7810.0000	7990.0000
Localization at Medium Scale	109.0000*	114.0000*	4350.0000*	4570.0000*
Localization at Large Scale	19.1000**	18.3000*	1020.000***	984.0000**
_CONST	-.0017***	-.0018***	-.0654***	-.0673***
Industry fixed effects	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 5: Marginal effects of Tobit estimation; analyzing the impact of agglomeration on Firm Arrival for the manufacturing industry in Punjab for the Sub-sample

	Arrival (2006)		
	(1)	(2)	(3)
<u>Localization</u>			
Aggregated Localization	3934.2360**		
Localization at Small Scale		194281.0000*	205158.0000**
Localization at Medium Scale		21437.0000	13521.0000
Localization at Large Scale		3027.0000	3659.0000*
<u>Urbanization</u>			
Aggregated Urbanization	-550.4590	-988.607.0000	
Urbanization at Small Scale			-19384.0000
Urbanization at Medium Scale			14634.0000*
Urbanization at Large Scale			-3571.0000**
<u>Socio-economic characteristics of a district</u>			
Average age of pop	0.0159	0.0109	0.012
Percent male pop	-0.0519	-0.0549	-0.019
Average income	0.0003*	0.0002	0.0029**
Unemployment rate	0.0003*	-0.0092	-0.0000
Percent pop with primary edu	-0.0183	-0.0102	-0.0137
Percent pop with secondary edu	0.0019	-0.0200	0.0076
Percent pop with higher edu	-0.0029	0.0034	-0.015
_CONST	2.4179	2.6402	0.7207
Industry fixed effects	Yes	Yes	Yes
Sub-provincial regions	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 6: Marginal effects of Tobit estimation; analyzing the impact of agglomeration on Scale of operations for the manufacturing industry in Punjab for the Sub-sample

	Scale of operations (2006)		
	(1)	(2)	(3)
<u>Localization</u>			
Aggregated Localization	17898.0000**		
Localization at Small Scale		9430186.0000**	11000000.0000**
Localization at Medium Scale		587514.0000	294886.0000
Localization at Large Scale		150407.0000*	192249.0000**
<u>Urbanization</u>			
Aggregated Urbanization	-5663.0000	-22625.0000	
Urbanization at Small Scale			-1024564.0000*
Urbanization at Medium Scale			768114.0000**
Urbanization at Large Scale			-156929.0000**
<u>Socio-economic characteristics of a district</u>			
Average age of pop	0.7244	0.5131	0.5503
Percent male pop	-2.4475	-2.6465*	-0.9695
Average income	0.0083	0.0059	0.0116*
Unemployment rate	-0.8909*	-0.7101	-0.2402
Percent pop with prim. educ.	-0.5002	-0.1530	-0.4349
Percent pop with sec. educ.	-0.3736	-1.3542	0.1390
Percent pop with higher educ.	0.1732	0.4668	-0.5699
_CONST	112.5439	126.1874	36.6770
Industry fixed effects	Yes	Yes	Yes
Sub-provincial regions	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 7: Tobit estimates; analyzing the impact of agglomeration on Firm's Arrival and Scale of operations for the manufacturing industry in Punjab with Robust standard errors.

	Arrival	Scale of Operations
Localization at Small Scale	2396184.4000** (968294.8000)	54772629.1000 (46300000.0000)
Localization at Medium Scale	833546.8000* (454840.2000)	37781584.6000** (19300000.0000)
Localization at Large Scale	106606.9000* (63727.0100)	6078403.1000** (2811970.0000)
Urbanization at Small Scale	-80001.6000 (262537.0000)	-8061320.8000 (10300000.0000)
Urbanization at Medium Scale	335394.4000* (179750.6000)	16956554.9000*** (6152567.0000)
Urbanization at Large Scale	-96180.3000** (38883.5100)	-3563281.0000** (1571621.0000)
Average age of pop	-0.7930.0000* (0.4679)	-25.2540** (13.7176)
Percent male pop	-0.3370 (0.8647)	-29.5800 (42.0785)
Average income	0.0119*** (0.0035)	0.4320*** (0.1436)
Unemployment rate	0.3290 (0.2489)	7.8300 (11.0516)
Percent pop with primary edu	-0.3490 (0.3058)	-7.9520 (10.9164)
Percent pop with secondary edu	0.0841 (0.7743)	-10.3700 (34.3061)
Percent pop with higher edu	-0.3590 (0.3397)	-9.2520 (11.8454)
_cons	1.3510 (1210.2390)	5.2860*** (2119.4930)

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level. Robust standard errors are in parenthesis.

Table 8: OLS estimates; analyzing the impact of agglomeration on Firm's Arrival and Scale of operations for the manufacturing industry in Punjab.

	Arrival			Scale of operation		
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Localization</u>						
Aggregated Localization	0.0283***			0.1336***		
Localization at Small Scale		0.0553***	0.0509***		0.1815***	0.1760***
Localization at Medium Scale		0.0113*	0.0116*		0.1014***	0.1005***
Localization at Large Scale		0.0116***	0.0133***		0.0539***	0.0557***
<u>Urbanization</u>						
Aggregated Urbanization	-0.0209**	-0.0307***		-0.0453	-0.0962***	0.0252
Urbanization at Small Scale			0.0290 **			0.0096
Urbanization at Medium Scale			-0.0072			-0.1006**
Urbanization at Large Scale			-0.0405***			
<u>Socio-economic characteristics of a district</u>						
Average age of pop	-0.7284***	-0.5290	-0.2356	-3.4380***	-2.5242***	-1.8598*
Percent male pop	-1.8558**	-1.7424	-1.6568**	-10.7848***	-10.6205***	-10.2855***
Average income	0.2670***	0.21174	0.1995**	1.3439***	1.0802***	1.0719***
Unemployment rate	0.023	0.0352	0.0420	-0.0637	-0.0278	-0.0080
Percent pop with primary edu	-0.4105***	-0.3240	-0.2381	-1.4712***	-1.1132**	-0.9011
Percent pop with secondary edu	0.2003	0.0857	-0.0635	0.2556	-0.2222	-0.4748
Percent pop with higher edu	-0.093	-0.0913	-0.0474	-0.0072	0.0238*	0.0673
_CONST	8.9903***	8.3384***	7.0708**	48.6435***	47.1811***	43.3697***
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sub-provincial regions	Yes	Yes	Yes	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 9: Tobit estimates; analyzing the impact of agglomeration and cost of agglomeration (testing for non-linearities) on Firm's Arrival and Scale of operations for the manufacturing industry in Punjab.

	Arrival	Scale of operation
	(1)	(2)
Aggregated Localization	0.0011***	0.0448***
Localization Square	-2.30e-08***	-7.88e-07***
Aggregated Urbanization	-0.00004***	-0.0008
<u>Socio-economic characteristics of a district</u>		
Average age of pop	-1.1624**	-33.8842*
Percent male pop	-0.4756	-48.2693*
Average income	0.0115***	0.3223***
Unemployment rate	0.3133	4.0789
Percent pop with primary edu	-0.7050***	-13.5308
Percent pop with secondary edu	0.9047*	-1.7074
Percent pop with higher edu	-0.2846	2.9647
_CONST	37.8431	2658.437*
Industry fixed effects	Yes	Yes
Sub-provincial regions	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

Table 10: Tobit and OLS estimates; analyzing the impact of agglomeration (using Herfindahl Index for Urbanization) on Firm's Arrival and Scale of operations for the manufacturing industry in Punjab.

	Arrival				Scale of operation			
	OLS	OLS	Tobit estimates	Tobit estimates	OLS	OLS	Tobit estimates	Tobit estimates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Aggregated Localization	0.0226***		0.0002***		0.1141***		0.0095***	
Localization at Small Scale		0.0539***		0.0018*		0.1743***		0.0219
Localization at Medium Scale		0.0054		0.0019***		0.0790***		0.0867***
Localization at Large Scale		0.0089**		0.00003		0.0450***		0.0033
Herfindahl Index	-0.0342	-0.0139	-5.3882**	-3.642	-0.2399***	-0.1503*	-211.2202**	-153.7017
<u>Socio-economic characteristics of a district</u>								
Average age of pop	-0.6875*	-0.4555*	-1.1486**	-0.9716**	-3.519***	-2.418***	-40.5659**	-36.6366**
Percent male pop	-2.2484***	-2.214***	-1.6153**	-1.3793*	-12.184***	-12.46***	-80.1323***	-70.1157**
Average income	0.2403***	0.1812**	0.0093***	0.0081***	1.2842***	0.9867***	0.3136***	0.2878***
Unemployment rate	0.0080	0.0143	0.1834	0.2323	-0.1034	-0.099	0.0166	2.8891
Percent pop with primary edu	-0.3496**	-0.2590*	-0.6354**	-0.4189	-1.2730**	-0.8748*	-15.7728	-10.01
Percent pop with secondary edu	0.1598	0.0518	0.3978	0.0253	0.0909	-0.3701	-10.3423	-18.7692
Percent pop with higher edu	-0.1088	-0.098	-0.2569	-0.2149	-0.1288	-0.0544	1.6403	1.2065
_CONST	10.3281***	9.7980***	103.3388**	85.7035**	54.2847***	53.6122***	4813.82***	4141.717**
Industry fixed effects	NO	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sub-provincial regions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: ***Denotes statistical significance at the 1 % level, **denotes statistical significance at the 5 % level, and * denotes statistical significance at the 10% level.

7. Conclusion

The empirical analysis in the present study looks at the impact of agglomeration on new firm formation and its scale of operations in Punjab, Pakistan. The relationship has been examined in the existing literature by employing data sets from the United States, Japan and the Netherlands. Using the Directory of Industries data of the year 2010 and 2006, this study has attempted to explore how local conditions of an area (measured by localization and urbanization) in 2006 impacts the arrival and scale of operations of arrivals (in 2008) in Punjab. In other words whether new firms locate in an area where the existing activity is geographically concentrated.

The graphical representation of the data indicates that there is agglomeration of firms in specific districts and new firms are more attracted to the districts where the level of agglomeration is higher. The district level analysis is consistent with the findings of the earlier studies done for other countries (Otsuka, 2008; Rosenthal & Strange, 2010; Delgado et al., 2010; Bosma et al., 2006; Figueiredo et al., 2009).

The findings of the study show that the presence of small, medium and large firms in an industry result in new firms of the same industry to enter in that area. Also, new firms are attracted to a district where there is diverse employment (employment in different industries) of medium size firms. Localization (presence of employment from the same industry) at medium and large scale enhances scale of operations. The scale of operations is also observed to be greater for firms that enter into an area which is urbanized i.e. where there is employment of diverse firms. Presence of employment at medium scale (urbanization) also increases scale of operations. The result leads to the conclusion that new firms enter in an agglomerated districts

and that local conditions of a district have a significant impact on new establishments and their scale.

The present study has implications for the field of economic development and public policy. The mechanisms through which entrepreneurial activity can be enhanced have been highlighted in this paper. The results imply that firms are more likely to enter in areas where there is already significant concentration. This has implications for government policy aimed at countering regional disparity and indicates that there might be a need for incentives and grants in order to attract investment in the less developed districts.

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