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Who Gains from CPEC in Pakistan: A Household Level Analysis?

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ABSTRACT

The standard Stolper-Samuelson theorem of international trade states that liberalization of trade leads to rise in the income of unskilled labour. Therefore, the poor unskilled labours are the largest beneficiary of trade liberalization. As Pakistan has comparative advantage in producing unskilled labour-intensive goods, hence it is reasonable to expect that trade reforms such as CPEC would be pro-poor. The study therefore aims to provide micro-econometric prediction of the likely impact of Pakistan-China trade relations on household welfare. In the first stage study calculated SITC 2-digit average annual tariff rates for various identified comparatively advantageous manufacturing industries by employing the UNCTAD TRAINS database. Tariff measures in the second stage matched to the PSLM survey data to represent the tariff for the industry in which the household head and other members are employed. After matching Tariff, measures at the two-digit level, to the PSLM survey data for 2005-06 and 2013-14, to represent the tariff for the industry in which the household labour force is employed, the study examines the effect of tariff on household income. We assumed that it might not be uniform across households engaged in different sectors/industries after trade liberalize with China. The study applies pseudo-panel econometric technique to the repeated cross-section dataset of PSLM in order to analyze the impact of trade on household labour earnings by time. The analysis suggests that higher tariff rates are associated with higher incomes for households employed in that sector. So tariff reductions may reduce income and decrease welfare in case Pak-China trade agreement reduce tariff barrier. In other words, if trade liberalization occurs, households affiliated to the industries that experience large tariff reductions would see a decline in their incomes.

***Keywords*:** International trade, unskilled, tariff, household analysis

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INTRODUCTION

Recently, there is a growing debate in exploring the impact of 3218 km long "China Pakistan Economic Corridor" on Pakistan's economy. This huge economic corridor is expected to bring economic prosperity, enhanced trade & regional connectivity, infrastructure development etc in the country. Most importantly, it would not only improve the people to people contact between the two countries but would also impact positively on the household welfare. However, it would be rational to expect varying level of affluence on various segments of the society depending on their level of education, skill level, occupation and geographical location etc.

On incorporating the theoretical background, Pakistan is expecting to gain in producing and exporting the factor abundant product to China at minimized cost of transportation through CPEC. In this respect, The Heckscher – Ohlin (H-O) Model predicts that the nation will gain by producing and exporting the abundant factor's commodities. For instance, the Pakistan is mostly abundant with unskilled labors; gains to trade would flow to unskilled labour. The model thus suggests the increased welfare and reduced inequality in labour intensive country. However, H-O model was criticized profoundly, especially since the Leontief Paradox. The validity of the model was challenged by Davis & Mishra (2006) among others as they found increased wage inequality, following the trade liberalization, in most of the labour intensive Latin American developing countries. The model was challenged on the basis of various restrictive assumptions as well. For instance, it assumes the identical production function for all firms and nations. However, technological gap between various countries is considered as the most important concern in the literature.

On the basis of profound criticism attached with the H-O model, various new trade theories emerge. According to new theories, trade liberalization could reduce the wages of unskilled labour even in a labour abundant country, tereby widening the gap between the rich and the poor. In this regard the "Specific Factor Model" and the "Ricardo Viner Model" gained the most popularity. According to these models workers may gain from trade reforms depending on whether they are attached to import competing sector or exporting sector. The model focus on the short to medium run and assume imperfect factor mobility with one factor mobile across sectors while the other is taken to be sector specific. With these assumptions, the models predict a positive association between protection and returns to factors of production. Protection reduces imports and reduced imports increase labour demand, which in turn increases wages. When the price of a good falls following trade liberalization the model predicts that the factor specific to the sector that experienced a price reduction loses while the other factor gains in real terms. In other words, if trade liberalization occurred households affiliated to the industries that experience large tariff reductions would see a decline in their incomes relative to the economy-wide average income, while households attached to other industries would gain in comparison.

Given the apparent ambiguity in the theoretical literature discussed above the relationship between trade liberalization and welfare (poverty) is ultimately an empirical matter. Although, empirically it is not easy to disentangle the effects of trade reforms through CPEC or any other macroeconomic policies and technological changes occurring simultaneously in the absence of policy variables in the household level datasets. Despite the general concern expressed by many on "Who will gain from the route?" very little is known about the impact of reforms on the smallest segment of the society – household. However, there has been some research available exploring the impact based on descriptive analysis but to the best of our knowledge there is no accessible multivariate econometric analysis using policy variables, such as tariffs, to examine the likely impact of CPEC on household welfare (measured either through wages or income). Further Pakistan China signed the Free Trade Agreement in 2006 implemented properly in 2007; the paper hence aims to predict the likely impact of CPEC by disentangling the impact of trade reforms before after FTA on household welfare. The study is in line with an earlier study conducted by Ackah, Morrisey and Appleton (2007). Ackah, Morrisey and Appleton (2007) estimated the impact of trade protection (tariff) on household income for Ghana.

The above stated objective is explored by first calculating SITC 2-digit average annual tariff rates for various identified comparatively advantageous manufacturing industries by employing the UNCTAD TRAINS database. Secondly, Tariff is matched to the PSLM survey data to represent the tariff for the industry in which the household head and other members are employed. Thirdly, after matching Tariff, measures at the two-digit level, to the PSLM survey data for 2005-06 and 2013-14, to represent the tariff for the industry in which the household labour force is employed, the study examines the effect of tariff on household income. Study precedes the empirical part based on pseudo panel technique.

The lack of suitable panel data at the household level has led to the widespread utilization of the cross sectional datasets in order to estimate the effect of public policy on welfare at household level. One potential problem is that the estimated coefficients are likely to be contaminated by unobserved household fixed effects leading to biases in the estimation results and incorrect inferences. Fortunately, there is by now rapidly growing literature on Pseudo panel data constructed from repeated cross sections. This study is in this same tradition. In this paper pseudo panel data set is constructed to observe the effects of trade reforms with China on the household welfare.

This study thus attempted to uncover the likely impact of trade reforms with China on welfare of Pakistani households. It is hypothesized in this study that CPEC could bring varying level of opportunity on different segments of the households, depending on various factors like household income, skill level of the earner (gauge by educational attainment), degree of liberalization in different industrial sectors, in which the main earner is working etc.

Thus the foremost objective of this study is to contribute in the literature on this overlooked dimension of the issue for the case of Pakistan's household through an empirical examination by employing the Pakistan Standard of Living Measurement survey (PSLM). The specific objectives of this study are demonstrated as under:

- To construct a Pseudo-panel data set by identifying the suitable cohort.

- To analyze the impact of trade reforms with China on various segments of society, working in various industrial sectors and equipped with different educational levels.
- To suggest the viable policy options to the policy makers, in the light of empirical evidences, thus to improve the welfare of the greater affected segment of the society.

The remainder of the paper is organized as follows. Section 2 presents a selected and brief review of relevant and scarce literature on the issue. Section 3 describes the data sources, variable construction and summary statistics of the variables used in estimation. Next section provides the empirical methodology. In this section, the methodology of construction of the pseudo panel dataset is described along with the description of econometric model used in the study. The panel data approach used to estimate the empirical model is also discussed in this section. Section 6 provides the empirical results and analysis, while, section 7 concludes the study.

Review Literature:

Attempts were instigated globally in exploring the relationship between trade liberalization and welfare, decades ago. However, the literature is still inconclusive in gauging the trade impact. Number of studies postulates the positive relationship between the two, while others, established negative relationship. It is believed that various factors, like degree and nature of openness, market structure, politico-economic and social characteristics of a nation etc, play significantly in developing the positive or negative relationship between trade liberalization and welfare. In this study, since we are interested in determining the impact of trade liberalization at household level using the micro-data, below is a brief and selected literature of the already scarce literature at the micro level.

Okodua and Alege (2014) examined the impact of trade liberalization on household welfare of Nigeria by using the Computable General Equilibrium (CGE) Model based on Social Accounting Matrix of 2006. The study found that the trade liberalization would have mixed welfare impact on Nigerian households. The study revealed that although trade liberalization would bring consumption and income improvement but are expected to bring unemployment in two important sectors of Agriculture and industry.

Cho and Diaz (2008) found the impact of trade liberalization on welfare of Slovenia by constructing a Social Accounting Matrix and by employing a household expenditure Survey. The study found that although trade liberalization enhanced the overall welfare however, the distributional impact of liberalization on various segments, based on age and skill levels of the household varies.

Ackah, Morrisey and Appleton (2007) estimated the impact of trade protection on household income for Ghana by employing the Ghanaian household survey statistics for 1991-92 and 1998-99. The study found varying impact of trade on various households, characterized by different skill levels. The results revealed that income is relatively higher for households employed in sectors with higher tariffs. Thus suggests the negative impact of trade liberalization on household welfare. The study also found the negative effect of trade liberalization on households with relatively unskilled members thus suggests the human capital investment as a complementary policy to enhance the household welfare.

Topalova (2007) estimated the impact of trade liberalization on poverty and inequality for Indian districts by employing the Indian National Sample Survey (NSS) for 1983-84, 1987-88, 1993-94 and 1999-00. The study also found the negative impact of trade liberalization on poverty and inequality. It was revealed that rural areas, which are concentrated with industries exposed to more liberalization, were the most affected. The study thus identifies the segments of the society in which trade liberalization impact negatively.

Jones, Anh, Hang (2007) examine the effect of trade liberalization on childhood poverty for Vietnam by employing the household survey data. By using the mixed method approach, the study revealed that communities with higher poverty rate, ethnic minority households, deprived households, female child etc are found to be most affected by trade liberalization.

Seshan (2005) inspected the effect of trade liberalization on household poverty and income inequality because of the Vietnam's rice and fertilizer's market integration between 1993 and 1998. The study found that the poverty fell from 59% to 37% during the reform period and for farm households' half of the reduction in poverty was attributed to liberalization. The study revealed that liberalization did not aggravate inequality rather rural households gained.

Aredo, Fekadu kebede (2001) investigate the impact of trade liberalization on poverty at household level for Ethiopia by employing the Computable General Equilibrium (CGE) modeling. The study employed 2001/2002 SAM constructed by IFPRI for Ethiopia. The results suggest that tariff reductions had strong negative effects on the textile and leather industries of the country. It was revealed that tariff cuts are associated positively on poverty and inequality. Among the different household groups, trade liberalization impact entrepreneur households the most, followed by farm households and wage earners.

Theoretical Concept: A Link between Trade Liberalization and Welfare:

This section describes the theoretical relationship between the welfare of a society and trade liberalization, especially from the perspective of developing countries. As described, the impact of trade liberalization is an unresolved matter in the literature. Most of the traditional theories propagate the positive impact of trade liberalization on the welfare of developing countries through the channel of increased factor prices. However, most of the empirical literature failed to prove this assertion.

In defense of trade liberalization, Stolper-Samuelson theorem is considered as the most famous theory. According to this theorem, the rise in the output price would lead to a simultaneous rise in the prices of the factor used intensively in the production process. Stolper-Samuelson theorem is considered a fundamental theorem in Hechscher Ohlin Trade Model. The Heckscher –Ohlin (H-O) Model predicts that the nation will gain by producing and exporting the abundant factor's commodities. For instance, the developing countries are mostly abundant with unskilled labors; gains to trade would flow to unskilled labour. The model thus suggests the increased welfare and reduced inequality in labour intensive developing countries. However, H-O model was criticized profoundly, especially since the Leontief Paradox. The validity of the model was challenged by Davis & Mishra (2006) among others as they found increased wage inequality, following the

trade liberalization, in most of the labour intensive Latin American developing countries. The model was challenged on the basis of various restrictive assumptions as well. For instance, it assumes the identical production function for all firms and nations. However, technological gap between various countries is considered as the most important concern in the literature.

On the basis of profound criticism attached with the H-O model, various new trade theories emerge. According to new theories, trade liberalization could reduce the wages of unskilled labour even in a labour abundant country, thereby widening the gap between the rich and the poor. In this regard the "Specific Factor Model" and the "Ricardo Viner Model" gained the most popularity. According to these models workers may gain from trade reforms depending on whether they are attached to import competing sector or exporting sector. The model focus on the short to medium run and assume imperfect factor mobility with one factor mobile across sectors while the other is taken to be sector specific. With these assumptions, the models predict a positive association between protection and returns to factors of production. Protection reduces imports and reduced imports increase labour demand, which in turn increases wages. When the price of a good falls following trade liberalization the model predicts that the factor specific to the sector that experienced a price reduction loses while the other factor gains in real terms. In other words, if trade liberalization occurred households affiliated to the industries that experience large tariff reductions would see a decline in their incomes relative to the economy-wide average income, while households attached to other industries would gain in comparison.

Given the apparent ambiguity in the theoretical literature discussed above the relationship between trade liberalization and welfare (poverty) is ultimately an empirical matter. Although, empirically it is not easy to disentangle the effects of trade reforms from other macroeconomic policies and technological changes occurring simultaneously in the absence of true panel data. The lack of suitable panel data at the household level has led to the widespread utilization of the cross sectional datasets in order to estimate the effect of public policy on poverty at household level. One potential problem is that the estimated coefficients are likely to be contaminated by unobserved household fixed effects leading to biases in the estimation results and incorrect inferences. Fortunately, there is by now rapidly growing literature on Pseudo panel data construction from repeated cross sections. This study is in this same tradition. In this paper pseudo panel data set is constructed to observe the effects of trade liberalization on the household welfare.

Data Description and Summary Statistics:

In this section of the study, the main sources of the data along with the definition and construction of main variables used in econometric analysis are described. The foremost data source is the Pakistan Standard of Living Measurement (PSLM) survey for the year 2005-06 and 2013-14. All the variables described in table 1 are constructed for each of the surveyed year at the household level to gauge the impact of trade protection on household welfare. Another main source of data is the (UNCTAD) TRAINS database, from which the SITC 2-digit annual average tariff rates are employed in the study. Tariff rates are used as a proxy of trade protection in this study. From the data obtained from the

above mentioned source, average annual tariff rates are calculated for 12 industries (at 2-digit level of PSIC 1970). The industries are selected on the basis of product traded between China and Pakistan since after FTA.

In the study, the household is restricted to the households with labour force aged 10 and above for the year 2005-06 and aged 18 and above for the year 2013-14. The households from which none of the individual included in the labour force are excluded from the sample. Each of the selected household is characterized by one (or more) of the 12 industries in which the labour force of the household is working.

In measuring the impact of trade protection on household welfare, average age of the household's labour force, working experience of the labour force, household size, educational attainment of the labour force are employed as control variables. Working experience of the labour force is calculated by firstly adding four years in the total years of education and then subtracting this from the current age of each labour force. For the individuals having no formal education the work experience is calculated by subtracting 10 years from their current age, by assuming that if a child is not in school he/she will start working at age not greater than 10. Furthermore, using the information on the highest qualification obtained, each household is characterized in to one of the six educational categories, i.e., no education, primary education (from class 1 to class 5), middle education (class 6 to class 8), Secondary education (class 9 to class 10), post-secondary education (class 11 to B.A/B.Sc.) and Tertiary education (degree level, M.Phil./Ph.D.). Finally, skill of the household's labour force is represented by four categories highly skilled, skilled, semi-skilled and unskilled. The categories of skills are based on the definition given by ILO. The ILO classified the occupational categories into four skill groups as explained above. For years, i.e, 2005-06 and 2013-14, table 1 presents the summary statistics for all the variables employed in the study.

Table 1: Summary Statistics

Variable	2006		2014	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Household Income	108252.6	43620.9	262773.8	98203.6
Age of Labour Force	39.0	15.4	47.0	15.8
Experience	1769.6	1244.1	2472.9	1539.0
Years of Education	2.7	2.3	2.8	2.6
Household Size	8.7	1.3	8.3	1.8
No Education	135.2	154.8	131.4	184.3
Basic Education	33.2	51.3	31.0	57.0
Primary Education	18.6	33.5	21.7	48.2
Secondary Education	20.3	31.6	22.1	43.9
Post Sec. Education	9.8	14.3	11.5	21.1
Tertiary Education	2.1	4.1	3.0	5.7
Highly Skilled	41.8	63.5	44.2	90.1
Skilled	144.6	175.0	159.4	209.7
Semi-skilled	2.6	5.5	3.1	6.7
Unskilled	0.6	1.5	0.8	2.1
Tariff	12.0	2.0	12.1	0.9

Table 1 shows that average household income increased by 142.7% from 2005-06 to 2013-14. This increase in the average household income is accompanied by the slight increase in the educational attainment. Table 1 reveals that average years of education has increased by 3.7% in the period of eight years. This increase in the average years of education is mainly because of the massive increase in the attainment of tertiary education. Summary statistics provided in table 1 shows the mean growth of about 42.9% in the attainment of tertiary education. Table also shows decrease in the illiteracy rate by 2.8% during 2005-06 to 2013-14. The average attainment of primary and secondary education is increased by 16.7% and 8.9% respectively. The post-secondary education, which includes 11 to 15 years of education, has increased by 17.3% in the same period.
Likewise, educational attainment, statistics provided in table 1 shows an increase in the skill level of the labour force. Average number of highly skilled and skilled labour force increased by about 5.7% and 10.2% respectively during the period under study.

Table 2: Educational Attainment by Province for 2005-06 and 2013-14

	2005-2006				2013-2014			
	KPK	**Punjab**	**Sindh**	**Balochistan**	**KPK**	**Punjab**	**Sindh**	**Balochistan**
No Education	61.97	58.14	63.65	71.37	60.43	50.35	66.93	70.68
Primary Education	12.36	16.1	16.32	11.59	10.23	16.68	13.55	9.46
Middle Education	9.94	10.89	5.36	4.7	9.23	14.56	5.75	5.61
Secondary Education	11.24	10.21	7.24	7.97	10.93	12.66	7.27	7.31
Post-Secondary Educat	3.29	3.96	6.08	3.73	6.84	4.25	5.52	5.93
Tertiary Education	1.2	0.7	1.35	0.63	2.35	1.5	0.98	1.01
Total	2,677	7,834	5,276	1,743	2,297	7,337	6,434	1,586

Table 2 shows educational attainment by province for the year 2005-06 and 2013-14. Table shows that the share of illiterate has increased in Sind province, whereas, Punjab, KPK and Baluchistan reports the decline in the illiteracy share. Primary education reports a declining share in all the four provinces during the period under study. Share of secondary education decline in KPK and Baluchistan province but increased in Sind and Punjab. Share of post-secondary education also increased in all the provinces except for Sind province, where the share of attainment of post-secondary education has declined from 6.08% to 5.52% during the eight years' period under study. Similar to table 1, table 2 also shows a massive and significant increase in the share of tertiary education in all the provinces except Sind province.

Table 3: Educational Attainment by region for 2005-06 and 2013-14

	2005-06		2013-14	
	Rural	**Urban**	**Rural**	**Urban**
No Education	67.78	39.96	65.87	31.28
Primary Education	14.73	16.63	13.62	15.97
Middle Education	7.34	12.5	8.16	17.39
Secondary Education	7.53	15.4	8.07	18.53
Post-Secondary Education	2.38	11.96	3.44	13.03
Tertiary Education	0.24	3.55	0.83	3.8
Total	13,699	3,831	14,416	3,238

Table 3 reports the educational attainment by region. Substantial variation is found in the educational achievement between the urban and rural areas of Pakistan. Most of the illiterate population are living in the rural areas, most of which are engaged in the agricultural sector. Table shows that major share of population who has attained education upto the post-secondary and tertiary level of education resides in urban areas. On the other hand, major share of the population in rural areas are either illiterate or attained education only upto primary, middle or secondary level.

Table 4: Educational level of Labour Force Employed by Industries

Industry*	**2006**						**2014**					
	No Education	***Primary Education***	***Middle Education***	***Secondary Education***	***Post-Secondary Education***	***Tertiary Education***	***No Education***	***Primary Education***	***Middle Education***	***Secondary Education***	***Post-Secondary Education***	***Tertiary Education***
11	68.43	14.64	7.02	7.13	2.51	0.27	69.11	12.83	7.52	6.99	3.02	0.54
12	50	16.67	4.17	12.5	12.5	4.17	44.83	3.45	24.14	13.79	3.45	10.34
13	73.03	8.99	11.24	4.5	0	2.25	72.82	13.59	6.8	3.88	0.97	1.94
31	31.31	17.93	14.29	17.6	13.07	5.78	32.05	17.83	12.64	22.12	11.74	3.61
32	39.56	21.47	14.63	13.4	9.12	1.84	43.95	19.28	14.45	14.13	6.63	1.56
33	42.59	21.48	16.67	13.3	4.81	1.11	39.26	23.78	20.63	12.61	3.15	0.57
34	32.2	15.25	16.95	1.64	11.86	5.08	27	10	13	32	14.08	4.23
35	28.57	6.12	11.22	21.43	14.29	18.37	22.02	10.12	7.74	25	29.17	5.95
36	33.33	22.22	16.05	19.75	6.17	2.47	50.34	14.04	14.04	13.01	6.16	2.4
37	27.27	16.36	17.27	20	15.45	3.64	26.38	21.47	25.77	20.86	3.68	1.84
38	21.68	22.38	18.88	24.5	9.09	3.5	18.57	22.14	15.71	19.29	18.57	5.71
39	50.65	17.42	10.3	13.35	6.24	2.03	26.42	20.05	20.05	20.96	9.34	3.19
Total	62.36	15.63	8.52	0.79	3.85	0.85	61.21	14.36	9.58	9.45	4.39	1.01

*Where;

11=Agriculture, livestock and hunting.
12=Forestry and logging
13=Fishing
31=Manufacture of food, beverages and tobacco
32=Manufacture of Textile, wearing apparel and leather industries
33=Manufacture of wood and wood products, including furniture
34=Manufacture of paper and paper products; printing and publishing
35=Manufacture of chemicals and chemical, petroleum, coal, rubber and plastic products
36=Manufacture of non-metallic mineral products, except of petroleum and coal
37=Basic metal industries
38=Manufacture of fabricated metal products, machinery and equipment
39=Other manufacturing industries

Table 4 reports the educational level of labour force employed in 12 different industries. Table shows that most of the labour forces employed in different sectors, related to agricultural and primitive activities, are illiterate. All the industries related to manufacturing of trade-able products employed labour force of various educational level depending on the work they performed. Major share of highly skilled labour force are found to be employed in the industries like Chemical & Chemical industries, Manufactures of food, beverages & Tobacco and Manufacture of fabricated metal products.

Empirical Methodology:

In this section of the study, empirical methodology is discussed in detail. Our main objective is to explore the relationship between trade protection on various segments of the household characterized by various educational categories and by various skill levels. For exploring such a relationship longitudinal data with multiple observations on the same households' overtime is required. However, like most of other developing countries, Pakistan also lacks panel data. To overcome this deficiency of panel data, we employ the Pseudo-panel technique to our repeated cross-sectional data.

Construction of Pseudo-Panel Data:

The Pseudo-panel data was introduced by Deaton (1985) for the analysis of consumer demand systems. In this method Deaton (1985) suggested to group individuals into cohorts on the basis of one or more shared characteristics such as same age group or gender etc. It is then assumed that the averages within these cohorts could be treated as observations in a Pseudo (means synthetic or artificial) panel.

Following the Deaton's study, we construct a Pseudo-panel by identifying the suitable cohorts of households through our two cross sections for the years 2005-06 and 2013-14. As already explained, cohorts can be described on the basis of single or multiple characteristics, depending on the nature of applied data sets. In this study, only two cross-sections are employed, hence if only single characteristic would be used to define a

cohort, the resulting cohort would contain a larger number of households and the number of cohort groups will be small and the cross sectional dimension of the panel will be small. Thus, in this study, Pseudo-panel is constructed by grouping households into cohorts based on multiple characteristics, which are common across households, like province, region, age categories and gender of the household's labour force. Age categories are constructed in the study with the ten years' gap except from the first category, where the study has also included the child labour (age 10-14) in the first category. Therefore, starting from age 10 to 24 and then 25 to 35 and onwards for the year 2005-06. However, since the second cross sectional data included in the study is eight years ahead, therefore, for 2013-14, age category starts from 18 years of age of labour force. In this way, five age categories are constructed for each cross section. For example, the first age category used to define a cohort is ages 10 to 24 for 2005-06 and 18 to 32 for 2013-14. Hence, the Pseudo panel is constructed in this study by defining a cohort on the basis of four provinces, two regions, five age categories and two sexes. The detailed of the cohort is given in appendix. Although, the actual households are different in both surveys, however, the Pseudo panel constructed in the study will be the representative of the actual households in the absence of a true panel.

Econometric Models:

Although, the impact of trade protection on household welfare can be determine by simple pooled OLS regression, however, in that case the unobservable individual or household heterogeneity cannot be controlled. Hence, the pseudo-panel constructed in the study is useful in controlling the unmeasured and uncontrollable household heterogeneity. Based on the cohort averages of all the variables, the Pseudo-panel regression function for estimating the impact of trade policy on household welfare is of the following form.

$$\ln \bar{w}_{ct} = \beta + \delta_1 \overline{age}_{ct} + \delta_2 \overline{exp}_{ct} + \delta_3 \overline{hhsize}_{ct} + \delta_4 \overline{edu}_{ct} + \delta_5 \overline{tariff}_{ct} + \delta_6 \overline{skill}_{ct} + \bar{\eta}_{ct} + \bar{\lambda}_{ct} + \bar{\varepsilon}_{ct} \quad (i)$$

In equation (i), the dependent variable is natural logarithm of average income of the cohort, which is taken as a proxy of welfare. The first explanatory variable is the cohort average of the age of the household labour force at time t ($\overline{age}_{ct}$). The second independent variable ($\overline{exp}_{ct}$) is the cohort average of the work experience of the household labour force at time t. The third variable ($\overline{hhsize}_{ct}$) is the cohort average of the household at time t. Fourth explanatory variable ($\overline{edu}_{ct}$) is the educational attainment of the household's labour force, averaged for each cohorts at time t. As explained earlier, six educational groups are constructed for the analysis. Each household's labour force are grouped in one of the six educational categories based on their educational attainment. Fifth variable ($\overline{tariff}_{ct}$) is the average tariff rates applied to imports of trade-able industry's product. These tariff rates are also averaged out for the households belonging to a particular cohort. Sixth, ($\overline{skill}_{ct}$) is the skill of the household's labour force average across cohort – represented by four categories highly skilled, skilled, semi-skilled and unskilled. The skills are identified based on the occupational categories, as defined by ILO. $\bar{\eta}_{ct}$ is the fixed effect for the household's industry affiliation, averaged out at the cohort level for time t. $\bar{\lambda}_{ct}$ is the year fixed effect and $\bar{\varepsilon}_{ct}$ is the error term.

Panel Data Regression Model: Fixed Effect Approach

In this study, we estimated equation (i) and (ii) by employing Fixed Effect Approach. Although, pooled OLS regression is the simplest model to estimate the impact of trade on household welfare. However, literature considered this model as the most restricted one because it does not take into account the difference of space and time dimensions of the pooled data. However, fixed effect model could be employed to capture the unobserved heterogeneity across households (or cohorts) and time. When using fixed effect model, it is assumed that individual heterogeneity biased the outcome variables and to eliminate this bias, these unobserved heterogeneities must be removed. Hence, fixed effect model removes the effect of these time invariant characteristics so that the net effect of the predictors on the outcome variables must be assessed. Another important assumption of the fixed effect model is that the time invariant heterogeneity is unique to each cross section and should not be correlated with other cross section. Each cross section is different, therefore, the cross-sectional's error term and the constant (which captures the cross sectional characteristics) should not be correlated with the others. If the error term is correlated, then Fixed Effect is not suitable since inferences may not be correct.

The general form of Fixed Effect model is as follows;

$$Y_{i,t} = \sum_{i=1}^{n} \beta_i D_{i\,t} + \alpha X_{it} + \mu_{it}$$

In the above model, subscript '*i*' with 'β' is used to estimate the separate intercept term for each cross section, whereas, 'D_i' denotes cross sectional dummies. X_{it} is a set of independent variables. The above equation is a fixed effect model for 'cross sectional varying, time invariant model'. Hence, statistically significant intercept values for each cross section would explain distinguish characteristics of each cross section. In the case of present study cross sections are described by cohorts.

To estimate fixed effect model to account for time effect along with the cohort effect time dummies could be included in the above equation.

$$Y_{i,t} = \sum_{i=1}^{n} \beta_i D_i + \sum_{t=1}^{T} \delta_t D_t + \alpha X_{it} + \mu_{it}$$

(b)

In equation, subscript't' with 'δ' is used to estimate the separate intercept terms for each time period.

Estimation Result:

In this section we discuss the econometric results, focusing on estimates of equation (i). Table 5 provides the estimated results of equation (i) through fixed effect approach. Table 5 reports the positive impact of tariff on household (cohort) welfare. The effect of protection on welfare is found to be positive and significant. In other words, holding other factors constant, the pseudo panel econometric evidence presented here suggests that welfare is higher (or in other words poverty is lower) in households or cohorts employed in protected sectors. The coefficient on tariff implies that increasing protection in a particular sector raises household income employed in that sector. Specifically a one unit increase in tariff will increase the household income by 2.7 percent. Conversely, increasing liberalization through reduction in tariff rates in previously protected sectors lowers welfare of the households employed in those sectors around 2.7 percent.

Besides the significant and positive impact of tariff on household welfare, other control variables also impact significantly on household welfare. For instance, average age of the household labour force impact positively and significantly on household income [a one year increase in the age of earners will increase the household income by 24 percent]. Table 5 also shows significantly negative impact of illiteracy, basic and primary level education on household welfare though the magnitude of the impact is very small [reducing household income around 0.34 percent in case earners have no formal education; 1 percent in case they have basic education only and 0.5 percent in case of having upto primary level education]. However, labour force of the households attained education upto secondary and post-secondary level does not impact significantly on household income, probably because of the limited working opportunity for the educated labour force in our country.

Table 5 also revealed some very important and viable results regarding the relationship between skill level of the labour force and household welfare. The table shows the positive and significant impact of all three categories of skill levels on household income. Again though the magnitude of the impact is small however, results suggest that poverty can be reduced by enhancing the skill level of the society and thus suggests some viable policy options for the policy makers. Specifically, highly skilled earners can increase the household income by 0.41 percent; skilled earners can increase the household income by 0.35 percent while semi skilled workers can increase the household income around 0.9 percent. The skill level of the employed labour force could be enhanced by providing on job training and re-training of the labour force. It is the need of the time to construct training institutes, especially in the far flung rural areas.

Table 5: Estimates through Fixed Effect Approach

Log of Income	Coef.	Std. Err. (Robust)	t-statistics	P-value
Age of Labour Force	0.238	0.124	1.92	0.059***
Experience	-0.13	0.127	-1.02	0.311
Household Size	0.07	0.042	1.68	0.096***
No Education	-0.003	0.001	-2.39	0.019*
Basic Education	-0.01	0.004	-2.38	0.02**
Primary Education	-0.006	0.003	-1.66	0.101***
Secondary Education	-0.003	0.004	-0.77	0.444
Post Sec. Education	0.001	0.003	0.37	0.711
Tariff	0.027	0.013	2.01	0.048**
Highly Skilled	0.004	0.002	2.13	0.036**
Skilled	0.003	0.002	2.23	0.028**
Semi-skilled	0.009	0.004	2.3	0.024**
Constant	5.439	1.109	4.91	0.00*
R-sq: within			0.8995	
Number of obs			160	
F(12,79)			114.26	
Prob > F			0.0000	
F test that all u_i				
F(79, 67)			8.44	
Prob > F			0.0000	

Finally as the data is panel data, cohort specific test is applied before estimating equation (i) in order to check if the cohort specific control is needed. F-statistics 8.44 (p-0.000) indicates that cohort specific intercepts are needed.

The above model imposes a uniform and linear restriction on the coefficient of tariff (δ_5) – the impact of tariff on welfare measured through household income. However, the assumption that the welfare effect of tariffs is uniform for all households may not be sufficient. In other words, the assumption that all households would derive the same benefits from trade liberalization is unlikely. To overcome the difficulty we explicitly allow the effect of tariffs on households to differ. We hypothesize that the differences are due to differences in education and skill levels. The following equation is estimated to allow the differential:

$$\ln \overline{w}_{ct} = \beta + \delta_1 \overline{age}_{ct} + \delta_2 \overline{exp}_{ct} + \delta_3 \overline{hhsize}_{ct} + + \delta_4 \overline{tariff}_{ct} + + \delta_5 \overline{tariff^2}_{ct} + \delta_6 \overline{edu}_{ct} * \overline{tariff} + \delta_7 \overline{tariff}_{ct} * \overline{skill}_{ct} + \overline{\eta}_{ct} + \overline{\lambda}_{ct} + \overline{\varepsilon}_{ct} \quad \text{(ii)}$$

In model (ii) we explicitly allowed non linear and differential impact of tariff on welfare. This identification strategy assumes that the changes in tariff rate will affect households differentially according to their earning member's education level and skill type. From the estimates of model (ii) we are hence able to make assessment of the argument that trade protection is beneficial for households regardless of the level of education and skill type. Table 6 presents the results.

Table 6: Estimates after Allowing Non Linear and Differential Impact

Log of Income	Coef.	Std. Err. (Robust)	t-statistics	P-value
Age of Labour Force	0.2513	0.1077	2.33	0.022**
Experience	-0.1505	0.1125	-1.34	0.185
Household Size	0.0138	0.0370	0.37	0.71
Tariff	0.6636	0.2510	2.64	0.01*
Square Term of Tariff	-0.0260	0.0099	-2.63	0.01*
No Education* Tariff	0.0002	0.0001	2.12	0.037**
Basic Education* Tariff	-0.0005	0.0002	-2.77	0.007*
Primary Education * Tariff	0.0006	0.0002	2.69	0.009*
Post Sec. Education* Tariff	0.0006	0.0003	2.28	0.025**
Tertiary Education* Tariff	0.0004	0.0008	0.44	0.663
Skilled* Tariff	-0.0002	0.0001	-2.03	0.046**
Semi skilled* Tariff	0.0000	0.0006	-0.05	0.964
Unskilled* Tariff	0.0004	0.0012	0.32	0.748
Constant	2.0196	1.6964	1.19	0.237
R-sq: within			0.9014	
Number of obs			160	
F(12,79)			100.84	
Prob > F			0.0000	

Table 6 exhibits some interesting results. The household income once again responding positively to tariffs i.e tariff reduction leads to a decline in household income however, the impact is now non linear. Specifically if the tariff rate increases more than 13% on a product it will instead of protecting the welfare decline the welfare of the household. Precisely a unit increase in tariff first increases the household income by 66.4 percent but further increase in tariff rate (more than 13 percent) will leads to a decline in the household income - around 2.6 percent.

Further the interaction terms of tariff with the Skill and educational dummies confirms the differential effect of trade protection on households characterized by different levels of education only. However for skill type only interaction term of tariff with skill category is significant at 5% significance level.

Conclusion:

In this paper we have performed micro-econometric analysis to disentangle the likely impact of trade liberalization with China on household income in Pakistan. Tariff rates measured at the 2-digit level, are matched with the PSLM survey data for 2005-06 and 2013-14 to represent the tariff for the industry in which the household labour force are employed. We hypothesized that the impact of tariff could be positive or negative on household welfare. The descriptive and summary statistics presented to show educational attainment of labour force in four different provinces and regions. Labour force employed in various industries is reported on the basis of their educational level as well. It is found that most of the labour forces employed in agricultural sector are either illiterate or have attained education only up to primary or secondary level.

In the study, the econometric evidences have shown positive and significant impact of trade protection on household welfare. In other words, holding other factors constant, the pseudo panel econometric evidence presented here suggestions that welfare is higher (or in other words poverty is lower) in households or cohorts employed in protected sectors. Hence any reduction in tariff or free flow of import from China because of CPEC will likely reduce income of the labour force engaged in that industry. Further to this study also endeavored to analyze the impact of trade protection on various segment of the society depending on the educational attainment of the labour force. The results show that trade liberalization would decrease the welfare of those households whose labour force was able to obtain only basic education. This segment of the society mainly comprises with the poor households and employed either in primitive activities or in low skilled work. It is thus concluded that contemplating trade liberalization without recognizing the complementary role of human capital investment may be a sub-optimal policy for the poor households.

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Appendix A:

Table A1: Cohort Definition

ID	Province	Region	Age Category	Gender	Year
1111	Kpk	Rural	Age 10 – 24	Male	2006
1111	Kpk	Rural	Age 18 - 32	Male	2014
1112	Kpk	Rural	Age 10 – 24	Female	2006
1112	Kpk	Rural	Age 18 - 32	Female	2014
1121	Kpk	Rural	Age 25 - 34	Male	2006
1121	Kpk	Rural	Age 33 - 42	Male	2014
1122	Kpk	Rural	Age 25 - 34	Female	2006
1122	Kpk	Rural	Age 33 - 42	Female	2014
1131	Kpk	Rural	Age 35 - 44	Male	2006
1131	Kpk	Rural	Age 43 - 52	Male	2014
1132	Kpk	Rural	Age 35 - 44	Female	2006
1132	Kpk	Rural	Age 43 - 52	Female	2014
1141	Kpk	Rural	Age 45 - 54	Male	2006
1141	Kpk	Rural	Age 53 - 62	Male	2014
1142	Kpk	Rural	Age 45 - 54	Female	2006
1142	Kpk	Rural	Age 53 - 62	Female	2014

1151	Kpk	Rural	Age 55 - 99	Male	2006
1151	Kpk	Rural	Age 63 - 99	Male	2014
1152	Kpk	Rural	Age 55 - 99	Female	2006
1152	Kpk	Rural	Age 63 - 99	Female	2014
1211	Kpk	Urban	Age 10 – 24	Male	2006
1211	Kpk	Urban	Age 18 - 32	Male	2014
1212	Kpk	Urban	Age 10 – 24	Female	2006
1212	Kpk	Urban	Age 18 - 32	Female	2014
1221	Kpk	Urban	Age 25 - 34	Male	2006
1221	Kpk	Urban	Age 33 - 42	Male	2014
1222	Kpk	Urban	Age 25 - 34	Female	2006
1222	Kpk	Urban	Age 33 - 42	Female	2014
1231	Kpk	Urban	Age 35 - 44	Male	2006
1231	Kpk	Urban	Age 43 - 52	Male	2014
1232	Kpk	Urban	Age 35 - 44	Female	2006
1232	Kpk	Urban	Age 43 - 52	Female	2014
1241	Kpk	Urban	Age 45 - 54	Male	2006
1241	Kpk	Urban	Age 53 - 62	Male	2014
1242	Kpk	Urban	Age 45 - 54	Female	2006
1242	Kpk	Urban	Age 53 - 62	Female	2014
1251	Kpk	Urban	Age 55 - 99	Male	2006
1251	Kpk	Urban	Age 63 - 99	Male	2014
1252	Kpk	Urban	Age 55 - 99	Female	2006
1252	Kpk	Urban	Age 63 - 99	Female	2014
2111	Punjab	Rural	Age 10 – 24	Male	2006
2111	Punjab	Rural	Age 18 - 32	Male	2014
2112	Punjab	Rural	Age 10 – 24	Female	2006
2112	Punjab	Rural	Age 18 - 32	Female	2014
2121	Punjab	Rural	Age 25 - 34	Male	2006
2121	Punjab	Rural	Age 33 - 42	Male	2014
2122	Punjab	Rural	Age 25 - 34	Female	2006
2122	Punjab	Rural	Age 33 - 42	Female	2014
2131	Punjab	Rural	Age 35 - 44	Male	2006
2131	Punjab	Rural	Age 43 - 52	Male	2014
2132	Punjab	Rural	Age 35 - 44	Female	2006
2132	Punjab	Rural	Age 43 - 52	Female	2014
2141	Punjab	Rural	Age 45 - 54	Male	2006
2141	Punjab	Rural	Age 53 - 62	Male	2014
2142	Punjab	Rural	Age 45 - 54	Female	2006
2142	Punjab	Rural	Age 53 - 62	Female	2014
2151	Punjab	Rural	Age 55 - 99	Male	2006

2151	Punjab	Rural	Age 63 - 99	Male	2014
2152	Punjab	Rural	Age 55 - 99	Female	2006
2152	Punjab	Rural	Age 63 - 99	Female	2014
2211	Punjab	Urban	Age 10 – 24	Male	2006
2211	Punjab	Urban	Age 18 - 32	Male	2014
2212	Punjab	Urban	Age 10 – 24	Female	2006
2212	Punjab	Urban	Age 18 - 32	Female	2014
2221	Punjab	Urban	Age 25 - 34	Male	2006
2221	Punjab	Urban	Age 33 - 42	Male	2014
2222	Punjab	Urban	Age 25 - 34	Female	2006
2222	Punjab	Urban	Age 33 - 42	Female	2014
2231	Punjab	Urban	Age 35 - 44	Male	2006
2231	Punjab	Urban	Age 43 - 52	Male	2014
2232	Punjab	Urban	Age 35 - 44	Female	2006
2232	Punjab	Urban	Age 43 - 52	Female	2014
2241	Punjab	Urban	Age 45 - 54	Male	2006
2241	Punjab	Urban	Age 53 - 62	Male	2014
2242	Punjab	Urban	Age 45 - 54	Female	2006
2242	Punjab	Urban	Age 53 - 62	Female	2014
2251	Punjab	Urban	Age 55 - 99	Male	2006
2251	Punjab	Urban	Age 63 - 99	Male	2014
2252	Punjab	Urban	Age 55 - 99	Female	2006
2252	Punjab	Urban	Age 63 - 99	Female	2014
3111	Sindh	Rural	Age 10 – 24	Male	2006
3111	Sindh	Rural	Age 18 - 32	Male	2014
3112	Sindh	Rural	Age 10 – 24	Female	2006
3112	Sindh	Rural	Age 18 - 32	Female	2014
3121	Sindh	Rural	Age 25 - 34	Male	2006
3121	Sindh	Rural	Age 33 - 42	Male	2014
3122	Sindh	Rural	Age 25 - 34	Female	2006
3122	Sindh	Rural	Age 33 - 42	Female	2014
3131	Sindh	Rural	Age 35 - 44	Male	2006
3131	Sindh	Rural	Age 43 - 52	Male	2014
3132	Sindh	Rural	Age 35 - 44	Female	2006
3132	Sindh	Rural	Age 43 - 52	Female	2014
3141	Sindh	Rural	Age 45 - 54	Male	2006
3141	Sindh	Rural	Age 53 - 62	Male	2014
3142	Sindh	Rural	Age 45 - 54	Female	2006
3142	Sindh	Rural	Age 53 - 62	Female	2014
3151	Sindh	Rural	Age 55 - 99	Male	2006
3151	Sindh	Rural	Age 63 - 99	Male	2014

3152	Sindh	Rural	Age 55 - 99	Female	2006
3152	Sindh	Rural	Age 63 - 99	Female	2014
3211	Sindh	Urban	Age 10 – 24	Male	2006
3211	Sindh	Urban	Age 18 - 32	Male	2014
3212	Sindh	Urban	Age 10 – 24	Female	2006
3212	Sindh	Urban	Age 18 - 32	Female	2014
3221	Sindh	Urban	Age 25 - 34	Male	2006
3221	Sindh	Urban	Age 33 - 42	Male	2014
3222	Sindh	Urban	Age 25 - 34	Female	2006
3222	Sindh	Urban	Age 33 - 42	Female	2014
3231	Sindh	Urban	Age 35 - 44	Male	2006
3231	Sindh	Urban	Age 43 - 52	Male	2014
3232	Sindh	Urban	Age 35 - 44	Female	2006
3232	Sindh	Urban	Age 43 - 52	Female	2014
3241	Sindh	Urban	Age 45 - 54	Male	2006
3241	Sindh	Urban	Age 53 - 62	Male	2014
3242	Sindh	Urban	Age 45 - 54	Female	2006
3242	Sindh	Urban	Age 53 - 62	Female	2014
3251	Sindh	Urban	Age 55 - 99	Male	2006
3251	Sindh	Urban	Age 63 - 99	Male	2014
3252	Sindh	Urban	Age 55 - 99	Female	2006
3252	Sindh	Urban	Age 63 - 99	Female	2014
4111	Balochis	Rural	Age 10 – 24	Male	2006
4111	Balochis	Rural	Age 18 - 32	Male	2014
4112	Balochis	Rural	Age 10 – 24	Female	2006
4112	Balochis	Rural	Age 18 - 32	Female	2014
4121	Balochis	Rural	Age 25 - 34	Male	2006
4121	Balochis	Rural	Age 33 - 42	Male	2014
4122	Balochis	Rural	Age 25 - 34	Female	2006
4122	Balochis	Rural	Age 33 - 42	Female	2014
4131	Balochis	Rural	Age 35 - 44	Male	2006
4131	Balochis	Rural	Age 43 - 52	Male	2014
4132	Balochis	Rural	Age 35 - 44	Female	2006
4132	Balochis	Rural	Age 43 - 52	Female	2014
4141	Balochis	Rural	Age 45 - 54	Male	2006
4141	Balochis	Rural	Age 53 - 62	Male	2014
4142	Balochis	Rural	Age 45 - 54	Female	2006
4142	Balochis	Rural	Age 53 - 62	Female	2014
4151	Balochis	Rural	Age 55 - 99	Male	2006
4151	Balochis	Rural	Age 63 - 99	Male	2014
4152	Balochis	Rural	Age 55 - 99	Female	2006

4152	Balochis	Rural	Age 63 - 99	Female	2014
4211	Balochis	Urban	Age 10 – 24	Male	2006
4211	Balochis	Urban	Age 18 - 32	Male	2014
4212	Balochis	Urban	Age 10 – 24	Female	2006
4212	Balochis	Urban	Age 18 - 32	Female	2014
4221	Balochis	Urban	Age 25 - 34	Male	2006
4221	Balochis	Urban	Age 33 - 42	Male	2014
4222	Balochis	Urban	Age 25 - 34	Female	2006
4222	Balochis	Urban	Age 33 - 42	Female	2014
4231	Balochis	Urban	Age 35 - 44	Male	2006
4231	Balochis	Urban	Age 43 - 52	Male	2014
4232	Balochis	Urban	Age 35 - 44	Female	2006
4232	Balochis	Urban	Age 43 - 52	Female	2014
4241	Balochis	Urban	Age 45 - 54	Male	2006
4241	Balochis	Urban	Age 53 - 62	Male	2014
4242	Balochis	Urban	Age 45 - 54	Female	2006
4242	Balochis	Urban	Age 53 - 62	Female	2014
4251	Balochis	Urban	Age 55 - 99	Male	2006
4251	Balochis	Urban	Age 63 - 99	Male	2014
4252	Balochis	Urban	Age 55 - 99	Female	2006
4252	Balochis	Urban	Age 63 - 99	Female	2014