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The Effect of Trade Liberalization on Firm Entry and Exit in Punjab, Pakistan

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Abstract

This study focuses on the impact of trade liberalization on firm entry and exit in Punjab's export manufacturing sector over the decade 2001–10. As far as the province's export industries are concerned, real exchange rate depreciation attracts new firms but also leads weaker firms to exit. A reduction in local or international tariffs, however, has no significant impact on firm entry or exit.

Keywords: trade liberalization, exchange rates, firm entry, Pakistan.

JEL classification: F41.

1. Introduction

The industrial organization literature has traditionally emphasized the role of new firms as stimulators of economic development. The entry of new firms is associated with employment changes, product and technological innovation, and other structural changes in that particular industry (Roberts & Thompson, 2003). Furthermore, as incumbent firms face growing competition from the new arrivals, their productivity is expected to improve.

Researchers have examined the relationship between trade liberalization and firm turnover to determine the extent to which international markets and policies influence regional industries and their development. Exchange rate depreciation and tariff reductions can lead to the expansion of exports as the output of existing firms increases or new firms enter the industry (Bernard and Jensen, 2004; Gu, Sawchuk, and Whewell, 2003). Domestic firms can face increased competition from abroad when domestic tariff rates fall or the domestic currency appreciates (Baggs, Beaulieu, & Fung, 2009; Fung, 2008; Head and Ries, 1999; Klein, Schuh, and Triest, 2000). The primary aim of this study is to analyze the impact of exchange rate depreciation and tariff reductions on the output resulting from the entry of new firms. However, it is pertinent to note that

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entry into the exports sector requires that firms are at least as productive as the incumbent firms in order to survive both local and foreign competition, which could otherwise lead them to exit if they do not deliver efficiently.

Over the last decade, Pakistan has experienced currency depreciations against the US dollar and the euro, together with an increase in export volume. In 2010, nearly 22 percent and 17 percent of its exports went to the European Union (EU) and the US, respectively; 48 other countries, each receiving a minimal share, accounted for the remaining volume. Accordingly, we look only at those sectors that export to the US and EU, while the depreciating rupee provides an opportunity to study its effects on firm turnover on the export industries in Punjab.

At the same time, the tariff rates of member countries of the World Trade Organization (WTO) have decreased since 2000, in an effort to boost world exports. Pakistan has also experienced this decline together with an increase in exports to the US and EU.

This study looks at the impact of spatial and industrial concentration, currency depreciation, and tariff reductions on the entry and exit rates of manufacturing firms in Punjab. Section 2 provides a literature review, Section 3 gives a theoretical background, and Section 4 describes the data used and descriptive statistics. Section 5 estimates the study's econometric model Section 6 analyzes firm entry, exit and trade liberalization in the context of the results while Section 7 concludes the study.

2. Literature Review

The literature on firm entry differentiates between new entrants—also referred to as greenfield firms—and existing or diversifying firms that have set up plants in different geographical areas and/or expanded their range of products. The importance of studying entry rates is associated positively with regional development. Whether the benefits are direct (in the form of job creation) or indirect (such as improvements in supply conditions), new establishments are known to stimulate economic development. They add to the resource flows of an industry (Roberts & Thompson, 2003), thus enhancing its productivity and contributing to product and technological innovation. According to Hopenhayn (1992), firms in the manufacturing sector tend to be replaced by new entrants over five-year periods, with a similar trend in job turnover. However, Fritsch and Mueller (2004) suggest that these benefits can take as long as eight years to occur.

Earlier studies have looked at the impact of macroeconomic shocks such as large exchange rate movements, changes in export and import duties, or international trade treaties that ease trade between the signatories. The empirical evidence shows that trade liberalization can affect the growth of exports by changing the entry, exit, and production decisions of heterogeneous firms that are major contributors to the economy's export sector. Trade liberalization in this context implies the depreciation or devaluation of the home currency, making home products relatively cheaper in the international market. However, it can also imply a reduction in tariffs by importing countries, which, again, influences the price of the final product sold to trading partners.

A currency appreciation is found to reduce sales and thus affect the survival of existing firms that might otherwise deter the entry of new firms (Baggs, Beaulieu, & Fung, 2009). However, the impact on firm survival is smaller for more productive firms, either because their technology is superior or their labor force more efficient. Domestic currency appreciation gives foreign firms a cost advantage and forces domestic firms or exporters to reduce their prices 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, currency depreciation tends to increase the number of establishments as well as the scale of production of existing firms (Head & Ries, 1999).

Klein, Schuh, and Triest (2000) have put forward similar findings on the significant role played by currency appreciation on job destruction. They show that job flows respond asymmetrically to changes in the real exchange rate, i.e., while job destruction is affected by the exchange rate, job creation is not. Moreover, how sensitive job destruction is to exchange rate fluctuations 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 once a firm finds it optimal to do so, while hiring new labor 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.

Changes in the exchange rate influence an economy by affecting its exports and imports. Dominguez and Tesar (2006) find that these changes are also correlated with firm and industry characteristics such as firm size, multinational status, international sales, international assets, and competitiveness. A favorable exchange rate movement may result in a boom in the exports market either through an expansion in the output of

existing producers or through the entry of new firms or both, depending on the barriers to entry that exist for that industry.

Bernard and Wagner (2001) assess firms' decision whether to enter the exports market and conclude that entry entails considerable sunk costs. Firm entry into the exports sector depends on firm size and productivity, which ultimately determines their level of success. Bernard and Jenson (2004) present a similar analysis for the US exports boom from 1987 to 1992. They argue that entry for firms in the exports sector is costly, even if there are favorable shocks in the international market. Using plant-level data, they find that a depreciating exchange rate and rising foreign income increases exports, while the existence of sunk costs increases the contribution of existing—as opposed to new—exporters.

So while exchange rate movements appear to have significant impacts, the evidence for tariff reductions, however, is weak. Head and Ries (1999) find that a decrease in home tariffs increases plant closure and reduces the scale of production of existing plants in the home country. However, a reduction in foreign tariffs increases the scale of production but does not induce the entry of new firms. After adding controls for exchange rate changes and fixed costs in terms of research and development, the authors find no significant change in the tariff coefficient.

Gu, Sawchuk, and Whewell (2003) use a panel dataset comprising 81 manufacturing firms over 14 years to determine the productivity (in the shape of firm size and turnover) caused by a reduction in tariffs under the free trade agreement between the US and Canada. The results suggest that less productive firms will exit after tariffs are reduced, while tariff reductions have no significant impact on the scale of production of existing firms.

In comparison to changes in tariffs, large fluctuations in exchange rates are considered to have greater consequences for firm performance and turnover. Fung (2008) uses data on a Taiwanese firm to study the impact of large fluctuations in the exchange rate on firm performance and turnover. By including an exchange rate variable in the firm's profit function, the study analyzes the impact of an appreciation of the New Taiwan dollar on the scale of production of existing firms and the exit rate in the industry. Intuitively, firm exit will rise as a result of currency appreciation because the costs of domestic firms will increase, forcing less productive firms to shut down. The results indicate that the relationship between currency appreciation and firm scale and productivity depends significantly on the magnitude and direction of changes in output and exports.

Given the temporary nature of changes in the exchange rate, however, firms are unlikely to change their production activities at all. Baggs et al. (2009) conducted a firm-level analysis of Canadian manufacturing firms for the period 1986 to 1997, incorporating exchange rate data with respect to the US dollar. This timeframe was divided naturally such that, during the first six years, the Canadian dollar appreciated by about 30 percent, after which it depreciated by 30 percent during the next six years. The model regressed three variables, i.e., firm survival, entry, and sales, individually on the trade-weighted exchange rate, the tariff rates of the two countries, and various control factors. The results suggested that the exchange rate had a stronger impact on firm survival, entry, and sales than tariff rates.

3. Theoretical Background

The study's theoretical background is based on Krugman's (1979) model, which looks at the effects of trade liberalization on the scale of production and the productivity of firms. Subsequently, Melitz (2003), Fung (2008), and Baggs et al. (2009) have extended this model in their analyses, particularly with the inclusion of an exchange rate variable to incorporate the effects of international trade on domestic industries.

These models assume that labor is the only factor of production and that a domestic currency appreciation gives foreign firms a cost advantage (in terms of the domestic currency). This increases the competition faced by domestic firms in the local and international markets, forcing them to decrease their own prices. The increase in competition and fall in prices charged will lead some firms to exit the industry. Accordingly, currency depreciation has the opposite effect and gives new firms an incentive to enter the industry.

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

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

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 $C_i = s_i E/P_i$ where E is total expenditure and s_i is the share of expenditure of firm i denoted by:

$$s_i = \frac{P_i C_i}{E} = \frac{\partial lnE(P,u)}{\partial lnP_i} = \alpha_i + \sum_j \gamma_{ij} lnP_j \tag{2}$$

The use of a symmetric expenditure function in translog form to derive the demand curve leads to varying mark-ups and scales of production for the sample firms. This is different from Krugman's (1979) initial model where the assumption of a constant elasticity of scale meant that the elasticity and scale of production were held constant, i.e., unaffected by exogenous shocks.

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

$$\varepsilon_i = 1 - \frac{\partial ln\, s_i}{\partial ln P_i} = 1 - \frac{\gamma_{ii}}{s_i} \tag{3}$$

where $\gamma_{ii} < 0$ 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 are applied:

$$\alpha_i = \frac{1}{\tilde{n}}, \gamma_{ii} = -\frac{\gamma}{\tilde{n}}, and\ \gamma_{ij} = \frac{\gamma}{\tilde{n}(\tilde{n}-1)} \quad \text{for } j \neq i, \quad \text{where } \gamma > 0 \tag{4}$$

Therefore, the demand elasticities (ε_i) are:

$$\varepsilon_d = 1 + \frac{\gamma}{\tilde{n} s_d} = 1 + \gamma \left[1 - \frac{n_f \gamma}{(\tilde{n}-1)} \left(ln\, P_d - ln P_f\right)\right]^{-1}$$

$$\varepsilon_f = 1 + \frac{\gamma}{\tilde{n} s_f} = 1 + \gamma \left[1 - \frac{n_d \gamma}{(\tilde{n}-1)} \left(ln\, P_d - ln P_f\right)\right]^{-1} \tag{5}$$

Interpreting equation (5) above is necessary as it shows the relationship between the elasticity and price of one good relative to competing goods. The equation indicates a positive relationship, implying that an increase in the price of an imported or foreign good (*f*) will reduce the competition faced by domestic firms, resulting in a lower elasticity of demand for local firms (ε_d) and a higher elasticity for foreign firms (ε_f). This will eventually increase domestic firms' mark-up over cost, and attract other firms to enter the profit-making industry.

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

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

$$\pi_i(X_i, X_i^*) = P_i X_i + eP_i^* X_i^* - w[\alpha + \alpha_x + \beta(X_i + X_i^*)] \quad (6)$$

where *e* is the exchange rate (the amount of domestic currency per unit of foreign currency), w is the wage level, and P_i^* is the price in foreign currency of firm *i*'s exports.

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

$$X_i = X_d = C_d = s_d \frac{wL}{P_d} = \frac{\gamma L}{\tilde{n}\varepsilon_d \beta} \quad (7)$$

$$X_i^* = X_d^* = C_d^* = s_d^* \frac{W^* L^*}{P_d^*} = \frac{\gamma^* w^* L^* e}{\tilde{n}\varepsilon_d^* \beta w} \quad (8)$$

where L and L^* are units of domestic and foreign labor, respectively, with the additional assumptions that $wL = E$ and $w^*L^* = E^*$. Given the above model and related assumptions, we can conclude that, in the case of currency depreciation (increase in *e*), domestic firms will have a cost advantage over foreign firms. This will, in turn, increase the number of domestic firms (n_d) as well as total firms ($\tilde{n}$) in the industry. Equation (8) shows that a rise in *e* leads to an expansion in exports, i.e., an increase in X^*.

$$\tilde{n} = \frac{\gamma^* e P_d^*}{\varepsilon_d^* \beta w s_d^*} \quad (9)$$

Equation (9) solves for the number of firms $\tilde{n}$, which establishes that a rise in *e* (depreciation) results in an increase in the total number of firms in the industry.

4. Data and Descriptive Statistics

We have used data from the Directory of Industries (compiled by the Punjab government) for 2002, 2006, and 2010. On average, the directory includes approximately 18,000 manufacturing firms. It also provides the names and addresses of all firms across nearly 180 industries in Punjab. Other information includes the year of establishment, the total number of employees, and each firm's initial investment. Table A1 in the Appendix gives the total number of firms in each industry for 2002 and 2006. In

almost every industry, the number of firms has either increased or decreased, indicating the variability of firm turnover across sectors.

The employment information provided by the directory is used to calculate the agglomeration index and determine firm size, while initial investment is used as a control factor to proxy for sunk costs.

4.1. Descriptive Statistics

Table 1 gives industry and firm descriptive statistics. In 2006, there were 180 industries comprising 18,007 firms operating in Punjab. From 2002 to 2006, the mean firm entry rate was 10 percent while the exit rate was 25 percent. Output growth was high over the five-year period with firms undertaking an initial investment of approximately PRs 40 million on average (with a median value of USD 2,648,000).

Table 1: Descriptive statistics, 2006 (all industries)

Number of industries	180
Number of firms	18,007
Mean firm age	17
Mean number of employees	48
Mean industry entry rate	0.10
Mean industry exit rate	0.25
Mean industry E-G index (2002)	0.1554
Mean industry output growth (%)	86
Mean initial investment (PRs '000)	40,892

Source: Government of Punjab, Directory of Industries.

For the trade liberalization analysis, we have used annual exchange rate data from the Federal Bureau of Statistics and data on tariff rates from the WTO. The latter provides tariff averages for its member countries across 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 a trade-weighted real exchange rate. Our analysis includes 25 industries in Punjab exporting to the US and EU.

Table 2 presents descriptive statistics for the industries exporting to the US and EU. Their average entry and exit rates are higher in the first five-year period than the second five-year period. In the latter half of the

decade, industrial concentration fell, indicating that export firms faced higher competition from incumbent firms. Tariffs fell between 2001 and 2005, but from 2006 to 2010 the average rate increased for industries exporting to the EU. The trade-weighted real exchange rate appreciated slightly from 2006 to 2010.

Table 2: Descriptive statistics for export industries

	2001–05	**2006–10**
Number of export industries	25	25
Number of firms	11,620	7,600
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 (PRs '000)	137,403	150,415
Mean tariff change (Pakistan)	-7.187	0.164
Mean tariff change (EU)	-0.328	0.007
Mean tariff change (US)	-0.596	-0.131
Mean trade-weighted real exchange rate	0.012	0.0153

Source: Government of Punjab, Directory of Industries.

Table 3 lists the top 20 industries in Punjab in descending order of entry, while Table 4 lists the top 20 industries in descending order of exit. Table 5 shows industry concentration as measured by the E-G index of agglomeration.

Table 3: Top 20 industries in Punjab with highest entry rates, 2006

No.	Industry	Entry rate*
1	Gypsum	0.93
2	Mineral water	0.55
3	Firefighting equipment	0.50
4	Motorcycles/rickshaws	0.50
5	Radios/TVs	0.50
6	Welding electrodes	0.50
7	Zips	0.50
8	Knitted textiles	0.45
9	Embroidery	0.43
10	Cones	0.43
11	Yarn doubling	0.41
12	Powder coating	0.33
13	Pesticides and insecticides	0.32
14	Citrus grading	0.29
15	Fruit juices	0.29
16	Readymade 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.
Source: Government of Punjab, Directory of Industries.

Table 4: Top 20 industries in Punjab with highest exit rates, 2006

No.	Industry	Exit rate*
1	Bus bodies	0.99
2	Nuts and bolts	0.97
3	Spices	0.95
4	Electroplating	0.89
5	Electric furnaces	0.88
6	Bakery products	0.85
7	Photographic goods	0.83
8	Razors/safety razors/blades	0.83
9	Dyes and blocks	0.80
10	Knitted textiles	0.79
11	Ice cream	0.79
12	Zinc sulfate	0.75
13	Bicycles	0.75
14	Hand-powered tools	0.67
15	Bulbs and tubes	0.67
16	Refineries	0.67
17	*Unani* medicines	0.67
18	Weights 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.
Source: Government of Punjab, Directory of Industries.

Table 5: Top 20 most agglomerated industries in Punjab, 2006

No.	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	Weights 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	Belts	0.9214
12	Canvas shoes	0.8583
13	Raising cloth	0.8529
14	Cutlery	0.8209
15	Fiber tops	0.8169
16	Polyester yarn	0.8091
17	Crown corks	0.7284
18	Fiberglass	0.7151
19	Sanitary fittings	0.7131
20	Machine tools	0.7128

* Note: E-G index in 2002 measured using employment data.
Source: Government of Punjab, Directory of Industries.

5. Econometric Model and Estimation Technique

We have designed two separate models to determine the impact of agglomeration and trade liberalization on firm entry and exit, controlling for industry-level factors. Table 6 defines all the variables used.

Table 6: Variable names and definitions

Explanatory variable	Definition
E-G index	Constructed using firm employment; consists of the Gini coefficient and Herfindahl index.
ER	Trade-weighted real exchange rate with respect to the USD and EUR (increase = appreciation of PRe)
$\Delta tariff^{PK}$	Change in tariff rates in Pakistan from 2001 to 2010
$\Delta tariff^{US}$	Change in tariff rates in the US from 2001 to 2010
$\Delta tariff^{EU}$	Change in tariff rates in the EU from 2001 to 2010
Average firm age	Average age of a firm in an industry (since establishment)
Average firm size	Average size of a firm in an industry as measured by its number of employees
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

The model for trade liberalization draws on Baggs et al. (2009), where the entry and exit of firms is regressed on the real exchange rates of Pakistan's two major trading partners, the US and the EU, together with the tariff rates of the three regions under analysis. The model specification is given below:

$$Entry_{it} = E_{it} = \frac{N_{it}}{I_{it}} = \beta_0 + \beta_1 ER_{it} + \beta_2 \Delta tariff_{it}^{PK} + \beta_3 \Delta tariff_{it}^{US} + \beta_4 \Delta tariff_{it}^{EU} + \beta_5 X_{it} + \tau_t + I_i + \varepsilon_{it} \quad (10)$$

where E_{it} is the 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} is the industry-specific trade-weighted real exchange rate. $\Delta tariff_{it}$ is the change in Pakistan, US, and EU tariff rates at the industry level. X is a vector of control factors (firm age, firm size, sunk costs, output growth, and concentration index). τ_t represents time fixed effects and I_i industry fixed effects.

The variable measuring entry is measured for 25 export industries and two periods, i.e., t = 1 (2002 to 2005) and t = 2 (2006 to 2010). The year of establishment is used to indicate that a firm is a new entrant. 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 that industry for that period.

$$Exit_{it} = Z_{it} = \frac{M_{it}}{F_{it}} = \beta_0 + \beta_1 ER_{it} + \beta_2 \Delta tariff_{it}^{PK} + \beta_3 \Delta tariff_{it}^{US} + \beta_4 \Delta tariff_{it}^{EU} + \beta_5 X_{it} + \tau_t + I_i + \varepsilon_{it} \quad (11)$$

Z_{it} is the exit rate in industry i and equals the number of firms in industry i in year t that did not exist in $t + 1$ (M_i) divided by the total number of firms in industry i in year t (F_i). ER_{it} is the industry-specific trade-weighted real exchange rate. $\Delta tariff_{it}$ is the change in Pakistan, US, and EU tariff rates at the industry level. X is a vector of control factors (firm age, firm size, sunk costs, output growth, and concentration index). τ represents time fixed effects and I_i are industry fixed effects.

The exit variable is also measured for two periods, i.e., $t = 1$ and $t = 2$. The number of firms that were present in year t but not 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 (see Baggs et al., 2009, appendix) (ER) is constructed using the equation

$$ExchangeRate_{it} = ER_{it} = \sum_{j \in top2} TW_{ij} rer_{jt} \quad (12)$$

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

$$TW_{ij} = \frac{(X+M)_{ij}}{\sum_{j \in top\ 2_i} \sum (X+M)_{ij}} \quad (13)$$

where $(X + M)$ is the sum of exports and imports for the two periods. The 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.[1]

The WTO tariff rates for 2002 and 2010 for the 25 export industries in our analysis are used to construct the variable $\Delta tariff_{it}$, which can be expressed as follows:

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

$$\Delta tariff_{i1} = tariff_{i2006} - tariff_{i2002} \text{ for } t = 1 \quad (14)$$

$$\Delta tariff_{i2} = tariff_{i2010} - tariff_{i2006} \text{ for } t = 2 \quad (15)$$

where $tariff_i$ is the simple average rate for the different product categories provided by the WTO. It is also necessary to control for other factors that affect the entry and exit of firms in order to minimize omitted variable bias. Initial investment is used as a proxy for sunk costs. Other control variables include industry concentration (Herfindahl index), average firm size, age, and output growth in the industry.

We use ordinary least squares to estimate the models while accounting for time and industry fixed effects. Time fixed effects are observed to account for time-variant factors such as government policies. Similarly, industry fixed effects take into account the individual differences between industries, e.g., the nature of the product being produced.

6. Analysis of Estimates

The results of the regression analysis indicate that an appreciation of the trade-weighted real exchange rate lowers the rate of exit of existing firms and the rate of entry of new firms, while depreciation increases the rate of entry as well as rate of exit (see Table 7). Movements in the exchange rate force firms to adjust to new competitive conditions, affecting their entry and exit positions. Currency depreciation makes exports cheaper than imports, thus boosting the sales of export firms. Since these industries enjoy higher rents, they become attractive to potential exporters. The entry of new firms starts to take place, raising the level of competition. This, in turn, causes weaker firms to exit the industry.

Table 7: Entry and exit/trade liberalization regression results

	Entry		Exit	
	(1)	(2)	(3)	(4)
ER	-8.335**	-7.700	-31.568**	-61.991**
(Increase = appreciation of PRe)	(3.418)	(7.047)	(12.568)	(27.692)
Tariff PK	-0.0001	0.001	-0.011	-0.015
	(0.002)	(0.003)	(0.022)	(0.027)
Tariff EU	-0.011	-0.033	0.194	0.283*
	(0.014)	(0.020)	(0.123)	(0.145)
Tariff US	-0.001	-0.001	0.004	0.018
	(0.001)	(0.002)	(0.006)	(0.012)
Concentration index	-0.067***	-0.013	0.202	0.261
	(0.023)	(0.063)	(0.246)	(0.430)
Output growth	0.008	-0.013	0.086**	0.142*
	(0.014)	(0.030)	(0.040)	(0.074)
Firm age	-0.003	-0.004	-0.004	0.002
	(0.002)	(0.005)	(0.006)	(0.014)
Firm size (small; dummy = 1 if < 49 employees)	-0.060	-0.176***	0.209	0.655***
	(0.044)	(0.032)	(0.161)	(0.192)
Firm size (medium; dummy = 1 if ≥ 49 and < 100 employees)	-0.010	-0.167***	0.227*	0.575***
	(0.045)	(0.037)	(0.130)	(0.177)
Firm size (large; dummy = 1 if ≥ 100 employees)	-	-	-	-
High cost	-0.019	-0.157***	0.025	-0.455**
(Dummy = 1 if sunk cost > PRs 50 mn)	(0.031)	(0.052)	(0.130)	(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
	R2 = 0.38	R2 = 0.15	R2 = 0.12	R2 = 0.05

Note: *** = statistical significance at 1 percent level, ** = statistical significance at 5 percent level, and * = statistical significance at 10 percent level. Robust standard errors are given in parentheses.
Source: Author's calculations.

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. The extent to which each industry is influenced by exchange rate fluctuations depends on its exposure to the export market. Greater 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. Baggs et al. (2009), Fung (2008), and Head and Ries (1999) establish

similar results for the US, Canada, and Taiwan: currency depreciation attracts entry or increases the scale of production, while the appreciation of the home currency deters the entry of new firms.

Gu et al. (2003) and Head and Ries (1999) show that a reduction in foreign rates in bilateral trade increases the rate of exit but has no significant impact on firms' entry or scale of production. On the other hand, a reduction in domestic rates leads to an increase in plant closure and a fall in the scale of production of existing plants in the home country. For Punjab's export industries—apart from the EU tariff variable, which only affects exit at a low significance level—neither of the other two tariff variables seem to have any significant impact on either entry or exit. This could be attributed to the low variation in the tariff rates, with small reductions observed from 2002 to 2006 and even smaller increases from 2006 to 2010.

The coefficient of industrial concentration (Herfindahl index) is negative and significant in our 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 firm exit.

Industrial output growth varies positively with exit rates, again reinforcing the notion that competitive conditions influence firm turnover, specifically causing weaker firms to exit. Additionally, firm entry is lower and firm exit is higher in industries that comprise more small or medium firms, holding other factors constant. This depends on the competitiveness of the firms in that industry. Finally, firms avoid industries that require large sunk or irrecoverable costs; exit rates are also observed to be lower in such industries. Sunk costs are considered a barrier to entry and exit as new firms find it more difficult to raise large amounts. Existing firms that have already undertaken such high initial investment continue operating till they are at least able to cover these costs.

An important conclusion to draw from this analysis is that firm entry (E_{it}) and exit (Z_{it}) are positively affected by a depreciating real exchange rate (ER_{it}), while the tariff reduction and firm turnover relationship remains inconclusive.

7. Conclusion

This study has shown that a real exchange rate appreciation or depreciation is more likely to influence firm entry and exit than large tariff changes. Whether these changes in 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 higher in industries comprising more smaller or medium firms, suggesting that they are more competitive and may pose a threat to new as well as existing firms. Finally, the results highlight the significant role of high initial investment in deterring firm entry and exit.

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Appendix

Table A1: Number of firms in Punjab's manufacturing sector, 2002 and 2006

	Industry	2002	2006		Industry	2002	2006
1	Air conditioners/ refrigerators/ deep-freezers	10	15	91	Liquified petroleum gas (LPG)	0	6
2	Agricultural implements	751	419	92	Lubricants	21	10
3	Aluminum products	16	35	93	Machine tools	65	62
4	Arms and ammunition	12	9	94	Marble	222	6
5	Automobile parts	287	278	95	Matches	2	2
6	Bakery products	164	35	96	Melamine (plastic) utensils	76	65
7	Baby bicycles	5	3	97	Mineral water	0	11
8	Batteries	3	5	98	Motorcars	1	1
9	Belts	8	7	99	Motorcycles/ rickshaws	2	23
10	Beverages	20	22	100	Motors/pumps	193	170
11	Bicycles	102	40	101	Musical instruments	9	11
12	Biscuits	29	32	102	Nuts and bolts	216	112
13	Boilers	2	4	103	Oil stoves	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 and paper board	83	110
17	Caustic soda	3	1	107	Paper cones	3	22
18	Cement	212	43	108	Parachute bags	1	1
19	Ceramics	23	111	109	Pencils/ ballpoint pens	4	6
20	Chalk	1	1	110	Pesticides and insecticides	12	25
21	Chemicals	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 and clips	5	2
24	Cold storage	442	633	114	Plaster of Paris	0	1
25	Cones	23	7	115	Plastic products	343	287

	Industry	2002	2006		Industry	2002	2006
26	Confectionery	69	89	116	Polypropylene bags	33	45
27	Cosmetics	5	7	117	Polyester yarn	4	9
28	Cotton ginning and 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 tyres/tubes	17	21	123	PVC pipes	30	40
34	Dairy products	17	25	124	Radios/televisions	2	2
35	Diapers (baby)	2	1	125	Cloth raising	13	7
36	Dyes and blocks	94	18	126	Razors/blades	6	1
37	Diesel engines	62	70	127	Readymade garments	105	364
38	Domestic hardware	107	70	128	Refineries	3	2
39	Yarn doubling	16	39	129	Rice mills	1066	1717
40	Drugs and pharmaceuticals	114	151	130	Rubber products	67	64
41	Dyes	3	3	131	Sanitary fittings	218	252
42	Elastic	0	6	132	Seed processing	8	11
43	Electric furnaces	51	15	133	Sewing machines /parts	25	23
44	Electric goods	223	219	134	Shoe lasts	1	1
45	Electric meters	5	7	135	Yarn sizing	197	204
46	Electric poles	1	1	136	Soaps and detergents	412	188
47	Electric transformers	16	18	137	Sodium silicate	42	39
48	Electroplating	17	1	138	Solvent oil extraction	18	24
49	Embroidery	50	150	139	Specialized textiles	0	1
50	Essences	1	1	140	Spices	1	2
51	Explosives	1	1	141	Sports goods	500	564
52	Fans/coolers	510	536	142	Spray machines	2	2
53	Fertilizer	7	11	143	Springs	2	1
54	Fiberglass	5	6	144	Starch and products	5	4
55	Fiber 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	8	6	149	Synthetic fiber	0	1

	Industry	2002	2006		Industry	2002	2006
60	Food products	39	47	150	Synthetic resins	4	5
61	Forging	3	17	151	Syringes	3	4
62	Foundry products	762	600	152	Tanneries	524	623
63	Fruit juices	22	28	153	Tents	12	26
64	Fruit preservation	2	1	154	Textile composite	23	28
65	GI/MS pipes	45	66	155	Textile made-ups	32	43
66	Gas appliances	29	45	156	Textile processing	355	483
67	Glass and glass products	29	42	157	Textile spinning	309	421
68	Glue	5	8	158	Textile weaving	188	219
69	Glycerin	1	1	159	Thermopore	6	8
70	Grinding wheels	1	1	160	Thread	11	9
71	Gypsum	14	1	161	Tobacco	3	5
72	Handheld tools	46	15	162	Towel	10	17
73	Hatcheries	23	21	163	Tractors and parts	158	158
74	Heavy engineering (bulldozers/cranes, etc.)	1	1	164	Trucks	1	1
75	Homeopathic medicines	2	2	165	Tyres and tubes	12	11
76	Hosepipes	1	1	166	Unani medicines	45	18
77	Hosiery	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	Vermicelli	5	10
81	Ink	6	6	171	Washing machines	94	105
82	Iron and steel rerolling	317	385	172	Weights and scales	41	14
83	Jute mills	13	22	173	Welding electrodes	2	2
84	Knitted textiles	95	91	174	Wire and cable	39	77
85	Leather footwear	96	100	175	Wooden products	6	6
86	Leather garments	201	392	176	Wool scouring	3	4
87	Leather products	51	64	177	Woolen textiles	125	132
88	Light engineering	198	233	178	Zinc sulphate	4	1
89	Locks and padlocks	32	27	179	Zari work	3	3
90	LPG (gas) cylinders	7	9	180	Zips	0	1

Source: Government of Punjab, Directory of Industries.