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Trade Openness: New Evidence for Labor-Demand Elasticity in Pakistan's Manufacturing Sector

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Abstract

This study is an attempt to investigate trade–labor market linkages in Pakistan. Our main hypothesis that trade liberalization leads to an increase in labor-demand elasticity is empirically verified using a panel data approach for the period 1970/71–2000/01 for 22 selected manufacturing industries in Pakistan. We use ordinary least squares to estimate models in levels and first-differences, in addition to a fixed effects model. Overall, our findings suggest weak evidence of increased labor-demand elasticity as a result of trade liberalization in Pakistan's manufacturing sector. Nor does the study find support for a positive labor market and trade linkage from an employment point of view—as otherwise suggested by standard trade theory. This may be due to increased capital intensity in the manufacturing sector by time, and the infusion of new technology. It could also be attributed to labor market imperfections preventing trade liberalization from favorably influencing employment conditions in Pakistan. Our policy recommendations based on the study's results stress the need for skill enhancement measures to increase labor productivity, helping it become competitive according to the demands of globalization.

Keywords: Trade openness, labor-demand elasticity, Pakistan.

JEL Classification: F16.

1. Introduction

Fundamental changes in global economic policy have made trade liberalization a key element of development policies since the 1970s. The neoliberal view of trade liberalization advocates market-oriented economic reforms with the aim of improving efficiency and stability in the economy. The formation of the World Trade Organization in 1995 gave impetus to the process of trade liberalization, which is usually measured in terms of changes in the trade regime and/or by realized trade flows such as a country's export and import flows. Edwards (1993)

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describes a liberal trade regime as one in which all trade distortions, including import tariffs and export subsidies, are completely eliminated.

Trade liberalization is favored primarily on the grounds of facilitating economic growth through its dynamic advantages of higher capacity utilization, more efficient investment projects, and by promoting export growth performance and enhanced productivity. The realized cost associated with trade liberalization is the loss in tariff revenues due to tariff reductions, which accounts for 10 to 20 percent of government revenues in developing countries. To compensate for this tariff revenue loss, a larger tax burden is imposed on the consumer, which has a distortionary effect on the economy. It is also asserted that the gains from trade liberalization are not distributed uniformly and create imbalances among and within countries.

Regarding trade liberalization and labor market linkages, proponents of trade liberalization argue that labor is one of the chief beneficiaries of greater openness in developing countries. This perspective expects trade liberalization to motivate such countries to shift away from capital-intensive production to labor-intensive production, keeping in view the respective comparative advantages that increase labor demand in labor-abundant countries, leading to higher wages and employment, and lower wage inequality.

One aspect of the trade–labor linkage that has received recent attention is the impact of trade liberalization on labor-demand elasticity. The importance of this aspect was first emphasized by Rodrik (1997), who argued that trade makes the demand for labor more elastic, which in turn leads to larger employment and wage shocks as a result of given vertical shifts in the labor demand curve (arising from shocks to productivity or output demand). Further, this increase in elasticity erodes the bargaining power of labor vis-à-vis capital in sharing supernormal profits. Finally, it also results in labor bearing a larger burden of the impact of nonwage labor costs. Thus, through this channel, workers are subject to greater pressure as a result of trade liberalization (see Slaughter, 1997).

Pakistan adopted a trade liberalization policy in 1988 against the backdrop of World Bank/IMF supported Structural Adjustment Program. The country underwent substantial trade liberalization and the effective rate of protection has fallen sharply since the early 1990s. A sequential shift was expected to occur from capital-intensive to labor-intensive production, in turn leading to employment generation because of the greater incentives afforded to labor-intensive exports in particular, along with higher wages. Nevertheless, labor-demand elasticity may also increase when pursuing trade liberalization due to tougher competition in the goods market, the substitution of patently unskilled—if cheaper—labor, and the global economic environment.

Most of the empirical literature on this issue focuses on developed countries. The linkage between trade and labor markets in the context of developing countries—specifically Pakistan—has yet to be thoroughly explored. In this regard, this study aims to investigate trade–labor linkages in Pakistan's manufacturing sector through the labor-demand elasticity. This is achieved by adopting a panel data approach for the period 1970/71–2000/01 for 22 selected manufacturing industries as a whole, and by disaggregating data into pre- and post-trade liberalization data. The estimation technique used is the common intercept model (CIM) for first-differenced data and the fixed effects model (FEM). Owing to the critical role of the manufacturing sector in contributing to gross domestic product (GDP) and employment, the study provides an important insight into the sensitivity of labor demand with respect to the trade liberalization policies adopted by Pakistan.

The rest of the article is organized as follows. Part 2 provides a review of the relevant literature. Part 3 gives an overview of the trade policies adopted by Pakistan with special reference to the phases of trade liberalization. Part 4 presents our model specification and estimation strategy. Part 5 details the data used. Part 6 presents and interprets the study's results, and Part 7 concludes the article.

2. A Review of the Literature

Theoretical Perspectives on Trade and Labor Market Linkages

The relevant literature deals with the various ways in which trade liberalization is channeled to the labor market. The basic precept of free trade is that it is more efficient for a country to produce goods that it is better able to produce according to its factor endowments relative to its trading partners. Regarding trade among countries, the Heckscher-Ohlin (HO) theory states that a country will export that commodity the production of which requires the intensive use of a relatively abundant and cheap factor, and will import that commodity the production of which requires the intensive use of a scarce and expensive factor.

A theorem arising from the HO model—the factor price equalization theorem—states that prices equalize across countries under an international mobility of factors depending on the assumption of similar technology shared by two countries and the existence of perfectly competitive markets. This holds that international trade homogenizes the absolute return on the factor of homogenous production among economies. Starting from the proposition of the HO theory, the Stolper-Samuelson theorem was the first theoretical formulation to explain the effects of free trade on income distribution among production factors. The crucial point is the correspondence between product price and input prices, which implies that an increase in the relative price of a good leads to an increase in the relative return on the factor used intensively to produce that good.

The traditional trade theories explained above may provide a solid base for incorporating labor market implications into the trade model, but they leave a significant part of international trade unexplained. Relaxing the assumptions of constant economies of scale, perfect competition, and differences in technology requires new complementary trade theories. Increasing returns to scale on a larger scale of operation make the greater division of labor and specialization possible. International competition forces every firm/plant to produce only one or a few varieties of the same product rather than many different types; this keeps the unit cost low, making it possible for all factors of production to gain from trade. The technological gap and product-cycle models can be regarded as an extension of the basic HO model in a technologically dynamic world (Salvatore, 1996).

Hamermesh (1993) best summarizes what determines an industry's equilibrium own-price labor-demand elasticity with "the fundamental law of factor demand." He assumes that the production function exhibits constant returns to scale, as described by *F*, and given as

$$Y = F(L, K) \qquad F_i > 0, F_{ii} < 0, F_{ij} > 0 \tag{a}$$

Y is output, and *K* and *L* are homogenous capital and labor inputs, respectively. A firm that maximizes profits subject to a limit on costs will set the marginal value of the product of each factor equal to its price.

$$F_L - \lambda w = 0 \tag{b}$$

$$F_K - \lambda r = 0 \tag{c}$$

w and r are the exogenous prices of labor and capital, respectively; λ is a Langrangean multiplier showing how extra profits are generated by relaxing the cost constraint; and the price of output is assumed to be unity. The cost constraint is given as

$$C^0 - wL - rK = 0 \qquad \text{(d)}$$

The ratio of equations (b) and (c) is the marginal rate of technical substitution, which equals the factor-price ratio for a profit maximizing firm. The own-wage labor demand elasticity at a constant output and constant r is given as (Allen, 1938, pp. 372–373)

$$\eta_{LL} = -[1-s]\,\sigma < 0 \qquad \text{(e)}$$

$s = wL/Y$, the share of labor in total revenue. Intuitively, the constant-output elasticity of labor demand is smaller for a given level of technology (σ), when labor's share is greater because there is relatively less capital toward which to substitute when the wage rate rises. When the wage rate increases, the cost of producing a given output rises. The price of the product will then rise, reducing the quantity of output sold. The scale effect depends on the (absolute value of the) elasticity of product demand (η) and on the share of labor in total costs (which determines the percentage increase in price). The scale effect is added in equation (e) and, modifying notations slightly, given as

$$\eta_{LLj} = -[1-s]\,\sigma - s\eta_j \qquad \text{(f)}$$

η_{LLj} is industry j's own-price labor-demand elasticity (defined as negative), s is labor's share of industry in total revenue, σ is the constant-output elasticity of substitution between labor and other factors of production, and η_j is the product-demand elasticity for industry j's output market. The variables s, σ, and η_j are all defined as being positive.[1]

[1] An increase in the wage rate affects the demand for labor in two ways: through the substitution effect and the scale effect. The first part of equation (6), -[1-s]σ, deals with the substitution effect, i.e., for a given level of output, showing how much the industry substitutes away from labor toward other factors when the wage rate rises. This term is often referred to as "constant-output labor-demand elasticity." The scale effect postulates that the wage rate increase causes the marginal cost of production to rise; under pressure to increase product prices and reduce output, this causes a fall in employment. The second part of equation (6), $s\eta_j$, shows the scale effect. When the wage rate rises, both effects tend to reduce labor demand. The four laws of Hicks and Marshall concerning the substitution and scale effects are given in standard books on labor economics.

Through the scale effect, the trade and labor market linkage is specified with the help of equation (f). The differential of equation (f) with respect to η_j yields

$$\partial \eta_{LLj} / \partial \eta_j = -s < 0 \qquad \text{(g)}$$

This shows that, as product demand becomes more elastic, i.e., η_j rises, so does labor demand, i.e., η_{LLj} falls. This works according to the fourth law of the Hicks-Marshall laws of factor demand. The larger the share of labor in cost and revenue (s), the stronger the pass-through from η_j to η_{LLj}.

Similarly, taking the differential of equation (f) with respect to σ (constant-output elasticity of substitution between labor and other factors of production) shows that, as this substitutability increases, labor demand becomes more elastic, i.e., η_{LLj} falls.

$$\partial \eta_{LLj} / \partial \sigma = -[1-s] < 0 \qquad \text{(h)}$$

Also, the smaller the share of labor in the industry's cost and revenue, the stronger the pass-through from σ to η_{LLj}. For any given value of σ, higher wages trigger larger (smaller) changes in the quantity of labor demanded the less (more) important labor is in total costs. In short, labor-demand elasticity can be increased through international trade by increasing η_j/σ. However, the Allen-Hamermesh approach used by Slaughter (2001) is specified for a perfectly competitive market; in an imperfectly competitive market, an increase in wages has a pure cost effect, but reduces at the same time the market share of the firm and thus its markup. As a result of this pro-competitive effect, there may be an incomplete pass-through between prices and wages, and the adjustment of labor demand would be then smaller than expected (Mirza & Pisu, 2003).

Hence, the trade–labor relationship is more easily said than predicted. This is far more than a theoretical concern and demands rigorous empirical work, the findings of which may provide a better insight into the mechanism behind the trade–labor linkage with reference to Pakistan.

Empirical Evidence on Trade and Labor Market Linkages

A channel of trade–labor linkage that has received much attention in recent years is the impact of trade on labor-demand elasticities. Most of the empirical literature focuses mainly on developed countries. In contrast, the linkage between trade and labor markets in developing countries has yet to be thoroughly explored, specifically for Pakistan. Here, we provide a brief review of the relevant studies.

A recent study by Riihimaki (2005) that uses industry-level data for Finland for the period 1975–2002 finds support for the idea that economic integration can lead to increased own-price labor-demand elasticity. The log-linear specification for which the quantity of factor employment is regressed on real factor prices and real production is applied to estimate labor-demand elasticity. Using a general theoretical model of intra-industry trade, the study analyzes the economic integration effect on labor-demand elasticity. This is provided that intensified trade competition increases labor-demand elasticity while the economies of scale decrease the elasticity of labor demand by decreasing the elasticity of substitution between differentiated products. If integration gives rise to an increase in input substitutability and/or outsourcing activities, labor demand will become more elastic. Overall, the results support the hypothesis that economic integration has contributed to the increased elasticity of total labor demand in Finland.

A study by Bruno et al. (2004) estimates labor-demand elasticity using an industry-year panel for a number of industrialized countries—including major European countries, Japan, and the US—for the period 1970–96. The employment adjustment cost is accommodated by estimating a dynamic specification. The findings suggest increasing elasticity over time in absolute terms for all manufacturing sectors in the UK and US, but decreasing elasticity for Italy, Japan, and Spain. A mixed picture is obtained for France for which elasticity increases in absolute value for only one subset of sectors (transport, traditional, and chemical) .

In another study by Haouas and Yagoubi (2004), the effect of trade liberalization on labor-demand elasticity is investigated using an employment demand equation for Tunisia's manufacturing industries for the period 1971–96. The production function is assumed to be a Cobb-Douglas function. To capture unobserved demand shocks, the authors use a fixed effects model (FEM). The estimated elasticities lie within the range of 0.213 to 0.453, which Hamermesh (1993) identifies as a reasonable range. But the parameter of elasticity change—the parameter corresponding to the wage variable that interacts with the liberalization dummy—appears to be small and largely insignificant. The lower responsiveness of labor-demand elasticity to trade liberalization is explained by the tight labor market regulations in place in Tunisia during 1987–96.

Using industry-level data disaggregated by state, Hasan, Mitra and Ramaswami (2003) find that trade liberalization has a positive impact on labor-demand elasticity in the Indian manufacturing sector. The elasticity turns out to be negatively related to protection levels that vary across industries and over time. Furthermore, the study finds that not only is labor-demand elasticity higher for Indian states with more flexible labor regulations, it is affected by trade reforms to a larger degree. After trade reforms, volatility in productivity and output is translated into larger wage and employment volatility, theoretically a possible consequence of higher labor-demand elasticity.

Slaughter (2001) adopts a two-stage approach to industry-year panel data for the US for 1961–91. He provides mixed support for the view that trade contributes to increased elasticity. The author finds that the demand for production labor has become more elastic in the American manufacturing sector overall and in five of eight industries within the sector; the same is not true, however, for nonproduction labor. For production workers as well as for nonproduction workers, time appears to be a very strong predictor of elasticity patterns and there is a large unexplained residual for changing factor-demand elasticities.

Slaughter's (2001) approach is also followed by Krishna, Mitra, and Chinoy (2001) and Fajnzylber and Maloney (2001), who find no support, however, for the conjecture that labor demand is more elastic in response to trade liberalization. Using Turkish plant-level data spanning a period of dramatic trade liberalization, Krishna et al. (2001) investigate empirically the link between trade openness and factor-demand elasticity. Their analysis suggests that the putative linkage between greater trade openness and labor-demand elasticity may be quite weak, which they explain by the variety of frictions that affect firms' labor-demand decisions.

Fajnzylber and Maloney (2001) provide only very mixed support and no consistent patterns for the idea that trade liberalization has an impact on own-wage elasticity. They use establishment-level data to provide consistent dynamic estimates of labor-demand functions for three Latin American countries (Chile, Colombia, and Mexico) across trade policy regimes. The results show that estimates of elasticity change greatly in magnitude, if not significantly, over time, and that comparisons across countries should take this into account when attempting to make inferences about the flexibility or efficiency of labor markets.

3. The Evolution of Trade Policy in Pakistan

Pakistan has adopted a variety of policies for its trade sector with special focus on its manufacturing sector. In the 1950s, three major steps were taken, including (i) the overvaluation of the rupee relative to other countries; (ii) the application of quantitative controls to imports to regulate the level and composition of imported goods, a highly differentiated structure of tariffs on imports; and (iii) export taxes on two principal agricultural exports: jute and cotton. These steps point to the absence of a real export promotion policy at least until 1956.

The export promotion scheme was introduced later on, which covered 67 primary commodities and 58 manufacturing goods whereby exporters were entitled to import licenses for certain specific items to the extent of 25 and 40 percent on various categories of manufacturing goods and 15 percent on the export of raw materials (Ahmed, 1984). During this period, the large-scale manufacturing sector grew by 23.6 percent between 1949 and 1954, and afterward by 9.3 percent up till 1960. During the 1960s, there was direct emphasis on the promotion of manufactured exports with the introduction of an export bonus scheme in 1959 based on a multiple exchange rate system.[2] This scheme, along with import licensing and liberalization, proved to have a dramatic impact: annual large-scale manufacturing growth increased from 8 percent in 1955 to 17 percent in 1965. The export bonus scheme also had a positive effect on exports in the early 1960s.

In 1972, the Pakistani government took steps to abolish the import licensing system, as well as the multiple exchange rate system and export bonus scheme. Economic activity in this decade slowed down, and the performance of the manufacturing sector weakened due to the nationalization of different industrial units, banks, and other private units. The most dramatic step taken was the devaluation of the rupee by 56 percent. Later, a series of steps were adopted to liberalize the trade regime: the number of banned goods was reduced and most nontariff barriers, which had been imposed after the oil shocks and foreign exchange stringency of the 1970s, were also removed.

[2] A multiple exchange rate system is explained as (i) different exchange rates for imports and exports; (ii) different exchange rates for different import categories (high-priority imported goods overvalued exchange while others that were not on the government's priority list undervalued the exchange rate); and (iii) different exchange rates for different export categories.

Since the 1980s, Pakistan has followed a combination of policies to move toward a more neutral trade regime. The most significant change was the formulation of a new trade policy in 1987 whereby tariff slabs were cut from 17 to 10, a uniform sales tax replaced previous rates that varied across commodities, and maximum tariff rates were reduced from 225 to 125 percent. Another policy that affected exports was the delinking of the rupee from the US dollar and the introduction of a flexible exchange rate system. In the 1990s, the government privatized various public units and provided exporters with a host of incentives in the form of tax holidays, tariff cuts, and other fiscal incentives. Pakistan's import policy continued to rationalize the import tariff, reducing nontariff barriers and simplifying the tariff structure.

This overview of trade policy in Pakistan indicates a steady move toward a free trade regime. Since Pakistan has adopted a number of measures to liberalize imports and promote exports over time, this could have far-reaching effects on its goods and factor markets.[3]

Table 1 provides means and standard deviations for production and trade measures of selected manufacturing industries for the pre- and post-trade liberalization period. Over the selected period, the trend in manufacturing sector employment follows an inconsistent pattern and exhibits fluctuations. Overall, employment increased by approximately 50 percent over 1970/71–2000/01. When comparing the pre- and post-trade liberalization periods, employment is seen to have increased under pre-trade liberalization (19.45 percent) more than under post-trade liberalization (3.9 percent). Hence, although overall employment has increased, a sharp rise is not observed in employment in manufacturing industries during the post-trade liberalization period. Conversely, there is a reduction in 1995 as compared to employment in 1990.

[3] Trade policies beyond the year 2000 are not discussed in detail since they do not fall under the data covered in this empirical analysis.

Table 1: Summary Statistics of Key Variables for Manufacturing Industries

Period	Year	Employment	Real production ('000)	Real wages/ hour/worker ('000)	Openness
	1970	17,810	13,662	0.0370	1.767
		(42,680)	(21,841)	(0.0155)	(3.010)
Pre-trade liberalization	1975	22,089	19,212	0.0423	1.700
		(46,897)	(30,521)	(0.0161)	(2.068)
	1980	18,960	34,875	0.0630	1.100
		(39,143)	(49,137)	(0.0170)	(1.128)
	1985	21,275	53,448	0.0850	1.475
		(37,818)	(68,543)	(0.0280)	(3.628)
	1990	26,101	71,697	0.0960	1.034
		(50,783)	(101,457)	(0.0360)	(1.929)
Post-trade liberalization	1995	23,789	80,407	0.1135	1.717
		(48,169)	(128,711)	(0.0690)	(4.170)
	2000	27,110	106,917	0.1340	2.298
		(66,185)	(170,265)	(0.0670)	(6.866)

Notes: (a) Employment is measured as the average number of workers engaged; openness is measured as exports + imports as a percentage of manufacturing output.
(b) Standard deviations are reported in parentheses.

As Majid (2001) states,

> Progressively over the last two decades growth in manufacturing has become more labor-productivity driven (than employment-expansion driven) and in the 1990s it seems to have been de-linked from employment expansion altogether.

Output growth in the manufacturing sector as reported in Table 1 shows a steadily rising trend over time. A dramatic change is seen to occur over the three decades: output increases by more than 650 percent over the period 1970–2000, implying a sharp rise and jumps in output due to the adoption of the industrialization policies discussed earlier.[4] The

[4] The highest growth in manufacturing output was in 1980, which increased by 80 percent. The government's industrial policy in 1978 and 1984 reiterated its thrust on continuing a pattern of industrialization. Although the 1990s have been termed a low-growth period by Majid (2001), this was due to a reduction in protection, deflationary tendencies in the economy, inconsistent policies,

real wage per worker (expressed in thousands) shows a consistent and slowly rising trend over time. Although it increases by more than 200 percent over time, the figures appear to be quite low in accordance with the rising inflation in the economy.

4. Model Specification and Estimation Strategy

Our model is based on a labor demand equation to examine the impact of trade liberalization on labor-demand elasticity. The manufacturing firm is assumed to choose a level of production *(y)*, with domestic factor input labor *(L)*, and *w* as the price of labor. These specifications are consistent with various goods and labor market structures.

Domestic labor demand is given as

$$ln\ L_{it} = \alpha + \beta_y\ lny_{it} + \beta_\omega\ ln\omega_{it} + \beta_{trlib}\ lntrlib_{it} + e_{it} \quad (1)$$

Labor (*L*) is defined as the average number of daily persons engaged in total manufacturing. Production (*y*) consists of the value of manufacturing finished products and byproducts, etc., is measured in thousands, and converted into real values by deflating it by the wholesale manufacturing price index (1980/81 = 100). Wages (*w*) include wages and salaries paid plus cash and noncash benefits paid to workers. This is measured by dividing the employment cost by *L*, in thousands. The data is further converted into wages per hour by dividing it by 48 working hours per week.

The term *trlib* stands for trade liberalization and is measured by two commonly used indicators: (i) the share of trade (exports plus imports) in each manufacturing unit's production (*lnopen*), and (ii) the average tariff rate computed for each manufacturing sector by dividing import duties by the value of imports in specific manufacturing sectors (*lnimpd*). The term β_y (output elasticity of labor demand) measures percentage changes in labor demand with respect to percentage changes in output; β_ω (wage elasticity of labor demand) measures percentage changes in labor demand with respect to percentage changes in wages; β_{trlib} measures percentage changes in labor demand with respect to trade liberalization; *i* stands for 22 selected manufacturing industries; and *t* refers to each five-year period between 1970/71–2000/01.

lower levels of investment, and the poor law-and-order situation (Kemal, 1998). Manufacturing growth increased by 34 percent over 1985–1990, and at an even lower rate (12 percent) over 1990–1995. Hence, trends in employment are similar to those in production during pre- and post-trade liberalization.

Panel Data Model

Since labor-demand elasticity measurement is a long-run phenomenon, using a panel data approach allows us to effectively capture the long-term fluctuations caused by the structural and institutional characteristics of different industries in the analysis. In this model, the existence of unobservable factors controlling industry-specific labor-demand elasticity can be taken into account in the estimation procedure.

A pooled ordinary least squares (OLS) model refers to a common intercept model (CIM) in which only one intercept is used for all cross-sectional units. Equation (1) is the specific form of this type of model, where α stands for the common intercept for 22 selected manufacturing industries over the period 1970/71–2000/01. The model is applied to pooled data in levels and first-differences. Applying the model to first-differenced data is preferable to using a simple OLS model because the former eliminates cross-industry differences rather than merely disregarding them. The straight application of OLS to this model discards the temporal and space dimension and thus throws away useful information. The limitations of OLS in this sort of application prompt interest in alternative methods such as the FEM.

Fixed Effects Model

The FEM approach assumes that shifts across industries are deterministic. The intercept term is allowed to vary across industries while random variations are assumed to be independent. For an FEM, equation (1) is modified accordingly as

$$ln\ L_{it} = \alpha + \alpha_i + \beta_y\ lny_{it} + \beta_\omega\ ln\omega_{it} + \beta_{trlib}\ lntrlib_{it} + e_{it} \quad (2)$$

α_i indicates the industry-specific term. Here, we use the least-squares dummy variable estimation technique. The FEM can also incorporate time effects by adding a time dummy variable to equation (2), which is constant across industries but evolves over time. Hence, equation (2) can be augmented by a set of $T - 1$ time dummies and the estimates would have a standard interpretation relative to the base or reference year chosen. Equation (2) can be written for both industry- and time-specific effects as

$$ln\ L_{it} = \alpha + \alpha_i + \alpha_t + \beta_y\ lny_{it} + \beta_\omega\ ln\omega_{it} + \beta_{trlib}\ lntrlib_{it} + e_{it} \quad (3)$$

α_t refers to time-specific effects. The combined time- and industry-specific regression model eliminates the omitted-variables bias of a CIM that arises from unobserved factors across industries. The time-specific effects are likely to capture the effects of policy interventions, trade policy shifts, and significant changes in productivity due to innovation, the impact of global changes, and so on.[5]

The choice between the findings of the FEM and random effects model (REM) is determined by the Hausman Specification test. The random effects formulation treats random effects as independent of the explanatory variables, and violating this assumption may lead to inconsistency and bias in the estimated parameters. If the effects are correlated with the explanatory variables, the fixed-effects estimators are consistent and efficient (for details, see Wooldridge, 2002).

Estimation Issues

Two main issues arise in estimating a labor demand model: (i) the identification problem, and (ii) the endogeneity of the regressors in the specified equations. From an economic theory perspective, both labor demand and labor supply depend on relative wages. It is therefore not clear what combination of labor-demand and labor-supply elasticities is obtained from the model.

In order to overcome this problem, we make a similar assumption to that of Slaughter (2001); Greenaway, Hine, and Wright (1999); and Faini, Falzoni, Galeotti, Helg, and Turrini (1999). In particular, labor supplies are assumed to be perfectly elastic. In this way, shifts in the labor supply curve, as measured by movements in wages, are able to trace the labor demand curve (whose position is controlled by the other regressors included in the model that are thought to leave the labor supply schedule unaffected).

The endogeneity of some regressors may yield biased estimates of labor-demand elasticity. In our study, labor demand and output have a bi-directional link in the neoclassical context. This causation could lead to endogeneity in output, as capital is not controlled in the model. However, both y and w can be checked for endogeneity by applying the same technique as the Hausman Specification test (for details, see Stock & Watson, 2004; for a detailed discussion on endogeneity, see Green, 2007).

[5] A random effects model takes industry-specific effects as random compared to an FEM where they are assumed to be deterministic. This is based on the assumption that random variations in various cross-sectional units come from overlapping, not from the same sample. See Wooldridge (2002) for detail.

5. Data Description

The dataset used in our study covers a panel of 22 manufacturing industries in Pakistan over the period 1970/71–2000/01, which were selected according to the Pakistan Standard Industrial Classification, 1970, comparable at a three-digit level to the International Standard Industrial Classification, 1968. The industries included in this study cover 81 percent of reporting establishments of manufacturing (Pakistan Economic Survey for 2000/01). Moreover, they account for 90 percent of production and 86.4 percent of employment in total manufacturing.[6]

The *Census of manufacturing industries* (CMI)—the only major source of data on manufacturing industries in Pakistan—suffers from certain limitations, such as under-coverage of manufacturing firms, changes in the definition of some variables over time, and gaps and irregularity in survey publications. Nonetheless, with no alternatives, we have used the CMI as our major source of data. Due to the unavailability of consecutive time series, we have used data with five-year gaps.[7] We have also segregated the data into pre- and post-trade liberalization periods for comparison: the period 1970/71–1980–85 represents the pre-trade liberalization period, and the period 1990/91–2000/01 indicates post-trade liberalization. All the variables are measured in natural log form.

The data on output (y), wages (w), and employment (L) was collected from various issues of the CMI, published by the Federal Bureau of Statistics (FBS). The data on imports and exports was taken from the FBS's publication, *50 years of Pakistan in statistics*. Since this data was given according to major commodity groups, we arranged it in accordance with the industrial divisions. Finally, the data on import duties was taken from various issues of the *CBR yearbook*, published by the Federal Board of Revenue.

6. Empirical Results and Interpretation

Table 2 reports the results for the CIM using first-differenced data and the FEM. Regression in the FEM is carried out with both time- and industry-specific effects, and thus the estimates are free of any omitted-variables bias, which the CIM is usually expected to suffer from.[8] The

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[6] Authors' calculations based on data from the CMI for 2000/01.

[7] Nevertheless, employing panel data does not deprive us of an efficiency gain due to a large number of degrees of freedom.

[8] The estimation was carried out in STATA 9.

results are reported only for the openness measure of trade liberalization (*lnopen*) since the second measure, import duties (*lnimpd*), appeared to have an insignificant effect in all the models.[9]

Table 2: Estimates of First-Difference Model and Fixed Effects Model

Dependent variable: *lnL*

	First-difference model			Fixed effects model		
Variable	**All years**	**Pre-TL**	**Post-TL**	**All years**	**Pre-TL**	**Post-TL**
C	-0.042	0.013	-0.0106**	-2.360	-2.820*	-3.430**
	(0.033)	(0.058)	(0.041)	(1.540)	(1.690)	(1.630)
lny	0.623*	0.532*	0.812*	0.602*	0.446*	0.768*
	(0.121)	(0.142)	(0.096)	(0.127)	(0.098)	(0.110)
lnw	-0.765*	-0.871*	-0.411**	-0.539*	-0.675*	-0.519*
	(0.087)	(0.087)	(0.163)	(0.103)	(0.119)	(0.124)
Lnopen	-0.101**	-0.148*	-0.019	-0.122	-0.224*	0.0015
	(0.050)	(0.044)	(0.056)	(0.088)	(0.078)	(0.068)
D75	-	-	-	-0.007	0.021	-
				(0.089)	(0.079)	
D80	-	-	-	-0.305*	-0.193	-
				(0.115)	(0.122)	
D85	-	-	-	-0.273**	-0.094	-
				(0.135)	(0.154)	
D90	-	-	-	-0.295**	-	-
				(0.143)		
D95	-	-	-	-0.452*	-	-0.132*
				(0.157)		(0.046)
D00	-	-	-	-0.523*	-	-0.216*
				(0.163)		(0.065)
N	132.000	66.000	66.000	154.000	88.000	66.000
R^2	0.660	0.680	0.670	0.690	0.71	0.69
F-test	30.390	46.820	55.700	15.510	13.350	20.080
F-statistic for fixed effects (p-value)				23.460 (0.000)	15.850 (0.000)	37.340 (0.000)
χ^2-statistic for Hausman Specification test (p-value)	-	-	-	11.980 (0.007)	21.540 (0.000)	32.040 (0.000)

Notes: (a) The results are robust with regard to white heteroscedasticity.
(b) Standard errors are reported in parentheses.
(c) *, **, and *** indicate significance at 1, 5, and 10 percent, respectively.

[9] For brevity's sake, Table A1 does not provide the results for import duties; these are available from the authors on request.

The panel data was first checked for stationarity as inferences from the F-statistic might be spurious in the case of nonstationary data and the test statistic will have nonstandard distributions. The Levin, Lin, and Chu (2002) test statistic for panel data is applied in this regard. The results are reported in Table A1 (see Appendix) and show no sign of a unit root. All the variables are integrated of the same order, I (0) in levels. Hence, the results based on this panel data are deemed reliable.

Results for the test for endogeneity of the output and wage variables are provided in Tables A2 and A3 (see Appendix), respectively. As already explained, these variables are likely to suffer from endogeneity problems leading to inconsistency in the estimated models to which we have applied 2SLS for estimation. The findings presented in both tables report no endogeneity problem regarding production and wages. The second column of each table provides estimates of the reduced form equation for production and wages, respectively; and the third column gives estimates of two-stage least squares (2SLS) based on the structural form equation. In the next column, we report the results obtained from the CIM in order to compare them with the 2SLS. The last column reports the result of an auxiliary regression of log employment on the residuals obtained from the reduced form equation to check for endogeneity in production and wages.

Applying the instrumental variable (IV) technique to the 2SLS model demands that the instruments be relevant and exogenous. We use one-year lags of output (*Llny*), wages (*Llnw*), and openness (*Llnopen*) as IVs in the model. In Table A2, the use of lagged values of the problematic variable and exogenous variables (wages and openness) is considered to be a good instrument since there is a smaller likelihood of correlation between the lagged values and error term than with the level values. Regarding the relevance of IVs in the output model, the value of the F-test statistic is 407.93. Since this exceeds the critical value of 10, it implies that the IVs used in the regression are relevant. In order to check the validity of the instruments, we apply the Sargan test, which yields a value of 0.406—this is less than the critical value. Hence, we do not reject the null hypothesis that the over-identifying restrictions are satisfied. This validates the instruments used in the 2SLS model.

We apply the Hausman Specification test with regard to the exogeneity of the production variable. The residual term is statistically insignificant and shows that production is exogenous in the pooled OLS model. These results validate the estimates obtained from OLS. Table A3 reports the required results for the exogeneity test for the wage variable, in which we use one-year lags for wages (*Llnw*), output (*Llny*), and openness (*Llnopen*) as IVs. These are deemed relevant and exogenous since the value of the F-test statistic is 27.30; this exceeds the critical value and shows that the IVs are relevant.

In checking the validity of the instruments, the value obtained from the Sargan test is 1.956, which is less than the critical value. This validates the instruments being used in the 2SLS model. Regarding the exogeneity of wages, the Hausman Specification test shows that the residuals from the structural form equation in Table A3 are statistically insignificant and indicate that wages are exogenous.

In general, the results for the own-wage elasticity of labor demand and output elasticity are in accordance with our expectations and with standard economic theory. The value for R^2 is reasonably high, keeping in view the presence of cross-industry variations. The F-statistic points to the overall significance of the models. We also examine the possibility of heteroscedasticity by applying the White heteroscedasticity test. The problem of autocorrelation is not expected, bearing in mind that the data has five-year gaps after each year. It is important to mention here that the variations in all the models were tested for interaction between *lnopen* with *lnw* and *lny*. However, the results obtained from these regressions are statistically insignificant in most cases, implying that the openness measure of trade liberalization has an insignificant impact on employment when interacted with wages and output.[10]

The Hausman Specification test rejects the REM in favor of the FEM, implying that the regressors and unmeasured characteristics of manufacturing industries are correlated. The industry-specific effects are reported in Table 3. The findings of the test for equality are reported in Table 4 in order to measure whether any statistical difference emerges in output, wages, and openness elasticities across the pre- and post-trade liberalization periods.

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[10] For brevity's sake, these results are not reported here.

Table 3: Industry-Specific Effects

No.	Industry	Fixed effects	No.	Industry	Fixed effects
1	Food	-1.050* (0.113)	12	Rubber products	-1.080* (0.404)
2	Beverages	-2.360* (0.675)	13	Glass and glass products	-0.730* (0.248)
3	Tobacco	-2.610* (0.543)	14	Nonmetal products	-1.070* (0.272)
4	Leather and leather products	-1.950* (0.320)	15	Iron and steel	-0.990* (0.247)
5	Footwear	-1.450* (0.385)	16	Metal products	-1.930* (0.689)
6	Wood products	-1.120* (0.323)	17	Nonelectrical machinery	-1.420* (0.565)
7	Paper and paper products	-1.300* (0.259)	18	Electrical machinery	-1.530* (0.471)
8	Industrial chemicals	-1.350* (0.256)	19	Transport equipment	-1.950* (0.632)
9	Other chemicals	-2.790* (0.259)	20	Photographic and optical groups	-1.570* (0.553)
10	Drugs and medicines	-1.310* (0.441)	21	Other manufacturing	-1.170* (0.300)
11	Petroleum and coal products	-0.864* (0.286)			

Notes: (a) Standard errors are reported in parentheses.
(b) The textiles industry is the base category and is thus excluded from the model.

Table 4: Test for Equality

Variable	Differenced model	Fixed effects model
Own-wage elasticity	0.460**	0.156
	(0.185)	(0.172)
Output elasticity	-0.280	-0.322**
	(0.171)	(0.147)
Openness	0.129***	0.222**
	(0.071)	(0.103)

Notes: (a) Standard errors are reported in parentheses.
(b) ** and *** indicate significant differences between coefficients across pre- and post-trade liberalization periods at 5 and 10 percent, respectively.

Structural Stability Test

The Chow test is applied to check the possible structural stability of the model. Since the simple Chow test is not valid in the presence of heteroscedasticity, a hetero-adjusted Chow test is used instead. Table 5 reports the results for the hetero-adjusted Chow test both for the first-difference model and the FEM. The log of employment is regressed on the key variables and these are also interacted with the liberalization dummy to find if there are any significant differences in parameters the across pre- and post- trade liberalization periods.

Table 5: Hetero-Adjusted Chow Test

Dependent variable: *lnL*

Variable	First-difference model	Fixed effects model
C	0.0131	-3.900**
	(0.058)	(1.540)
Lny	0.532*	0.560*
	(0.142)	(0.127)
Lnw	-0.871*	-0.730*
	(0.087)	(0.090)
Lnopen	-0.148*	-0.103
	(0.044)	(0.092)
Dtrlib	-0.118***	1.106
	(0.071)	(1.170)
*dtrlib*lny*	0.280***	-0.0530***
	(0.171)	(0.031)
*dtrlib*lnw*	0.459**	0.046
	(0.185)	(0.111)
*dtrlib*lnopen*	0.128***	0.029
	(0.071)	(0.039)
N	132	154
R^2	0.690	0.740
F-test	43.980	22.150
F-statistic for Chow test	4.330*	1.320

Notes: (a) Standard errors are reported in parentheses.
(b) *, **, and *** indicate significance at 1, 5, and 10 percent, respectively.
(c) The Chow test is applied at F (3, 124) for first-difference results. The null hypothesis for the Chow test is: $H_0 = \gamma_1 = \gamma_2 = \gamma_3 = 0$. H_0 is rejected in this model and implies that pooling is not justified. The Chow test for the FEM is applied at F (3, 125). H_0 is not rejected in the FEM and implies that pooling is justified here.

The variable *dtrlib* stands for the trade liberalization dummy. It takes a value of 1 for the post-trade liberalization period and 0 for the pre-trade liberalization period. The value of the F-statistic in the first-differenced model exceeds the critical value and implies that pooling is not justified here. The results for *dtrlib*, interaction between *dtrlib* and log production (*lny*), log wages (*lnw*), and log openness (*lnopen*) in the first-difference model are statistically significant, indicating a significant difference across the pre- and post-trade liberalization periods.

However, the FEM presents the reverse: the estimates for the trade liberalization dummy variable (*dtrlib*) appear to be statistically insignificant, indicating no difference between pre- and post-trade liberalization. The parameters for interaction between *dtrlib* and other variables indicate an insignificant difference in elasticities across the pre- and post-trade liberalization period. Thus, a pattern of insignificant elasticity appears on one hand while pooling is justified on the other. Consequently, we rely on the results of the full time period in the FEM's case. Although the results for output and wages are similar in the FEM and first-difference model, the FEM controls for industry- and time-specific effects, which also appear to be significant and are thus preferable.

The results for output elasticity in both models are statistically and positively significant at 1 percent, and are supported by the Hicks-Marshall law of factor demand, which asserts that labor-demand elasticity will be higher in response to the higher price-elasticity of product demand. However, values for output elasticity that are between 0.5 and 0.8 are inelastic in the manufacturing sector. The findings of lower elasticity are similar to the majority evidence for the manufacturing sector in Pakistan, while the test for equality yields a higher output-elasticity for the post-trade liberalization period.

The wage variable appears to have a statistically significant negative effect on employment at 1 percent in both models. According to economic theory, a rise in the wage rate will increase the relative cost of labor and induce employers to use less labor and more other factors of production, according to the substitution effect. However, as a result of the scale effect, an increase in wages will cause the marginal cost of production to rise and put pressure on product prices to increase and output to decrease, causing a fall in employment. In addition, the own-wage elasticity of labor demand does not change significantly across the two phases of trade liberalization as shown by the findings of the FEM reported in Table 4.

The openness effect in the FEM appears to be statistically insignificant, controlling for all years and industries. This shows that openness has not affected employment in the way suggested by standard trade theory. The results for pre- and post-trade liberalization are similar to the first-difference model, which shows that openness is significant for the pre-trade liberalization period and statistically insignificant for the post-trade liberalization period. However, pooling is justified in these models as reported in Table 5, and the test for equality reported in Table 4 provides evidence of decreased openness-elasticity in the FEM. A comparison across pre- and post-trade liberalization periods is, however, not that straightforward as the openness parameter is significant for pre-trade liberalization but insignificant for post-trade liberalization. Again, using the interaction of wages and output with openness fails to show a significant pattern (Table 5).

The figures for the capital-labor ratio show that it kept increasing from 1970 onward. Although the food and textile sectors are major contributors to manufacturing output and are considered less capital-intensive, this ratio also increases over time in these sectors. Sectoral shifts are important in this matter. In the 1990s, the share of food production declined from 24.3 to 14.2 percent of overall output. The share of textiles decreased from 24.3 to 20 percent, while that of the industrial chemical sector, which is highly capital-intensive, increased significantly.[11] Hence, capital intensity might better explain the features of employment in the manufacturing sector. Due to trade liberalization in the long run, technical infusion may raise the demand for capital and labor productivity, and hence the demand for skilled labor.

When observing the results for the time dummies in the FEM, the coefficient for the years 1980 to 2000 appear to be statistically negatively significant, demonstrating a significant difference between employment in 1970 (the base category) and employment in later years. The time factor thus proves to be a strong predictor of employment patterns in this model. The results are consistent with the empirical evidence on trends in employment in Pakistan's manufacturing sector. The high-growth 1980s and low-growth 1990s have contributed little to employment generation in this sector.

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[11] Here, capital is measured using a proxy: fixed assets such as land, buildings, plants and machinery, and other fixed assets expected to have a productive life of one year plus the depreciation, addition, and alteration made during that year.

The overall significance of industry-specific effects is determined by the F-test, reported in Table 2 (conducted for fixed effects). The results for industry fixed effects are reported in Table 3. The coefficient for industry-specific dummies shows that labor absorption in the textiles sector is highest, while employment in petroleum is lowest due mainly to institutional and internal factors that vary from one industry to the other but are assumed to be constant over time. We have tried to identify the measurable factors responsible for these variations by estimating the impact of the capital-output ratio on fixed effects.[12] The effect of the capital-output ratio is statistically significant at 1 percent, and explains 28 percent of the variation in industry fixed effects.

Overall, our findings suggest that trade liberalization in the manufacturing sector has an insignificant effect on labor-demand elasticity. Although Pakistan has adopted a stance in favor of trade liberalization over time, and the effective rate of protection has fallen very sharply since the early 1990s, the consequential shift from labor-intensive production to capital-intensive production has been gradual and not in keeping with the static comparative advantage. This, in turn, has not led to an increase in employment generation, and could be due to technical infusion over time (which would demand skilled labor and capital components) or to increased competition in international markets for exports and the easy availability of input.

7. Conclusions and Policy Implications

The impact of trade liberalization on the labor market via the channel of labor-demand elasticity has gradually begun to receive attention in the literature on developing countries, but there is still a dearth of empirical research on this aspect in Pakistan's context. According to empirical evidence from a number of countries, trade liberalization does not directly affect the labor market, specifically from the perspective of sensitivity. Trade reforms are commonly perceived as being implemented in such a way that minimizes their impact on the labor market. In addition, the labor market's sluggish response to trade liberalization may be due to imperfect competition in the labor market.

This study has examined the impact of trade liberalization on labor-demand elasticities in selected manufacturing industries in Pakistan, using pooled and disaggregated data for pre- and post-trade

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[12] Authors' calculations based on data from the CMI (various issues).

liberalization periods spanning 1970/71 to 2000/01. Overall, our findings suggest that trade and labor market linkages are not as strong as suggested by the H-O-S type of theory of international trade. According to trade theory, openness can lead to an increase in labor demand in labor-abundant countries due to comparative advantage, and this is expected to increase labor-demand elasticities as labor comes under pressure due to stiffer competition in the goods and labor markets. But in Pakistan's case, labor-demand elasticities are not as affected, rather, openness has had an insignificant effect on labor demand during the period of trade liberalization.

Most importantly, when time and industry-specific factors are introduced into the models used, these factors appear to have greater significance. Employment in all years, other than 1975, is significantly lower than that in the base year (1970s). Thus, one might infer that the overall reduction in labor demand and its insensitivity can be explained by increased capital intensity in the manufacturing sector. Trade liberalization may result in enhanced labor productivity in the long run, but for fewer workers with greater skills as required in the globalized era, leading to higher demand and higher wages for skilled workers. In particular, the infusion of new technology requires skilled labor and capital for production, whereas in Pakistan, little attention is paid to skills enhancement and vocational training for labor.

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Appendix

Table A1: Panel-Data Unit-Root Test

	Levin, Lin, and Chu test statistic	
Variable	**With trend and intercept**	**Integration order**
Employment	-12.130	I (0)
	(0.000)	
Production	-6.680	I (0)
	(0.000)	
Wage	-7.670	I (0)
	(0.000)	
Openness	-16.730	I (0)
	(0.000)	
Import duty	-21.530	I (0)
	(0.000)	

Notes: (a) All variables are checked for stationarity in levels.
(b) Probability values are reported in parentheses.
(c) The null hypothesis of the unit root against the stationary alternative is rejected for all variables. All variables are integrated of order zero, i.e., I (0).

Table A2: Exogeneity Test for Production Function

Variable	**Reduced-form equation (*lny*)**	**2SLS (*lnL*)**	**OLS (*lnL*)**	**Exogeneity test structural-form equation (*lnL*)**
C	4.070*	-9.000*	-8.030*	-8.980*
	(1.240)	(2.340)	(2.070)	(1.590)
Lny	-	0.847*	0.832*	0.847*
		(0.039)	(0.035)	(0.039)
Lnw	0.195	-1.06*	-0.983*	-1.060*
	(0.132)	(0.22)	(0.196)	(0.143)
Lnopen	-0.363*	0.075**	0.077*	0.076**
	(0.055)	(0.031)	(0.029)	(0.033)
D75	-	-	-0.029	-
			(0.146)	
D80	0.086	-0.069	-0.122	-0.072
	(0.141)	(0.186)	(0.191)	(0.186)
D85	-0.038	0.084	0.017	0.081
	(0.148)	(0.195)	(0.199)	(0.205)
D90	-0.233	0.159	0.089	0.157
	(0.159)	(0.205)	(0.207)	(0.218)
D95	-0.391**	0.105	0.027	0.102
	(0.171)	(0.207)	(0.206)	(0.230)
D00	-0.238	0.118	0.029	0.115
	(0.184)	(0.229)	(0.230)	(0.248)
Llny	0.929*	-	-	-
	(0.027)			
Llnw	0.112	-	-	-
	(0.136)			
Llnopen	0.391*	-	-	-
	(0.059)			
Residual	-	-	-	-0.076
				(0.051)
N	132	132	154	132
R^2	0.930	0.800	0.810	0.800
F-test	172.920	67.380	77.820	55.250
F-statistic for IV	407.930*	-	-	-
χ^2-statistic for Sargan test	-	0.406	-	-

Notes: (a) The results are robust with regard to heteroscedasticity.
(b) Standard errors are reported in parentheses.
(c) *, **, and *** indicate significance at 1, 5, and 10 percent, respectively.
(d) The Sargan test is applied at χ^2 (2).

Table A3: Exogeneity Test for Wage Function

Variable	Reduced-form equation (*lnw*)	2SLS (*lnL*)	OLS (*lnL*)	Exogeneity test structural-form equation (*lnL*)
C	-3.830	-9.990*	-8.030*	-9.820*
	(0.812)	(2.470)	(2.070)	(2.460)
lny	0.091	0.842*	0.832*	0.840*
	(0.062)	(0.042)	(0.035)	(0.042)
lnw	-	-1.165*	-0.983*	-1.149*
		(0.225)	(0.196)	(0.224)
lnopen	0.015	0.078*	0.077*	0.077**
	(0.044)	(0.034)	(0.029)	(0.034)
D75	-	-	-0.029	-
			(0.146)	
D80	0.420*	-0.018	-0.122	-0.024
	(0.089)	(0.201)	(0.191)	(0.201)
D85	0.427*	0.169	0.017	0.159
	(0.094)	(0.238)	(0.199)	(0.238)
D90	0.365*	0.259	0.089	0.247
	(0.105)	(0.260)	(0.207)	(0.259)
D95	0.425*	0.216	0.027	0.203
	(0.113)	(0.280)	(0.206)	(0.279)
D00	0.526*	0.249	0.029	0.234
	(0.117)	(0.312)	(0.23)	(0.312)
Llny	-0.058	-	-	-
	(0.060)			
Llnw	0.644*	-	-	-
	(0.073)			
Llnopen	0.008	-	-	-
	(0.047)			
Residual	-	-	-	0.051
				(0.079)
N	132	132	154	132
R^2	0.720	0.780	0.810	0.800
F-test	34.640	57.630	77.820	54.230
F-statistic for IV	27.300*	-	-	-
χ^2-statistic for Sargan test	-	1.956	-	-

Notes: (a) The results are robust with regard to heteroscedasticity.
(b) Standard errors are reported in parentheses.
(c) *, **, and *** indicate significance at 1, 5, and 10 percent, respectively.
(d) The Sargan test is applied at χ^2 (2).

Table A4: Estimates of Fixed Effects Model

Dependent variable: *lnL*

	Fixed effects model (with import duties as a percentage of total imports as the trade liberalization measure)		
Variable	**All years**	**Pre-trade liberalization**	**Post-trade liberalization**
C	-1.800***	-1.880	-1.240
	(1.006)	(1.750)	(1.240)
Lny	0.810*	0.719*	0.760*
	(0.073)	(0.137)	(0.085)
Lnw	-0.564*	-0.701*	-0.499*
	(0.094)	(0.120)	(0.128)
Lnimpd	-0.005	-0.029	-0.016
	(0.020)	(0.024)	(0.021)
D75	0.048	0.076	-
	(0.083)	(0.074)	
D80	-0.283*	-0.134	-
	(0.103)	(0.108)	
D85	-0.286*	-0.058	-
	(0.103)	(0.142)	
D90	-0.300**	-	-
	(0.129)		
D95	-0.433*	-	-0.140*
	(0.137)		(0.045)
D00	-0.521*	-	-0.230*
	(0.150)		(0.068)
N	154	88	66
R^2_{within}	0.750	0.730	0.690
F-test	22.560	15.300	19.740
Wald test	-	-	-
Lagrange Multiplier test (p-value)	-	-	-
F-test for fixed effects	32.110	17.990	40.450
(p-value)	(0.000)	(0.000)	(0.000)
χ^2-statistic for Hausman Specification test (p-value)	-	-	-

Notes: (a) The results are robust with regard to white heteroscedasticity.
(b) Standard errors are reported in parentheses.
(c) *, **, and *** indicate significance at 1, 5, and 10 percent, respectively.