EFFECTS OF AGGLOMERATION AND TRADE LIBERALIZATION ON FIRM ENTRY AND EXIT

By

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Abstract

The turnover of firms in an industry is affected by both domestic and international factors as has been highlighted by research in industrial organization. This thesis conducts a firm level analysis to see the impact of agglomeration on firm entry and exit in domestic industries, and the impact of trade liberalization on firm entry and exit in export industries in Punjab. The study also illustrates using maps how some industries are present in clusters while others are highly dispersed. The results suggest that higher firm entry and exit takes place in highly agglomerated industries and a real exchange rate depreciation increases firm entry and exit while tariff reduction has no significant impact on firm turnover.

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1. Introduction

The role of new firms as stimulators of economic development has been traditionally highlighted by researchers in industrial organization and some of the more recent research has focused on analyses of the factors that affect the establishment and performance of new firms. New firm entry is associated with employment changes, product and technological innovation and other structural changes in the related industry. Furthermore, the effect on incumbent firms, as they are faced with intensified competition from new arrivals, results in improvements in productivity which would otherwise cause a crowding out of these firms.

This study looks at, firstly, the effect of agglomeration on firm entry and exit in the manufacturing sector for the year 2005-06 and, secondly, the effect of trade liberalization on the entry and exit of new firms in the export manufacturing industries over the past decade i.e. 2001 to 2010. Both analyses have been conducted for the industries present in the Punjab province in Pakistan.

Evidence of industry agglomeration and factors causing geographical concentration of firms in Pakistan was put forward by Burki and Khan (2010). Their analyses showed that industries are concentrated in districts where infrastructure in the form of road density, markets and resources such as a skilled labor force is available. Accordingly, new firms are more likely to locate near similar firms in order to take advantage of positive spillovers of resource sharing or knowledge or technological spillovers. In this study industrial agglomeration as a factor attracting new businesses has been analyzed.

The relationship between trade liberalization and firm turnover is one that has been examined by researchers in order to determine the extent to which the international market and policies influence regional industries and their development. Exchange rate depreciation and tariff reductions both lead to an expansion in the exports of a country, which is due to an increase in output by existing firms or the entry of new firms and it is this latter contribution which has been the focus of this study. However, it is pertinent to note that entry into the exporting sector requires firms to be at least as productive as the incumbent firms in order to survive both local and foreign competition, which could otherwise cause them to exit if they do not deliver efficiently.

Pakistan has experienced currency depreciations in the last decade against both the United States (US) dollar and the common currency of the European Union (EU), the Euro, together with an increase in export volumes. In 2010, Pakistan had nearly 22% and 17% of its exports going to the EU and US respectively, while the remaining share going to forty eight other countries, each receiving a minimal share. As a result only those sectors exporting to the US and EU have been included in the analysis of firm entry and exit. The depreciating currency provides an opportunity to study the effects on firm turnover in the exporting industries present in Punjab.

Also, according to the World Trade Organization, the tariff rates of its member countries have decreased since 2000 as an incentive to boost exports all over the world. Pakistan has also experienced this decline together with an increase in exports to both the US and EU. This study, therefore, aims to take advantage of the reduction in tariffs and its impact on the entry of new firms in export industries over the last decade.

Among the literature on industrial organization in Pakistan, there is presently no study on the entry and exit rates or factors affecting entry and exit of new firms primarily due to the unavailability of detailed data required to carry out the analysis. The entry and exit rate analysis for this study has been done using the Punjab Directory of Industries which is available for the years 2002, 2006 and 2010. This paper also presents some maps that show how some firms locate in clusters while others are highly dispersed. This study thus aims to contribute to the existing literature on industrial organization in Pakistan by looking at the impact of spatial and industrial concentration, currency depreciation and tariff reduction on the entry and exit rates of manufacturing firms in the Punjab province.

The results conform to existing literature that finds that firm entry and firm exit are higher in more agglomerated industries, ceteris paribus. As far as export industries are concerned, a real exchange rate depreciation attracts new firms but also causes weaker firms to exit, however, a reduction in local or international tariffs has no significant impact on firm entry or exit.

The overview of the literature on firm entry as affected by openness to trade and agglomeration is discussed in section two. Section three looks at the theoretical models while section four has the discussion on data, mapping of firms and hypotheses. The econometric model and the discussion of results are presented in sections five and six respectively. The last section concludes the paper.

2. Literature Review

Empirical research has studied factors that can limit or attract the entry of new establishments by conducting analyses at the firm or the plant level, considering manufacturing, retail or non-financial sectors. According to Hopenhayn (1992) firms in the manufacturing sector tend to be replaced by new entrants over five year periods, and there is a similar trend in job turnover. The literature on firm entry differentiates between new entrants, also referred to as greenfield firms, and existing or diversifying firms opening plants in different geographic areas and/or expanding their range of products. The importance of studying entry rates has been highlighted in the literature as being associated with contribution towards regional development. Whether the benefits are direct, in the form of job creation, or indirect, such as improvements in supply conditions, new establishments have been known to stimulate economic development in an economy. New entrants add to resource flows into their industries as suggested by Robert and Thompson (2003), affecting the industry's productivity and also contributing to product and technological innovation. Moreover, these entrants increase competition in the existing market thus affecting output, pricing and non-pricing decisions of firms. However, Fritsch & Mueller (2004) further suggested that these benefits can take as long as eight years to occur.

Agglomeration as a source of entry and exit of new firms was scrutinized by various researchers (Devereux et al., 1999; Dumais et al., 1997; Carlton, 1983; and Rosenthal and Strange 2007, De Silva et al 2011) and their findings suggest that agglomeration has a significant impact on the entry of small firms, low tech firms and survival rates of existing firms. New establishments or new plants are likely to locate where the input suppliers are located or where other similar firms or plants exist. This allows the new establishment to take advantage of

positive externalities in the form of labor pooling or technological or knowledge spillovers. These effects vary across industries as well as geographic areas. A finding regarding manufacturing plants suggested that exit of plants contributed a decline in industry concentration while new plant entry resulted into rise in clustering of firms in the location. This suggests that a region's acquired characteristics rather than the endowed resources are an important part of firm location. Porter (2000) further put forward several reasons to why new businesses are more likely to establish within a cluster rather than a remote area: Lower barriers to entry and exit is one of these reasons; the provision of resources such as assets, skills and inputs are readily available in a cluster therefore entry rates are high in clusters. Similarly, due to a lower requirement of specialized investment, exit rates are also high. The combination of lower entry and exit barriers together with intense competition from incumbent firms in a cluster results into high entry and exit rates of firms in more agglomerated industries. Survival in particular becomes difficult the more agglomerated an industry becomes. Competition from incumbent firms becomes intense as resources become more accessible together with a rise in spillover benefits.

On the contrary, there is also evidence that agglomeration negatively affects new firm entry, as measured by employment share, especially for large firms as they seem to be more fully integrated than small firms. This is suggestive of the fact that new firms are more likely to locate where there is less geographic concentration of similar firms, however, the risk of closure is also more pronounced among these firms.

In order to measure agglomeration, an index was created by Ellison and Glaeser (1997), which uses the Gini coefficient, measuring raw geographical concentration, and the Herfindahl

index of industrial concentration for each industry to determine whether the industry is agglomerated or not. The index requires employment data to calculate the above ratios and usually takes a value between positive one and negative one; a highly agglomerated industry will have a high positive value, while a low or negative value implies a dispersed industry. An index value in the intermediate range depicts a moderately agglomerated industry. This study also uses the Ellison-Glaeser index to measure agglomeration.

The effect of international shocks on the domestic economy of a country has also been the subject of study by many researchers. Shocks studied have included large exchange rate movements, changes in export and import duties, or international trade treaties that have eased trade between the signatories. Empirical evidence shows that trade liberalization can affect growth of exports by changing the entry and exit and production decisions of heterogeneous firms that are major contributors to the export sector of the economy. Trade liberalization here implies the depreciation or devaluation of the home currency making home products relatively cheaper in the international market. Also, another idea of trade liberalization is the reduction in tariffs by importing countries which again influences the price of the final product sold to trading partners. The correlation between trade related variables namely, exchange rate and tariffs, and performance of industries at both the plant and firm level is illustrated by the following studies.

An appreciation of the currency is found to reduce sales and hence survival of existing firms that deter the entry of new firms as argued by Baggs, Beaulieu and Fung (2007). However, the impact on survival is less for firms that are more productive either because of superior technology or an efficient labor force. Domestic currency appreciation gives foreign firms a cost advantage and forces domestic firms or exporters to reduce the price that they charge as a result

of the rise in competition. This fall in price makes it difficult for some firms to maintain their mark-up and as a result compels them to exit the industry. On the other hand a depreciation of the currency tends to increase the number of establishments as well as the scale of production of existing firms as shown by Head and Reis (1997).

In comparison to changes in tariffs, large fluctuations in exchange rates are considered to have greater consequences on firm performance and turnover. Fung (2006) used Taiwanese firm level data to study this phenomenon. By including an exchange rate variable to the firms profit function, the author, analyzed the impact of the Taiwanese currency appreciation on the scale of production of existing firms together with the exit rate in the industry. Intuitively, firm exit would rise as a result of the appreciating currency as the costs of domestic firms would increase and less productive firms would be forced to shut down. The results indicated that the relationship between currency appreciation and firm scale and productivity significantly depends upon the magnitude and direction of output changes and export changes. On the other hand it is also argued that due to the temporary nature of exchange rate change, firms are unlikely to change production activities at all. Most exchange rate analyses is done at the country or industry level, however, Baggs et al. (2007) conducted a firm level analysis looking at twelve year data (1986 to 1997) on Canadian manufacturing firms incorporating exchange rate data with respect to the US dollar. This time frame provided a natural setting as during the first six years the Canadian currency appreciated approximately 30% and then depreciated 30% during the latter six years. The model to test this analysis included regressing three variables, i.e. firm survival, entry and sales, individually, on trade-weighted exchange rate, tariff rates of the two countries

and various control factors. The results suggested a stronger impact of exchange rate on firm survival, entry and sales than tariff changes.

Klien, Schuh and Triest (2000) put forward a similar finding regarding the significant role an appreciation of the currency has on job destruction. They further illustrate that the responsiveness of job flows to changes in real exchange rate is asymmetric meaning while job destruction is affected by exchange rates, job creation is not. Moreover, how sensitive job destruction is to fluctuating exchange rates depends on the extent of the industry's exposure to trade. A contributing factor to this analysis is that workers can be laid off immediately after a firm finds it optimal to do so, but hiring new ones often requires screening and training. As a result of these delays, it may be difficult to identify the response of job creation to exchange rate changes, even if the response does exist.

Exchange rate changes influence the domestic economy by affecting the exports and imports of a country. Dominguez and Tesar (2005) show that these changes are also correlated with other firm and industry characteristics such as firm size, multinational status, sales in international market, international assets, and competitiveness. A favorable exchange rate movement may result into a boom in the export market through either the expansion of production by existing producers or by the entry of new firms or both, depending on the barriers to entry that exist for that industry such as high sunk costs. The decision of whether to enter the export market or not by firms was looked at by Bernard and Wagnor (2001). They concluded that as export entry requires considerable sunk costs, firm entry into export sector is dependent on size and productivity which ultimately determines their level of success. Bernard and Jenson (2004) take up this analysis for the United States export boom from 1987 to 1992. They found that entry for

firms in exporting is costly, even if there are favorable shocks in the international market. Using plant-level data, they found that depreciation in exchange rates and rising foreign income increased exports, and the existence of sunk costs increased contribution by existing exporters as opposed to new ones.

Moving from a discussion of exchange rate influences on firm turnover to a review of the literature on tariff reductions on entry and exit, Head and Reis (1997), discovered that a decrease in home tariff led to an increase in plant closure and a reduction in the scale of production of existing plants of the home country. However, the reduction in foreign country tariffs resulted into an increase in the scale but did not induce entry of firms. After adding controls for exchange rate changes and fixed costs in terms of research and development, the authors found no significant change in the tariff coefficient. Gu, Sawchuk and Whewell (2003) used a panel data set of 81 manufacturing firms for fourteen years to determine the productivity in the form of firm size and firm turnover caused by a reduction in tariffs under the Free Trade Agreement (FTA) between the United States and Canada. The results suggested the exit of less productive firms after tariff reductions, and having no significant impact on the scale of existing firms.

From the above discussion on trade an important conclusion emerges; exchange rate depreciation and tariff reduction are likely to lead to scale expansion causing more firms to join the industry, however, the evidence against tariff reduction is weak. The studies have mostly analyzed the effects of specific tariff reductions in bilateral trade. This study will be looking at the overall reduction in tariff of the major trading partners of Pakistan which has boosted the country's exports.

3. Theoretical Background

The first model discussed in section 3.1 relates agglomeration, through knowledge spillover, to firm entry assuming that all other domestic and foreign factors that influence firm entry are held constant. The second model in section 3.2 relates trade liberalization to firm entry holding domestic effects constant.

3.1. Agglomeration and Firm Entry in Domestic Industries

Marshal (1920) put forward the notion that geographic concentration or clustering of industries enhances learning and the exchange of knowledge between firms**.** These externalities imply that firms similar in nature would prefer to locate near each other to take advantage of these spillovers. A formalized model of this notion was introduced by Soubeyran and Thisse (1998) who looked at knowledge spillovers (technological externality) in districts entailing agglomerated industrial clusters where new firms are attracted. Knowledge spillovers in this model are acquired by the learning-by-doing process where information and ideas are shared amongst workers within a particular geographic boundary which eventually increases their productivity when they work for a firm. An assumption that holds at this point is that labor is immobile between geographic locations, such as districts and, therefore, knowledge spillovers are limited to geographic boundaries or the industrial clusters existing within a particular location. Moreover, the higher the stock of knowledge or spillover effects in a cluster, the more attractive the industrial cluster becomes to new firms.

The model by Soubeyran and Thisse (1998) initiates with a set of locales indicated by *M*, with $x \in M = \{1, \ldots, m\}$, each with a fixed labor supply $\boldsymbol{L_t^x}$ in locale *x* in period *t*, an initial stock of knowledge $\boldsymbol{S_0^x \geq 0}$, and identical continuum of entrepreneurs who can start a new firm, with

capital $\boldsymbol{K_t^x}$ at an interest r_t, and sell homogenous goods in the world at a price p_t. There is infinite number of periods *t = 1, 2…*, and entrepreneurs can set up a firm in a new location in a new period. In order to incorporate Marshallian industrial districts (indicating an agglomerated industrial area), labor accumulates knowledge over time through different social interactions (hence the spillover effect) and firms can take advantage of these spillovers only if they locate in that locale. Lastly it is assumed that $\boldsymbol{\ell'(S_{t-1}^x) < 0}$.

The cost function faced by a firm in locale *x* in period t is given by:

$$\boldsymbol{C_t^x(q_t^x, w_t^x, S_{t-1}^x) = w_t^x \ell(S_{t-1}^x) q_t^x + r_t K(q_t^x)} \quad (3.1.1)$$

Where $\boldsymbol{q_t^x}$ is output, $\boldsymbol{w_t^x}$ is wage, and $\boldsymbol{S_{t-1}^x}$ is sum of past productions. The labor coefficient $\boldsymbol{\ell(S_{t-1}^x)}$ takes into account the skills accumulated by labor through knowledge spillovers over time and the more knowledge spillovers the higher the skills accumulated over time. The capital $\boldsymbol{K(q_t^x)}$ required by a new firm is the same across locales.

The profit of a firm established in locale *x* in period *t* is denoted by:

$$\boldsymbol{\Pi_t^x(q_t^x, w_t^x, S_{t-1}^x) = p_t q_t^x - C_t^x(q_t^x, w_t^x, S_{t-1}^x)} \quad (3.1.2)$$

Firms deciding to enter a new location in period *t*, maximize profit $\boldsymbol{\Pi_t^x}$ with negligible impact on total industry output. The term $\boldsymbol{S_{t-1}^x}$ is the technological externality (knowledge stock) affecting the firms in the locale or industry. By differentiating (3.1.2) with respect to $\boldsymbol{S_{t-1}^x}$ we can see the effect of knowledge on firm profit:

$$\boldsymbol{\frac{\partial \hat{\Pi}_t^x}{\partial S_{t-1}^x} = -w_t^x \hat{q}_t^x \ell'(S_{t-1}^x) > 0} \quad (3.1.3)$$

Equation (3.1.3) above shows that firm profits in a locale increases with the knowledge stock accumulated there.

The following expression indicates positive production by firms:

$$\hat{q}_t^x = (K')^{-1}\{[p_t - w_t^x \ell(S_{t-1}^x)]/r_t]\} \quad (3.1.4)$$

Given w_t^x and S_{t-1}^x, equation (3.1.3) is maximized with respect to q_t^x in order to get:

$$\frac{\partial \pi_t^x}{\partial q_t^x} = P_t - w_t^x \ell(S_{-1}^x) - r_t K'\left(q_t^x\right) \leq 0, \qquad q_t^x \frac{\partial \pi_t^x}{\partial q_t^x} = 0, \qquad q_t^x \geq 0 \quad (3.1.5)$$

with the second-order condition partially satisfied. Let $\hat{q}_t^x$ be the unique solution to (3.1.5). The following expression indicates positive production by firms:

Combining (3.1.5) with (3.1.2) gives the value function:

$$\widehat{\Pi}_t^x = \Pi_t^x[\hat{q}_t^x(w_t^x, S_{t-1}^x, r_t, p_t), w_t^x, S_{t-1}^x] = \widehat{\Pi}_t^x(w_t^x, S_{t-1}^x, r_t, p_t). \quad (3.1.6)$$

Which can be further summarized as: $\widehat{\Pi}_t^x = r_t \lambda(\hat{q}_t^x)$, (3.1.7)

(3.1.7) gives the maximum profits that a firm can make when it locates in a locale *x*, and will assist in determining the equilibrium distribution of firms across locales.

In the short-run equilibrium of the model, there are no firms located at *t=0*, and initial knowledge stock is $S_0^x \geq 0$. To maximize profits, firms set up in locale *x* in *t=1*. Firms are attracted to the locales where knowledge stock is the highest indicating a more productive labor force. In equilibrium, profits are equal between locales. Given full employment the number of firms (n_t^x) in locale *x* is indicated by:

$$n_t^x = L^x / \hat{q}_t^x \ell(S_{t-1}^x) \quad (3.1.8)$$

The condition that profits are equal between locales together with equation (3.1.8) imply that $r_t\lambda(\hat{q}_t^x) = r_t\lambda(\hat{q}_t^y)$ with $x,y \in I_t$ (where I_t represents the locales where firms establish). This shows that output of firms in equilibrium is the same across locales. Equilibrium output is denoted by:

$$\hat{q}_t(I_t) = \sum_{x \in M} L^x v(S_{t-1}^x) \qquad \text{(where } v \text{ is sictly increasing)} \quad (3.1.9)$$

Combining (3.1.9) and (3.1.8) gives the equilibrium distribution of firms:

$$n_t^x(I_t) = \frac{L^x v(S_{t-1}^x)}{\sum_{y \in I_t} L^y v(S_{t-1}^y)}, \qquad x \in I_t \quad (3.1.10)$$

Interpretation of equation (3.1.10) is important as it shows that the higher the labor (*L*) or the higher the knowledge spillover (*S*) in locale I_t, the higher the number of new firms (*n*) that will set up there.

3.2. Trade liberalization and Firm Entry in Export Industries

Krugman (1979) developed a model of the effects of trade liberalization on the scale and productivity of firms, and subsequently researchers (Melitz, 2003; Fung, 2006; and Baggs, et al., 2007) presented variations of this model to enhance their analysis, particularly the inclusion of an exchange rate variable to incorporate the effects of international trade on the domestic industries. In these models labor is the only factor of production assumed and the result of an appreciation of the domestic currency is the cost advantage accruing to foreign firms in terms of domestic currency. This leads to a rise in competition faced by domestic firms in the local and

international markets forcing them to decrease the price they can charge. This increase in competition and fall in prices charged will lead to the exit of some firms. Accordingly, a currency depreciation has the opposite effect and results into entry in the industry by new firms due to the advantage they have over foreign firms.

A brief overview of the mathematical specification of the model as adopted by Fung (2006) starts with the expenditure function given below:

$$ln\,E(p,u) = ln\,u + \sum_{i=1}^{\tilde{n}} \alpha_i lnP_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij} lnP_i lnP_j \qquad \text{with } \gamma_{ij=}\gamma_{ji}\,, \qquad (3.2.1)$$

Where ñ represents the sum of local and foreign varieties and *P* is the price charged by firm *i*. The demand function derived is represented by $C_i = s_i E/P_i$ with *E* representing total expenditure and s_i is the share of expenditure of firm *i* denoted by:

$$s_i = \frac{P_i C_i}{E} = \frac{\partial lnE(P,u)}{\partial lnP_i} = \alpha_i + \sum_j \gamma_{ij} lnP_j \qquad (3.2.2)$$

The use of a symmetric expenditure function in translog form to derive the demand curve leads to a varying mark-up and scale of production of the firms. This is different form the initial model set up by Krugman (1979) where the assumption of constant elasticity of scale held caused the elasticity and the scale of production to be constant i.e. being unaffected by exogenous shocks.

Further assumptions regarding the expenditure function are that it is homogenous of degree one, thus $\sum_i \alpha_i = 1$ and $\sum \gamma_{ij} = \sum \gamma_{ji} = 0$ and the price elasticity of demand, which is positive, is represented by:

$$\varepsilon_i = 1 - \frac{\partial ln\, s_i}{\partial ln P_i} = 1 - \frac{\gamma_{ii}}{s_i} \qquad (3.2.3)$$

With $\gamma_{ii} < 0$ for demand to be elastic. The assumption of symmetry is imposed on foreign (*f*) and domestic (*d*) goods indicated by: $P_{id} = P_d$, $C_{id} = C_d$ and $P_{if} = P_f$, $C_{if} = C_f$. Given this assumption the following restrictions will be applied:

$$\alpha_i = \frac{1}{\tilde{n}}, \gamma_{ii} = -\frac{\gamma}{\tilde{n}}, and\ \gamma_{ij} = \frac{\gamma}{\tilde{n}(\tilde{n}-1)} \qquad \text{for } j \neq i, \qquad \text{where } \gamma > 0 \qquad (3.2.4)$$

Therefore, the demand elasticities (ε_i) are:

$$\varepsilon_d = 1 + \frac{\gamma}{\tilde{n}s_d} = 1 + \gamma\left[1 - \frac{n_f\gamma}{(\tilde{n}-1)}\left(ln\, P_d - lnP_f\right)\right]^{-1}$$
$$\varepsilon_f = 1 + \frac{\gamma}{\tilde{n}s_f} = 1 + \gamma\left[1 - \frac{n_d\gamma}{(\tilde{n}-1)}\left(ln\, P_d - lnP_f\right)\right]^{-1} \qquad (3.2.5)$$

Interpretation of equations (3.2.5) above is necessary as they show the relationship between the elasticities and the price of the good relative to competing goods. According to the equations this is a positive relationship implying that an increase in price of an imported or foreign good (*f*) will lead to a reduction in competition faced by domestic firms, resulting into a lower elasticity of demand for the local firms (ε_d) and higher elasticity for foreign firms (ε_f). This will eventually increase the domestic firms mark-up on cost or profits and attract new entry in the profit making industry.

On the supply side, given *n* as the firms producing in a monopolistically competitive industry, the total production of firm *i* is represented by: $(X_i + X_i^*)$ i.e. the sum of domestic sales and exports. The cost of the only input labor is defined as: $l_i = \alpha + \alpha_x + \beta(X_i + X_i^*)$, where α

is fixed cost, α_i is the fixed cost of exports and β is marginal cost. Given this cost information, the profit function of the exporting firm is:

$$\pi_i(X_i, X_i^*) = P_i X_i + eP_i^* X_i^* - w[\alpha + \alpha_x + \beta(X_i + X_i^*)] \quad (3.2.6)$$

In equation (3.2.6), *e* represents the exchange rate i.e. amount of domestic currency per unit of foreign currency, *w* is wage, while P_i^* is price in foreign currency of firm *i*'s exports.

In this partial equilibrium model the number of domestic firms (n_d) is endogenous, keeping all other factors constant, and the equilibrium quantity of domestic sales and exports are:

$$X_i = X_d = C_d = s_d \frac{wL}{P_d} = \frac{\gamma L}{\tilde{n}\varepsilon_d \beta} \quad (3.2.7)$$

$$X_i^* = X_d^* = C_d^* = s_d^* \frac{W^* L^*}{P_d^*} = \frac{\gamma^* w^* L^* e}{\tilde{n}\varepsilon_d^* \beta w} \quad (3.2.8)$$

L and L^* in the (3.2.7) and (3.2.8) are the units of domestic and foreign labor respectively, with additional assumptions that $wL = E$ and $w^*L^* = E^*$. Given the above model and the related assumptions, it is concluded that in case of currency depreciation (increase in *e*) the domestic firms will have a cost advantage over foreign firms which in turn would increase the number of domestic (n_d) and total number of firms ($\tilde{n}$) in the industry. From equation (3.2.8) we can see that the effect of a rise in *e* is the expansion in exports i.e. an increase in X^*.

$$\tilde{n} = \frac{\gamma^* e P_d^*}{\varepsilon_d^* \beta w s_d^*} \quad (3.2.9)$$

Equation (3.2.9) solves for the number of firms $\tilde{n}$ which establishes that a rise in *e* (depreciation) results into an increase in the total number of firms in the industry.

4. Data

This study uses the Directory of Industries compiled by the Punjab Government which is available for the years 2002, 2006 and 2010. On average there are approximately 18,000 manufacturing firms included in the Directory. The Directory further includes the names and addresses of all the firms in nearly 180 industries (2-digit) in Punjab. Other information that exists includes the year of establishment of the firms, employment, and initial investment. Table A4 in the Appendix shows the total number of firms in each industry in 2002 and 2006. For almost all the industries the number of firms has either increased or decreased indicating volatility in firm turnover.

Employment information from the directory has been used to calculate the agglomeration index and determine firm size while initial investment has been used as a control factor to proxy for sunk cost.

Industry and firm descriptive statistics are presented in Table 4.1. There were 180 (2-digit) industries with 18007 firms present in Punjab in 2006. On average the firms were operating for 17 years employing around 48 workers. From 2002 to 2006 the mean firm entry rate in the industries was 10% while the exit rate was 25%. In terms of agglomeration, on average industries were more agglomerated as indicated by a positive Ellison-Glaeser index value. Output growth has been high for the industries over the five year period with initial investment amount of approximately Rs. 40 million undertaken on average (with median value of $2,648, 000) by the firms.

Table 4.1 Descriptive Statistics 2006 - All Industries

Number of Industries	180
Number of Firms	18007
Mean Firm Age	17
Mean Number of Employees	48
Mean Industry Entry Rate	0.10
Mean Industry Exit Rate	0.25
Mean Industry EG index (2002)	0.1554
Mean Industry Output Growth	86%
Mean Initial Investment (Rs. 000)	40,892

For the trade liberalization analysis, annual exchange rate data by the Federal Bureau of Statistics and tariff rates data made available by the World Trade Organization (WTO) were used. The WTO provides tariff averages of its member countries for a large range of goods for multiple years. These were used to calculate tariff changes in order to assess their impact on the entry and exit rates of new firms. The exchange rate data was used to construct the trade weighted real exchange rate. Twenty-five industries in Punjab exporting to the United States and European Union were included in the export analysis.

Table 4.2 Descriptive Statistics - Export Industries

	2001 -2005	**2006-2010**
Number of Export Industries	25	25
Number of Firms	11620	7600
Mean Firm Age	18	21
Mean Number of Employees	67	69
Mean Industry Entry Rate	0.105	0.029
Mean Industry Exit Rate	0.41	0.1
Mean Industry Concentration (Herfindahl index)	0.1365	0.0628
Mean Industry Output Growth	25%	46%
Mean Initial Investment (Rs. 000)	137,403	150,415
Mean Pakistan Tariff Change	-7.187	0.164
Mean EU Tariff Change	-0.328	0.007
Mean US Tariff Change	-0.596	-0.131
Mean Trade Weighted Real Exchange Rate	0.012	0.0153

Table 4.2 presents descriptive statistics for the industries exporting to US and EU. The average entry rate and exit rate in the export industries was higher between the first five year period as compared to the second five year period. Industrial concentration fell indicating that the export firms faced higher competition from incumbent firms in the latter half of the decade. Tariff reduction was observed between 2001 to 2005, however, from 2006 to 2010 the rates increased on average for industries exporting to the EU. The trade weighted real exchange rate appreciated slightly from 2006 to 2010.

Table 4.3 lists top 20 industries in Punjab in descending order of entry, while Table 4.4 lists top 20 industries in descending order of exit, and lastly Table 4.5 shows concentration as measured by the Ellison-Glaeser index of agglomeration.

Table 4.3 Top 20 industries with highest entry rates in Punjab for 2006

	Industry	Entry Rate*
1	Gypsum Industry	0.93
2	Mineral Water	0.55
3	Fire Fighting Equipment	0.50
4	Motor Cycle / Rickshaw	0.50
5	Radio / Tv	0.50
6	Welding Electrodes	0.50
7	Zip	0.50
8	Knitted Textile	0.45
9	Embroidery	0.43
10	Cone Factory	0.43
11	Doubling Of Yarn	0.41
12	Powder Coating	0.33
13	Pesticides & Insecticides	0.32
14	Citrus Grading	0.29
15	Fruit Juices	0.29
16	Ready Made Garments	0.28
17	Gas Appliances	0.28
18	Textile Made Ups	0.28
19	Ceramics	0.28
20	Fertilizer	0.27

*NOTE: Entry Rate in Industry *i* = Number of new firms in industry *i* in 2006 that did not exist in 2002 divided by the total number of firms in industry i in 2006

Table 4.4 Top 20 industries with highest exit rates in Punjab for 2006

	Industry	Exit Rate*
1	Bus Body	0.99
2	Nut & Bolt	0.97
3	Spices Factory	0.95
4	Electroplating	0.89
5	Electric Furnace	0.88
6	Bakery Products	0.85
7	Photographic Goods	0.83
8	Razors/ Safety Razors/ Blades	0.83
9	Dies & Blocks	0.80
10	Knitted Textile	0.79
11	Ice Cream	0.79
12	Zinc Sulphate	0.75
13	Bicycle	0.75
14	Hand Tools	0.67
15	Bulbs And Tubes	0.67
16	Refinery	0.67
17	Unani Medicines	0.67
18	Weight And Scales	0.66
19	Agricultural Implements	0.64
20	Pins/Clips	0.60

*NOTE: Exit Rate in Industry *i* = Number of firms in industry i in 2002 that did not exist in 2006, divided by the total number of firms in industry *i* in 2002

Table 4.5 Top 20 most agglomerated industries in Punjab for 2006

	Industry	E-G Index*
1	Electroplating	1.5948
2	Citrus Grading	1.1967
3	Wool Scouring	1.1652
4	Powder Coating	1.1072
5	Musical Instruments	1.0586
6	Weight And Scales	1.0529
7	Sports Goods	1.0333
8	Leather Garments	0.9820
9	Surgical Instruments	0.9380
10	Utensils (All Sorts)	0.9254
11	Belt	0.9214
12	Canvas Shoes	0.8583
13	Raising Cloth	0.8529
14	Cutlery	0.8209
15	Fibre Tops	0.8169
16	Polyester Yarn	0.8091
17	Crown Corks	0.7284
18	Fibre Glass	0.7151
19	Sanitary Fitting	0.7131
20	Machine Tools	0.7128

*Note: Ellison Glaeser Index in 2002 measured using employment data

4.1. Clustering and Dispersion of Firms in Punjab: An Aerial View

The notion that new firm location is likely to take place near or around similar firms, thus leading to the formation of industrial clusters can be illustrated using maps. These maps were created using firm addresses from the Directory of Industries data for the year 2010 and represent the first time such a mapping exercise has been done. In Punjab there are many industrial clusters that have formed in specific areas making it easier for incumbent as well as new firms to have access to necessary resources and technology. On the other hand, there also exist industries that are completely dispersed and hence do not comply with the spatial

concentration hypothesis highlighted in literature. Below are examples of a few industries that are present in clusters as they require more specialized inputs, and other industries that are highly dispersed in Punjab.

4.1.1. Examples of Clustered Industries

Figure 4.1. Rubber Industry

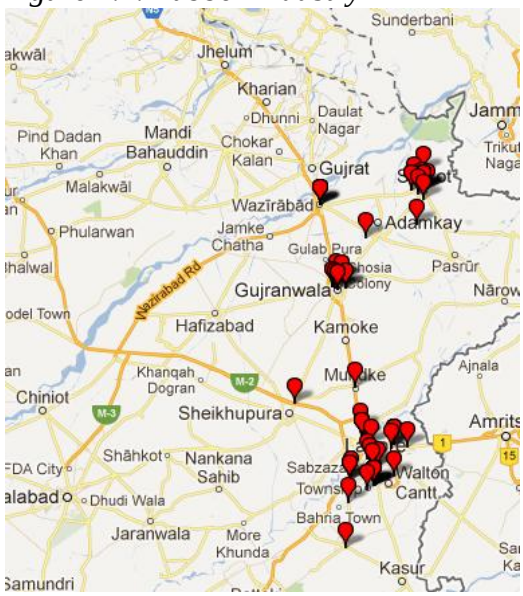


Figure 4.2.Surgical Instruments Industry

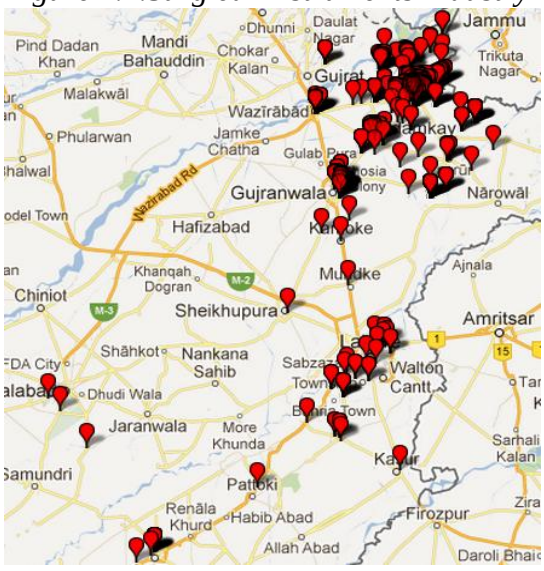


Figure 4.3. Sports Industry

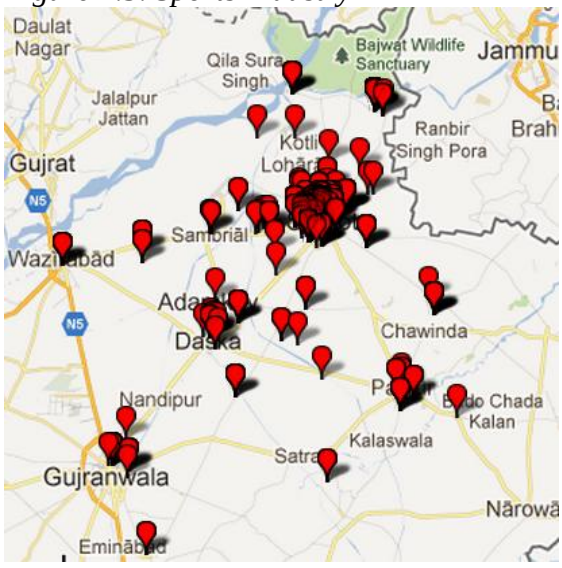
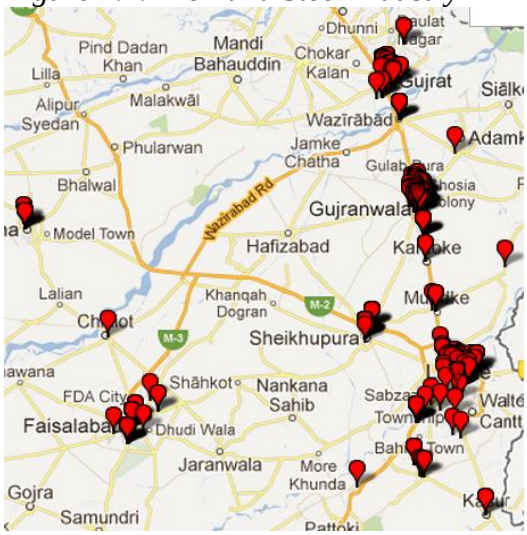


Figure 4.4. Iron and Steel Industry



4.1.2. Examples of Dispersed Industries

Figure 4.5. Sugar Industry

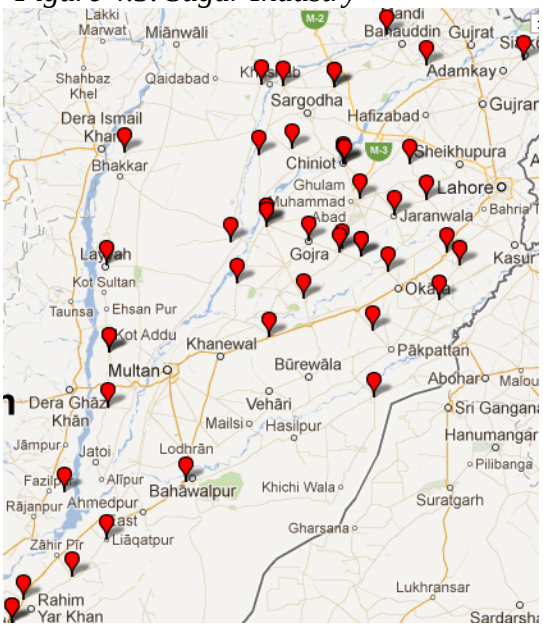


Figure 4.6. Cement Industry

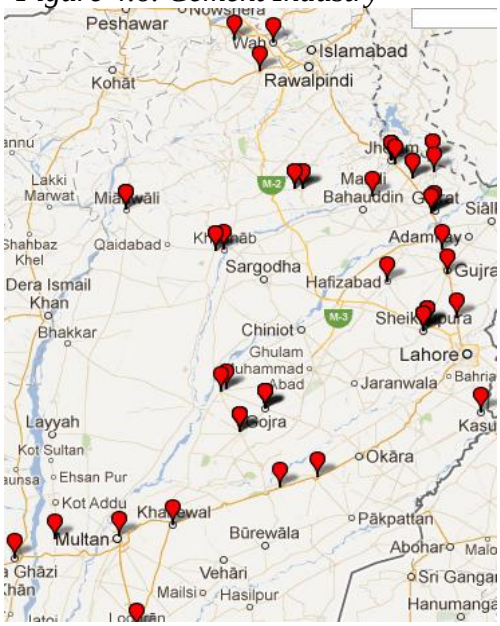


Figure 4.7. Cotton Industry

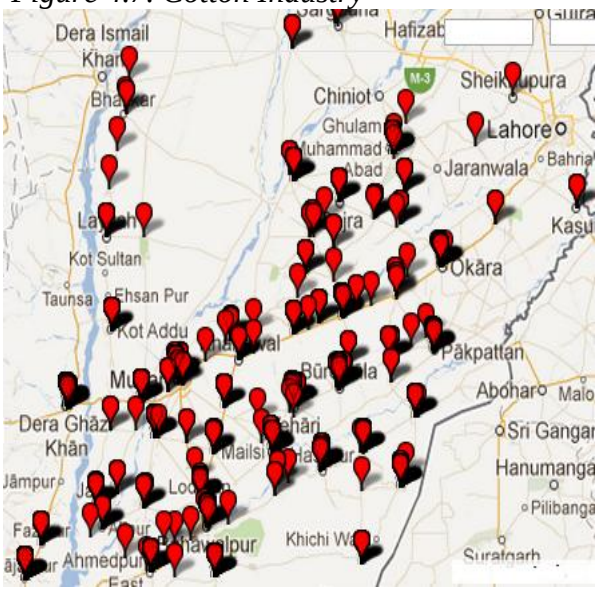
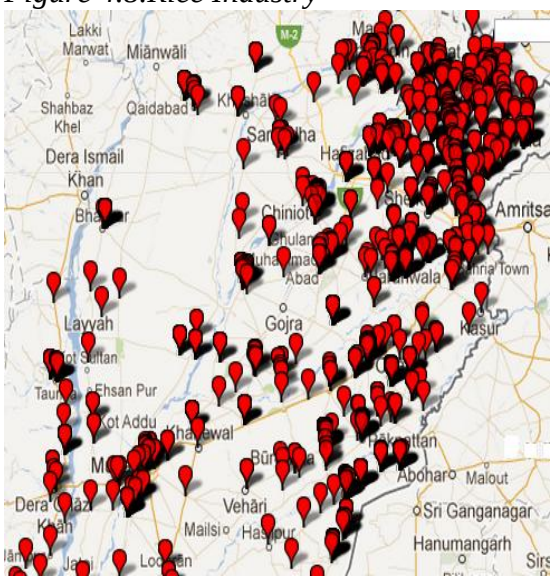


Figure 4.8.Rice Industry



5. Econometric Model

The econometric models together with the estimation techniques have been discussed in this section. The two separate models are designed to see the impact of, firstly, agglomeration on firm entry and exit and, secondly, trade liberalization on firm entry and exit while controlling for other industry level factors that affect entry and exit. Table 5.1 in this section presents all the variables with their definitions as well as their hypothesized signs.

5.1. Agglomeration, Firm Entry and Exit

Various estimation models of firm turnover and agglomeration have been used by researchers (Devereux et al., 1999; Dumais et al., 1997; and Carlton, 1983), and the following is an adaption of the previous models where both entry of new firms and exit of existing firms is estimated against the agglomeration index, while controlling for other factors that affect firm entry and exit. This cross-sectional analysis includes all the 180 industries in Punjab for the year 2005-06. The equations are as follows:

$$Entry_i = E_i = \frac{N_i}{I_i} = \beta_0 + \beta_1 E\text{-}Gindex_i + \beta_2 X_i + \varepsilon_i \qquad (5.1.1)$$

E_i: Entry Rate in Industry i = Number of new firms in industry i in 2006 that did not exist in 2002 (N_i) divided by the total number of firms in industry i in 2006 (I_i)
E-G index: Ellison-Glaeser Index of Agglomeration for Industry i in 2002
X: Vector of control variables: firm size, firm age, sunk cost, output growth

To measure the entry rate of new firms, the datasets of two years were compared i.e. firms that existed in the 2006 dataset but were not present in the 2002 dataset were considered as new entrants. The subscript i refers to the 180 industries present in the manufacturing industry in Punjab.

$$Exit_i = Z_i = \frac{Mi}{F_i} = \beta_0 + \beta_1 E\text{-}Gindex_i + \beta_2 X_i + \varepsilon_i \quad (5.1.2)$$

Z_i: Exit Rate in Industry i = Number of firms in industry i in 2002 that did not exist in 2006 (Mi) divided by the total number of firms in industry i in 2002 (Fi)
E-G index: Ellison-Glaeser Index of Agglomeration for Industry i in 2002
X: Vector of control variables: firm size, firm age, sunk cost, output growth

Exit of the firms in the industry is determined by comparing the 2002 and 2006 datasets, firms present in 2002 but not in 2006 are considered to have exited the industry. The exit rate is thus the firms that have exited as a proportion of the total firms in the industry in 2002.

The vector of control variables, for both regression equations above, includes other industry factors that impact entry and exit of firms. These are average firm size in the industry, firm age, sunk cost or initial investment by the firm and output growth of the industry. Employment data was used to measure firm size while year of establishment was used to determine a firm's age. The output growth variable measures the change in output of the industry from 2002 to 2006.

In order to measure agglomeration, the Ellison & Glaeser index (*E-Gindex*) was used which takes a value between positive and negative one. The higher the value of the index the more concentrated the industry is likely to be. The index is given below for an industry *i:*

$$E\text{-}Gindex_i = \gamma_i = \frac{G - \left(1 - \sum_j X_j^2\right) H_i}{\left(1 - \sum_j X_j^2\right)(1 - H_i)} \quad (5.1.3)$$

G = Gini coefficient i.e. $\sum_j (S_{ij} - X_j)^2$
X_j = share of districts j total employment in the Punjab employment
S_{ij} = share of district j employment in industry i in Punjab's employment of industry i.
H_i = Herfindahl Index of industry i: $\sum_k Z_k^2$
Z_k = k^{th} firm's share on industry's employment.

The Gini coefficient (G) and the Herfindahl index (H) on their own are useful measures to study. The Gini coefficient is used as a measure of income inequality across a population while

in the *E-G*index (γ) it is a representative of raw geographic concentration. From the above equation we can see that it has a positive impact on agglomeration i.e. a rise in *G* will lead to a rise in γ. Intuitively this means that the more firms in a location, the more agglomerated an industry is likely to be. The Herfindahl index is a measure of industry concentration and is also a rough indicator of the market structure the industry belongs to. It is negatively related to the agglomeration index according to the above specification, implying that a high value of *H* is obtained when there are few firms in the industry and will thus result into lower agglomeration, conversely a low value of *H* will be associated with a large number of firms in the industry with more agglomeration.

The Ordinary Least Squares estimation technique (robust regression) was used to calculate the regression coefficients for both the entry and exit analysis.

5.2. Trade Liberalization, Firm Entry & Exit

The model for trade liberalization has been adopted from Baggs et al. (2007), where entry and exit of firms was regressed against the real exchange rates of the two major trade partners of Pakistan namely the US and the EU, together with the tariff rates of the three regions under analysis. The model specification is given below:

$$Entry_{it} = E_{it} = \frac{N_{it}}{I_{it}} = \beta_0 + \beta_1 ER_{it} + \beta_2 \Delta tariff_{it}^{PK} + \beta_3 \Delta tariff_{it}^{US} + \beta_4 \Delta tariff_{it}^{EU} + \beta_5 X_{it} + \tau_t + I_i + \varepsilon_{it} \quad (5.2.1)$$

E_{it}: Number of new firms in industry *i* in year *t* (N_{it}) divided by the total number of firms in industry *i* in year *t* (I_{it})
ER_{it}: Industry-specific trade-weighted real exchange rate
$\Delta tariff_{it}$: Changes in Pakistan, US and EU tariff rates at the industry level
X: Vector of control factors: firm age, firm size, sunk cost, output growth, and concentration index
τ_t: Time fixed effect
I_i: Industry fixed effects

The variable measuring entry is measured for twenty-five export industries and for two time periods i.e. *t=1* represents the years 2002 to 2005 while *t=2* represents the years 2006 to 2010. The year of establishment is used as an indicator of the firm being a new establishment in the industry. Thus the entry rate of industry *i* in year *t* is the number of entrants in *t* as a fraction of the total number of firms in the industry for that time period.

$$Exit_{it} = Z_{it} = \frac{M_{it}}{F_{it}} = \beta_0 + \beta_1 ER_{it} + \beta_2 \Delta tariff_{it}^{PK} + \beta_3 \Delta tariff_{it}^{US} + \beta_4 \Delta tariff_{it}^{EU} + \beta_5 X_{it} + \tau_t + I_i + \varepsilon_{it} \quad (5.2.2)$$

Z_{it}: Exit Rate in Industry *i* = Number of firms in industry *i* in year *t* that did not exist in *t+1* (*Mi*) divided by the total number of firms in industry *i* in year *t* (*Fi*)
ER_{it}: Industry-specific trade-weighted real exchange rate
$\Delta tariff_{it}$: Changes in Pakistan, US and EU tariff rates at the industry level
X: Vector of control factors: firm age, firm size, sunk cost, output growth, and concentration index.
τ: Time fixed effect
I_i: Industry fixed effects

The exit variable is also measured for two time periods i.e. *t=1* and *t=2*. The firms that are present in year *t* but were not present in *t+1* as a fraction of the total number of firms in industry *i* in year *t* gives us the exit rate.

The trade weighted real exchange rate variable[1] (*ER*) is constructed using the equation:

$$ExchangeRate_{it} = ER_{it} = \sum_{j \in top2} TW_{ij} rer_{jt} \quad (5.2.3)$$

where *i* represents industry, *j* represents the top two trading partners of the industry (US and EU in the case of Pakistan), and *t* represents time period. TW_{ij} or trade weight is estimated by taking the share of the industry's export and import with the trading partners as a proportion of the total

[1] See Appendix: Baggs,J., Beaulieu,E. & Fung,L. (2007) Firm Survival, Performance, and the Exchange Rate, *Canadian Journal of Economics*,42 (2), 393-421.

exports and imports of all the manufacturing industries exposed to trade with the top two trading countries. The equation for the trade weight is shown below:

$$TW_{ij} = \frac{(X+M)_{ij}}{\sum_{j \in top\ 2_i} \sum (X+M)_{ij}} \qquad (5.2.4)$$

where *(X+M)* is the sum of exports and imports for the two time periods.

The other term rer_{jt} refers to the real exchange rate in terms of the two trading countries, which is normalized for each country using 2000 as the base year[2].

Tariff rates, which have been made available by the World Trade Organization for its member countries for all years between 2002 and 2010 for each industry in the analysis, are used. The rates are available for a large range of goods for multiple years, and for the purpose of this study the rates pertaining to the twenty-five export industries for the last decade have been used to construct the $\Delta tariff_{it}$ variable which can be expressed as follows:

$$\Delta tariff_{i1} = tariff_{i2006} - tariff_{i2002} \qquad \text{for t=1} \quad \text{and} \qquad (5.2.5)$$

$$\Delta tariff_{i2} = tariff_{i2010} - tariff_{i2006} \qquad \text{for t=2.} \qquad (5.2.6)$$

where $tariff_i$ is the simple average rate for the different product categories provided by the WTO.

Furthermore, it is necessary to control for other factors that affect the entry and exit of firms in an industry in order to avoid omitted variable bias. Initial investment will be used as a proxy

[2] This is done to avoid the unit problem which occurs when bilateral exchange rates have different units.

for sunk cost. Other control variables include industry concentration (herfindahl index), averages of firm size, age, and output growth in the industry.

This panel analysis pertains to the years 2002 to 2010 for twenty five industries exporting to the US and EU. The Ordinary Least Squares estimation technique was used while accounting for time and industry fixed effects. Time fixed effects were observed to account for time-variant factors such as government policies. Similarly industry fixed effects were observed to take into account the individual differences in the industries e.g. nature of product being produced.

5.3. Hypotheses

Given the above discussion on entry and exit of new firms, the following hypothesis have been tested under this study

Hypothesis 1: Firm entry (E_i) and exit (Z_i) are positively affected by agglomeration ($E\text{-}Gindex_i$) ceteris paribus

The rational behind the above hypothesis is that similar firms tend to locate in similar locations in order to take advantage of the spillovers associated with agglomerated industries in the form of input and knowledge sharing and the labor resources available. Therefore, the proposed direction of the entry and agglomeration relationship is positive implying that the more concentrated the industry is, the higher the entry rate in that industry is likely to be. Survival of firms becomes difficult in highly concentrated industries due to higher competition amongst incumbent firms and, therefore causes the weaker firms to exit. Thus the hypothesized sign for this relationship is positive. Studies conducted in United States and the United Kingdom have

found the relationships to hold, however, the literature in developing countries on this issue is sparse.

Hypothesis 2: Firm entry (E_{it}) & exit (Z_i) are positively affected by exchange rate (ER_{it}) depreciation and foreign tariff reduction ($tariff_{it}$) ceteris paribus

The second hypothesis tends to analyze the link between trade liberalization arising due to currency depreciation and duty reduction and the expansion in export contribution by the entry of new firms. The proposed direction of the relation is positive implying that with the promotion of trade in the world, increases in industry contribution to the export market attracts the entry of new firms as well as causing the exit of weaker firms. Baggs et al. (2007) and Head et al. (1997) found this relationship to hold for the Canadian manufacturing industry, while Fung (2006) found a similar relationship to hold for the Taiwanese manufacturing sector. In the United States currency depreciation was found to positively affect both firm entry and job creation (Bernard et al. 2004; Klien et al. 2000). On the contrary, Fajnzylber, Maloney and Ribeiro (2001) found ambiguous results on this issue in Colombia and Chile.

Table 5.1 Variable names and definition

Explanatory Variable	Definition
E-G index	The Ellison-Glaeser index of agglomeration is constructed using firm employment and consists of the Gini coefficient and the Herfindahl index
ER	Trade-weighted real exchange rate with respect to the US dollar and EU euro. (Increase=appreciation of Pak. Rs.)
$\Delta tariff^{PK}$	Change in tariff rates in Pakistan from 2001 to 2010
$\Delta tariff^{US}$	Change in tariff rates in US from 2001 to 2010
$\Delta tariff^{EU}$	Change in tariff rates in EU from 2001 to 2010
Firm Age	Average age of a firm in an industry (since establishment)
Firm Size	Average size of a firm in an industry as measured by the number of employees working
Output Growth	Change in output during the time period
Sunk Cost	Average initial investment of firms in an industry
Industry Concentration	Herfindahl index measured using employment data

6. Results and Discussion

6.1. Firm Entry, Exit & Agglomeration Estimation Analysis

This section presents the results of entry and exit of firms in manufacturing industries in Punjab from 2002 to 2006 as affected by agglomeration, which implies spillover benefits arising from geographic and industrial concentration. The results support the argument put forward by researchers (Devereux et al., 1999; Dumais et al., 1997; Carlton, 1983; and Rosenthal and Strange 2007, De Silva et al, 2011) that agglomeration has a significant impact on the entry and exit rates of firms and that the two rates are likely to be correlated. Firms tend to locate near similar firms or in clusters, in order to take advantage of spillovers in the form of accessibility to technology, knowledge sharing and labor with the required skills. The results further suggest that firm exit is higher in highly agglomerated industries, which indicates that competition is intense and weaker firms find it difficult to survive as incumbent firms start taking advantage of higher spillover benefits.

Table 6.1 presents the Ordinary Least Square regression results of the entry-agglomeration and exit- agglomeration analysis. The first two columns show the firm entry and agglomeration analysis coefficients, where column (2) controls for effects of large industries (in terms of size) by incorporating industry dummies, whereas column (1) excludes them. The firm entry variable is the ratio of new firms that have entered between 2002 and 2006 over the total number of firms present in 2006. As shown in column (2) the Ellison-Glaeser index of agglomeration is positive and significant implying that more firms will enter in highly agglomerated industries than in dispersed industries, holding other industry factors constant.

Moving on to the exit-agglomeration results, again the results have been segregated into with and without industry dummies regressions shown in columns (3) and (4) respectively. Exit here is the ratio of firms that have been operating in 2002 but did not exist in 2006 as a proportion of total firms present in 2002. Column (4) in table 6.1 reports that exit of firms is positively influenced by the Ellison-Glaeser index confirming that firms are more likely to close down in highly agglomerated industries. This result can be further scrutinized by considering the impact of the two components of the Ellison-Glaeser index i.e. the Gini coefficient and the Herfindahl index. As both components measure concentrations of firms, therefore, the more firms present either geographically or within an industry, the more competitive the industry is likely to be, thus making it difficult for existing firms to survive. If firms consider highly agglomerated industries to be associated with higher spillover benefits, then intuitively there will be a higher number of entrants, however it could be that weaker firms are being attracted and hence a probability of them to exit.

Among the control factors, output growth is seen to have a direct impact on the entry of new firms and this result only holds when industry dummies are controlled for. Industries enjoying output growth would be relatively more attractive for new firms in the hope of achieving higher output and in turn higher profits themselves. Another factor having a significant impact on firm entry is firm age. It is seen to have a negative impact on firm entry and a positive impact on firm exit. The higher the number of old age firms present in an industry, the lower the number of new firms entering or the higher the number of exiting firms in that industry, holding other factors constant. Older firms that are well established may have stronger networks together with a

certain degree of loyalty from customers thus creating a barrier for new firms to enter or making it difficult for weaker firms to survive.

Furthermore, the results show that the high cost and firm size variables have no significant impact on either entry or exit, even though other analyses have found them to impact firm entry and exit significantly.

Given the above results, we can accept our first hypothesis that firm entry (E_i) and exit (Z_i) are positively correlated with the agglomeration index ($E\text{-}Gindex_i$), ceteris paribus.

6.2. Firm Entry, Exit & Trade Liberalization Estimation Analysis

Table 6.2 presents the trade-liberalization, firm entry and exit results. The results show that an appreciation of the trade weighted real exchange rate lowers both exit of existing firms and entry of new firms, while a depreciation of the trade weighted real exchange rate increases entry as well as exit of firms. Movements in the exchange rate forces firms to change to new competitive conditions and therefore impact their entry and exit positions. A depreciating currency makes exports relatively cheaper than import, thus boosting sales of the export firms. As these industries enjoy higher rents they become attractive to potential exporters. The entry of new firms starts to take place and raises the level of competition. This, in turn, causes weaker firms to exit the industry. In terms of magnitude, the results show that an appreciation or depreciation of the trade weighted real exchange rate seems to affect firm exit more than firm entry. How much each industry is influenced by exchange rate fluctuations depends on their exposure to the export market. More exposure puts the firms in that industry at a higher risk of mortality specifically if they do not have a competitive edge over foreign firms.

Researchers (Baggs et al. 2007, Fung. 2006, Head and Reis. 1997) established that currency depreciation attracted entry or increased scale of production, while an appreciation deterred entry of new firms. Countries where these results were established included United States, Canada, and Taiwan. Thus the results of this study for the trade analysis conform to literature.

The tariff reduction and firm turnover literature (Gu, Sawchuk and Whewell, 2003, Head and Reis. 1997) suggested that a reduction in foreign rates in bilateral trade, increased exit but had no significant impact on entry or scale of firms. On the other hand a reduction in domestic rates led to an increase in plant closure and a reduction in the scale of production of existing plants of the home country. For the Punjab export industries, apart from the EU tariff variable which only impacts exit at a low significance level, none of the remaining two tariff variables seem to have any significant impact on either entry or exit of firms. This could be attributed to low variation in the tariff rates, with small reductions observed from 2002 to 2006 while even smaller increases observed from 2006 to 2010.

The coefficient of industrial concentration (Herfindahl index) is negative and significant in the estimation for firm entry without fixed effects in place, indicating that new firms will avoid industries where the market share is concentrated in the hands of a few firms. However, the variable becomes insignificant once fixed effects are incorporated. Also, it has no significant impact on the firm exit.

Table 6.1. Entry-Agglomeration & Exit-Agglomeration Regression Results

	Entry		Exit	
	(1)	(2)	(3)	(4)
EG-index	0.007 (0.0089)	0.016** (0.006)	-0.015 (0.026)	0.036** (0.018)
Output Growth	0.003 (0.0023)	0.009*** (0.002)	0.002 (0.007)	-0.005 (0.005)
Firm Age	-0.003*** (0.0007)	-0.001* (0.003)	0.002 (0.001)	0.003*** (0.001)
High Cost (dummy =1 if sunk cost > Rs. 50 m)	0.002 (0.0219)	0.036 (0.022)	0.027 (0.063)	0.028 (0.066)
Firm Size –Small (dummy =1 if <49 employees)	-0.011 (0.024)	-0.002 (0.024)	0.083 (0.068)	-0.028 (0.072)
Firm Size – Medium (dummy=1 if ≥49 & <100 employees)	0.030 (0.026)	0.015 (0.025)	0.064 (0.074)	-0.085 (0.072)
Firm Size – Large (dummy=1 if ≥100 employees)	-	-	-	-
Industry Dummies	NO	YES	NO	YES
Cons.	0.129*** (0.026)	0.044* (0.024)	0.118* (0.070)	0.081 (0.070)
	N = 180	N = 180	N = 180	N = 180
	R^2 = 0.08	R^2 = 0.46	R^2 = 0.02	R^2 = 0.44

NOTE: *** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level, and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses

Table 6.2. Entry& Exit-Trade Liberalization Regression Results

	Entry		Exit	
	(1)	(2)	(3)	(4)
ER (Increase=appreciation of Pak. Rs.)	-8.335** (3.418)	-7.700 (7.047)	-31.568** (12.568)	-61.991** (27.692)
Tariff PK	-0.0001 (0.002)	0.001 (0.003)	-0.011 (0.022)	-0.015 (0.027)
Tariff EU	-0.011 (0.014)	-0.033 (0.020)	0.194 (0.123)	0.283* (0.145)
Tariff US	-0.001 (0.001)	-0.001 (0.002)	0.004 (0.006)	0.018 (0.012)
Concentration Index	-0.067*** (0.023)	-0.013 (0.063)	0.202 (0.246)	0.261 (0.430)
Output Growth	0.008 (0.014)	-0.013 (0.030)	0.086** (0.040)	0.142* (0.074)
Firm Age	-0.003 (0.002)	-0.004 (0.005)	-0.004 (0.006)	0.002 (0.014)
Firm Size –Small (dummy =1 if <49 employees)	-0.060 (0.044)	-0.176*** (0.032)	0.209 (0.161)	0.655*** (0.192)
Firm Size – Medium (dummy=1 if ≥49 & <100 employees)	-0.010 (0.045)	-0.167*** (0.037)	0.227* (0.130)	0.575*** (0.177)
Firm Size – Large (dummy=1 if ≥100 employees)	-	-	-	-
High Cost (dummy =1 if sunk cost > Rs. 50m)	-0.019 (0.031)	-0.157*** (0.052)	0.025 (0.130)	-0.455** (0.214)
Cons.	0.269***	0.456*	0.513***	0.583*
Time and Industry Fixed Effects	NO	YES	NO	YES
	N =48	N = 48	N = 48	N = 48
	R^2 = 0.38	R^2 = 0.15	R^2 = 0.12	R^2 = 0.05

NOTE: *** Denotes statistical significance at the 1 percent level, ** denotes statistical significance at the 5 percent level, and * denotes statistical significance at the 10 percent level. Robust standard errors are in parentheses

Industry output growth is seen to vary positively with exit rates, again reinforcing the notion that competitive conditions influence firm turnover specifically causing the exit of weaker firms. Also, firm entry is lower and firm exit is higher in industries where more small or medium sized firms are present, holding other factors constant. This would depend upon the competitiveness of the smaller or medium sized firms in the industry. Lastly, firms avoid industries where there is a requirement of large sunk or irrecoverable costs and exit rates are lower in such industries. Sunk costs are considered to be a barrier to entry and exit as new firms find it more difficult to raise large amounts, and existing firms that have already undertaken such high initial investments continue operating till they are, at least, able to cover these costs.

We can partially accept the second hypotheses and conclude that firm entry (E_{it}) and exit (Z_{it}) are positively affected by a real exchange rate depreciation (ER_{it}) but the tariff reduction and firm turnover relationship remains inconclusive.

6.3. Data Limitation and Future Research

The directory of industries for Punjab is not published annually therefore the entry and exit analysis was restricted to five year interval estimations rather than annual. Given the accuracy of the information provided by the directory regarding the firm names and addresses, the possibility of understating or overstating the entry and exit rates exists as some firms may have names spelled differently thus affecting their possibility of being included as an entering or exiting firm. This problem was minimized by matching the firms using the year of establishment as well. Furthermore, the lack of availability of information on firm sales, use of technology and leverage limited the use of control variables used in the estimations. Finally, this study only incorporated

industries present in Punjab and can further be extended to the other provinces given the availability of data.

7. Conclusion

This paper attempts to contribute to the industrial organization literature in Pakistan by looking at domestic and international factors affecting firm turnover in Punjab. New firms are attracted to industries where agglomeration economies are present in the form of human and capital spillover benefits. Furthermore, entry is taking place in industries where output growth is high as higher output acts as an opportunity for the new establishments to grow. The results further suggest that new firms are hesitant to enter industries where older firms exist as these may be a threat for having a stronger market share. The exit rate is also higher in these industries as weaker firm may find it difficult to survive.

As for the impact of international factors on firm turnover, a real exchange rate appreciation or depreciation is more likely to influence firm entry and exit than large tariff changes as supported by literature. Whether the changes in the tariff rates take place in the domestic market or foreign market, they seem to have very little impact on firm turnover. Firm entry is lower and firm exit is higher in industries where more smaller or medium sized firms are present suggesting that they are more competitive and threatening for new as well as existing firms. Lastly the results highlight the role of high initial investment to deter entry and lower exit rates for firms.

The study provides insight for industrial policies with regard to promoting clusters where firms are highly integrated and resource and technological flows assist firms in improving productivity and growth. Industries are likely to grow together with promoting competition

amongst the firms if they are more agglomerated. The study further highlights the role of exchange rate and trade policies in influencing industrial activities. Finally, it finds a stronger role for exchange rate changes in influencing firm turnover than that of local or foreign tariff rates.

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Appendix

Table A4

NUMBER OF FIRMS IN 2002 AND 2006 IN THE MANUFACTURING INDUSTRIES IN PUNJAB, PAKISTAN							
	INDUSTRY	2002	2006		INDUSTRY	2002	2006
1	A.C/ REFRIGERATOR/ DEEP FREEZERS	10	15	91	LPG GAS	0	6
2	AGRICULTURAL IMPLEMENTS	751	419	92	LUBRICANTS	21	10
3	ALUMINIUM PRODUCTS	16	35	93	MACHINE TOOLS	65	62
4	ARMS AND AMMUNITION	12	9	94	MARBLE INDUSTRY	222	6
5	AUTO PARTS	287	278	95	MATCHES	2	2
6	BAKERY PRODUCTS	164	35	96	MELAMINE (PLASTIC) UTENSILS	76	65
7	BABY CYCLE	5	3	97	MINERAL WATER	0	11
8	BATTERIES	3	5	98	MOTOR CAR	1	1
9	BELT	8	7	99	MOTOR CYCLE / RICKSHAW	2	23
10	BEVERAGE	20	22	100	MOTOR /PUMPS	193	170
11	BICYCLE	102	40	101	MUSICAL INSTRUMENTS	9	11
12	BISCUITS	29	32	102	NUT & BOLT	216	112
13	BOILER	2	4	103	OIL COOKER	2	1
14	BULBS AND TUBES	3	3	104	PACKAGES	93	187
15	CANVAS SHOES	1	1	105	PAINTS AND VARNISHES	61	61
16	CARPETS	67	50	106	PAPER & PAPER BOARD	83	110
17	CAUSTIC SODA	3	1	107	PAPER CONE	3	22
18	CEMENT	212	43	108	PARACHUTE BAGS	1	1
19	CERAMICS	23	111	109	PENCILS/ BAL POINTS	4	6
20	CHALK	1	1	110	PESTICIDES & INSECTICIDES	12	25
21	CHEMICAL	41	85	111	PETROLEUM PRODUCTS	0	3
22	CHIP/STRAW BOARD	13	88	112	PHOTOGRAPHIC GOODS	6	1
23	CITRUS GRADING	4	41	113	PINS/CLIPS	5	2
24	COLD STORAGE	442	633	114	PLASTER OF PARIS	0	1
25	CONE FACTORY	23	7	115	PLASTIC PRODUCTS	343	287
26	CONFECTIONERY	69	89	116	POLY PROPYLENE BAGS	33	45
27	COSMETICS	5	7	117	POLYESTER YARN	4	9
28	COTTON GINNING & PRESSING	1236	1358	118	POLYTHENE BAGS	12	27
29	COTTON TAPE	2	1	119	POTTERY	143	185
30	COTTON WASTE	66	56	120	POULTRY FEED	85	79
31	CROWN CORKS	2	2	121	POWDER COATING	2	3
32	CUTLERY	214	227	122	POWER GENERATION	43	46
33	CYCLE TYRE /TUBES	17	21	123	PVC PIPE	30	40
34	DAIRY PRODUCTS	17	25	124	RADIO / TV	2	2
35	DIAPERS -BABY	2	1	125	RAISING CLOTH	13	7
36	DIES & BLOCKS	94	18	126	RAZORS/ BLADES	6	1
37	DIESEL ENGINE	62	70	127	READY MADE GARMENTS	105	364
38	DOMESTIC HARDWARE	107	70	128	REFINERY	3	2
39	DOUBLING OF YARN	16	39	129	RICE MILLS	1066	1717
40	DRUGS & PHARMACEUTICAL	114	151	130	RUBBER PRODUCTS	67	64
41	DYES	3	3	131	SANITARY FITTING	218	252
42	ELASTIC	0	6	132	SEED PROCESSING	8	11
43	ELECTRIC FURNACE	51	15	133	SEWING MACHINES /PARTS	25	23

44	ELECTRIC GOODS	223	219	134	SHOE LASTS	1	1
45	ELECTRIC METERS	5	7	135	SIZING OF YARN	197	204
46	ELECTRIC POLES	1	1	136	SOAP & DETERGENTS	412	188
47	ELECTRIC TRANSFORMERS	16	18	137	SODIUM SILICATE	42	39
48	ELECTROPLATING	17	1	138	SOLVANT OIL EXTRACTION	18	24
49	EMBROIDERY	50	150	139	SPECIALIZED TEXTILE	0	1
50	ESSENCE	1	1	140	SPICES FACTORY	1	2
51	EXPLOSIVES	1	1	141	SPORTS GOODS	500	564
52	FANS/ COOLERS	510	536	142	SPRAY MACHINE	2	2
53	FERTILIZER	7	11	143	SPRING MANUFACTURING	2	1
54	FIBRE GLASS	5	6	144	STARCH AND ITS PRODUCTS	5	4
55	FIBRE TOPS	2	2	145	SUGAR	39	41
56	FIRE CLAY	1	1	146	SULPHURIC ACID	10	7
57	FIRE FIGHTING EQUIPMENT	1	2	147	SURGICAL COTTON / BANDAGES	13	50
58	FLOUR MILLS	437	543	148	SURGICAL INSTRUMENTS	999	1298
59	FOAM MANUFACTURING	8	6	149	SYNTHETIC FIBRE	0	1
60	FOOD PRODUCTS	39	47	150	SYNTHETIC RESINS	4	5
61	FORGING	3	17	151	SYRINGES	3	4
62	FOUNDRY PRODUCTS	762	600	152	TANNERY	524	623
63	FRUIT JUICES	22	28	153	TENTS	12	26
64	FRUIT PRESERVATION	2	1	154	TEXTILE COMPOSITE	23	28
65	G.I./ M.S. PIPES	45	66	155	TEXTILE MADE UPS	32	43
66	GAS APPLIANCES	29	45	156	TEXTILE PROCESSING	355	483
67	GLASS & GLASS PRODUCTS	29	42	157	TEXTILE SPINNING	309	421
68	GLUE	5	8	158	TEXTILE WEAVING	188	219
69	GLYCERINE	1	1	159	THERMOPORE	6	8
70	GRINDING WHEELS	1	1	160	THREAD INDUSTRY	11	9
71	GYPSUM INDUSTRY	14	1	161	TOBACCO	3	5
72	HAND TOOLS	46	15	162	TOWEL	10	17
73	HATCHERY	23	21	163	TRACTOR & PARTS	158	158
74	HEAVY ENGG. (BUILDOZERS/ CRANES ETC.)	1	1	164	TRUCKS	1	1
75	HOMEOPHATHIC MEDICINES	2	2	165	TYRE AND TUBES	12	11
76	HOSE PIPE	1	1	166	UNANI MEDICINES	45	18
77	HOSIERY PRODUCTS	444	366	167	UTENSILS (ALL SORTS)	534	488
78	ICE CREAM	14	11	168	GHEE AND COOKING OIL	96	92
79	INDUSTRIAL /BURN GASES	32	28	169	VELVET CLOTH	1	1
80	INDUSTRIAL (textile) MACHINERY	92	92	170	VERMICELLIES	5	10
81	INK MANUFACTURING	6	6	171	WASHING MACHINE	94	105
82	IRON & STEEL RE-ROLLING	317	385	172	WEIGHT AND SCALES	41	14
83	JUTE MILLS	13	22	173	WELDING ELECTRODES	2	2
84	KNITTED TEXTILE	95	91	174	WIRE & CABLE	39	77
85	LEATHER FOOTWEARS	96	100	175	WOODEN PRODUCTS	6	6
86	LEATHER GARMENTS	201	392	176	WOOL SCOURING	3	4
87	LEATHER PRODUCTS	51	64	177	WOOLLEN TEXTILE	125	132
88	LIGHT ENGINEERING	198	233	178	ZINC SULPHATE	4	1
89	LOCK AND PADLOCKS	32	27	179	ZARI INDUSTRY	3	3
90	LPG (GAS) CYLINDERS	7	9	180	ZIP	0	1