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Impact of Trade Liberalization on the Industry Wages in Pakistan (1995 – 2015)

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Abstract *The paper estimates the effects of trade reforms on workers' earnings in Pakistan's manufacturing sector during 1995-2015, employing data from 14 rounds of the Pakistan Labour Force Survey. OLS technique has been used for estimation and separate analysis for workers engaged in informal manufacturing activities is also undertaken. The results indicate that a tariff fall on intermediate products is associated with a rise in real earnings of workers employed in the manufacturing sector during this period, while a corresponding decline in tariffs on final goods has no effect on worker's wages. The results show that real wages of workers employed in the mainly export oriented industries of food, beverages & tobacco, textiles, apparel & leather and non-metallic mineral industries have declined over the twenty years period of trade reforms implemented in Pakistan. On the other hand, real wages are observed to have increased in the chemical & petroleum and basic metals industries.*

Key Words
Trade Liberalization, Wages, Input/ Output Tariffs

Introduction

Trade liberalization has been shown to have increased growth, productivity and efficiency across the developing economies (Busse & Koniger, 2012). Subsequent research has explored the issue of trade reforms on labour markets in developing economies. The Stolper-Samuelson Theorem (1941) stipulates that developed countries produce skill intensive products, whereas developing countries produce labour intensive goods, offers clear theoretical predictions about the influence of trade reforms on worker's earnings around developing countries. The linkages between trade liberalization and wages have been examined by numerous studies encompassing both the developed and developing countries. This strand of literature has mainly made use of the industry wage premium methodology introduced by Krueger and Summers (1988) and mostly covers Latin American countries, which pursued trade liberalization policies relatively earlier in the 1980s.

The findings of a large section of this body of empirical evidence contradict the *a priori* expectations of the Stolper-Samuelson theorem, as they show that trade liberalization has widened wage-gap among unskilled and skilled workers [Feliciano (2001), Galiani and Sanguinetti (2003), Pavcnik et. al (2004), Pavcnik and Goldberg (2005), Harrison and Hanson (1999), Revenga (1997), and Robertson (2005)]. However, some studies [Kumar and Mishra (2007), Galiani and Porto (2010) and Amiti and Cameron (2012)] find that trade reforms resulted in a reduction in the skilled-unskilled wage-gap within the manufacturing industries in India, Argentina and Indonesia, respectively. In case of Thailand, Jayanthakumaran et al. (2013) observe increase in wage premiums due to a fall in tariffs on final goods, while a decline in tariffs of intermediate goods exerts a stronger positive effect on wage premiums.

The present study offers newer perspectives on distributional consequences of trade liberalization on wages, in respect of a developing country – Pakistan, which has implemented wide ranging trade liberalization reforms since 1990s. These trade reforms encompassed not only reduction in tariffs but also focused on lowering non-tariff barriers, like import quotas and import surcharges (Liaqat 2013). Pakistan significantly liberalized its tariffs, resulting in the peak tariff rate falling from 225 percent in 1987 to 65 percent by 1996, which was subsequently brought down to 25 percent in 2002. The unweighted average tariff rate went down from 61.1 percent in 1992 to 42 percent in 1996, which slid down to 17.3 percent by 2002 (Pursell, Khan & Gulzar, 2011).

Pakistan initiated trade reforms under the framework of an IMF sponsored structural adjustment program that the country entered into due to severe balance of payments crisis. Since this program of trade reforms was exogenous, it can be used as a natural experiment to investigate the influence of trade opening on the labour market. The present study extends the existing

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literature in a number of ways. It focuses on both the formal and informal segments of Pakistan's manufacturing sector, as previous research has mainly examined the impact of trade liberalization on formal segments. Moreover, it also examines the effect of trade liberalization separately for workers engaged in informal sector employment. In addition, the study explores the effect of fall in both tariffs on final goods and those on intermediate products to examine overall effect on wage earnings. The study employs a large sample of pooled worker level data from 14 rounds of the Labour Force Survey over a twenty-year period to determine trade liberalization's impact on real earnings of workers in the country's manufacturing sector.

The paper is comprised of six sections. Section 2 presents empirical methodology, while the data used, and construction of variables is discussed in Section 3. The findings of the empirical analysis are presented in Section 4. Concluding remarks are given in Section 5, while the last section provides policy implications.

Empirical Specification

The analysis of industry-level trade liberalization on real wages is started off by estimating a basic model, based on the human capital literature (Mincer, 1958, & Becker, 1962). This model which includes human capital characteristics, such as education and experience (proxied by age), worker characteristics, such as marital status and gender and educational attainment and indicators of broad manufacturing industrial sector, is given as:

$$realwage_i = \beta_o + \beta_1 age_i + \beta_2 age_i^2 + \alpha_1 married_i + \alpha_2 male_i + \alpha_3 technical_i + \alpha_4 informal_i + \varphi S_i + \gamma l_i + \varepsilon_i \quad (1)$$

where real wage$_i$, the logarithm of yearly real wages is the dependent variable. Age$_i$ and age$_i^2$ are proxies for experience and experience square, respectively (As age and experience are highly correlated, the former can be used as a suitable proxy for the latter). Dummy variables are included for marital status, gender and various levels of educational attainment as well as for technical training received. A dummy variable for informal sector employment accounts for the impact of wages if a worker is employed in informal sector. S represents dummies for the level of education while the manufacturing industry dummies are represented by I. Manufacturing dummies are added to capture the industry wise variations within the manufacturing sector.

Using Ordinary Least Squares (OLS) method, the basic equation for pooled sample comprising of data from 14 rounds of the LFS is estimated to highlight the important determinants of wages in the manufacturing sector during selected time period. This serves as a baseline for the subsequent estimation of the impact of trade liberalization on real wages.

Following this, the basic model (eq. 1) is extended for modeling influence of trade liberalization on wages through controlling for year fixed effects and including interaction term of a manufacturing industry with its respective tariff rates. The industry-wise tariff rates (output and input tariffs) indicate industry-specific trade liberalization, while the year fixed effects capture the economy-wide effect of a specific time period on wages. This extended model is represented as:

$$realwage_i = \beta_o + \beta_1 age_{it} + \beta_2 age_{it}^2 + \alpha_1 married_{it} + \alpha_2 male_{it} + \alpha_3 technical_{it} + \alpha_4 informal_{it} + \varphi S_{it} + \gamma l_{it} + \mu l_{\mathrm{it}} avgt_{it} + \sum_{t=2}^{14} Y_t + \varepsilon_i \quad (2)$$

Where real wage$_{it}$ shows the wage for the ith cross-sectional unit at time t and $\mu l_{\mathrm{it}} avgt_{it}$ is the interaction term of a particular manufacturing industry and tariff rate. Y_t represents the time dummies for the 14 years (year 1994-95 is taken as the base category). All other variables are the same as used in model 1.

Data and Variables

The study utilizes micro data from 14 rounds of the Pakistan Labour Force Survey (LFS), conducted over the period 1994-95 to 2014-15, encompassing the period of trade liberalization reforms undertaken in Pakistan. The use of this long-term series of employment data over a period of 20 years helps in carrying out a robust analysis of the trade reforms effect on wages in the manufacturing sector of Pakistan. The LFS captures employment at two-digit Pakistan Standard Industrial Classification (PSIC), although more recent rounds of LFS have employment information available at the four-digit PSIC level.

To make the definition of industry employment consistent over this 20 year period, the study uses employment at the two-digit PSIC level. In each of the 14 rounds of the LFS, only the sample of workers engaged in different forms of paid employment in the 9 two-digit industries of the manufacturing sector have been used, as LFS only reports wages for paid employees. The sample of workers has been restricted to the age group of 15-65 years as per the international definition of working age population.

In line with the existing literature, the outcomes of trade liberalization on wages in the manufacturing sector are analyzed using two measures of tariffs – output tariff and input tariffs. The output tariff represents the tariffs on final goods, as shown in the country's tariff schedule; while input tariffs show the tariffs applicable on intermediate goods/ raw materials. Both these tariff measures have been defined at two-digit PSIC industry level, for which tariff data during this period classified under the Harmonized System has been converted into the corresponding 9 two-digit industries using the concordance developed by Sarwar (2016).

The output tariff measure, representing tariff on final produced goods, is the trade weighted average of the two-digit HS tariff lines falling under each of the nine manufacturing industries has been obtained from the United Nations Conference on Trade and Development's (UNCTAD) Trade Analysis Information System (TRAINS) database. The input tariffs represent a weighted mean of output tariffs, with the import shares of raw materials by each two-digit PSIC industry taken as weights. This import share is obtained from the Census of Manufacturing Industries (CMI) data. (The import shares of raw material at firm level, across the two-digit PSIC industries in the manufacturing sector, have been obtained from the 2000-01 round of the CMI. As other rounds of CMI do not give this information, it is assumed that the import shares stay constant over the period of our analysis, i.e., 1994-2015.)

Table 1 presents the variables used in our analysis. As the wage data obtained from different rounds of the LFS is time series data, it has been adjusted for inflation. The nominal wage data from different rounds of LFS has been adjusted for inflation using GDP deflator, with 2014-15 used as base year to deflate the wage variable.

The summary statistics of the pooled dataset, comprising of 14 rounds of LFS, employed in the regression analysis is shown in table 2.Table 2 also gives the summary statistics of the sample of the workers involved in informal sector employment across the different industries of Pakistan's manufacturing sector during the period of analysis. A comparison of the full sample with the sample of informal sector workers shows a slightly lower mean age of workers in informal employment. A higher proportion of informal sector workers had no formal education/ less than primary level of education compared to the full sample (61 percent *vs.* 58 percent), while surprisingly a higher share of informal sector workers had degree and above educational attainment (10 percent *vs.* 7 percent) and had obtained technical training (30 percent *vs.* 23 percent).

The trends in output and input tariffs over the period under review are presented in table 3. The analysis indicates that towards start of the trade reforms (1995), most of the manufacturing industries were operating behind high levels of tariff protection, with tariffs being highest for the non-metallic mineral products; food, beverages & tobacco and wood, wood products & furniture industries. As a result of the subsequent trade liberalization reforms, both output and input tariff rates have declined considerably over time across the nine two-digit PSIC industries. The decline in tariff rates has been greater during the 1995-2005 period, while tariffs in some industries have gone up slightly during 2010-15.

Table 1. Variables used for Examining Impact of Trade Liberalization on Wages

Variable	Description
Dependent variables	
Log real wages (two-digitPSIC level)	Log of annual wages (in Rupees) divided by the GDP deflator
Independent/ explanatory variables	
Worker characteristics	
Age	Age of worker (proxy for experience)
Age Squared	Square of age
Gender	=1 if male, 0 otherwise
Never married	=1 if never married, 0 otherwise
Currently Married	=1 if currently married, 0 otherwise
Widow/ divorced	=1 if widowed/ divorced, 0 otherwise
Education	
No formal education/ below primary	=1 if no formal education/ education below primary level, 0 otherwise
Middle	=1 if primary to middle level education, 0 otherwise

Secondary	=1 if above middle and upto intermediate, 0 otherwise
Degree and above	=1 if education of bachelor's degree and above, 0 otherwise
Technical training	=1 if worker has acquired technical training, 0 otherwise
Informal employment	=1 if working in informal sector enterprise, 0 otherwise
Industrial dummies	
Industry 1	=1 if employed in Food, Beverages & Tobacco, 0 otherwise
Industry 2	=1if employed in Textile, Wearing Apparel and Leather, 0 otherwise
Industry 3	=1 if employed wood and wood products, 0 otherwise
Industry 4	=1 if employed in paper and paper products, printing and publishing, 0 otherwise
Industry 5	=1 if employed in chemicals, petroleum, coal, rubber & plastic, 0 otherwise
Industry 6	=1 if employed in non-metallic mineral products, 0 otherwise
Industry 7	=1 if employed in basic metal industries, 0 otherwise
Industry 8	=1 if employed in fabricated metal products, machinery & equipment, 0 otherwise
Industry 9	=1 if employed in other manufacturing industries and handicrafts (reference category), 0 otherwise
Tariffs	
Output tariff rate	Weighted applied tariff rates for industries at two-digitPSIC level
Input tariff rate	Output tariff rates weighted by share of imported inputs for industries at two digit PSIC level

Table 2. Summary Statistics of Dataset used for Examining Impact of Trade Liberalization on Wages

Variables	Full Sample	Informal Workers Sample
Dependent variables		
Log of annual real wages (two-digit PSIC level)	11.670	11.407
	(0.766)	(0.780)
Independent variables		
Age	30.595	29.237
	(11.629)	(11.462)
Age squared	1071.304	986.210
	(828.564)	(801.604)
Gender	0.888	0.800
	(0.315)	(0.399)
Marital status		
Unmarried	0.421	0.458
	(0.494)	(0.498)
Married	0.561	0.518
	(0.496)	(0.499)
Widow/Divorced	0.018	0.022
	(0.133)	(0.149)
Educational Status		

Variables	Full Sample	Informal Workers Sample
No formal education	0.575	0.697
	(0.494)	(0.459)
Middle	0.152	0.151
	(0.359)	(0.358)
Secondary	0.204	0.140
	(0.103)	(0.347)
Degree & above	0.069	0.010
	(0.254)	(0.102)
Technical Training	0.230	0.298
	(0.421)	(0.457)
Informal Employment	0.446	-
	(0.497)	
Industrial dummies		
Industry 1	0.116	0.103
	(0.321)	(0.305)
Industry 2	0.476	0.497
	(0.500)	(0.500)
Industry 3	0.040	0.074
	(0.196)	(0.261)
Industry 4	0.027	0.026
	(0.164)	(0.161)
Industry 5	0.058	0.022
	(0.234)	(0.147)
Industry 6	0.104	0.072
	(0.305)	(0.259)
Industry 7	0.021	0.009
	(0.142)	(0.096)
Industry 8	0.090	0.097
	(0.286)	(0.296)
Industry 9	0.068	0.096
	(0.252)	(0.295)
Tariff		
Output tariff	18.961	17.853
	(9.770)	(7.715)
Input tariff	2.382	2.084
	(2.345)	(1.932)
Number of observation	58,003	25,896

Mean in top row
Standard deviation in parenthesis

Table 3. Trends in Industrial Tariff Rates (%)

	Tariff Rates	1995	2000	2005	2010	2015
Industry 1	Output	62.49	28.32	22.22	26.71	20.32
	Input	6.73	3.05	2.39	2.88	2.19
Industry 2	Output	49.36	25.32	14.90	13.91	14.31
	Input	3.68	1.89	1.11	1.04	1.07
Industry 3	Output	57.19	26.15	15.02	13.65	12.72
	Input	1.27	0.58	0.33	0.30	0.28
Industry 4	Output	46.61	17.16	12.63	11.25	11.68

	Input	11.40	4.20	3.09	2.75	2.86
Industry 5	Output	45.37	19.87	11.80	10.42	10.51
	Input	19.65	8.60	5.11	4.51	4.55
Industry 6	Output	67.52	32.99	21.39	24.42	21.55
	Input	3.79	1.85	1.20	1.37	1.21
Industry 7	Output	38.53	17.45	9.25	7.56	8.07
	Input	11.77	5.33	2.83	2.31	2.46
Industry 8	Output	45.82	28.53	13.90	14.22	13.56
	Input	17.80	11.09	5.40	5.52	5.27
Industry 9	Output	54.62	27.77	15.55	15.73	15.13
	Input	7.56	3.85	2.15	2.18	2.10

Results

The table 4 reported the OLS estimates of the basic model, eq. (1). According to the estimation results age has a positive relationship with real wages during the period under review, with wages of workers increasing with age at a decreasing rate. Male workers earn more than their female counterparts. The analysis by marital status shows that in comparison to unmarried workers, their married counterparts have higher earnings, while widowed/ divorced workers, on average, have lower wages.

The findings with respect to educational attainment show that in comparison to workers with no formal education/ education below primary level, the wages of workers increase monotonically across the subsequent three education levels – middle, secondary and degree and above, with the returns to education being highest for workers with educational level of degree and above. Workers with technical training are observed to have significantly higher earnings, while workers engaged in informal sector employment earn lower than their counterparts employed in formal sector.

There is considerable variation observed in wages across the nine manufacturing industries, over the sample period, in comparison to wage levels in 'other manufacturing industries' which is the reference category. Real wages of workers in four industries – food & beverages, textile & apparel, paper & publishing and non-metallic mineral products are observed to have declined over the 20-year period in comparison to the base category; with this finding being statistically significant. On the other hand, real wages in the remaining four industries increased during the period under review, although the finding for fabricated metals and equipment is not statistically significant.

Table 4. Regression Results of Basic Model for Pooled Sample, 1994-95 to 2014-15

Variables	**Coefficient**
Age	0.045***
	(0.002)
Age Squared	-0.0005***
	(0.000)
Gender	0.757***
	(0.015)
Marital status	
Married	0.018**
	(0.009)
Widow/Divorced	-0.060***
	(0.023)
Educational Status	
Middle	0.102***
	(0.007)
Secondary	0.210***
	(0.007)
Degree & above	0.855***

	(0.018)
Technical Training	0.095***
	(0.009)
Informal Employment	-0.191***
	(0.007)
Industrial dummies	
Industry_1	-0.093***
	(0.015)
Industry _2	-0.071***
	(0.013)
Industry _3	0.007
	(0.021)
Industry _4	-0.051***
	(0.020)
Industry _5	0.038**
	(0.017)
Industry _6	-0.047***
	(0.016)
Industry _7	0.127***
	(0.028)
Industry _8	0.002
	(0.016)
Constant	10.384***
	(0.079)
R-squared	0.3762
Province x time dummies	Yes
Number of observations	58,003

Robust standard errors in parenthesis.
***, **, * show significance at 1 %, 5 % and 10 % respectively.

The results of eq. (2) showing the effects of trade reforms on real earnings, estimated using OLS are presented in table 5. Since micro level data from LFS is obtained from cluster sampling, the standard errors are corrected for clustering at the primary sampling unit (PSU) level in the two models shown in table 5.

The results indicate that a reduction in output tariffs leads to a fall in real wages, while a decline in input tariffs results in a rise in the real wages; with only the results with respect to input tariffs being statistically significant. The effect on real wages is observed to vary across the different industries, with workers in the food & beverages, textile & apparel, wood & wood products, paper & publishing and non-metallic mineral products industries experiencing a fall in real wages over this period, while real wages of workers in the remaining three industries witnessed an increase.

The results of the model run on the pooled sample of informal sector workers over the 14 rounds of the LFS are given in column 2 of table 5. Goldberg and Pavcnik (2003) postulate that firms respond to increased competition from cheaper imports in the wake of lower tariffs brought about by trade reforms by reducing formal employment and substituting it with cheaper informal employment. The results point towards a positive association between both final goods tariffs (output tariffs) and intermediate goods tariffs (input tariffs) and real wages. However, both the results are not statistically significant, thus we can infer that there are no systematic linkages between trade liberalization and real wages in the informal segment of Pakistan's manufacturing sector.

Table 5. OLS Regression Results for Models Examining Impact of Trade Liberalization on Wages

	Model 1 Full Sample	**Model 2 Informal Workers Sample**
	Coefficient	Coefficient
Age	0.045***	0.059***
	(0.002)	(0.003)

	Model 1 Full Sample	**Model 2** **Informal Workers Sample**
	Coefficient	Coefficient
Age Squared	-0.0005***	-0.0006***
	(0.00002)	(0.00003)
Male	0.757***	0.883***
	(0.015)	(0.017)
Married	0.017***	-0.017
	(0.009)	(0.013)
Widow/ Divorced	-0.060***	-0.067**
	(0.023)	(0.032)
Middle	0.102***	0.111***
	(0.007)	(0.011)
Secondary	0.210***	0.159***
	(0.007)	(0.012)
Degree & above	0.855***	0.437***
	(0.018)	(0.053)
Technical training	0.096***	0.098***
	(0.009)	(0.013)
Informal employment	-0.190***	-
	(0.007)	
Output tariff	0.002	-0.0003
	(0.002)	(0.003)
Input tariff	-0.005**	0.004**
	(0.003)	(0.006)
Industry 1	-0.111***	-0.097***
	(0.021)	(0.035)
Industry 2	-0.074***	-0.101***
	(0.014)	(0.020)
Industry 3	-0.003	-0.036
	(0.022)	(0.027)
Industry 4	-0.035	-0.093***
	(0.022)	(0.035)
Industry 5	0.067***	-0.041
	(0.021)	(0.039)
Industry 6	-0.068***	-0.066**
	(0.020)	(0.032)
Industry 7	0.153***	0.009
	(0.033)	(0.052)
Industry 8	0.025	-0.102***
	0.019	0.030
Province x time dummies	Yes	Yes
Constant	10.327***	9.803***
	(0.101)	(0.133)

	Model 1 Full Sample	**Model 2** **Informal Workers Sample**
	Coefficient	Coefficient
R-Squared	0.3763	0.3196
Number of observations	58,003	25,896

***, **, * significant at 1 %, 5 % and 10 % respectively.

Overall, our results only provide confirmation of inverse relationship between trade liberalization and real wages through the impact of tariffs on intermediate goods. This implies that access of firms to cheaper and better-quality imported inputs helps in increasing productivity, which leads to increase in real wages. However, in case of workers employed in informal segments of the different two-digit industries, no increase in real wages is observed. This may be attributable to the fact that firms working in informal activities do not make use of higher quality imported inputs and raw materials and prefer to rely on cheaper locally available inputs.

Conclusion

The present study analyzed the impact of trade liberation reforms carried out in Pakistan over the period 1994-2015 on wages in the country's manufacturing sector. The study employed micro level data on employment at the two-digit PSIC industry level from 14 rounds of the Pakistan Labour Force Survey combined with macro level data on two types of tariffs, including tariff on final products and tariff on intermediate goods/ raw materials. For the empirical analysis the study used OLS technique.

Firstly, a simple linear regression is used to find the important determinants of real wages of workers in Pakistan's manufacturing sector during the period under review. In the second stage, tariffs on final goods and those on intermediate goods are included in the regression framework, to ascertain the effect of trade reforms on wages of workers in the manufacturing sector. The results show that a fall in input tariffs positively impacts wages of manufacturing workers.

The results further indicate that real wages of workers employed in food, beverages& tobacco, textiles, apparel& leather and non-metallic mineral industries have declined over the twenty years period of trade reforms implemented in Pakistan. On the other hand, real wages are observed to have increased in the chemical & petroleum and basic metals industries. The four industries that experienced fall in real wages, on average, accounted for slightly under three-fourths of total employment in the country's manufacturing sector over the twenty-year period reviewed.

Contrary to *a priroi* expectations, the analysis was unable to uncover a systematic relationship between trade liberalization and real wages of workers employed in Pakistan's large and growing informal sector. The real earnings of informal workers in all the two-digit PSIC industries are observed to have declined during this period of trade reforms, except for workers employed in the basic metal industry. The lack of any well-defined relationship output and input tariffs on real wages of informal sector workers can be attributable to the fact that goods manufactured by firms in the informal sector are not close substitutes of imported goods and that the production of these goods does not involve use of imported inputs and raw materials.

Policy Implications

This study's main finding indicates that productivity improvements in the country's manufacturing sector have been driven by use of higher quality imported inputs and raw materials due to a fall in tariffs on intermediate inputs. In view of this finding, the Government should revise the country's tariff structure to make it more cascading, i.e., there should be lower tariffs on raw materials and other low value-added imports and proportionately higher tariffs with each stage of value addition. This will ensure that the manufacturing industries continue to have access to cheaper imported inputs, while direct competition from imported finished goods is kept at a reasonable level to promote the sector's future growth and development prospects.

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