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The impact of trade reforms on industry wage premia in Pakistan: A sectoral perspective

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ABSTRACT

Pakistan witnessed significant trade liberalization reforms between 1988 and 2005. This study investigates the impact of Pakistan's significant trade liberalization policies in 1988 on industry wage premia. We use an estimation strategy that takes into account dispersion in sector wage premiums and trade reforms over time and across sectors. We employed the wage premium approach and Restricted Least Squares to obtain sectoral wage premia. We used weighted least squares and two-stage-least-squares (2SLS) to explore the liaison between trade reforms and sector wage premia. Contrary to previous empirical studies on less developed economies, our findings reveal a significant and resilient correlation between changes in trade reforms and fluctuations in sector wage premiums during the liberalisation period of 1990-2005. Our findings are consistent with short- and medium-run trade models in which workers are immobile across industries or, on the other hand, with the presence of sector rents that are reduced when trade policy is liberalized.

Contribution/ Originality: This study adds to the trade-wage nexus literature of Pakistan by using import tariffs at the manufacturing (2-digit industry-level) industries as a measure of trade liberalization. We employed the wage premium approach and Restricted Least Squares to obtain industry wage premia. We used weighted least squares and two-stage-least-squares (2SLS) in panel analysis.

1. INTRODUCTION

The subject of how trade openness affects labor markets is a critical one in any public debate regarding the merits and demerits of trade openness. Although the subject of trade openness (TO), salaries, and employment is significant in public policy, empirical research on their relationship is inconclusive (Aslam, Ul-Haq, Cheema, & Visas, 2022; Feliciano, 2001; Goldberg & Pavcnik, 2005; Khanum, Ul-Haq, Hye, & Cheema, 2024; Kumar & Mishra, 2008; Pavcnik, Blom, Goldberg, & Schady, 2004). The empirical literature commonly uses measures of trade liberalization such as exports, imports, export and import growth, product prices when available, and price indices of imports and exports. However, these measures are highly debatable due to theoretical issues in explanation, and their use as independent variables in regression models can lead to simultaneity biases (Goldberg & Pavcnik, 2005). In addition to this,

distinguishing the impacts of trade factors from other concurrent advancements, such as technological progress, has generated additional contention.

As opposed to this view, the prospects for trade liberalization in emerging nations, particularly in South Asia, offer favorable opportunities to investigate the liaison between labor markets and trade liberalization. As most of these countries were never part of the GATT's discussions regarding lowering protection rates, the Pre-trade reforms Tariff levels in these countries were very high[1]. The most outstanding aspect of the trade reforms was the comprehensive tariffs reduction that brought them in line with those of developed countries. From an empirical perspective, these trade reforms are beneficial because they accurately measure and compare tariffs over time, unlike non-tariff barriers (NTBs).

Our study looks at the impact of TO in Pakistan from 1988 to 2005 to see how liberalizing trade reforms affected the labor market. Pakistan began progressive trade liberalization in 1988 as part of the Bretton Woods' Structural Adjustment Program (SAP) after 1990. The impacts of trade reforms on average tariffs and protection structures are measurable; it is inspiring to associate them with all-industry labor market developments. The study centers on the effects of TO on relative earnings, measured by wage premium across industries. These premiums for industry's workers are the share of industry[2]'s earnings not accounted for by the industries or the worker's attributes. Our investigation diverges from prior scholarly discourse by focusing on industry wage premiums as opposed to solely examining the effects of reform on worker characteristics and wages. Trade models, such as imperfect competition and special factor models of trade, propose that reforms ought to have an impact on industries' premiums. These premiums may be incentives for sector rents or incentives for sector-specific talent. While it is true that each sector employs individuals with varying levels of education and skill, disparities in earning premiums reflect differences in the relative earnings of skilled and amateurish workers (Goldberg & Pavcnik, 2005; Jameel, Hina, & Ul-Haq, 2023; Pavcnik et al., 2004).

This study adds to the trade-wage nexus literature in the case of Pakistan in the following ways: Firstly, it examines the impact of the 1988 trade reforms on industry wage- prevalence using micro-level data from the manufacturing industries of Pakistan. Secondly, we used a reduction in protection rates (i.e., import tariff rates) at the manufacturing (2-digit industry-level) industries as a proxy of trade liberalization that is believed to be a better measure. Thirdly, we utilize the wage premium approach, a widely recognized methodology in the labor literature. Fourthly, our study covers the whole regime of trade liberalization (i.e., 1990–2005) in Pakistan for empirical analysis. Fifth, we used sectoral panel data for empirical analysis.

We structure the rest of this paper as follows: Section 2 discusses the context of Pakistan's trade reforms. Section 3 describes the theoretical rationale. Section 4 outlines an empirical framework. Section 5 discusses instrumenting for trade liberalization. Section 6 discusses data, data sources, and descriptive statistics. Section 7 presents the estimation of wage premiums. Section 8 presents our empirical data, while Section 9 presents the conclusion.

2. BACKGROUND OF PAKISTAN'S TRADE REFORMS

Pakistan has habitually used protectionist and import substitution policies to achieve self-sufficiency and shield its domestic industry (or infant industry) from foreign competition. The lack of infrastructure and political instability in an agrarian economy led to the establishment of an import-restricted trade policy until the 1960s (Shoukat, Abdullah, Rafique, & Qamri, 2023). Trade liberalization began in Pakistan immediately after Zia assumed control of the government. Zia took a number of initiatives to liberalize the economy, which included lowering the number of forbidden commodities on the trade restriction list and removing other quantitative restrictions. The government

[1] Pakistan joined General Agreement on Tariffs and Trade (GATT) in 1948 and the WTO 1995. But that as it may, article XVIII of GATT allowed the developing economies to continue imposing high tariffs as GATT members.

[2] The terms "sector" and "industry" are used interchangeably in whole document.

removed all non-tariff measures, such as import licenses, quotas, embargoes, foreign exchange restrictions, and import deposits, that were implemented after the FOREX reserves crisis and oil shocks in the 1970s. Despite these measures, the World Bank rated Pakistan's import regime in the 1980s as the most restrictive. Pakistan began its major trade liberalization reforms in 1988 to comply with the Bretton Woods SAP to streamline import tariff structures and improve the efficiency of domestic manufacturing industries. Between 1985 and 2005, Pakistan's trade policy witnessed significant changes. The number of tariff slabs dropped from 17 to 10, and the average import duty fell from 77% in 1986–87 to 14% in 2005–06. The maximum tariff fell from 225 percent in 1986–87 to 45 percent in 2005–06 (Ul-Haq, 2016).

3. RELATIVE WAGES AND INTERNATIONAL FLOWS PROTECTION: THEORETICAL RATIONALE

To better understand the empirical study, it is helpful to first identify the pathways by which trade openness influences the sector earnings gap. To start, we take a look at some theoretical reasons why trade liberalization has led to earnings disparities in these industries.

A specific factor model might be the most appropriate starting point when considering trade flows and relative earnings. The model accounts for factors of production immobility across industries and is inherently short-run. The specific factor model recommends a positive association between the industry's earnings and tariffs. Within the framework of trade liberalization reforms, this indicates that industries's wage premiums should decrease in tandem with the magnitude of protection reductions that occur in those industries. The Ricardo-Viner (R-V) medium-run model, which accounts for capital mobility but immobile labor across sectors, yields similar forecasts. The well-known belief that liberalizing trade policy lowers wages in the most guarded industries is also consistent with the Ricardo-Viner (R-V) model.

Unlike short- and medium-term models, the Hecksher-Ohlin (H-O) long-run model predicts that trade liberalization policies should affect compensations across the economy, rather than sector-specific compensations (the compensations to factors of production given that all factors are movable). Primarily, the H-O model posits that trade openness targeting sectors with high labor intensity will result in a decline in the average wage due to a reduction in aggregate labor demand. On the other hand, the assumption of sector-level parity leads to the expectation that relative earnings will remain constant. One challenge associated with employing this framework for investigative purposes is the considerable discrepancy in compensation across sectors for comparable and similar positions. This discrepancy is difficult to reconcile. The absence of a correlation between reforms and relative compensations signifies acclimation, which the H-O model defines as "the reallocation of labor across industries."

The assumption of perfect competition in the goods and factor markets is central to the trade models mentioned earlier. The inclusion of imperfect competition in trade models reveals new channels through which trade policies can impact earnings. For example, through better negotiations, unions may be able to extract some of the industry's rents, particularly in successful and lucrative sectors, and obtain higher compensations for the industry's workers. As trade openness is likely to erode the profit margins of local industries that were protected from outside competition before reforms (Harrison, 1994) lower protection rates are associated with lower sector earnings. On the other hand, there is a possibility that unions pull out some part of rents connected with protections in the form of job security rather than in the form of higher earnings (Grossman, 1984; McDonald & Solow, 1981).

Lastly, trade openness may impact sector compensations by causing changes in trade-induced production efficiency. There is little unanimity on the impact of openness on productivity (Dani, 1992; Melitz, 2003; Roberts & Tybout, 1996). Most empirical studies, such as Harrison (1994) for Cote d' Ivoire, Krishna and Mitra (1998) for India, Kim (2000) for Korea, Fernandes (2007) for Colombia, Hay (2001) for Brazil, and Pavcnik (2002) for Chile, found a positive relationship between trade liberalization and productivity. As protection decreases, industrial units must increase productivity to stay competitive. The increased competition from foreign firms caused by low tariffs pushes

domestic firms to innovate, resulting in higher productivity. Reducing protection will increase workers' earnings in previously protected industries, provided that higher sector compensations partially transfer productivity gains to them. The above discussion implies that although sector association influences how trade liberalization affects industry wages, relying solely on theoretical considerations does not ensure that trade policy will have the anticipated impact on industry earnings. Therefore, it is necessary to address these concerns through empirical methods.

4. EMPIRICAL FRAMEWORK

In empirical research, our estimation strategy for investigating the impact of commercial policy on earnings is the industry wage premium methodology (henceforth IWP), which is a well-known and commonly used methodology in labor economics. The IWP has been widely used in labor and trade literature[3]. The objective is to use differences in earnings and import protections (trade-related non-tariff barriers) across manufacturing sectors and epochs to evaluate the impact of trade flows on workers' earnings. The estimation process is conducted in two steps. First, we run a regression taking the log of worker i's weekly earnings in industry j at time t $[\ln(w_{ijt})]$ as endogenous, and the explanatory is a vector of individual's traits H_{ijt} which include sex, level of education, marital status, location indicator, age, dummies for occupation and a dummy set (I_{ijt}) representing sector affiliation of the workers:

$$\ln(w_{ijt}) = H_{ijt}\beta_H + I_{ijt}wp_{jt} + \varepsilon_{ijt} \qquad (1)$$

The estimates of industrial indicators' or the wage premia (wp_{jt}) of sector j at time t describe the share of the deviation in wages that is not captured by individual worker traits. According to Krueger and Summers (1988) the calculated sector wage premia are expressed as deviances from employment-weighted mean wage premia. These normalized sector wage premia are taken as the relative variation in wages for a labor in a given sector compared to an average worker with seemingly similar attributes across all sectors. The industry wage premiums normalized earning gaps, and their exact standard errors are assessed using Restricted Least Squares (RLS) put forward by Haisken-DeNew and Schmidt (1997). The first-step models, Equation 1, are estimated separately for each year in the liberalization-regime. In the second step, wage premiums of each sector taken from the first step estimations, are pooled across time and regressed on industry trade-related attributes. The regression model of the second stage is as follows:

$$wp_{jt} = T_{jt}\beta_T + D_{jt}\beta_D + u_{jt} \qquad (2)$$

Where T_{jt} is the vector of trade-related industry characteristics, including tariffs as the principal variable? The use of protection rates (i.e., import tariffs) is a significant improvement over existing work that has relied on other measures like price indices, trade ratio, etc. The protection measures are conceptually the right measure to evaluate the effect of trade policy changes on relative wages, as they can be more realistically considered as exogenous (Casabianca, 2016; Goldberg & Pavcnik, 2005; Gourdon, Maystre, & De Melo, 2008; Wu, Ul-Haq, Zafar, Sun, & Jiang, 2019). The vector D_{jt} contains industry and time dummies.

The first step derives the dependent variable in the second-step estimation, the coefficient of the industry dummy. Consequently, its calculation is imprecise. The second-step model experiences increased noise, resulting in greater variability among its estimators. We expect the volatility in wage premiums to vary across different sectors based on the variability of the estimated coefficients obtained in the initial stage. Therefore, our study employs the weighted least squares (WLS) technique to estimate the regression model in the second step. The weights we use are the reciprocal of the standard error of premium estimations from the first-stage regression. This places greater emphasis on sectors with lower fluctuations in sector wage differentials, and vice versa.

[3] For instance Dickens and Katz (1987); Krueger and Summers (1988); Gaston and Trefler (1994); Pavcnik et al. (2004); Goldberg and Pavcnik (2005); Kumar and Mishra (2008); Ul-Haq, Arif, Hye, Visas, and Cheema (2023) and Nisa, Ul-Haq, and Nazeer (2022).

5. INSTRUMENTING FOR TRADE PROTECTION

Two empirical issues that persist despite the implementation of first difference or fixed effects to account for time-invariant unseen sector heterogeneity are the simultaneous impact of political factors on industry wages and tariff structure, and time-varying selection based on unobserved individual attributes across sectors. If present, our estimates would be subject to bias. We employ an instrumental variable framework to examine trade policy and mitigate these empirical concerns. The best tool should have a strong positive relationship with import protection rates, specifically tariffs, and no relationship with industry-specific compensations that change over time and can't be seen. Prior to devising instruments, it is advisable to analyze the variables that contribute to fluctuations in tariffs across different sectors and over different periods of time. In the 1980s, many developing countries faced a shortage of FOREX reserves. To address this issue, Pakistan first accepted the IMF's SAP and implemented it in 1988. Figure 1 depicts a thorough picture of Pakistan's FOREX reserves. The radical Trade reforms were part of the agreement between the IMF and Pakistan. Consequently, the rise in FOREX reserves is likely to be linked to changes in protection over the years, which provide the justification for using FOREX reserves as an instrument. We also expect the variability in FOREX stocks to have no correlation with unobserved factors of earnings.

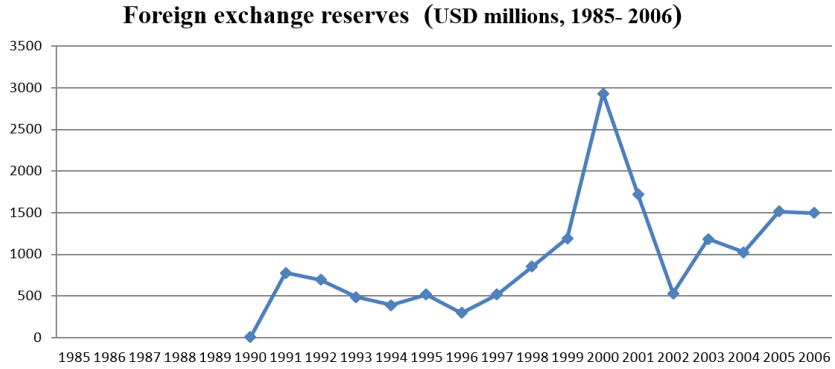

Figure 1. Foreign exchange reserves of Pakistan over time.
Source: IFS (2008).

Following Goldberg and Pavcnik (2005) and Wu et al. (2019), we used pre-reform protections (i.e., import tariffs) in 1988 (1988 is the year that the liberalizing policy was adopted), and the proportion of unskilled workers by sector (in 1990) as a determinant of changes in trade policy. The relationship between the 2005-1990 tariffs and the 1988 tariffs is presented in a scatter diagram (see Figure 2). The regression model that connects the 2005-1990 fall in protections (i.e., tariff reductions) to the 1988 protection levels (i.e., import tariff levels) yields a coefficient of determination of 0.90 and an estimate of 1988 protection levels of 0.6796 (with a t-value of 22.91).

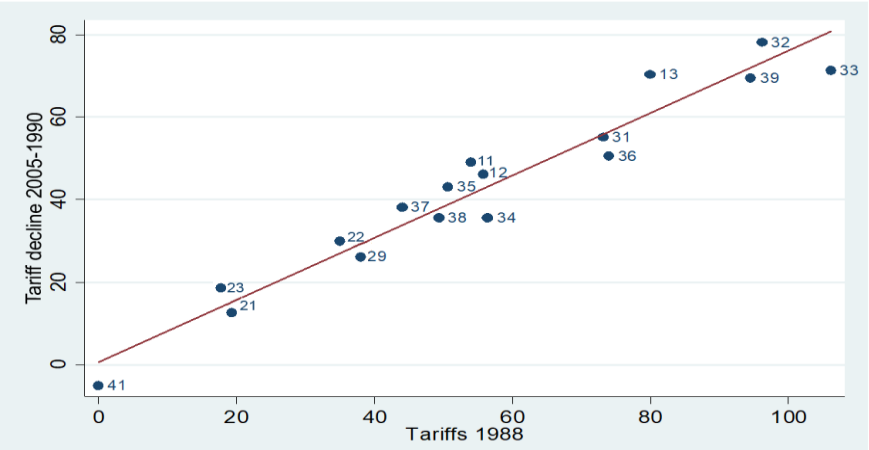

Figure 2. Tariffs in 1988 and tariff decline 2005-1990.
Source: PCT (Various Issues) and WITS-WB (Various Years).

Figure 3. Tariff decline 2005-1990 and percentage (Share) of unskilled in 1990.
Source: PCT (Various Issues); WITS-WB (Various Years) and LFS (Various Issues).

The association between the proportion of unskilled labor in 1990 and the 2005-1990 tariff decline is illustrated in Figure 3. We also regressed the 2005-1990 tariff reduction on the share of unskilled (SUK) labor in 1990, and the coefficient of SUK is 0.795 (with a t-value of 7.23) and R^2 of 0.47.

6. DATA

6.1. Trade Liberalization Policy

Pakistan's trade policy saw major shifts during the 1988 to 2005 epoch[4]. Though Pakistan significantly liberalized its economy during Zia's era, important changes were made to the trade policy as part of the SAP and implemented in 1988.

Table 1. Tariffs descriptive statistics from 1990-2005.

Overall	Obs.	Average	SD	Min.	Max.
1988	18	62.64	39.92	0	176.362*
1990	18	62.43	37.55	0	163.24*
1992	18	64.08	28.05	0	160
1994	18	50.45	20.62	0	120
1996	18	41.07	19.53	0	111.8*
1999	18	24.05	11.36	0	83.52*
2001	18	19.38	10.02	1.83*	60
2003	18	16.05	8.19	3.5	48.92*
2005	18	13.28	8.67	0.29*	45.71*
Manufacturing					
1988	9	63.68	40.3	0	176.36*
1990	9	63.32	37.84	0	163.24*
1992	9	64.44	27.81	0	160
1994	9	51.29	20.27	0	120
1996	9	41.47	19.39	0	111.8*
1999	9	24.3	11.28	0	83.52*
2001	9	19.99	9.98	1.83*	60
2003	9	16.51	8.2	3.5	48.92*
2005	9	13.76	8.74	0.29*	45.71*

Note: "*" shows the Ad valorem equivalence and N is the number of industries.
Source: PCT (Various Issues).

[4] See Zaidi (2005) for details about the exact timing of the reforms.

The cut in industrial Protection rates was surprising and consistent across sectors and over-time. Sectoral protection-levels have changed noticeably. Advantageously for the manufacturing sector, the average tariffs on imports from the three most strictly regulated industries: wood, wood products and furniture, textiles and apparel, and other manufacturing and handicraft, were 106%, 96%, and 94%, respectively.

This suggests that Pakistan mostly protected unskilled-labor-intensive industries, a scenario similar to that of Colombia and Brazil (Goldberg & Pavcnik, 2003) and Mexico (Harrison & Hanson, 1999). Pakistan gradually liberalized its trade policy by lowering tariff slabs, then lowering protection rates, and then abolishing non-tariff trade barriers. Tariff rates fell steadily throughout the study period, with the most significant drop occurring between 1988 and 1995. Table 1 shows descriptive statistics for all sectors and the manufacturing industry from 1988 to 2005, which corresponds to the study period. Average tariffs dropped from 63% to 13% during 1988-2005 in overall sectors and from 64% to only 14% in the manufacturing industry during the same period.

Table 2 presents the correlation matrix of import tariffs across the sample epoch. These correlations substantiate that the tariffs' structure has acclimated during the study episode. The pair-wise correlations vary between 0.98 and 0.78 in all industries. The inter-temporal association of Pakistani import tariffs is similar to that of Colombian and Indian, and considerably lesser than the U.S.A. tariffs, where the association among post-Kennedy and post-Tokyo rounds of GATT tariffs is 0.98.

Table 2. Correlation matrix of tariffs over 1988-2005.

Years	1988	1990	1992	1994	1996	1999	2001	2003	2005
1988	1								
1990	0.988	1							
1992	0.961	0.978	1						
1994	0.788	0.799	0.798	1					
1996	0.853	0.867	0.874	0.831	1				
1999	0.865	0.869	0.863	0.942	0.872	1			
2001	0.8	0.798	0.742	0.752	0.713	0.81	1		
2003	0.816	0.812	0.761	0.775	0.711	0.832	0.982	1	
2005	0.796	0.783	0.734	0.802	0.747	0.868	0.953	0.96	1

Source: PCT (Various Issues).

6.2. National Household Data

We connect trade openness data to household data. We take Pakistani households data from labor force surveys (hereafter LFS) for the period 1990 to 2005. The key socio-economic and demographic features of LFS over time are presented in Table 3.

Table 3. Summary of descriptive statistics of LFS.

Variables	1990	1992	1994	1996	1999	2001	2003	2005
Log weekly wage	5.78	6.02	6.257	6.55	6.69	6.74	6.83	5.99
Weekly wage (Current PKR)	398.24	520.35	656.04	881.26	1018.43	1074.68	1243.82	1105.23
Monthly wage (Current PKR)	1594.86	2078	2612.15	3525.03	4073.7	4298.73	4975.26	4420.91
Male	0.915	0.907	0.919	0.91	0.895	0.897	0.889	0.878
Age	32.76	33.08	33.37	34.18	34.05	33.69	33.85	32.68
Married	0.687	0.681	0.693	0.727	0.715	0.699	0.679	0.646
Head of household	0.758	0.733	0.763	0.795	0.756	0.749	0.704	0.705
Literate	0.562	0.584	0.612	0.737	0.756	0.752	0.768	0.645
Below primary	0.469	0.451	0.431	0.292	0.273	0.288	0.273	0.389
Primary but below middle	0.12	0.122	0.122	0.107	0.111	0.122	0.116	0.147
Middle but below matric	0.093	0.092	0.094	0.099	0.107	0.108	0.117	0.116
Matric but below inter	0.149	0.155	0.156	0.199	0.19	0.194	0.187	0.15
Inter but below graduation	0.067	0.0669	0.0786	0.12	0.109	0.105	0.11	0.073
Graduate	0.076	0.082	0.086	0.142	0.144	0.121	0.13	0.082
Post graduate	0.025	0.031	0.032	0.041	0.064	0.062	0.067	0.042

Variables	1990	1992	1994	1996	1999	2001	2003	2005
Managers	0.027	0.03	0.027	0.013	0.01	0.009	0.01	0.005
Professionals	0.131	0.129	0.134	0.191	0.157	0.113	0.119	0.076
Technicians	0.05	0.053	0.065	0.248	0.173	0.195	0.176	0.122
Clerks	0.135	0.128	0.119	0.096	0.158	0.162	0.163	0.11
Services	0.143	0.131	0.132	0.042	0.056	0.068	0.075	0.048
Skilled	0.073	0.07	0.067	0.02	0.014	0.008	0.01	0.016
Crafts	0.15	0.141	0.14	0.303	0.309	0.306	0.305	0.394
Plant	0.05	0.052	0.049	0.088	0.123	0.139	0.143	0.229
Elementary	0.241	0.266	0.266					
Formal				0.692	0.651	0.635	0.587	0.394
Punjab	0.449	0.444	0.455	0.427	0.456	0.449	0.427	0.494
Sindh	0.278	0.292	0.278	0.296	0.255	0.272	0.283	0.259
KPK	0.182	0.18	0.167	0.163	0.157	0.147	0.155	0.156
Baluchistan	0.09	0.084	0.1	0.113	0.132	0.133	0.135	0.09
Observations	12055	12075	11760	7833	6672	7808	7803	23389

Source: LFS (Various Issues).

The LFS is a nationally representative annual survey of Pakistan that spreads across quarters to address seasonal disparities. The prime target of the survey is to gather data on a variety of statistics on several traits of the country's work force. It provides information on a wide range of aspects of the economy's civilian work force.

The demographics comprise information on various aspects like age, household head, gender, marital status, schooling, literacy, profession, migration, sectoral affiliation, etc. The aspects of the workforce include statistics on (i) the working force categorized by sector, informal-formal sector, job status, occupation, working hours, and education level; (ii) information on the working condition of workers; and (iii) unemployed workers by education level and prior work experience. The employment data of workers is testified at 2-digit ISIC categorizations in the LFS, which gives us 33 sectors in total[5] and 9 manufacturing industries.

The data on worker traits has some limitations. First, union membership is often regarded as a key indicator of worker wages; the LFS does not provide data regarding the union affiliation status of workers. Secondly, LFS also does not provide data regarding individuals' working experiences. We offer a solution to this problem by using age and age-squared in our regression model (controlling for education level).

7. ESTIMATION OF INDUSTRY WAGE PREMIUMS

Firstly, we estimate Equation 1 for each cross-section of the Labor force survey for both specifications. Both specifications include a complete set of industry indicators, but do differ in sample selection criteria and individual worker's characteristics which are comprised in a vector H_{ijt}. In the first specification, we include workers having a positive wage and between 14 years of age to 65 years of age exclusive, while the second specification consists of the whole sample with positive wages. Our specifications differ a little bit due to data unavailability. In this study, we only report the results of specifications 1 and 2, along with our interpretation of these finding.

Table 4 presents the regression coefficients of specifications 1 and 2 for 1990, 1996, and 2003, respectively. The magnitudes and signs of the coefficients on workers' characteristics are similar to those presented in earlier studies. Older individuals who are male, married, literate, and employed in the formal sector earn comparatively more. Individuals working in the informal sector receive lower wages than those in the formal sector with the same observable individual characteristics.

A comparison of the regression coefficients between 1990, 1996, and 2003 suggests that the earnings associated with most of the individual traits have changed over time. Most importantly, the returns to formal sector work and education level appear to change with time. The wage gap between formal and informal workers is increasing. Our

[5] There is a small variation in number of sectors in different Labor Force Surveys.

findings are in contrast with those of Goldberg and Pavcnik (2005). Findings for Colombia show that this gap has declined progressively. There is a general downward trend in returns to the different levels of education, but in some cases, a little improvement as compared to 1996 is observed. The earning gap between males and females rose steadily from 1990 to 2003. Males earn 31.6% higher as compared to females in 1990 and 39% higher in 2003. There is an upward trend in earnings for older individuals. Head of household's earnings rose until 1996 but fell between 1996 and 2003.

Next, we examined how much of the variation in log weekly wages is explained by specification 1 of Equation 1. With an industry indicator, the R-squared in specification one (IWP1) varies between 0.36 and 0.59, while without an industry indicator, the R-squared ranges between 0.34 and 0.54 over time. The difference in R-squared with and without an industry indicator is between 1.8% and 4.85%. When controlling for industry characteristics, this disparity reveals that industry affiliations explain about 2% of the variation in workers' log weekly wages.

Table 4. Estimates of earning equation for 1990, 1996 and 2003.

Variable	IWP1			IWP2		
	1990	1996	2003	1990	1996	2003
Male	0.316***	0.326***	0.39***	0.331***	0.352***	0.412***
	(0.017)	(0.023)	(0.023)	(0.017)	(0.022)	(0.023)
Age	0.0328***	0.033***	0.043***	0.036***	0.046***	0.054***
	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
Age2	-0.0004***	-0.0003***	-0.0004***	-0.0004***	-0.0004***	-0.0005***
	(3.58e-05)	(5.16e-05)	(5.45e-05)	(2.59e-05)	(3.97e-05)	(4.22e-05)
Primary	0.039*	-0.067*	-0.007	0.026	-0.0284	-0.003
	(0.022)	(0.039)	(0.036)	(0.021)	(0.038)	(0.035)
Middle	0.136***	-0.008	0.049	0.113***	0.035	0.021
	(0.024)	(0.039)	(0.036)	(0.023)	(0.039)	(0.036)
Matric	0.237***	0.068**	0.136***	0.207***	0.110***	0.097***
	(0.022)	(0.037)	(0.035)	(0.022)	(0.036)	(0.034)
Inter	0.347***	0.171***	0.222***	0.328***	0.203***	0.175***
	(0.027)	(0.039)	(0.038)	(0.027)	(0.039)	(0.038)
Graduate	0.620***	0.451***	0.462***	0.588***	0.472***	0.409***
	(0.027)	(0.039)	(0.038)	(0.027)	(0.039)	(0.038)
Postgraduate	0.809***	0.641***	0.663***	0.749***	0.648***	0.597***
	(0.036)	(0.047)	(0.043)	(0.037)	(0.046)	(0.043)
HH	-0.018	0.037***	-0.022	-0.002	0.041**	-0.023*
	(0.011)	(0.016)	(0.015)	(0.011)	(0.016)	(0.015)
Married	0.054***	0.077***	0.069***	0.073***	0.076***	0.075***
	(0.012)	(0.018)	(0.019)	(0.012)	(0.018)	(0.019)
Literate	0.051***	0.159***	0.099***	0.074***	0.101***	0.125***
	(0.019)	(0.037)	(0.033)	(0.019)	(0.036)	(0.033)
Constant	5.227***	5.164***	5.076***	4.487***	4.965***	5.169***
	(0.046)	(0.073)	(0.076)	(0.038)	(0.061)	(0.065)
Provinces	Yes	Yes	Yes	No	No	No
Region	No	No	No	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Occupations	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,055	7,833	7,803	12,682	8,069	8,029

Note: *** p<0.01, ** p<0.05, * p<0.10.
Source: LFS data. The dependent variable is log-weekly-wage in all models. Standard errors are presented in parentheses.

This again further highlights the importance of industry conditional wages over unconditional industry wages, as in IWP1. It further substantially decreases the variation in industry earnings differentials.

8. TRADE POLICY AND INDUSTRY WAGE PREMIUMS

8.1. Results and Discussions

This section demonstrates the empirical findings on the nexus of relative wages and trade policy. Using the Weighted Least Squares (WLS), our study estimated Equation 2, and both specifications results are given in Table 5. Both specifications are closely related to previous work based on the same equations using a cross-sectional dataset. However, it exposed three major features; (i) both specifications show the relationship between import duties and relative wages is negative and statistically significant. The workers linked with highly protected sectors earned lower wages as compared to those with matching visible individual features in sectors having lower protection rates; (ii) the estimated effects of import tariffs are huge. For the manufacturing industry, take an industry with mean tariffs of 17.43% in 2005 to elaborate on the nominal tariff coefficient size. Suppose that we implemented the conceptual practice of shifting the individual from this sector to that sector without import tariffs. Next, in specification, the coefficient of estimated tariffs having the year and IWP1 (controls for individual characteristics) infers that the said individual's wage would increase by 4.32% (0.248×17.43%). Further, the same influence in 1990, when the mean tariff was 89%, would be 0.248×89% = 22.07%. Our results support those of Gaston and Trefler (1994) for U.S., Goh and Javorcik (2005) for Poland, Goldberg and Pavcnik (2005) for Colombia, and Kumar and Mishra (2008) for India.

Table 5. Industry wage premia and import tariffs.

Variable	(1) IWP1	(2) IWP1	(3) IWP2	(4) IWP2
Nominal tariff	-0.002*** (0.0005)	0.003*** (0.0008)	-0.002*** (0.0005)	0.031*** (0.0007)
Industry	No	Yes	No	Yes
Year	Yes	Yes	Yes	Yes

Note: Dependent variable is the industry wage premium (IWP) specification 1 & 2. Number of observation is 72 in all models. *** represent 1% level of significance. Standard errors (SEs) presented in parentheses are clustered on the industry.

The results of both specifications are presented in Table 5, and the following tables include year indicators. These indicators allow for controlling for macroeconomic shocks or structural reforms that may have an impact on relative wages. As an example, we can think of a recession scenario resulting in a fall in wage premiums and subsequently, a possible action of increasing tariffs by the government to address the issue of lower domestic demand. Therefore, we can observe a negative bias in the tariff coefficient. One way to take care of this issue is to use time dummies with industry-fixed effects.

Third, the degree of control over individual characteristics determines the magnitude of correlations between wage premiums and nominal import tariffs. By conditioning the sector earning differentials on individual characteristics in the first stage of regression estimation, we partially control for this spurious association between tariffs and relative wages; hence, the estimated protection coefficient decreases in absolute value.

Unanswered is the question of whether apparent individual characteristics, along with unobserved industry and individual characteristics, determine the level of protection. Researchers in the past have tried to solve the problem of simultaneity bias by using other sector attributes in the estimation and using industry attributes (like employment, concentration indices, capital intensity, unemployment, etc.) and individual characteristics as instruments for protection. After correcting for simultaneity bias, Gaston and Trefler (1994) obtained a greater negative protection coefficient. We tackled the possible simultaneity bias in a simple and uncomplicated way due to the nature of our data: We employ industry fixed effects (FEs) to control political economy factors based on latent individual characteristics, which are time-invariant.

The noteworthy feature of the results in the second and fourth columns is that adding industry FEs changes the negative sign and significance of the protection coefficient in both specifications. The effect is sizable and important. To illustrate the impact of the nominal tariff coefficient, consider a manufacturing industry that had mean tariffs of

89% in 1990 but now has a protection level of zero. According to the estimates in Table 5, this translates to a 28.57% (0.321×89%) reduction in the industry wage premium in that industry. It is interesting to note that, in contrast to the results without industry fixed effects, the protection coefficient is now less responsive to the industry wage premium's specific. This intuitively validates the hypothesis that unobserved sector attributes caused a negative association between relative wages and protection in the first and third columns; once we control these attributes through sector fixed effects, accounting for observable firm and worker characteristics becomes less important.

Our estimates reveal a positive relationship between a reduction in protection rates and wage premia. Our estimates about the liaison are consistent with those of Goldberg and Pavcnik (2005) for Colombia but inconsistent with those of Kumar and Mishra (2008) for India, Gaston and Trefler (1994) for the U.S., Goh and Javorcik (2005) for Poland, Feliciano (2001) for Mexico, and Pavcnik et al. (2004) for Brazil, who found a negative but statistically insignificant liaison between reduction in protection rates and wage premia.

8.2. Robustness Checks

Our primary indicator of trade policy is the protection rate (or tariffs), and we are confident that our method is advantageous for the reasons outlined previously. Besides protections, there are a variety of other ways that trade policy might affect relative wages. Manufacturing industries, for example, may experience varying levels of informal trade barriers, communication and transportation costs, and FOREX rates throughout time. In this section, we look at the relevance of a few of these factors. We begin by estimating both wage specifications, which include, in addition to protections, additional measures of industry import penetration ratio and export consumption ratio. We add different interactive variables to the estimation. We add interactive variables for import and export because of over-invoicing and under-invoicing problems in developing countries in general and Pakistan in particular (Bhagwati, 1964; Mahmood, 1997; Mahmood & Azhar, 2001; Sheikh, 1974). Following Goldberg and Pavcnik (2005) we estimate both specifications by adding different variables.

Table 6 presents the results. This approach is not based on a theoretical framework; therefore, we do not try to explain the estimated coefficient using a theoretical explanation. Rather, we treat these variables as conditioning variables so that we can examine the robustness of protection coefficients. We believe that these variables capture the maximum effects of trade-related channels. The worth-mentioning aspect in Table 6 is that the protection coefficients look robust with the inclusion of extra trade-related factors in both specifications[6].

Table 6. Industry wage premia and import tariffs (Robustness check[7]).

Variables	1 IWP1	2 IWP1	3 IWP1	4 IWP1
Nominal tariff	0.003** (0.0008)	0.003*** (0.0008)	0.002*** (0.0008)	0.003*** (0.0008)
IP×NEER		0.0004 (0.0006)		0.0009 (0.0006)
XCR×NEER			0.001*** (0.0003)	0.001*** (0.0003)
Industry indicator	Yes	Yes	Yes	Yes
Year indicator	Yes	Yes	Yes	Yes

Note: *** and ** represent 1%, and 5% level of significance respectively. SEs presented in parentheses are clustered on the industry. IP, NEER, and XCR stands for import penetration ratio, nominal effective exchange-rate, export-consumption ratio respectively.

[6] Sensitivity analysis of IWP2 are similar and are available from the authors upon request.

[7] For robustness check, we added interactive terms of net importer (NM) and net exporter (NX) with protection rates (i.e., Nominal tariff (NT)) (i.e. NM*NT and NX*NT) in different models presented in Table 6. Our findings are robust and insensitive to the addition of the interactive variables. The sign and significance remain the same in all models. We can share the results of these models upon request.

Finally, if time-variant and sector-specific variables that alter industry wage premia associated with import tariff increases are not accounted for in the estimation framework, our protection estimates will be biased. Minimum wages, capital, and unionization are three examples of industry-specific components that come to mind. In the individual-level data set, we don't have any information on workers' union membership status.

The second and more crucial aspect is the national setting of Pakistan's minimum wage, which remains consistent across sectors.

Table 7. Industry wage premia and import tariffs (Robustness check)[8]

Variables	1 IWP1	2 IWP1	3 IWP1	4 IWP1
Nominal tariff	0.003*** (0.0008)	0.004** (0.001)	0.004** (0.001)	0.003** (0.001)
Lagged X× NEER		-0** (0)	-0** (0)	-0** (0)
Lagged M × NEER			0 (0)	0 (0)
Log GFCF				-0.129*** (0.033)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes

Note: Dependent variable is industry wage premium (IWP) specification 1. *** and ** represent 1% and 5% level of significance respectively. SEs presented in parentheses are clustered on the industry.

The industry-fixed effects can handle any influence if they exist. The addition of sector-specific capital as a control is challenging as it has impacts on variations in factor-costs (i.e., factor earnings).

For the sake of robustness of the estimates, we added it (i.e., a proxy of capital) to our core model as one of the controls. Following Goldberg and Pavcnik (2005) and Kumar and Mishra (2008) we employed gross fixed capital formation. We got the data on sectoral gross fixed capital formation (GFCF) from the Census of manufacturing industry. The log GFCF effect is negative and statistically significant.

Even after including different variables, the findings remain robust. In the next section, we address any remaining concerns about the omitted variable bias by implementing changes in trade reforms.

8.3. Results from Instrumenting

We used the close link between the initial levels of the tariff in 1988 (two years prior to our sample and implementation year of SAP) and the magnitude of the reductions in the tariff as an instrument for tariff policy changes. The differences in averages between 1988 and 1990 are negligible. In the previous section, we already discussed this close link and illustrated it clearly in graphs.

We begin our discussion by more rigorously identifying the determinants of yearly tariff changes from 1990 to 2005. In Table 8, we connect the yearly change in protection from 1990 to 2005 to different variables discussed in the previous section. In the first column, tariff changes are regressed on the 1988 tariff level, a year indicator and an intercept term.

The coefficient on the 1988 protection level is -0.097, and the R-squared is 0.675.

[8] For robustness check, we added interactive terms of net importer (NM) and net exporter (NX) with protection rates (NT) (i.e. NM*NT and NX*NT) in different models presented in Table 7. Our findings are robust and insensitive to the addition of the interactive variables. The sign and significance remain the same in all models. We can share the results of these models upon request.

Table 8. Determinants of trade policy changes (First stage regression results of 2SLS).

Variable	1	2	3	4
Tariffs88	-0.097*** (0.012)			
FOREX reserves × Tariffs88		-7.25e-09*** (1.16E-09)		
Exchange rate × Tariffs 88			-0.001*** (0.0002)	
Share of unskilled workers in 1990				-0.114** (0.046)
R-squared	0.675	0.624	0.708	0.645
Year indicator	Yes	Yes	Yes	Yes

Note: Dependent variable is a year-to-year change in tariffs. SEs that are clustered on the industry are presented in parentheses. Number of observations is 63. *** p<0.01 and ** p<0.05.

In columns 2 and 3, we regressed the protection changes on the interactive variables FOREX reserves × Tariffs 88 (i.e., PCT-1988) and Exchange rate × Tariffs 88, which yielded the coefficients -7.25e-09 and -0.0014 for FOREX reserves × Tariffs 88 and Exchange rate × Tariffs 88, respectively. The R-squared values are 0.624 and 0.708 for the regressions in columns 2 and 5, respectively. The last column reveals that tariff declines are highest in industries with more unskilled labor (a reduction in protection corresponds to a negative change). These interactions can produce sector-specific, time-variant instruments. The joint explanatory power of these factors as regressors remains high in all five wage specifications.

Table 9 displays the results of the two-stage-least-squares (2SLS) for Equation 2. The results of the 2SLS using various sets of instruments are reported in columns 1-4. It's worth noting that our estimates were robust to tariffs in 1988, the proportion of unskilled workers in 1990, and pre-reform interacting relationships between tariffs, FOREX reserves, and exchange rates. Our results are positive and statistically significant, despite the fact that the magnitude of the protection coefficient decreases when compared to other instruments but improves when compared to baseline specification 1. The association between tariff reductions and wage premium reductions is robust and significant.

Table 9. Wage premia and nominal tariffs (2SLS).

Variable	1	2	3	4	5
Nominal tariffs	0.003*** (0.0008)	0.019** (0.008)	0.057*** (0.014)	0.011** (0.005)	0.030*** (0.007)
Instrument	No	Tariffs 88	FOREX reserves × Tariffs 88	Exchange rate × Tariffs 88	Share of unskilled workers in 1990
Year indicator	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable is wage premiums from IWP1. SEs that are clustered on the industry are presented in parentheses. Number of observations is 63. *** p<0.01 and ** p<0.05

9. CONCLUSION

This study investigates the influence of Pakistani trade policy on wage premiums in the manufacturing industry from 1990 to 2005. We integrated micro-level labor market data from the Labor Force Survey (LFS) with tariffs and additional non-tariff measures. Our study's primary discovery is that wages in manufacturing industries with greater tariff reductions experienced a decline compared to the national average. When accounting for sector characteristics that do not change over time, the previously observed negative association between protections and wage premiums becomes positive. In each sector, the inclusion of trade-related factors, along with their interaction with nominal effective exchange rates (NEER) and capital accumulation (measured by gross fixed capital formation), does not impact our results. The positive correlation remained strong even after employing instruments to account for time-varying political economy factors that influence variations in trade policy and time-varying.

We have derived our conclusions from trade models that impose short- or medium-term restrictions on worker movement between industries. Our findings indicate that the reduction in tariffs primarily affected industries that employ a large number of unskilled workers, as shown in the scatter graph. This suggests that a particular factor may have influenced the wage gap between skilled and unskilled workers. Furthermore, our research revealed that the process of trade liberalization in Pakistan's manufacturing industry resulted in an expansion of the wage disparity between skilled and unskilled laborers.

Due to data availability in LFS at the ISIC 2-digit level, we could not go deeper by utilizing further disaggregation. This is one of our study's limitations. A higher level of disaggregation can give us a deeper level of understanding.

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