

**Web Appendix for  
Trade Adjustment and Human Capital Investments:  
Evidence from Indian Tariff Reform**

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This appendix includes supplementary tables discussed in the main text of the paper.

### Web Appendix Section on Returns to Education

In section V.A of the paper, we consider whether there is evidence of decreases in the returns to education in either the expenditure or adult employment data. Here we provide a brief discussion about our approach. Because of innumerable measurement problems, we do not attempt to directly measure returns to education and pursue a more inferential approach.<sup>1</sup> In particular, we compare per capita expenditures of households with literate and illiterate heads of household as a measure of the returns to education.<sup>2</sup> We relate the relative expenditures of literate and illiterate households in a district to the employment weighted tariff using a specification parallel to equation (7). We regress the ratio of per capita expenditure in literate households to illiterate households in a district at time  $t$  on a district tariff, post-reform indicator, pre-reform district characteristics interacted with the post-reform indicator, and instrument for tariffs with traded tariffs. Standard errors are large relative to the estimated coefficients, but the sign on the tariff coefficient is most consistent with increases in the consumption of the literate relative to that of the illiterate with tariff declines. We observe a similar finding when we split the sample by primary school completion rather than literacy of household head. Overall, the expenditure evidence is more consistent with increasing, rather than decreasing, returns to education (see web appendix table 8 for details).

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<sup>1</sup> Measuring returns to education for each district is a challenge. Current labor market returns may not be a good proxy for expected future returns. The observed average returns may not equal the marginal return relevant for a family's decision-making. Estimates of returns based on observed wages will be biased by non-random selection into wage work. In addition, we face a data problem: information on wages is missing for most individuals in our baseline data. In general, around 30 percent of individuals report working for wages in rural areas in various NSS rounds. However, only 7 percent of individuals report wages in rural areas in 43<sup>rd</sup> round of NSS.

<sup>2</sup> We thank Esther Duflo for this suggestion. This comparison assumes that individuals infer future returns to education by comparing the living standards of the literate to those of the illiterate. Given the high levels of illiteracy in rural India, literacy is potentially the most obvious measure of education that can be observed outside of an individual's household. Neighbors are more likely to know whether someone can read or write than whether he has completed 3 or 4 years of education.

Web Appendix Table 1: Coefficients on Demographic and Household Characteristics from Table 3

	1	2	3
Tariff	0.376*** [0.090]		0.362** [0.137]
Traded Tariff		0.124** [0.055]	
Female Indicator	-2.934 [3.048]	-2.871 [3.086]	-2.815 [3.079]
Age	1.624*** [0.559]	1.622*** [0.556]	1.623*** [0.557]
Female*Age	0.726 [0.781]	0.71 [0.791]	0.696 [0.789]
Age <sup>2</sup>	-0.133*** [0.047]	-0.133*** [0.047]	-0.133*** [0.047]
Female*Age <sup>2</sup>	-0.062 [0.066]	-0.061 [0.067]	-0.059 [0.067]
Age <sup>3</sup>	0.004*** [0.001]	0.004*** [0.001]	0.004*** [0.001]
Female*Age <sup>3</sup>	0.002 [0.002]	0.002 [0.002]	0.002 [0.002]
Hh belongs to scheduled caste	-0.078*** [0.013]	-0.078*** [0.013]	-0.078*** [0.013]
Hh belongs to scheduled tribe	-0.115*** [0.014]	-0.116*** [0.014]	-0.116*** [0.014]
Hindu Indicator	-0.03 [0.027]	-0.034 [0.026]	-0.034 [0.026]
Islam Indicator	-0.123*** [0.029]	-0.127*** [0.029]	-0.127*** [0.029]
Christian Indicator	0.011 [0.035]	0.007 [0.034]	0.008 [0.034]
Sikh Indicator	-0.002 [0.039]	-0.007 [0.038]	-0.007 [0.038]
Hh Head is Female	0.088*** [0.012]	0.089*** [0.012]	0.088*** [0.012]
Age of Hh Head	0.003*** [0.000]	0.003*** [0.000]	0.003*** [0.000]
Head is Literate	0.169*** [0.010]	0.168*** [0.010]	0.169*** [0.010]
Head has Primary Education	0.067*** [0.007]	0.068*** [0.007]	0.068*** [0.007]
Head has Middle School Education	0.120*** [0.010]	0.121*** [0.010]	0.121*** [0.010]
Head has Secondary School Educ.	0.166*** [0.015]	0.169*** [0.015]	0.168*** [0.015]
Head has Higher Level of Education	0.178*** [0.016]	0.181*** [0.016]	0.181*** [0.016]
r2	0.25	0.26	0.26
N	95488	95488	95488

Standard errors in parenthesis are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. This table reports the coefficients on child's demographic and household characteristics from regressions in table 3, column 1, 2, and 3, respectively. Indicators for education of household head reflect the highest level of completed education by a household head. The excluded group is no complete education. All regressions also include district fixed effects and post reform survey round indicator. Regressions in columns 2 and 3 additionally include interactions of post reform indicator with initial district characteristics described in notes to table 3.

Web Appendix Table 2: First Stage Results for Table 3, column 3

Dep. Variable: Tariff

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Traded Tariff (TrTariff)	0.341*** [0.068]
Demographic Characteristics	yes
Household Characteristics	yes
District Indicators	yes
Post Reform Indicator	yes
Initial District Characteristics*Post Reform	yes
F statistic for significance of instrument	24.88
R <sup>2</sup>	0.92
Number Observations	95488

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Standard errors in parenthesis are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. This table reports first stage results for table 3, column 3. See notes to table 3 for further explanation. Data: 43rd and 55th rounds of the NSS.

Web Appendix Table 3: The Effect of Tariffs on School Attendance with no Demographic and Household Controls

	(1)	(3)	(6)
Tariff	0.415*** [0.094]	0.541*** [0.169]	0.536*** [0.185]
Post Reform Indicator (Post)	0.185*** [0.013]		
Pre-reform Trend in Schooling*Post			0.133 [0.090]
IV with traded tariff	no	yes	yes
District Indicators	yes	yes	yes
Initial District Conditions*Post	no	yes	yes
R <sup>2</sup>	0.12	0.12	0.12
N	95488	95488	93285

Standard errors in brackets are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. Column headings of this table (1, 3, 6) reflect column headings of related regression results in column 1, 3, and 6 of table 3 in the main body of the paper. The regression specifications in the current table are the same as those reported in respective columns in table 3, except they do not control for demographic, household, and household head characteristics.

Web Appendix Table 4: The Effect of Tariffs on School Attendance, Controlling for Other Reforms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tariff	0.362** [0.137]	0.319** [0.139]	0.365*** [0.135]	0.387*** [0.136]	0.408*** [0.148]	0.383*** [0.125]	0.394*** [0.142]
Licensed Industries		-0.092** [.037]					-0.0925** [0.0374]
FDI			0.019 [.042]				-0.0005 [0.0455]
Number of banks per 1000 people				1.645*** [0.394]			1.665*** [0.446]
Exports					-0.0001* [0.0001]		-0.0001* [0.0001]
Number of primary schools per capita						25.031 [18.173]	11.361 [18.428]
IV with traded tariff	yes	yes	yes	yes	yes	yes	yes
Demographic Controls	yes	yes	yes	yes	yes	yes	yes
Household Controls	yes	yes	yes	yes	yes	yes	yes
Post Reform Indicator (Post)	yes	yes	yes	yes	yes	yes	yes
District Indicators	yes	yes	yes	yes	yes	yes	yes
Initial District Conditions*Post	yes	yes	yes	yes	yes	yes	yes
R <sup>2</sup>	0.26	0.26	0.26	0.26	0.26	0.26	0.26
N	95488	95488	95488	95249	95488	95488	95249

Standard errors in brackets are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. See notes to table 3 in main text for further explanations. Differences in sample size in columns 4 and 7 are due to missing data.

Web Appendix Table 5: The Effect of Tariffs on Schooling Infrastructure

	Number of Primary Schools per capita (Census, AIES)	Total Schools per capita (census, AIES)	Number of Primary Schools per capita (AIES)	Total Schools per capita (AIES)	Pupil Teacher Ratio in Primary Schools (AIES)	Pupil Teacher Ratio in Upper Primary schools (AIES)
	(1)	(2)	(3)	(4)	(5)	(6)
Tariff	-0.0005 [0.0012]	-0.0003 [0.0011]	-0.0004 [0.0009]	-0.0001 [0.0010]	30.71 [36.966]	20.661 [24.196]
IV with traded tariff	yes	yes	yes	yes	yes	yes
District Indicators	yes	yes	yes	yes	yes	yes
Post Reform Indicator (Post)	yes	yes	yes	yes	yes	yes
Initial District Conditions*Post	yes	yes	yes	yes	yes	yes
R2	0.93	0.93	0.96	0.95	0.83	0.84
N	798	798	798	798	787	787

Notes: Standard errors in brackets are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. Information on number of primary schools per capita and total schools per 1991 capita in columns 1 and 2 is from 1991 Census (for pre-reform period) and 7th AIES for post reform period. Information in columns 4-6 is from 6th and 7th AIES for the pre- and post- reform round, respectively. See notes to table 3 in the text for description of initial district conditions that are interacted with post reform indicator. Differences in sample sizes reflect missing observations.

Web Appendix Table 6: The Effect of Tariffs on School Attendance: Alternative District Tariffs

Dep. Variable: Attend School	(1)	(2)	(3)	(4)	(5)
Tariff (Employment Based)	0.362** [0.137]		0.365*** [0.134]		0.471* [0.269]
Consumption tariff		-0.076 [0.117]	-0.122 [0.115]		-0.151 [0.147]
Input tariff				-0.322 [1.243]	-0.413 [1.187]
IV for Employment Based Tariff	yes	n.a.	yes	n.a.	yes
IV for Consumption Tariff	n.a.	no	no	n.a.	no
IV for Input Tariff	n.a.	n.a.	n.a.	yes	yes
Demographic Controls	yes	yes	yes	yes	yes
Household Controls	yes	yes	yes	yes	yes
District Indicators	yes	yes	yes	yes	yes
Post Reform Indicator (Post)	yes	yes	yes	yes	yes
Initial District Conditions*Post	yes	yes	yes	yes	yes
R <sup>2</sup>	0.26	0.26	0.26	0.26	0.26
N	95488	95488	95488	95488	95488

Standard errors in brackets are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. See notes to table 3 in main text for further description of control variables.



Web Appendix Table 7: The Effect of Tariffs on Rural District Population

	Log Population			Male Female Ratio		
	0-14	15+	Total	0-14	15+	Total
	(1)	(2)	(3)	(4)	(5)	(6)
Tariff	-0.075 [0.251]	-0.223 [0.144]	-0.164 [0.171]	0.076 [0.070]	-0.136 [0.124]	-0.077 [0.083]
IV with Traded Tariff	yes	yes	yes	yes	yes	yes
District Indicators	yes	yes	yes	yes	yes	yes
Post Reform Indicator (Post)	yes	yes	yes	yes	yes	yes
Initial District Conditions*Post	yes	yes	yes	yes	yes	yes
R2	0.99	1	1	0.96	0.9	0.92
N	798	798	798	798	798	798

Notes: Standard errors in brackets are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. See notes to table 3 in the text for description of initial district conditions that are interacted with post reform indicator. Data: district tabulations of 1991 and 2001 Indian Census.

Web Appendix Table 8: The Effect of Tariffs on Relative District Per Capita Consumption, by Adult Literacy

	PCE Literate/ PCE Illiterate	log (PCE Literate/ PCE Illiterate)	PCE Literate/ PCE Illiterate	log (PCE Literate/ PCE Illiterate)	PCE Primary/ PCE Non- Primary	log (PCE Primary/ PCE No Primary)
	(1)	(2)	(3)	(4)	(5)	(6)
Tariff	-0.032 [0.266]	0.042 [0.199]	-0.678 [0.563]	-0.468 [0.424]	-0.351 [0.343]	-0.244 [0.257]
IV with Traded Tariff	yes	yes	yes	yes	yes	yes
District Indicators	yes	yes	yes	yes	yes	yes
Post Reform Indicator (Post)	yes	yes	yes	yes	yes	yes
Initial District Conditions*Post	yes	yes	yes	yes	yes	yes
Data Source	Schedule 1	Schedule 1	Schedule 10	Schedule 10	Schedule 1	Schedule 1
r2	0.63	0.63	0.58	0.59	0.64	0.65
N	798	798	798	798	797	797

There are two ways to measure per capita expenditures in the NSS data. In columns 1, 2, 5, and 6 we use per capita expenditure measures from the detailed expenditure modules (Schedule 1). There is a substantive questionnaire change between rounds in this module that is a cause for concern if recall biases or purchase frequencies differ with literacy (or primary school completion in columns 5 and 6). As a robustness check, we replicate our approach using the household per capita expenditure reported in the Employment and Unemployment Schedule 10 of the NSS that does not suffer from this problem in columns 3 and 4. Notes: Standard errors in brackets are clustered at state-year level. See notes to table 3 in the text for description of initial district conditions that are interacted with post reform indicator. Differences in sample sizes reflect missing observations.

Web Appendix Table 9: The Effect of Poverty on Activities of Children: Poverty

**Poverty gap**

Dependent variable: Poverty Gap

Tariff -0.195\*\*\*  
[0.069]

**Two Stage Least Squares**

Dependent variable:	school	work	work only	market work	domestic work	idle
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A: All</b>						
Poverty gap	-2.354** [1.001]	0.897 [0.688]	0.952 [0.682]	-0.106 [0.575]	1.003 [0.624]	1.402** [0.648]
<b>Panel B: Boys</b>						
Poverty gap	-1.623* [0.896]	0.865 [0.679]	0.757 [0.686]	0.548 [0.703]	0.318** [0.129]	0.867 [0.692]
<b>Panel C: Girls</b>						
Poverty gap	-3.426* [1.730]	1.028 [1.043]	1.253 [1.064]	-1.018 [0.791]	2.046 [1.437]	2.173** [1.011]

Standard errors in brackets are clustered at state-year level. \*\*\*, \*\*, \* denotes significance at 1, 5, and 10 percent level. The results labeled **poverty gap** use 43rd and 55th round of NSS to compute district - year poverty estimates. The regression shown is estimated at the district-survey round level. Regressions include district fixed effects, a survey round indicator, and the initial district characteristic\*survey round interactions listed in the notes to table 3. This regression includes only districts in states in which poverty lines are available. Results are similar if we include all states, with poverty lines assumed to be equal to neighboring states' poverty lines when missing. **Two stage least squares results** return to the child as the unit of observation. All regressions include all of the controls and match the specification of column 3 of table 3.