

Students Today, Teachers Tomorrow ? Identifying Constraints on the Provision of Education

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Defining the Problem

- MDGs
 - Universal primary education by 2015
 - eliminating gender disparities in primary/secondary education.
- Increasing use of policies that increase the *demand* for education to help meet the MDGs
 - Cash conditional on enrollment (Brazil, Mexico, Bangladesh, Pakistan)
- Theoretical literature highlights the possibility of *supply-side* constraints (Banerjee 05, Ljungqvist 93)
- Empirical literature – teacher quality & compensation (Urquiola & Vegas 05, Hoxby & Leigh 04)
- This paper provides empirical support that supply-side factors (local/affordable teachers) matter

This Paper

- Uses private sector location decisions as a marker of the conditions in the local market for education

Two Results

- (1) Government Schooling Investments facilitate private sector involvement in education
 - Private Schools are *3 times* more likely to arise in villages where the government previously constructed a *secondary school for girls* (GSS)

How? GSS led to private schools either through

- Increased revenues (through increased demand)
- Decreased costs (due to more potential teachers)

- (2) Supply-side factors played a role: Private school teachers wages are 20 percent lower in villages with a GSS

Voices of the entrepreneurs

“The big problem is teachers. In most villages, I can set up a private school, but who will teach? All the men are working and if I pay them what they want, I will never make a profit. I cannot get women from other villages---who will provide the transport for them if it gets dark? How will she be able to work in another village if she is married? The only way we can work is if there are girls who can teach in the village---that is why, I go to every house and ask if there is a high-school educated girl who can teach. I can pay them Rs.800 (\$14) a month and run the school. Otherwise there is no possibility.”

(Interview w/ Private school entrepreneur, November 2003)

A Roadmap

- Why Pakistan: Decompose the previous quote
- The Country Context (Some Facts)
- The Basic Results in unadulterated figures
- Econometrics: Making sure that the basic results work (Identification)
 - Further Econometric Notes
- Channels through which the GSS impact works
- Endnotes:
 - Short vs. Long Term effects ?
 - Are private schools improving the quality of education or do they represent a sectoral shift ?

The country

- Pakistan: A country where educational debates/questions very similar to the US, **except** for religion
 - Which plays a much smaller role
 - The “Failed-State argument” and religious schools
 - Our related research: Madrassas (<1%)

- Main educational debate within the country 
 - Low overall educational attainment
 - Bad quality of government schools
 - Role of private schools
 - School choice

4 Reasons for Why Pakistan

Reason 1: Large Private Sector Informative about constraints to education

- Large and growing private sector (India: 15%, Pakistan, Bangladesh > 30%)
 - A third of enrolled children in private schools –higher at primary level [Evidence](#)
 - Ten-fold increase in last 2 decades [Figure 1](#)
 - Increasingly in rural areas [Evidence](#)

- Government sector
 - Teacher hiring is centralized, wages do not respond to local market conditions, postings are non-transparent

- Private Sector - Pure market phenomenon
 - No public subsidies or grants; For profit; Negligible percentage are NGO run (<2%)
 - Almost no *de facto* regulation
 - Responds to higher revenues (school fees) and lower costs (teachers' wages)
 - Affordable: Low Monthly Fee = days unskilled wage (annually 4 % of GDP/capita US: 14%) due to Lower Costs (Wages one-fifth) in Private Sector - [Evidence](#)

- Private sector responses thus indicative about the constraints to education (in ways that centralized government system performance may not be)

4 Reasons for Why Pakistan

Reason 2: Can separate gender & level (primary vs. secondary) effects

- Education separated by levels and gender in public schools, no gender separation in private

- Allows us to separate out effects of different types of school construction
 - Boy's secondary and primary schools
 - Girl's secondary and primary schools

Reason 3: Isolating local shocks

- Restricted (geographical & occupational) female mobility
 - 70 percent of marriages are village endogamous
 - 87% of women teachers/health workers
 - Implies that local shocks to supply of skilled labor take longer to dissipate

- Eases identification of local supply shocks on local markets

4 Reasons for Why Pakistan

Reason 4: Data Availability

- Data issues: FBS carried out census of private schools in 2000, which is critical for the exercise
 - Low number of secondary schools (<5 percent of villages) : Cannot use household-survey data
 - Candidate instruments (perhaps wider applicability) based on restrictions within admin areas on where schools can/cannot be located

- Matching FBS census to village-level census data allows us to examine these questions
 - Not aware of comparable data in other countries

Motivating Facts

- The 80s:
 - Private Schools denationalized
 - Wave of (girls) school construction in the 80s – [Figure](#)

- Private Schools and (pre-existing) public schools
 - Girls Secondary Schools (GSS) matter the most
 - [Figure II](#)

- Private Schools & Educated Adults
 - Women matter more
 - [Figure III](#)

- Private Schools:
 - Teachers mostly women (76% vs 44% in public), local (2/3rd live w/in 15 mins walk)
 - Women teachers - 50% lower wages (25-30% conditional on education, experience etc.)

Hypotheses

- Main:
 - ***Girls Secondary School (GSS) construction in village (eventually) leads to Private School Creation***
 - Problem: Omitted Variables
 - GSS placement endogenous (village selection)

- **Channels?** Supply vs Demand - Women as Teachers:
 - GSS Creates Teachers
 - GSS → ↑ Supply of local educated Women → lower costs (women teachers) of private schools (female labor market locally restricted)
 - Plausible?
 - Punjab 1981: 60% villages 3 or less female high school graduates, 34% none
 - Punjab 2001: Start with a 1000 women
 - 45 have secondary education
 - 8 in non-agricultural work (7 teachers/health-workers)
 - Alderman experiment
 - Problem: GSS may also affect Demand
 - +ve: Educated mothers/women
 - -ve: Less residual demand (if GSS has primary classes)

What we do

- Argue +ve association between Girl's high schools and private schools is **causal**:
 - Instrument using GSS placement rules
 - Identification checks

- Present further evidence to argue data is **consistent** with a “women as teachers” supply side channel: Some portion of the effect is due to supply-side improvements
 - Quantity:
 - GSS matters most (not GPS, BPS, BHS)
 - GSS affects supply of potential teachers (high-educated women)
 - Educated women matter more than men for Private Schools

 - Price:
 - A “net” test: Is the “wage-bill” of private schools lower in villages with a girl's secondary school?
 - Why a net test?

BUT

- cannot structurally separate demand from supply channels

The Data

- Where are the private schools?
 - Census of Private Schools (FBS): PEIP
- Where are the public schools?
 - EMIS for Punjab, largest province with 54% of the population
- Contemporaneous & Past Village Characteristics
 - 2001 Population Census
 - 1981 Population Census
- Match all 4 sources
 - PEIP to 1998 Census is easy (both collected by FBS)
 - EMIS to Census: 8 months through phonetic matching - 85% success
 - 1981 Census to 2001 Census: 6 months - 94% success
 - Final: 85% of villages, covering 84% of Punjab rural population
- Final Sample:
 - Exclude (a) villages w/ pre-81 girls schools and (b) PCs with pre-81 GSS - 40% sample
 - Why?
 - Baseline (81) data used to control (selection) & construct Instrument (81 pop rank)
 - Pre-existing neighbour (in PC) GSSs may have LT spill-over effects – confound interpretation
 - However: Results similar though attenuated in Full sample (Appendix Table IV)

Methodology

- Simple frame-work:

- Myopic entrepreneur/zero-fixed costs
- Private School exists in Village i IFF $NetReturn_i \geq 0$

$$NetReturn_i = Fee_i * N_i - Wage_i * T_i$$

- Empirically

$$NetReturn_i = \alpha + (\beta_1 + \gamma_1)GSS_i + \beta' X_i^D + \gamma' X_i^S$$

- Treat Net-return as Latent variable

Identification of GSS Impact

■ Outcome Equation:

$$Private_{it} = \alpha + (\beta_1 + \gamma_1)GSS_{it} + \beta'X_{it} + \sum_r \gamma'_r J_{irt} + (v_i + \varepsilon_{it}) \quad (3)$$

- $Private_{it} = 1$ if village has private school
- $GSS_{it} = 1$ if village received GSS between 1981 and 2001
- $J_{irt} = 1$ depending on other schooling options
- X_{it} : Observable Village level characteristics

■ Selection Equation

$$GSS_{it} = \alpha_1 + \varphi X_{it} + (\lambda_i + \mu_{it})$$

Identification of GSS impact (II)

- OLS (& Propensity Score)
 - Issue? Biased if $cov(\nu_i, \lambda_i) \neq 0$.
 - Village-specific omitted variables (although few observed baseline differences between GSS & non-GSS villages)

- First-Difference Specification

- Takes care of time-invariant omitted variables

$$\Delta_t PriSchool_i = \alpha + (\beta_1 + \gamma_1)\Delta_t GSS_i + \beta' \Delta_t X_i^D + \sum_r \gamma'_r \Delta_t J_{irt} + (\varepsilon_{it+1} - \varepsilon_t)$$

- Biased if $cov(\varepsilon_{it}, \mu_{it}) \neq 0$.

- Time-varying omitted variables (e.g. new roads)

- So: Use IV strategy based on GSS placement guidelines

Instrumental Variables

- Instrument: Placement Rule for GHS according to Government guidelines
 - Size – Preference for larger populations
 - Radius - Cannot have other school within 10 km
- Issue: don't have village GPS (distances between) etc.
- Instead use admin structures in Pakistan - PCs
 - Province (Punjab)
 - Districts
 - Tehsils
 - Qanoon-Go Halqa
 - * Patwar Circles
- Patwar Circles: Smallest Admin units, typically 3-4 villages
- Back of envelope: Average PC area roughly satisfies radius requirement

Non-Linearity in Placement Rules (II)

- Our Eligibility Rule (instrument?):
 - 1 if village has largest (population) in PC
 - 0 o/w
 - Don't use radius directly - endogenous placement of GSS in neighbor
- Problem?
 - Probability of Private Schools increases in population
 - Probability of GSS increases in population
- Idea:
 - Use Rule as instrument while conditioning on polynomials in village population and max PC population (Campbell 69, Angrist & Lavy 99)
 - Solution: Identify of Non-linearities/Non-monotonicities
 - Non-Linearity in placement rules of GSS allow simultaneous controls for population
 - Non-Linearity justified through explicit policy
- Further concerns:
 - Direct effects of village PC top-rank – Identify of top-rank interactions
 - Binary Outcome & Instrument:
 - Differences across Linear IV and Bivariate probits due to low treatment probabilities – prefer Biprobit

Results

- OLS and First-Differences
- IV:
 - Understanding the IV Results
 - IV Results
 - Further Identification Test
- Channels:
 - Quantity
 - Price

Results - OLS and First Difference

Table II - Private School Existence and Previous Girls High Schools

	(1)	(2)	(3)	(4)	(5)
	Probit	Probit - All controls	OLS (PC Location Dummies)	First difference	First difference & PC Dummies
Treatment- Received GSS	0.097 (0.0223)	0.0646 (0.0207)	0.0928 (0.0247)	0.1494 (0.0250)	0.1739 (0.0241)
1998 Population (000s)	0.051 (0.0032)	0.0391 (0.0075)	0.0905 (0.0176)		
1998 Population (000s) Sq	-0.0014 (0.0002)	-0.0011 (0.0003)	-0.0046 (0.0014)		
1981 Population (000s)		0.0275 (0.0133)	0.0134 (0.0281)		
1981 Population (000s) Sq		-0.0013 (0.0012)	0.0029 (0.0041)		
% Perm Houses		1.2862 (0.0821)	0.9383 (0.1804)		
1998-1981 Population (000s)				0.0795 (0.0070)	0.1162 (0.0079)
Years Exposure - GPS		0.001 (0.0005)	-0.0001 (0.0007)		
Years Exposure - BPS		0.0001 (0.0002)	0.0004 (0.0003)		
Years Exposure - BSS		0.0011 (0.0002)	0.002 (0.0003)		
With Patwar-Circle Dummies	NO	NO	YES		
With PC cluster-specific time trends				NO	YES
Observations	6968	6761	6761	6968	6968
Pseudo R-sq	0.1	0.18			
Adj R-sq			0.34	0.07	0.3



IV – source of Identification

Figure IV - Private School Existence/ Rule-Based Instrument and 1981 Population

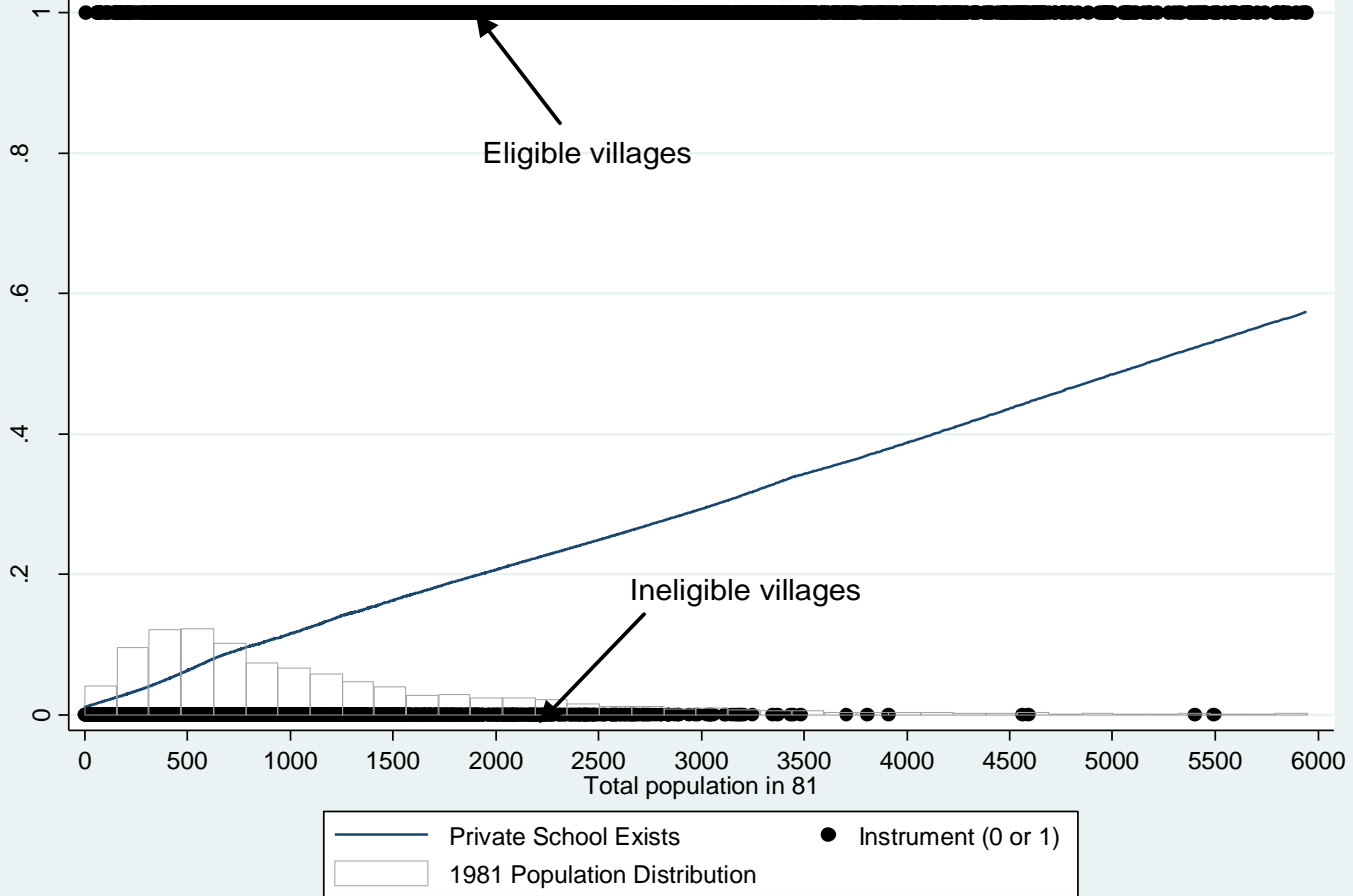
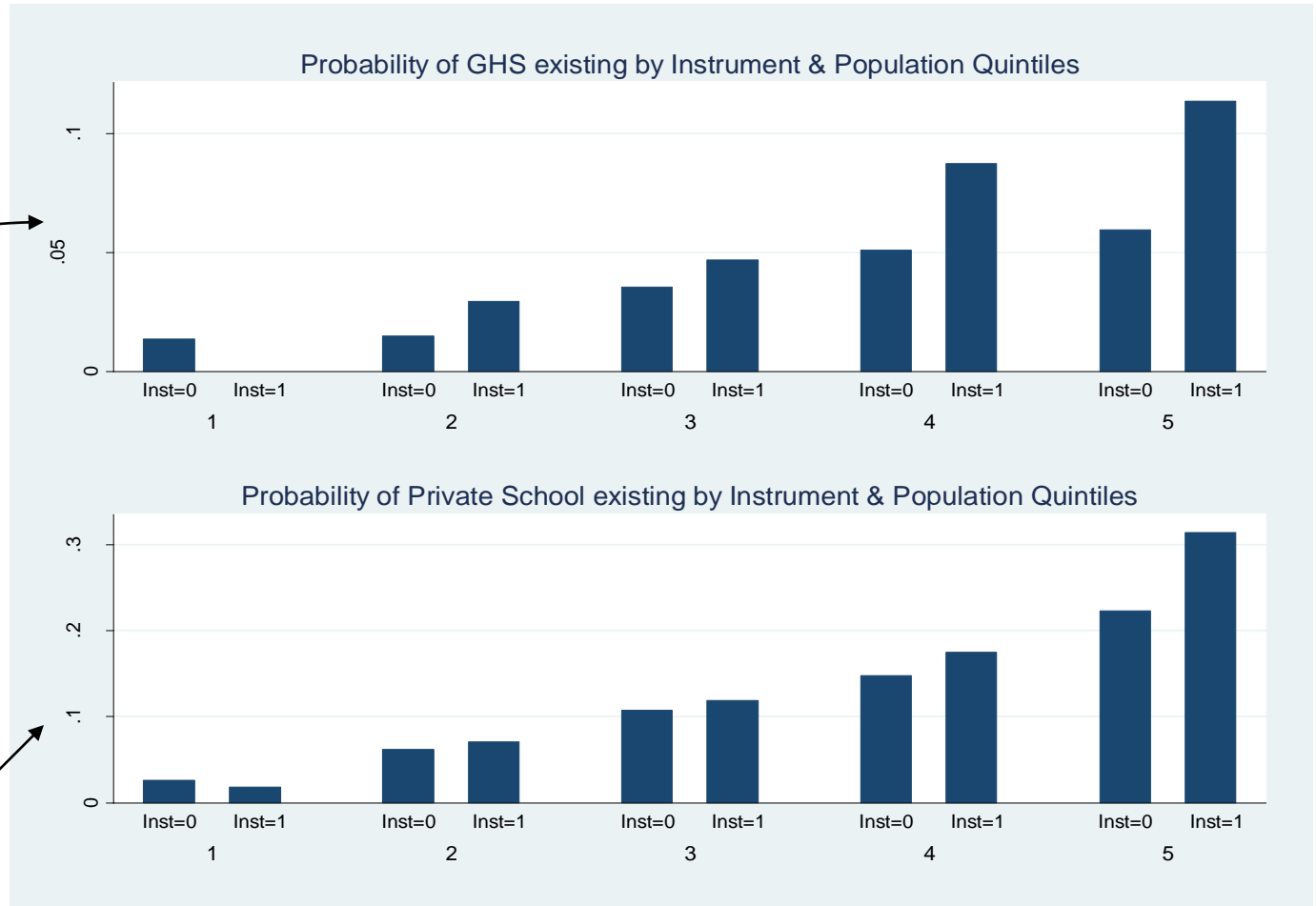


Figure V: Illustrating the IV



$$\beta_{IV} = \text{Cov}(Y, Z | \text{Pop}) / \text{Cov}(\text{GSS}, Z)$$



IV results

Table III - Private School Existence - Instrumental Variables

	(1)	(2)	(3)	(4)	(5)	(6)
			First-Stage (QH Location Dummies)	Linear 2nd- Stage	Linear 2nd- Stage- QH Location Dummies	BiProbit (xx vars are also included but Coeffs and SEs not reported)
	First- Stage Probit	First-Stage Probit				
Girls Secondary School Rule	0.0595 (0.0065)	0.0216 (0.0076)	0.0241 (0.0076)			
Treatment- Received GSS				1.1785 -0.5907	1.0477 -0.5734	0.367 (0.1385)
1981 Population (000s)		0.029 (0.0058)	0.0362 (0.0065)	0.0125 (0.0305)	0.006 (0.0311)	xx
1981 Population (000s) Sq		-0.0024 (0.0006)	-0.0018 (0.0008)	-0.001 (0.0016)	-0.0003 (0.0017)	xx
1981 Max Population (000s) in PC		-0.0033 (0.0050)	0.0058 (0.0063)	-0.0011 (0.0094)	-0.0066 (0.0103)	xx
1981 Max Population (000s) sq in PC		0.0006 (0.0005)	0.0002 (0.0008)	-0.0003 (0.0014)	-0.0005 (0.0013)	xx
1998 Population (000s)				0.0379 (0.0116)	0.052 (0.0111)	xx
1998 Population (000s) Sq				0.0002 (0.0006)	-0.0006 (0.0006)	xx
% Perm Houses				1.2757 (0.1169)	0.7417 (0.1671)	xx
Observations	6968	6968	6968	6874	6874	6874
Chi-sq/F-Test (GSS Rule = 0)	109.49	9.53	10.02			
Pseudo R-sq	0.04	0.07				
Number of QGH 1998			656		656	
Prob > chi2	0	0			0	0
Prob > F			0	0		
Adj R-sq			0.07			



IV Concerns

- Direct Effects of being top-ranked village in PC?
 - Private entrepreneur (also) prefers top-rank
 - Other public goods delivered to top-ranked

Unlikely:

- PC land-revenue collection boundary (Mughal/British period) – Political boundary is UC
- Little difference in observables (baseline & other public good outcomes) between top-ranked and others – [Table IV](#)
- Identification Test 1: [Table V](#)
 - GSS only placed in 5% of all villages
 - Divide PCs into:
 - Program PCs – at least one village got a GSS
 - Non-Program PCs – no village got a GSS
 - “Falsification” exercise:
 - Does top-rank matter in non-program PCs
 - Issue? “Special” (top-rank) village in a “special” PC?
 - No observed diff between Program and Non-program PCs – robust to propensity of selection controls
- Identification Test 2: [Table V](#)
 - Use variation in PC land area – top-rank matters (more) in smaller PCs
 - Identify of Top-rank*Area while controlling for top-rank and area etc.



TABLE IV
DIFFERENCES IN MEANS

	Instrument=1	Instrument=0	Difference
Number of Villages	2227	4738	
1981 Female Literacy Rate	0.013 (0.002)	0.015 (0.002)	-0.002 (0.003)
1981 - % adult women with Middle and above Education	0.011 (0.002)	0.013 (0.002)	-0.001 (0.003)
1981 % girls age 0-4	0.159 (0.008)	0.153 (0.005)	0.006 (0.009)
1981 % girls age 5-14	0.287 (0.010)	0.284 (0.007)	0.003 (0.012)
1981 adult Male Literacy Rate	0.161 (0.008)	0.167 (0.005)	-0.006 (0.009)
1981 - % adult men with Middle and above Education	0.110 (0.007)	0.121 (0.005)	-0.011 (0.008)
1981 % boys age 0-4	0.145 (0.007)	0.142 (0.005)	0.004 (0.009)
1981 % boys age 5-14	0.296 (0.010)	0.292 (0.007)	0.004 (0.012)
1981 Female/Male Ratio	0.904 (0.006)	0.907 (0.004)	-0.002 (0.008)
1981 Population	2160.87 (37.01)	764.07 (8.26)	1396.80 ^{***} (15.24)
1998 % with water	0.011 (0.002)	0.010 (0.001)	0.001 (0.003)
1998 % with electricity	0.072 (0.005)	0.074 (0.004)	-0.002 (0.007)
1998 % with Perm Houses	0.060 (0.005)	0.065 (0.004)	-0.006 (0.006)



Identification Tests

Table V - Private School Existence - Instrumental Variable Robustness; Interacted Instruments

Girls Secondary School Eligibility Rule

Girls Secondary School Eligibility
Rule*Program-PC

Treatment- Received GSS

GSS Rule*Inverse Distance (sqrt PC Area)

Inverse Distance (sqrt PC Area)

1981 Population (000s)

1981 Population (000s) Sq

1981 Max Population (000s) in PC

1981 Max Population (000s) sq in PC

1998 Population (000s)

1998 Population (000s) Sq

% Perm Houses

Predicted PC Propensity

Predicted PC Propensity Sq

Observations

Results - Channels

- Women as Teachers Channel – consistent evidence:
 - Quantity: [Table VI](#)
 - GSS matters most (not GPS, BPS, BHS)
 - GSS affects supply of potential teachers (high-educated women)
 - Educated women matter more than men for Private Schools
 - For demand channel would therefore need:
 - Women matter not men; secondary educated matter not primary
 - Price: [Table VII](#)
 - GHS lowers educated female wages in village (Restricted Labor market)
 - Issue: Sample Selection
 - wage data only where have private school
 - High & low wage truncation – bias either way
 - Heckman and Control function approaches

Conclusion

- Supply constraints (upward sloping local supply) important in Education
 - Developing countries but even in Developed (US?)

- Should we view this as a increase in the quality of education or a sectoral shift? (former) [Private Schools and Enrollments](#)
 - Higher Enrollments (esp girls) in Villages with Private Schools
 - Significant use of the private sector by the poor
 - % Private (Poor, Has Private) = % Private (Rich, No Private) Higher Enrollments:
Better Quality: [Private Schools and Test-Scores](#)

- Dynamics – different (stronger demand) long-term effects
 - Wage quadratic in years of exposure to GSS ([Full sample results](#))

- Big-Push Theories (Rodenstein-Rodan 54, MSV 94):
 - Focus on Primary only? NO - Secondary School Investments important – “virtuous cycle”

- Glimpse into Education History
 - US decline in high-quality teachers – increasing employment/wages for skilled women in other fields
 - This implicit subsidy alive & kicking in Pakistan (LDCs?)

Channels (1)



Table VI - Private School Existence - The Female Teacher Channel?

	PANEL A							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Private School Existence				Dependent Variable: Percentage of Adult Women with Middle and Above Education			
	Probit	OLS - Controls & PC Location Dummies	First Difference	First difference & PC Dummies	OLS	OLS- Controls & PC Location Dummies	First Difference	First difference & PC Dummies
Years Exposure - GSS	0.0044 (0.0010)	0.0059 (0.0016)						
Years Exposure - GPS	0.0016 (0.0006)	-0.0002 (0.0007)						
Years Exposure - BSS	0.0013 (0.0002)	0.002 (0.0003)						
Years Exposure - BPS	0.0002 (0.0002)	0.0004 (0.0003)						
Treatment- Received GSS					0.0221 (0.0037)	0.015 (0.0042)	0.015 (0.0031)	0.0183 (0.0039)
1998-1981 Population (000s)			0.0798 (0.0071)	0.116 (0.0081)			-0.0014 (0.0012)	0.0039 (0.0013)
Change in Exposure - GSS			0.1515 (0.0255)	0.16 (0.0250)				
Change in Exposure - GPS			0.0103 (0.0081)	-0.008 (0.0107)				
Change in Exposure - BSS			-0.0645 (0.0438)	-0.0314 (0.0693)				
Change in Exposure - BPS			-0.0144 (0.0088)	-0.0126 (0.0114)				
Location Dummies	NO	YES	NO		NO	YES	NO	
Cluster-Specific Time-Trends	NO	NO	NO	YES	NO	NO	NO	YES
Observations	6854	6761	6854	6854	6967	6767	6964	6964
Pseudo R-sq	0.12							
Adj R-sq		0.34	0.07	0.3	0.01	0.5	0.003	0.38

Channels (2)



	PANEL B			
	(9)	(10)	(11)	(12)
Dependent Variable: Private School Existence				
	Probit	Controls & PC FEs	First Difference	First diferece & PC Dummies
% middle & above adult females	0.4149 (0.0819)	0.52 (0.1217)		
% middle & above adult males	0.3506 (0.0469)	0.0783 (0.0738)		
Change in % Females middle+			1.0146 (0.1029)	0.5801 (0.1153)
Change in % Males middle+			0.0498 (0.0531)	-0.0118 (0.0716)
1998-1981 Population (000s)			0.0839 (0.0076)	0.1186 (0.0080)
Observations	6967	6873	6964	6964
Pseudo R-sq	0.17			
Adj R-sq		0.34	0.09	0.3

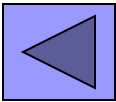
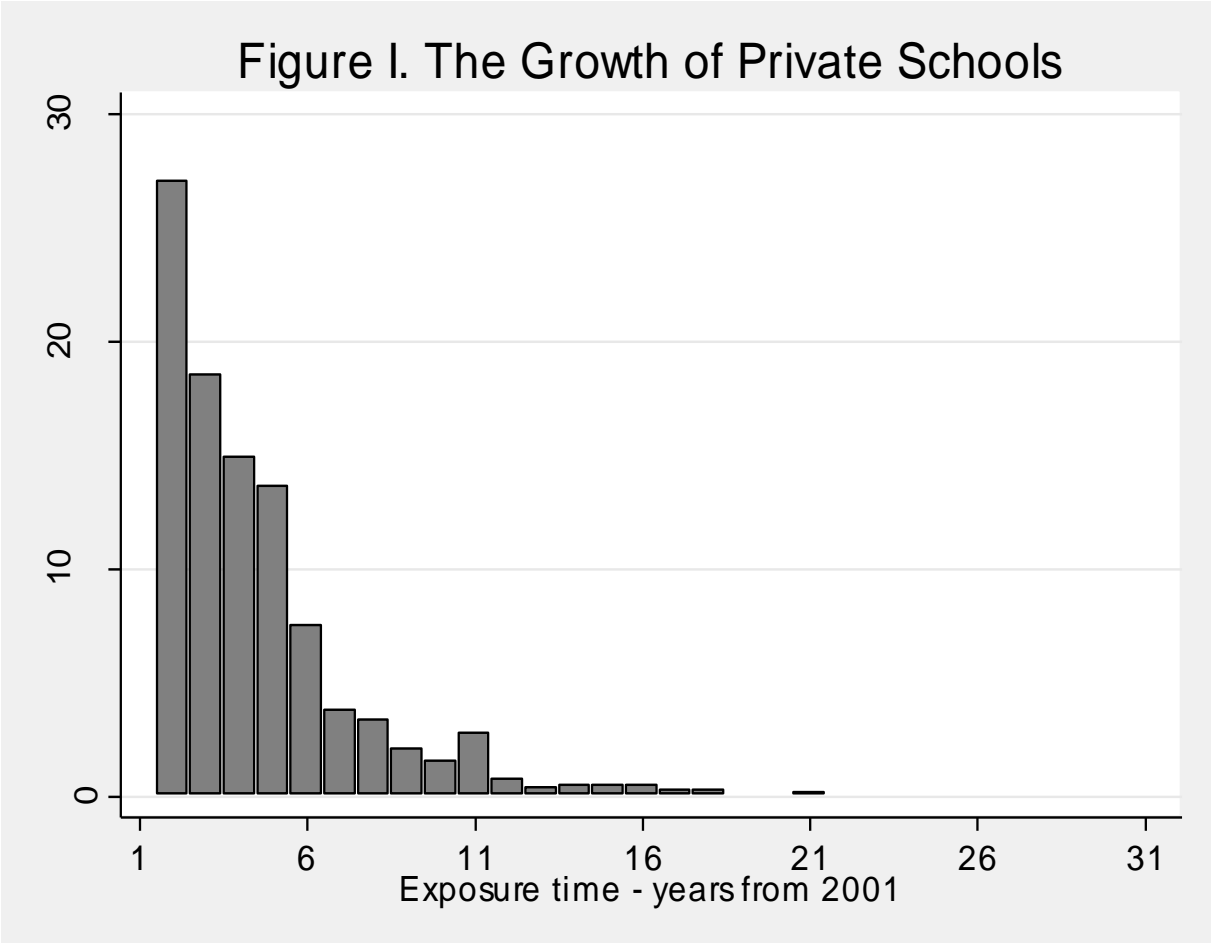
Channels (3)



Table VII - Supply Side Impact - Teaching Costs

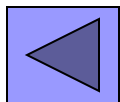
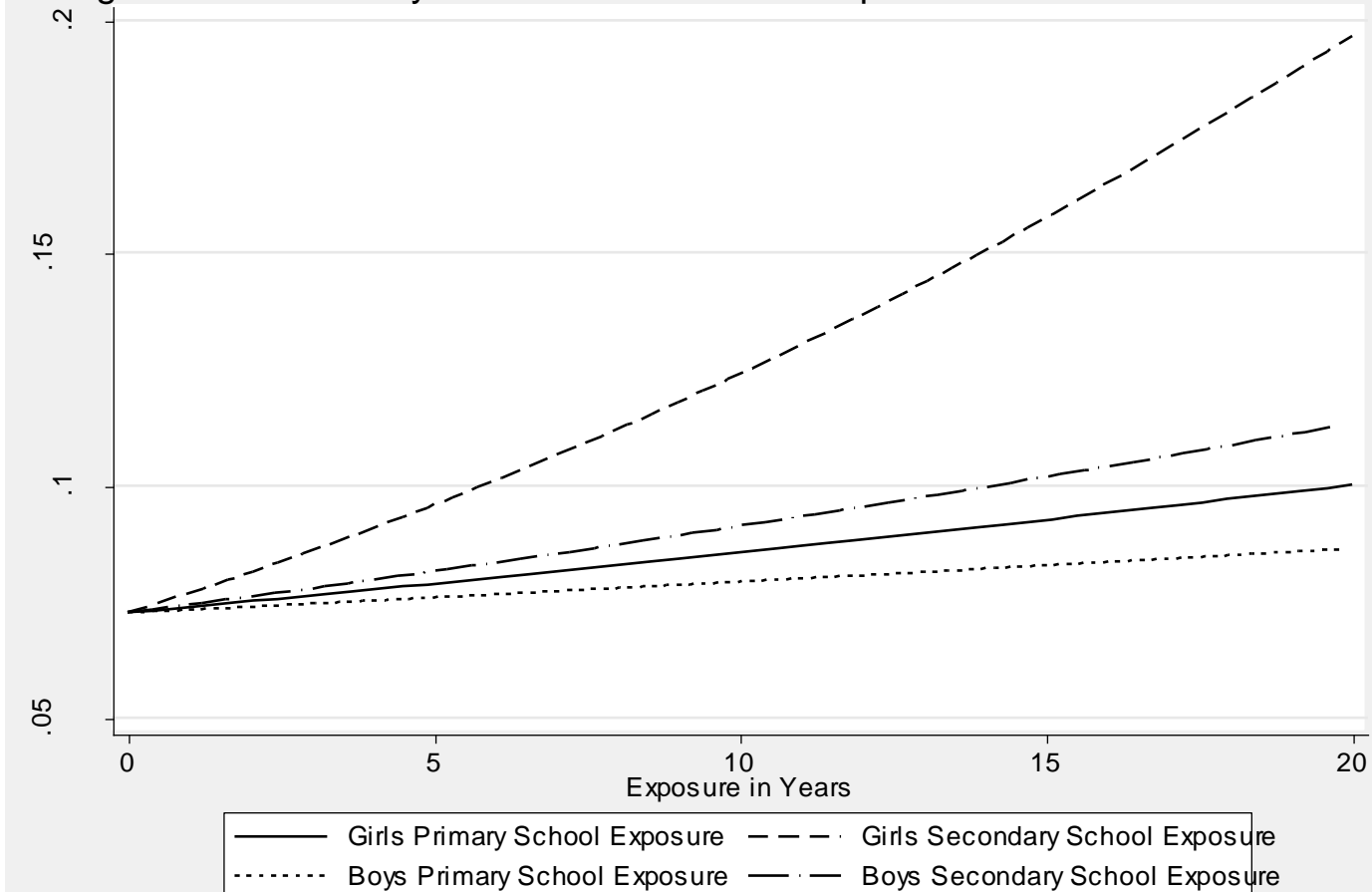
	(1)	(2)	(3)	(4)	(5)
	OLS - Controls & QH Dummies	Heckman- Controls & QH Dummies	Heckman - Controls & QH Dummies, BPS	Control Function Controls & QH Dummies	Control Function Controls & QH Dummies, BPS
Treatment- Received GSS	-0.1977 (0.1078)	-0.2016 (0.0790)	-0.2041 (0.0794)	-0.2031 (0.1079)	-0.2095 (0.1083)
Years Exposure - BSS	0.0006 (0.0010)	0.0004 (0.0008)	0.0004 (0.0008)	0.0002 (0.0011)	0.0002 (0.0011)
1998 Population (000s)	0.0329 (0.0233)	0.0002 (0.0322)	0.0113 (0.0310)	-0.0173 (0.0452)	-0.0055 (0.0434)
1998 Population (000s) Sq	-0.0004 (0.0010)	0.0004 (0.0011)	0.0001 (0.0010)	0.001 (0.0015)	0.0007 (0.0014)
Observations	877	6967	6967	877	877
Pseudo R-sq					
Prob > chi2		0	0		
Adj R-sq	0.15			0.15	0.15

Private School Growth



Private & Public Schools

Figure II. Probability of Private School w/ Exposure to Government Schools



Private Schools and Adult Education

Figure III. Probability Private School w/ Adult Middle & Above Educ

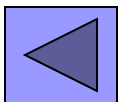
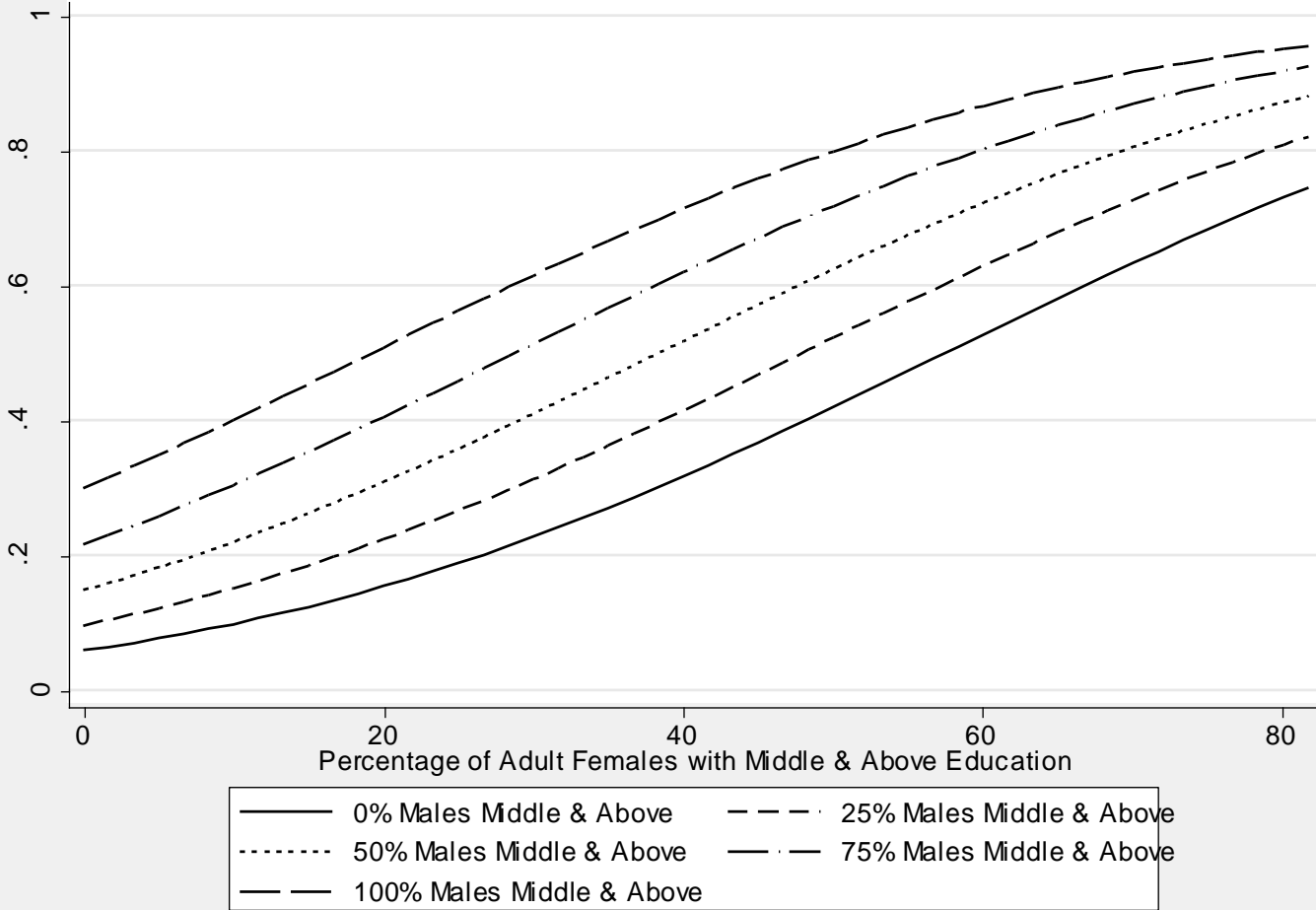


TABLE I
SUMMARY STATISTICS

variable	mean	median	sd	N
GSS Exists?	0.05	0	0.21	6968
GPS Exists?	0.54	1	0.50	6968
BSS Exists?	0.11	0	0.31	6968
BPS Exists?	0.89	1	0.31	6968
Private School Exists?	0.13	0	0.34	6968
Number of Private Schools	0.22	0	0.81	6968
1998 % Enrolled in Private Schools	0.10	0	0.21	902
Years Exposure - GSS (conditional on existence)	14.54	15	4.56	328
Years Exposure - GPS (conditional on existence)	13.38	13	3.83	3739
Years Exposure - BSS (conditional on existence)	57.32	50	28.66	770
Years Exposure - BPS (conditional on existence)	32.54	30	17.81	5644
Years Exposure - Private (conditional on existence)	4.66	4	3.48	907
1981 Population	1210.50	828	1272.31	6968
1998 Population	1829.09	1203	2023.31	6968
1981 Number of Women w/ Middle and Above Education	4.25	1	17.60	6968
1998 Number of Women w/ Middle and Above Education	27.18	11	66.53	6968
1981 Number of Women w/ Matric and Above Education	1.84	0	8.29	6968
1998 Number of Women w/ Matric and Above Education	13.07	5	39.36	6968
1981 Percentage of Adult Women with Middle and Above Education	0.012	0.004	0.026	6965
1998 Percentage of Adult Women with Middle and Above Education	0.056	0.031	0.067	6967
1998 % HHs w/ Permanent Housing	0.06	0	0.05	6968
Village Land Area	1647.79	1146	2340.71	6874
Number of Villages in Patwar Circle	4.38	4	2.12	6968

APPENDIX TABLE I
PRIVATE SCHOOLS IN PUNJAB

PANEL A			
	Private Schools	Public Schools	Difference
Differences in Wages			
Men	1758.28 (-1284.52)	6394.18 (-2678.37)	4635.89 (-122.46)
Women	1067.270 (761.540)	5888.480 (2066.280)	4821.21 (55.58)
All	1231.000 (959.140)	6178.000 (2447.010)	4946 -55.71
PANEL B			
	Villages With private schools (Punjab)	Villages Without Private Schools (Punjab)	Difference
Percentage Enrolled	61	46	15
Percentage Females Enrolled	56	35	21
Percentage Males Enrolled	67	55	12
Private Enrollment Share	23	11	12
Public Enrollment Share	76	88	-12
Private Enrollment Share (Poor Only)	17	6	11
Private Enrollment Share (Middle Only)	18	11	7
Private Enrollment Share (Rich Only)	34	18	16
PANEL C			
	Private Schools	Public Schools	Difference
Differences in Test Scores			
English Scores (Raw Percentage Correct)	41.800 (15.500)	24.400 (15.080)	17.400 (0.400)
English Scores (Item Response Scaled Scores)	0.640 (0.630)	-0.260 (0.910)	0.900 (0.020)
Mathematics Scores (Raw Percentage Correct)	43.430 (16.610)	34.560 (18.520)	8.870 (0.470)
Mathematics Scores (Item Response Scaled Score)	0.360 (0.660)	-0.030 (0.820)	0.390 (0.020)



Appendix Table III - Impact of Private Schools on Overall Village Enrollment (%)

	(1)	(2)	(3)
	OLS	OLS - All controls	PC FEs - All controls
Private School Exists	0.1155 (0.0065)	0.0977 (0.0069)	0.1271 (0.0105)
1998 Population (000s)	-0.0563 (0.0039)	-0.0605 (0.0084)	-0.1019 (0.0108)
1998 Population (000s) Sq	0.0024 (0.0004)	0.0027 (0.0007)	0.0064 (0.0009)
1981 Population (000s)		-0.0194 (0.0081)	-0.0482 (0.0172)
1981 Population (000s) Sq		0.0006 (0.0006)	0.0086 (0.0025)
% Perm Houses		-0.0294 (0.0721)	0.2719 (0.1109)
Years Exposure - GSS		0.0047 (0.0008)	0.0059 (0.0010)
Years Exposure - GPS		0.0026 (0.0003)	0.0037 (0.0004)
Years Exposure - BPS		0.0015 (0.0001)	0.002 (0.0002)
Years Exposure - BSS		0.0024 (0.0002)	0.003 (0.0002)
Observations	6968	6761	6761
R-squared	0.1184	0.1886	
Adj R-sq			0.31



Baseline Differences

APPENDIX TABLE II

BASELINE DIFFERENCES IN MEANS

	Treated	Not Treated	Difference
Number of Villages	328	6640	
1981 Female Literacy Rate	0.017 (0.007)	0.015 (0.001)	0.002 (0.007)
1981 - % adult women with Middle and above Education	0.016 (0.007)	0.012 (0.001)	0.004 (0.007)
1981 % girls age 0-4	0.154 (0.020)	0.155 (0.004)	-0.001 (0.020)
1981 % girls age 5-14	0.289 (0.025)	0.285 (0.006)	0.004 (0.026)
1981 adult Male Literacy Rate	0.184 (0.021)	0.164 (0.005)	0.020 (0.022)
1981 - % adult men with Middle and above Education	0.135 (0.019)	0.116 (0.004)	0.019 (0.019)
1981 % boys age 0-4	0.143 (0.019)	0.143 (0.004)	0.001 (0.020)
1981 % boys age 5-14	0.295 (0.025)	0.293 (0.006)	0.002 (0.026)
1981 Female/Male Ratio	0.911 (0.016)	0.906 (0.004)	0.005 (0.016)
1981 Population	2069.69 (94.17)	1168.05 (15.12)	901.63 ^{***} (71.16)

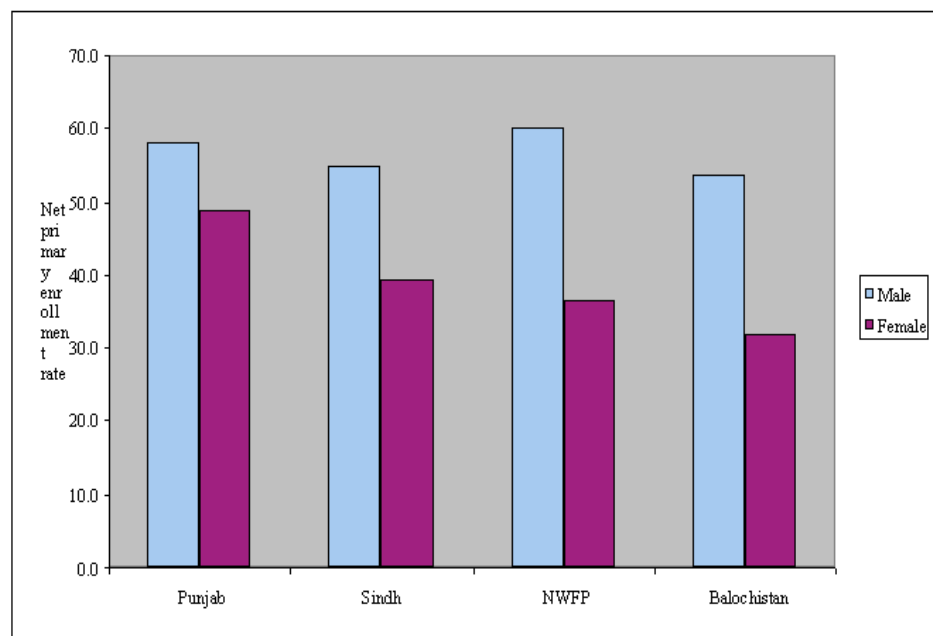


Appendix Table IV - Full Sample Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Private School Existence				Channels				
	OLS (PC Location Dummies)	Linear 2nd-Stage-QH Location Dummies	BiProbit Using BiProbit (xx vars are also included but Coeffs and SEs not reported)	Distance*Population Rank as Instrument (xx vars are also included but Coeffs and SEs not reported)	LHS: Private School Existence	LHS: % middle & above adult females	LHS: Private School Existence	LHS: Wage	
					OLS - Controls & PC Location Dummies	OLS- Controls & PC Location Dummies	Controls & PC FEs		
Treatment- Received GSS	0.1108 (0.0105)	0.7369 (0.1549)	0.2315 (0.0392)	0.1375 (0.0701)		0.0329 (0.0015)		-0.0473 (0.0238)	
Years Exposure - GSS					0.003 (0.0003)				-0.0035 (0.0013)
Years Exposure Squared- GSS									0.0001 (0.0000)
% middle & above adult females							0.5888 (0.0550)		
% middle & above adult males							0.0895 (0.0354)		
Girls Secondary School Eligibility Rule				xx					
Inverse Distance (sqrt PC Area)				xx					
GSS Rule*Inverse Distance (sqrt PC Area)									
Years Exposure - GPS	0.001 (0.0003)				0.001 (0.0003)				
Years Exposure - BPS	0.0008 (0.0002)				0.0007 (0.0002)				
Years Exposure - BSS	0.0018 (0.0001)				0.0016 (0.0001)			0.0009 (0.0003)	0.0008 (0.0003)
1981 Population (000s)	0.0691 (0.0095)	0.0251 (0.0170)	xx	xx	0.0691 (0.0095)	0.0041 (0.0015)	0.0681 (0.0071)		
1981 Population (000s) Sq	-0.0066 (0.0011)	-0.0038 (0.0011)	xx	xx	-0.0069 (0.0011)	-0.0002 (0.0002)	-0.0045 (0.0008)		
1981 Max Population (000s) in PC		-0.0135 (0.0069)	xx	xx					
1981 Max Population (000s) sq in PC		0.0017 (0.0008)	xx	xx					
1998 Population (000s)	0.0966 (0.0054)	0.0463 (0.0062)	xx	xx	0.0967 (0.0054)	0.0007 (0.0008)	0.0941 (0.0039)	0.0133 (0.0042)	0.0136 (0.0042)
1998 Population (000s) Sq	-0.0024 (0.0002)	-0.0005 (0.0001)	xx	xx	-0.0024 (0.0002)	0 (0.0000)	-0.0022 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)
% Perm Houses	0.5118 (0.1150)	0.3837 (0.1282)	xx	xx	0.5313 (0.1151)	0.2775 (0.0190)	0.3487 (0.0878)		
Observations	18052	18911	18911	18412	18000	18615	23698	4683	4661
Adj R-sq	0.38				0.38	0.61	0.37		
R-squared								0.0154	0.0168
Prob > F								9.15	8.82
Number of QGH 1998		725							

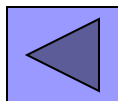
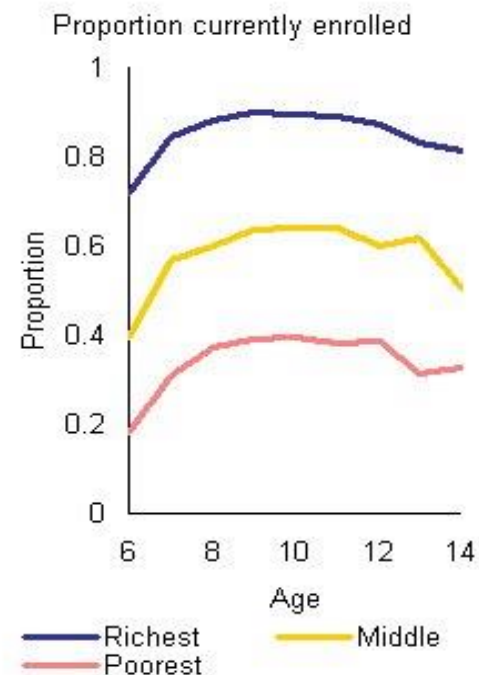
Educational Attainment Levels

Figure 5 : Gender Inequality in Education



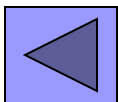
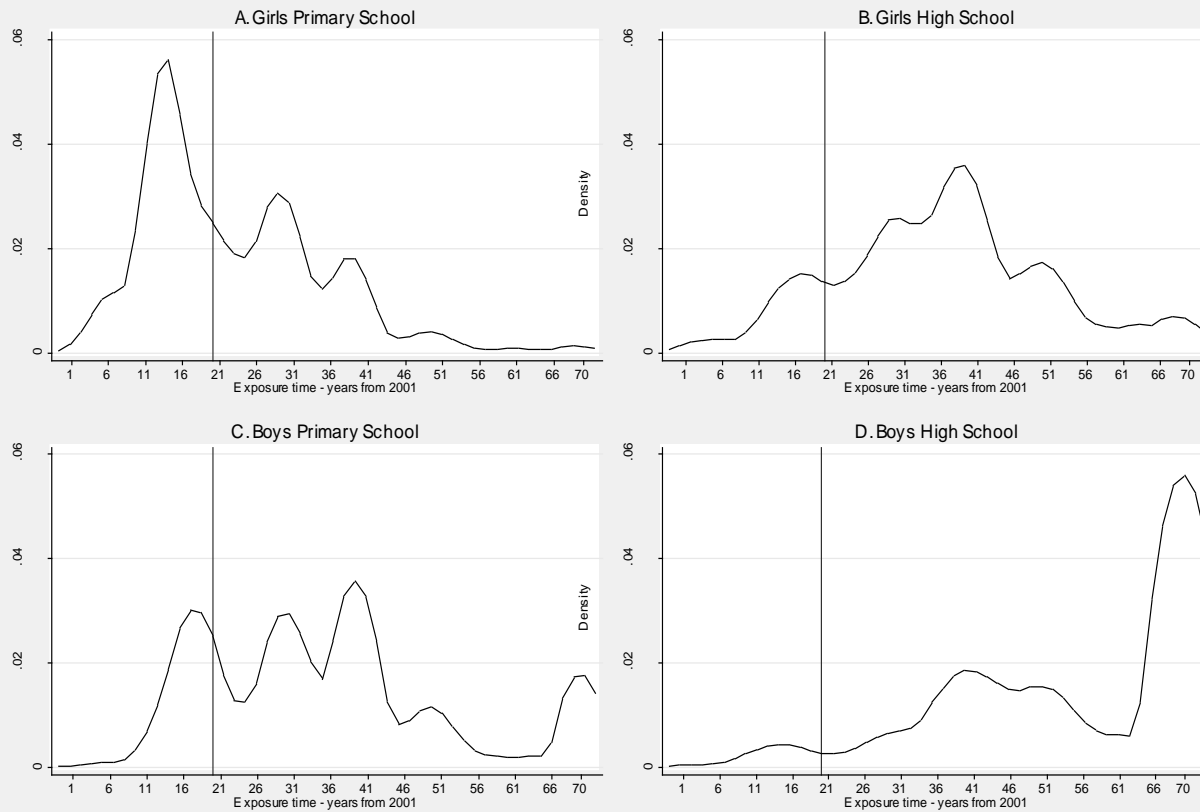
Source : PIHS 1998-99 .

Pakistan 1990-91

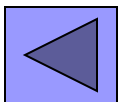
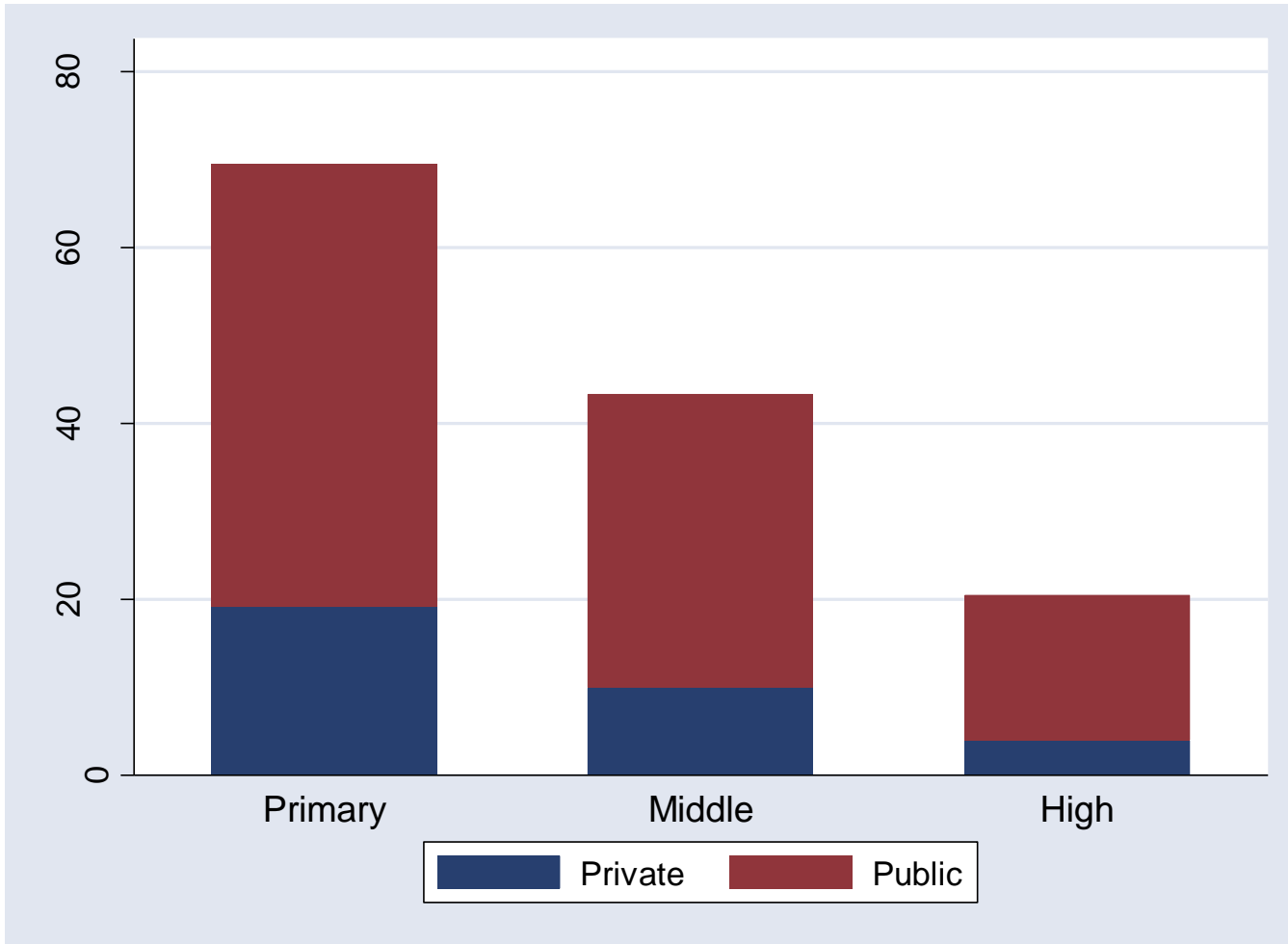


Public School Construction

Figure I. Government School Exposure conditional on receiving school



School Enrollment

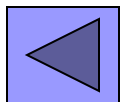


Private School Enrollment: The 90s

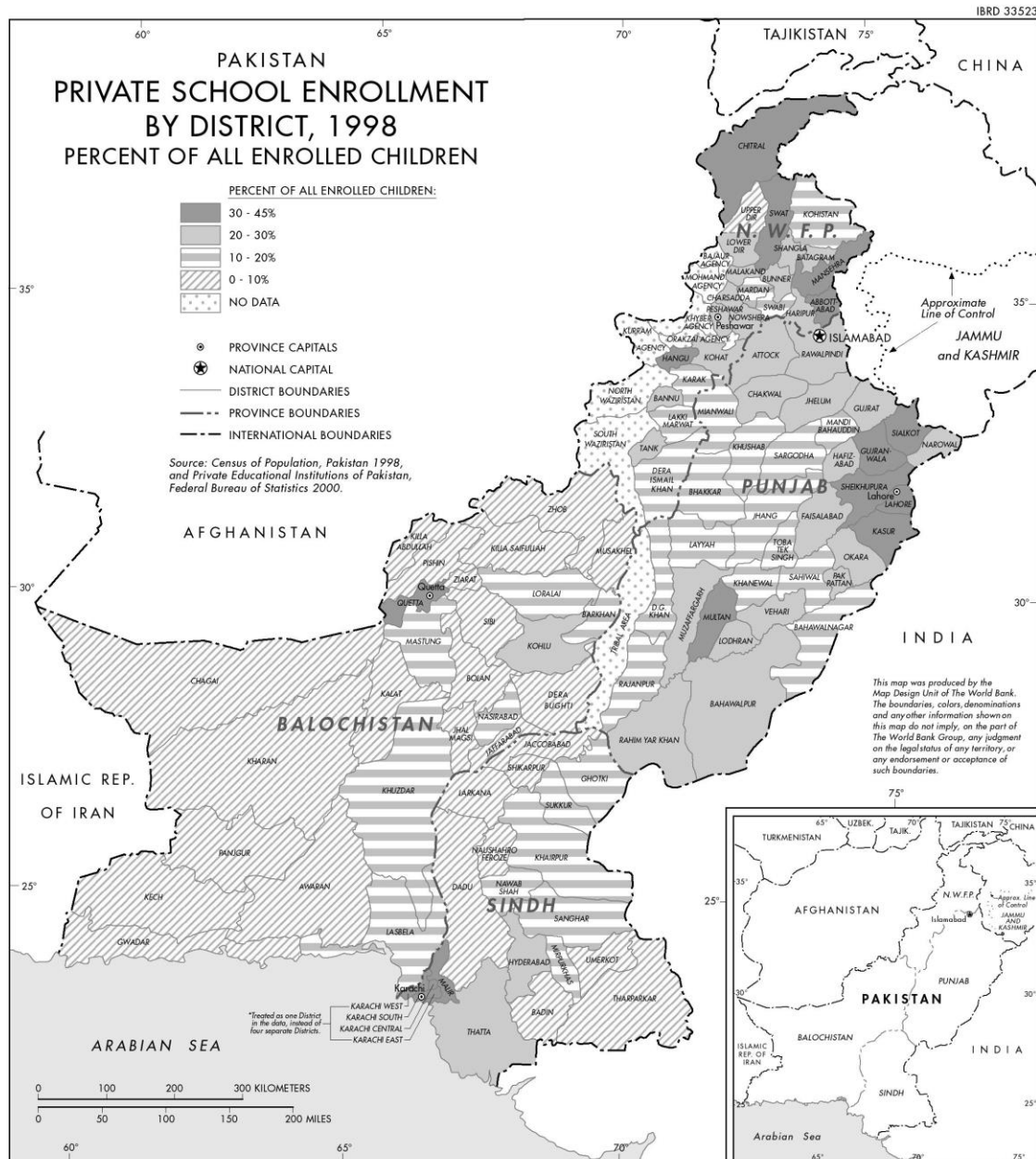
Table 4: Percentage of children enrolled in private schools

	Punjab	Sindh	NWFP	Balochistan
1991	15.5	16.07	4.29	4.4
2001	30.7	21.13	17.32	6.49

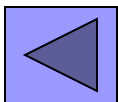
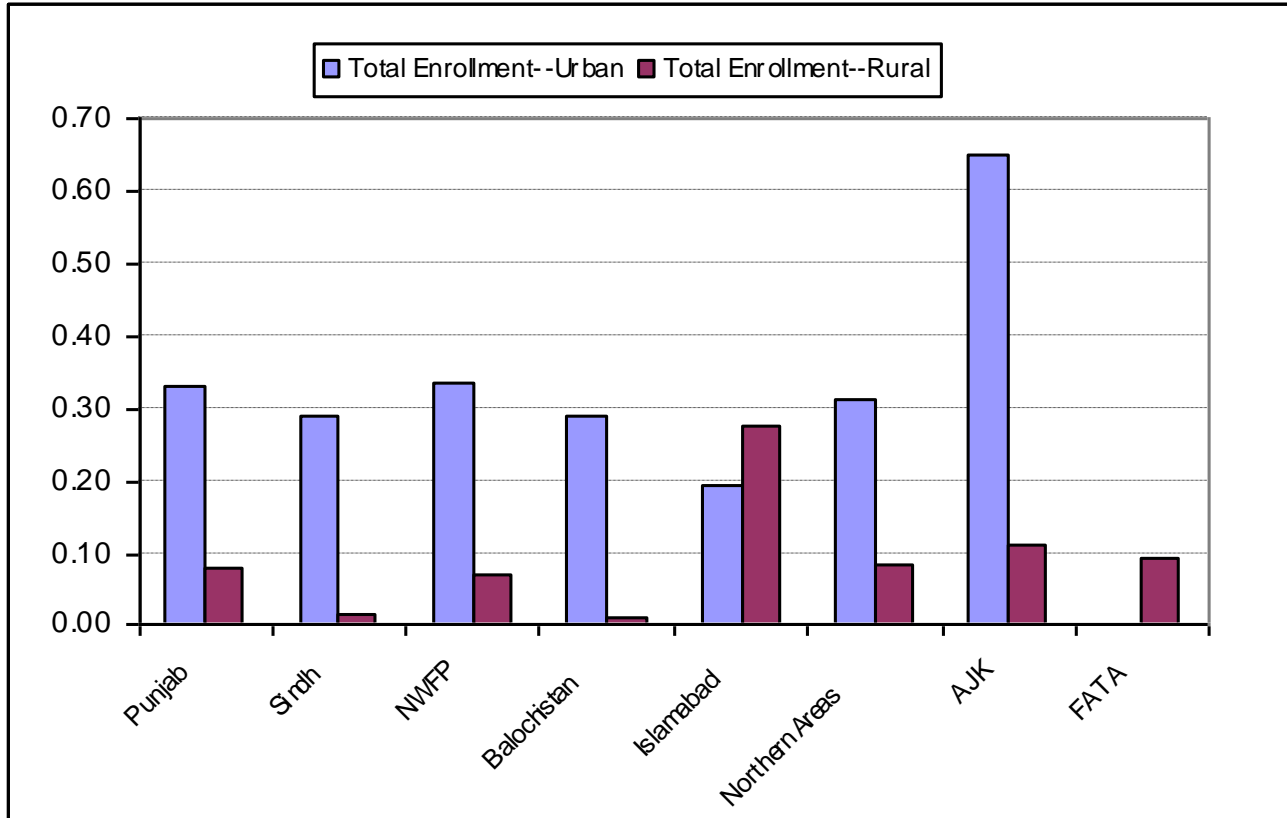
Notes: Based on PIHS data, 1991 and 2001 rounds. The table shows the percentage of enrolled children in private schools in the four main provinces of Pakistan.



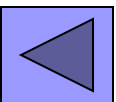
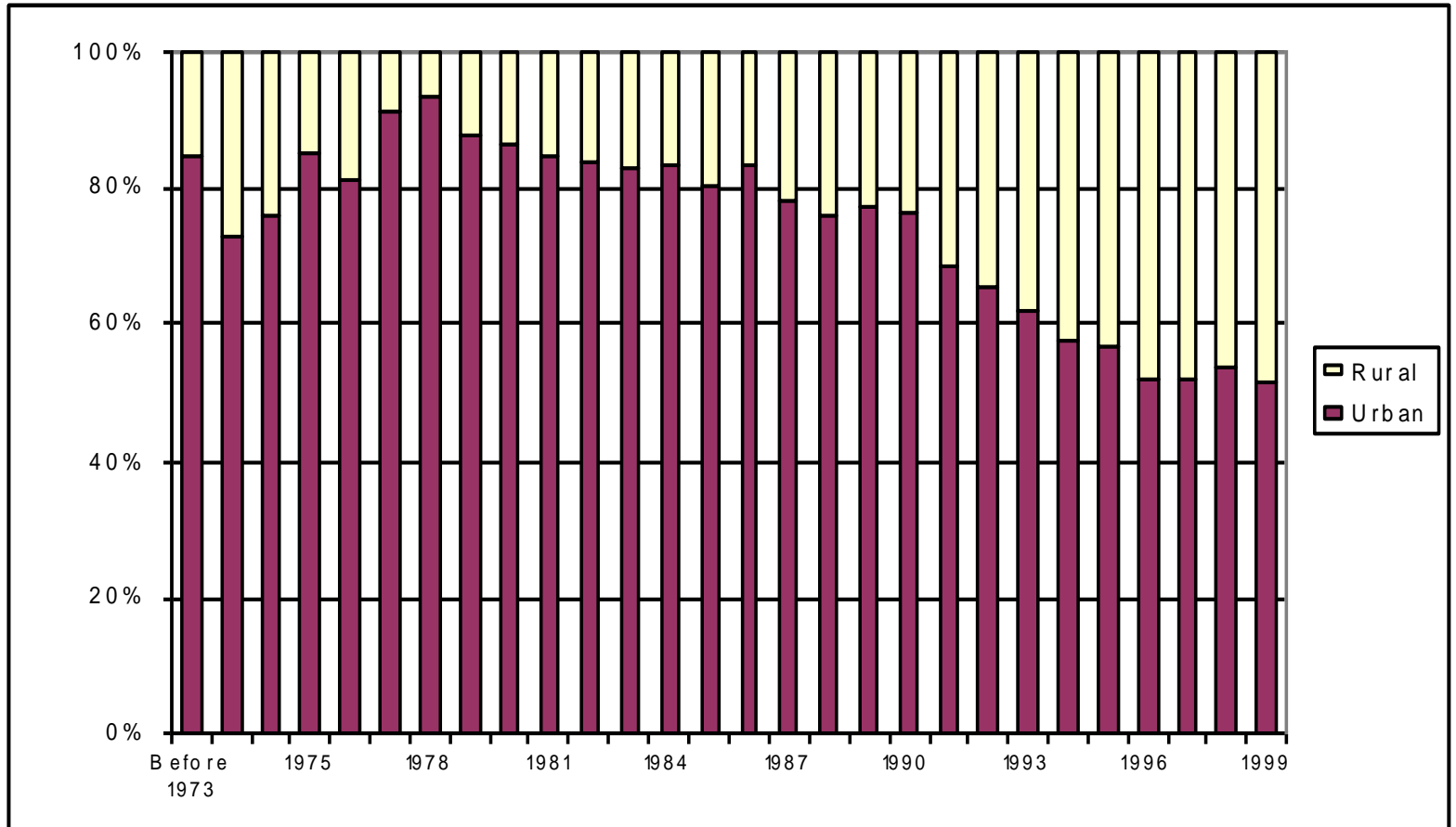
Private Enrollment



Private School Enrollment



The Setting up of Private Schools

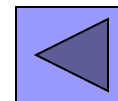


Some Facts About the Private Sector

PANEL B

Differences in Wages	Private Schools	Public Schools	Difference
Men	1758.28 (-1284.52)	6394.18 (-2678.37)	4635.89 (-122.46)
Women	1067.270 (761.540)	5888.480 (2066.280)	4821.21 (55.58)
All	1231.000 (959.140)	6178.000 (2447.010)	<u>4946</u> -55.71

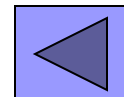
- Lower Wages in Private Sector
 - Public sector salaries are 5 X
- No Gender difference in Public Sector
 - Significant difference in private sector
- Teacher's wages 90% of overall expenditures
 - Private Sector is ½ as expensive per child!



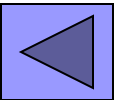
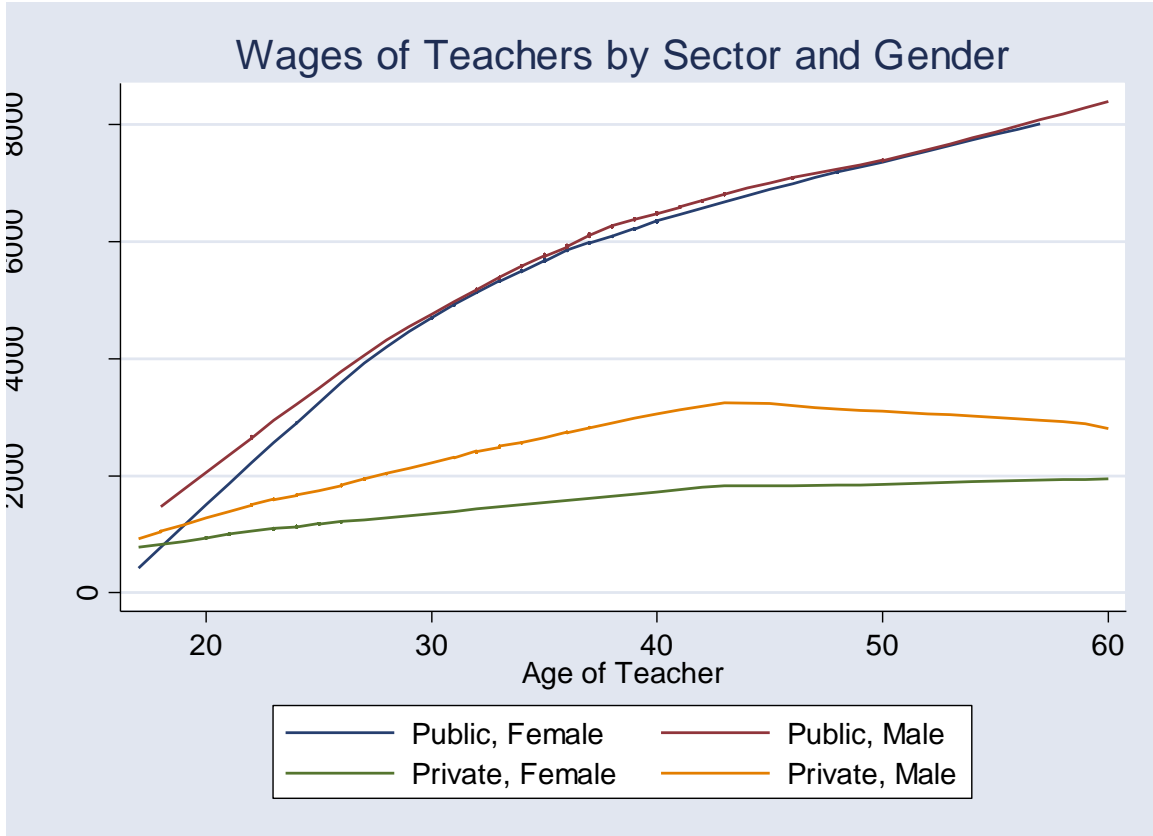
Female Penalty in Private Sector Wages

	(3)	(4)
	All Schools	All Schools
Female	0.023 (0.019)	0.025 (0.02)
Local	-0.066 (0.024)***	-0.065 (0.025)**
Female*Private	-0.291 (0.053)***	-0.275 (0.047)***
Local*Private	-0.143 (0.049)***	-0.082 (0.044)*
Private	-0.721 (0.045)***	-0.797 (0.045)***
Education: F.A./F.Sc..	0.159 (0.022)***	0.145 (0.020)***
Education: B.A./B.Sc.	0.333 (0.030)***	0.312 (0.027)***
Education: M.A./M.Sc. or above	0.475 (0.039)***	0.475 (0.038)***
Training: PTC/JV/SV	0.256 (0.044)***	0.252 (0.044)***
Training: CT	0.186 (0.037)***	0.193 (0.036)***
Training: B.Ed. or above	0.278 (0.042)***	0.274 (0.040)***
Experience: 1-3 years	0.135 (0.031)***	0.117 (0.027)***
Experience: > 3 years	0.217 (0.034)***	0.21 (0.032)***
Age	0.038 (0.009)***	0.04 (0.008)***
Age Squared	0 (0.000)**	0 (0.000)***
Constant	6.931 (0.172)***	6.926 (0.155)***
Fixed Effects	none	Village Level
Observations	4552	4552
R-squared	0.83	0.85

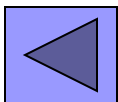
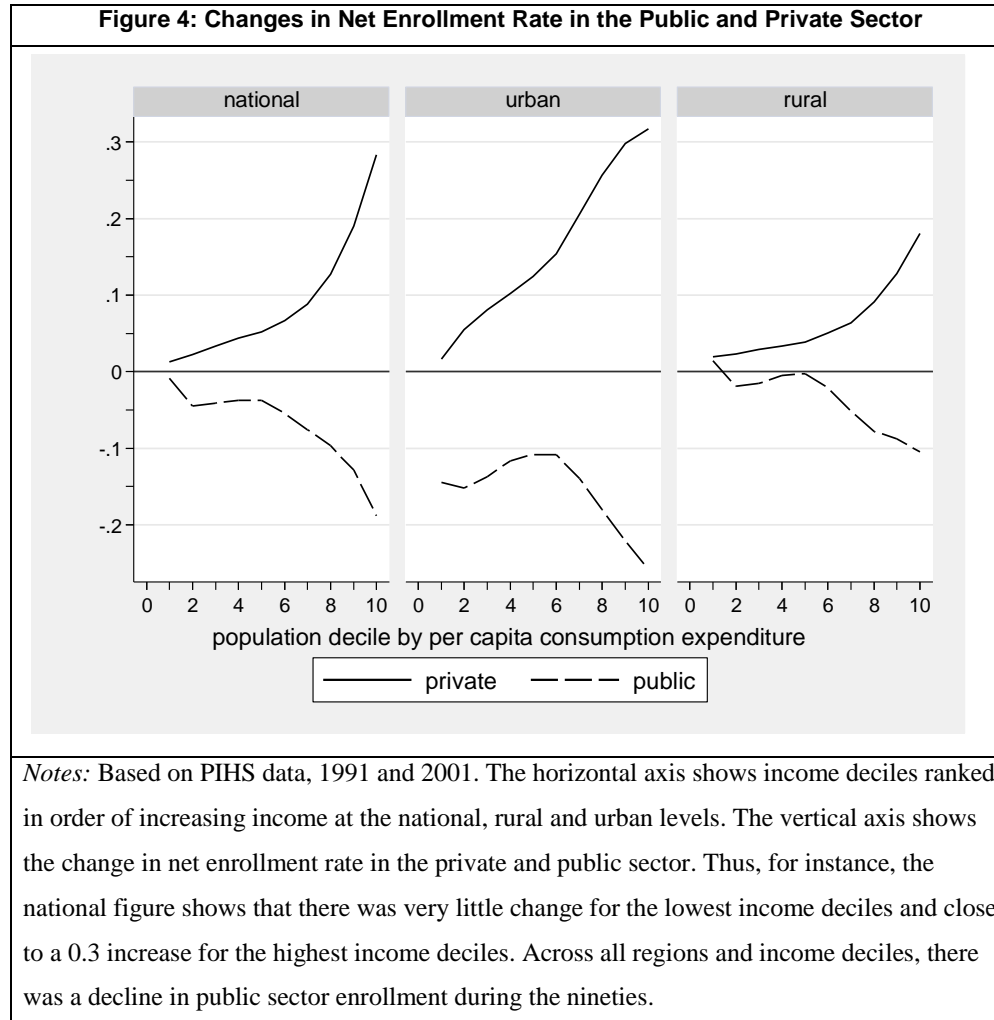
- The table on the left shows the wage regressions used to generate the adjusted and unadjusted wage figures
- The dependent variable is the log of the salary earned
- The first column is based on the cross-section
- The second column adds in village fixed-effects, so that we compare only among those teaching in the same village



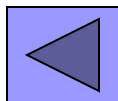
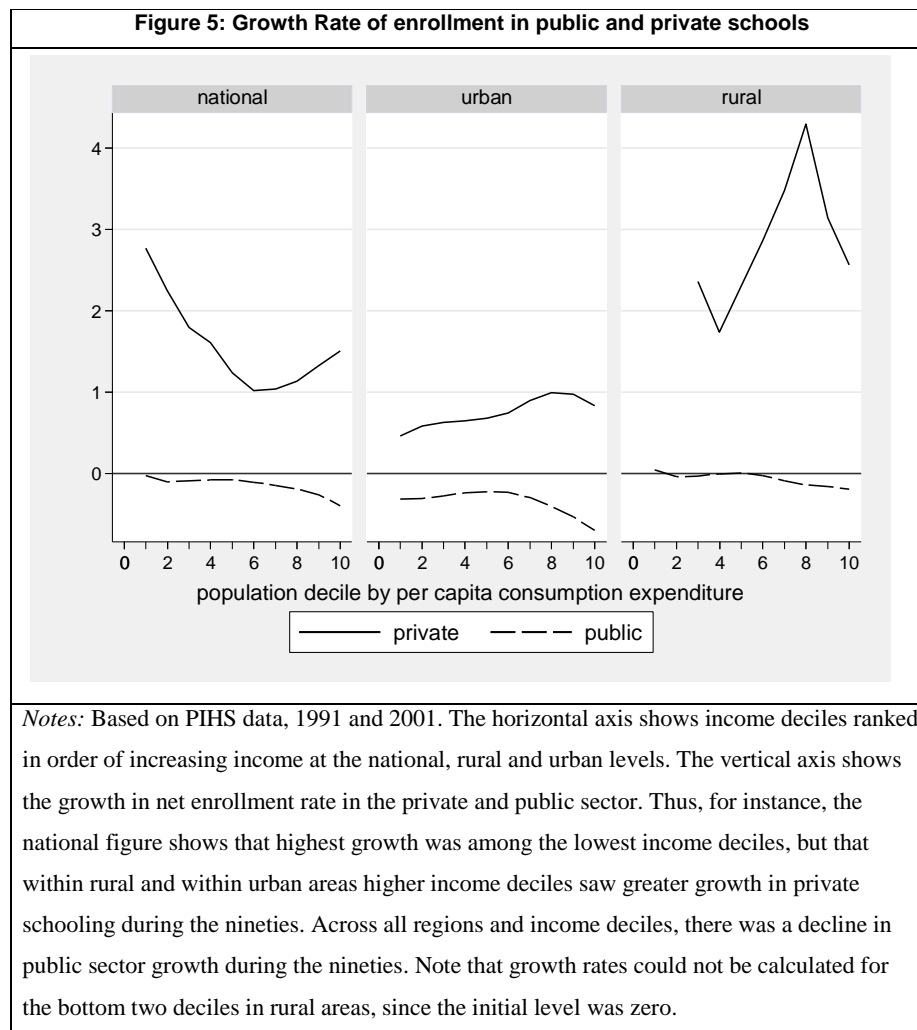
Wage Differentials for teachers



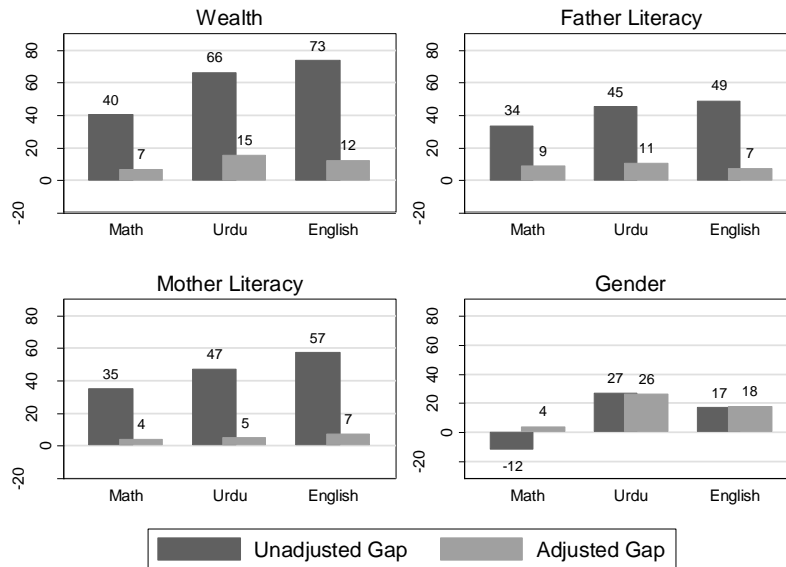
Private Schools: Who Goes (1)



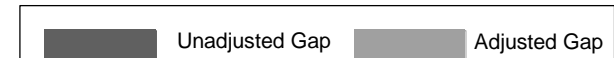
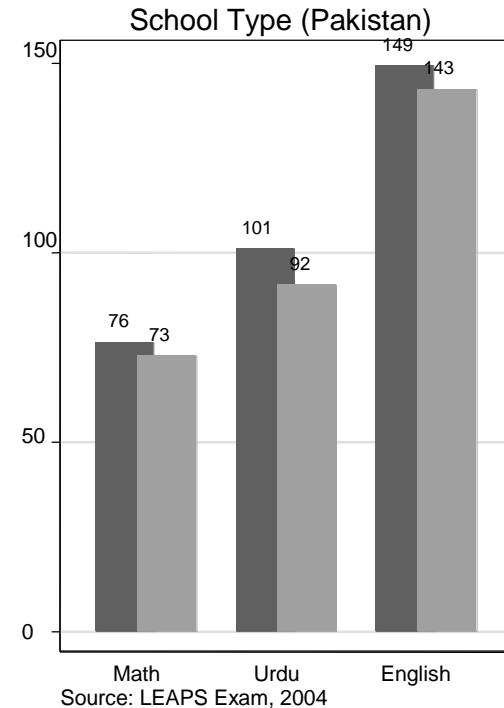
Private Schools: Who Goes (2)



Some Facts About the Private Sector



Source: LEAPS Exam, 2004



- Not much to say....
- Turns out to be around 2 years learning...
- Similar to Jiminez and Tan, Tooley results

