Supply and Demand Constraints on Educational Investment: Evidence from Garment Sector Jobs and the Female Stipend Program in Bangladesh*

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Abstract

While increasing school enrollment is a major goal of development policy, little is known about the relative effectiveness of supply-side interventions that lower the cost of schooling relative to demand-side interventions that make existing schooling more appealing. We examine the effects of a roughly simultaneous supply-side influence (the Female Stipend Program) and a major demand-side influence (the expansion of the garment industry) on girls schooling in Bangladesh in the 1980's and 1990's. The garment sector could increase girls schooling by providing jobs which require education or from income effects of parents working in the sector. To identify effects of the garment sector on girls' schooling, we look for changes in girls' enrollment (relative to boys) in garment villages (relative to non-garment villages) when there are increases in the number of garment jobs available. We find that the arrival of garment jobs increases schooling for younger girls: a ten percent increase in garment jobs corresponds to an 1.35 percentage point percent increase in the probability that a 5-year-old girl is in school. There is a zero average effect for older girls, some of whom likely drop out of school to take the jobs right away. We identify effects of the FSP with a regression discontinuity and do not find a statistically significant effect of the program.

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1 Introduction

Increasing school enrollment, particularly of girls, is a key goal of development policy. However, little is known about the relative effectiveness of supply-side interventions that lower the cost of schooling relative to demand-side interventions that make existing schooling more appealing. Most of the existing literature has focused on the role of supply-side interventions, particularly recent randomized control trials of programs that build schools, provide inputs, improve the quality of schooling or supply parents with conditional cash transfers if children attend school.[1] There is comparatively less evidence on demand-side determinants of enrollment. Some exceptions are Badiani (2009), shows that technological changes in India that increased the returns to education increased boys' school enrollment (though not girls). Other evidence shows that interventions that inform students of the labor market returns to education increase enrollment rates (Jensen 2010; Oster and Millett 2010).

This paper assesses the effects of a roughly simultaneous large supply-side program and a major demand-side influence to girls schooling in Bangladesh in the 1980's and 1990's. This period represents a rapid increase in girls schooling, both absolutely and relative to boys' schooling, as depicted in figure 1. The supply side intervention is the Female Stipend Program (FSP) begun in the early 1990's that pays parents to keep their daughters in school. A key demand side factor occurring during the same time period is the rapid expansion of the garment industry, which has provided employment opportunities to women in a country where women traditionally have not worked outside the home. Enrollment effects of the garment sector could come from girls enrolling in school with hopes of obtaining well-paying garment jobs which require numeracy and literacy or from income effects of parents working in the sector.

To identify effects of the garment sector on girls' schooling, we compare the effects of the arrival of garment sector jobs on girls versus boys' enrollment in villages within commuting distances to garment factories to villages in the same subdistrict that are not. The main idea of the identification strategy is depicted visually in figure 2: girls' enrollment was similar before the take-off of the garment industry in the early 1980's but was higher in garment villages afterwards. By

[1] See, for instance, Burde and Linden (2010) on building schools, Duflo et al. (2008) on decreasing class size and tracking, Duflo et al. (2009) on rewarding teachers for attendance, Glewwe et al. (2009) on providing textbooks, or Glewwe et al. (2004) on flipcharts. Rawlings and Rubio (2005) provides a summary of the estimated effects of conditional cash transfers.

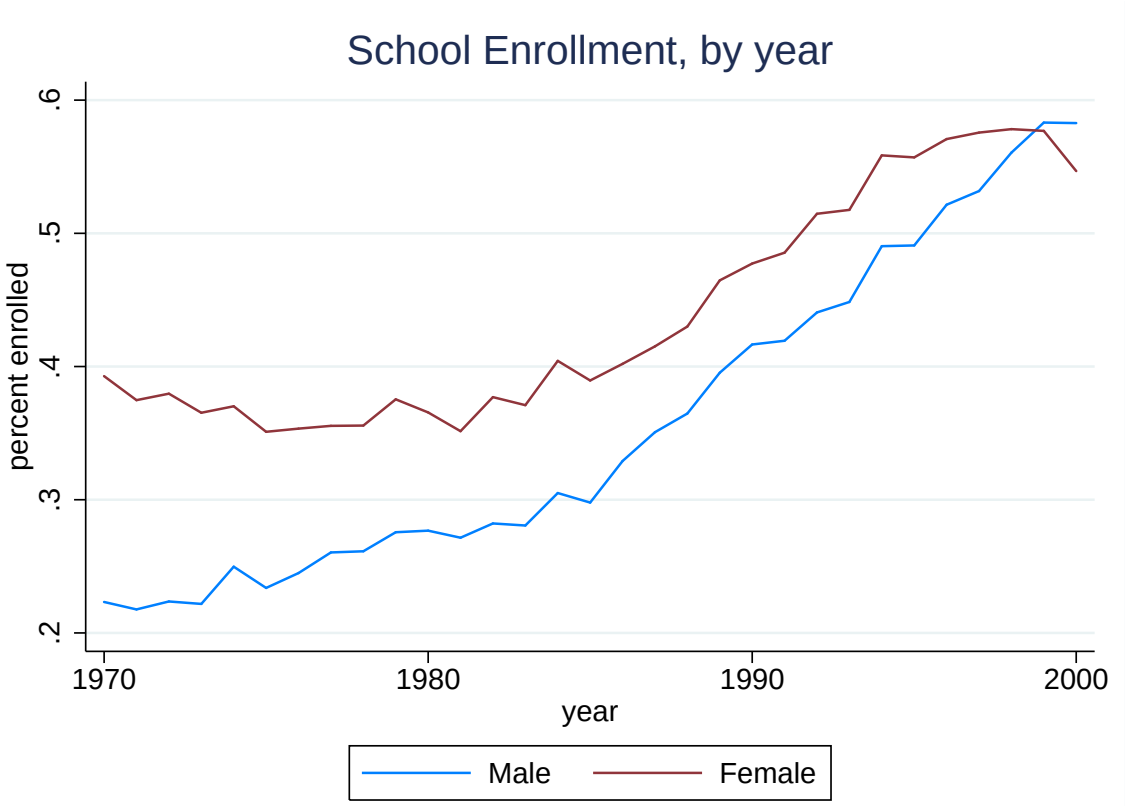

Figure 1: Girls versus Boys Enrollment rates over time

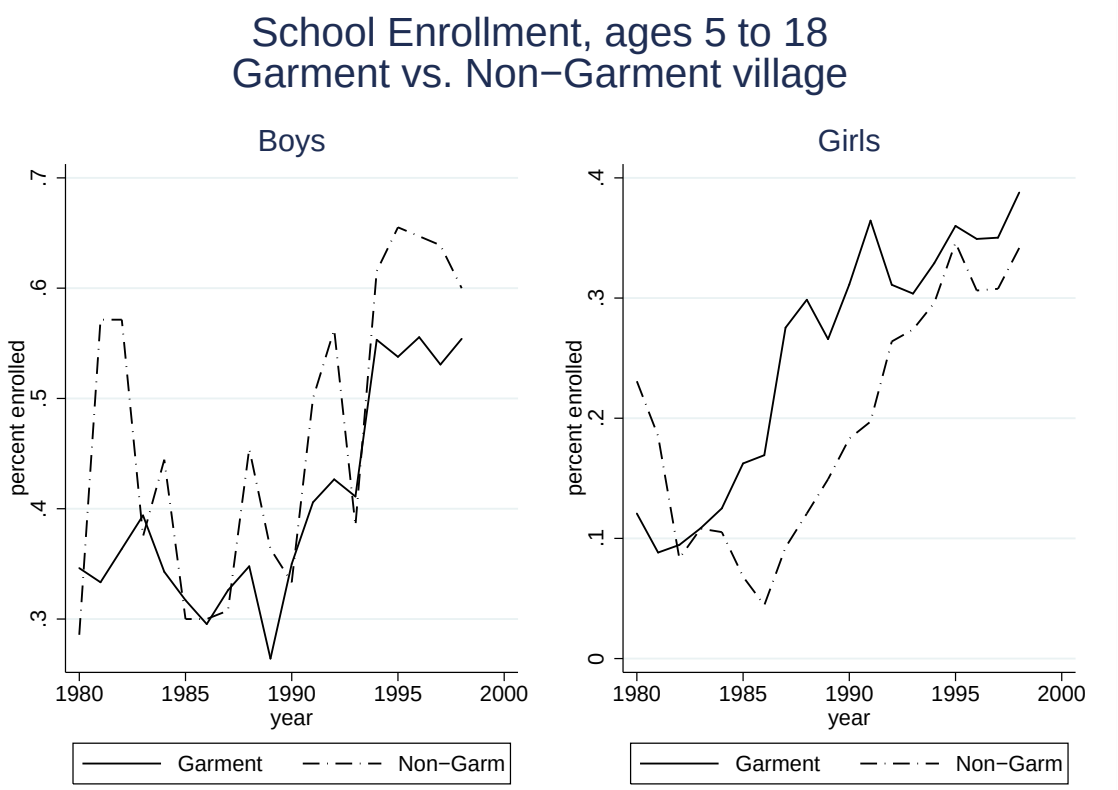

Figure 2: Enrollment rates over time, garment vs. non-garment villages

contrast, boys' enrollment in garment villages was higher even before the advent of the garment industry but if anything, the gap closes after the coming of the garment industry.

Our econometric model estimates that the arrival of garment jobs increases schooling for younger girls: a ten percent increase in garment jobs leads to a 1.35 percentage point percent increase in the probability that a 5-year-old girl is in school. There is a roughly zero average effect for older girls, some of whom likely drop out of school to take the jobs right away. We identify effects of the FSP with a regression discontinuity at the time of the program inception and conclude that once we take into account the general upward trend in girls' education, the program had negligible effect.

The dramatic increase in girls' schooling (both absolutely and relative to boys' schooling) in Bangladesh in the past 30 years has frequently been attributed to the FSP.[2] This conclusion is often

[2]For instance, the International Development Association of the World Bank (2005) posted a write-up on its website entitled "Stipends Triple Girls Access to School", in which all of the increase in girls' enrollment between 1991 and 2005 was attributed to the stipend. Since it did not have the data to estimate the counterfactual rise in girls' enrollment

made despite the fact that the ratio of stipend levels to average income is low compared to those of similar programs in other countries. For instance, the FSP amount is 0.8 percent of the income of beneficiaries; the well-known Oportunidades Program in Mexico, by contrast, represents 21.8 percent of the income of beneficiaries (Fiszbein et al., 2009). Since the program is costly to administer (despite the relatively low payments to beneficiaries), representing up to 13 percent of the total national education budget (BANBEIS, 2008) and much foreign aid funding, an accurate assessment of the true effects of the FSP is important for policymakers who are assessing the most efficient use of government funding.

More generally, our results suggest that demand-side interventions that raise household incomes or increase the availability of jobs that require education can increase schooling levels. For instance, trade policy on the part of developing countries can promote export-oriented factories in which many jobs require education. We further argue that more attention should be paid to why developing country households may not find education valuable.

The rest of the paper proceeds as follows. Section 2 provides background on the FSP and the garment industry's relationship with girls schooling. In section 3 we describe the empirical strategy we use to estimate the effects of the FSP and garment industry. Section 4 gives results, and section 5 concludes.

2 Background on the Female Subsidy Program and Garment Industry

The Female Stipend Program (FSP) was piloted in a sample of rural villages in 1991 and became nationwide in rural areas in 1994. The program gives a monthly stipend (currently ranging from 25 to 60 Taka per month depending on grade level, or approximately 34 to 82 cents US) to female students in grades 6 to 10 in rural areas who maintain attendance rates of at least 75 percent, achieve 45 percent marks on term and annual exams, and remain unmarried. The stipend money is directly deposited in an account in the girl's name in the nearest Agrani Bank, a nationwide system of rural banks. Schools also receive a tuition supplement from the government for each student receiving the stipend.

As shown in figure 3, the Bangladeshi garment industry has experienced explosive growth

absent the program, it was not able to substantiate the claimed effect size.

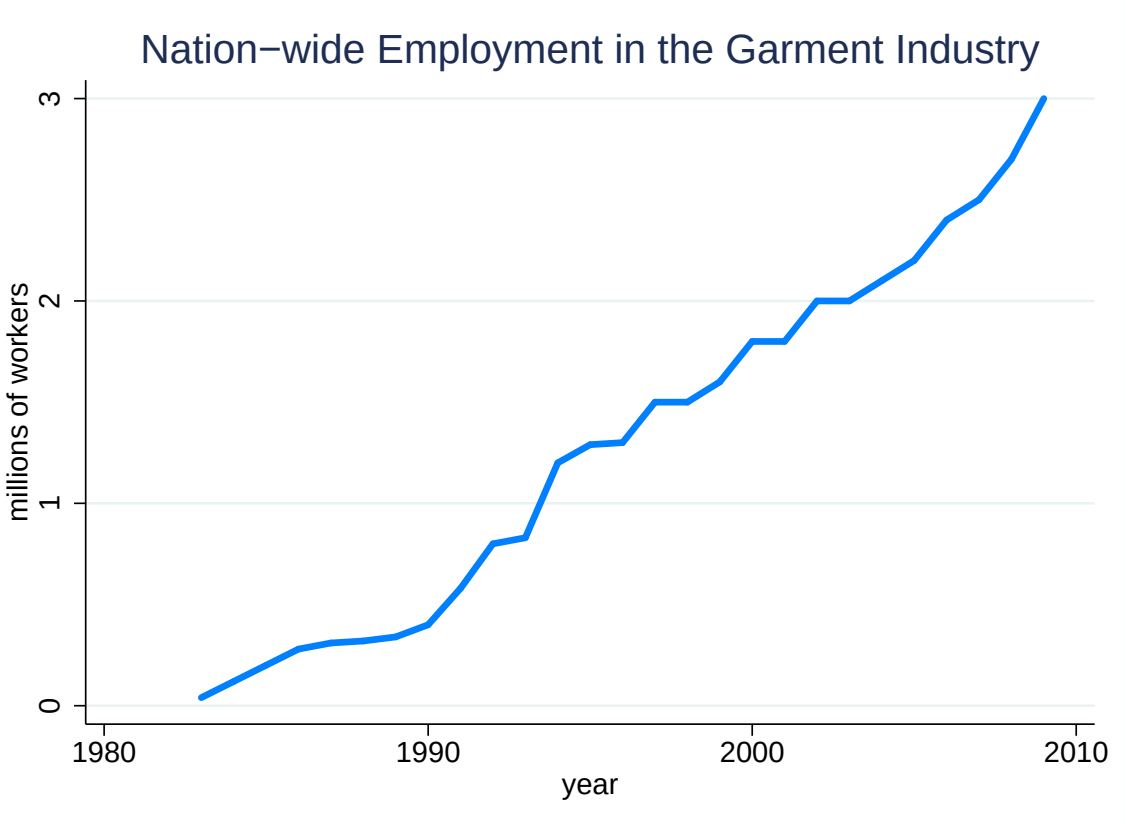

Figure 3: Employment in the garment industry over time

in the past 30 years. In 1983 there were 40,000 people employed in the industry; since then an average yearly growth rate of 17 percent has resulted in a current employment of over 3 million (Bangladesh Garment Manufacturers and Exporters Association, 2010). Approximately eighty percent of garment workers are female, and garment jobs often represent females' only option to work outside the home.

There are several channels through which the arrival of garment jobs could affect girls' schooling. The first is that better jobs within factories require education. Supervisors must be able to keep written records, and educated workers on assembly lines can more easily learn new work from a pattern than from than watching it be done, which allows them to fill in for absent other workers. So when a new job arrives, if parents assume it will persist indefinitely, they may choose to keep their pre-working age daughters in school with the hopes that their daughters will later be able to secure a garment factory job. Pāla-Majumadāra and Begum (2006) argue that parents

respond to the returns to education in the garment industry: "both urban and rural poor educate their girl children with an intention to engage them in the garment industry."

Garment jobs could also affect girls could also increase girls' schooling through income effects if their parents get jobs in the industry. Furthermore, the arrival of new labor force opportunities for females could also impact the bargaining power of women, even those who are not working in garment factories by improving their outside option. However, the garment industry also has the potential to decrease girls' schooling if girls drop out to take jobs in factories. Even though officially the minimum age to work in the factories is 16, anecdotal evidence suggests that this has not always been enforced.[3] The direction of the effect of garment jobs on girls' schooling is therefore an empirical question.

3 Empirical Strategy

3.1 Data

The data in the survey come from a survey of 1395 households conducted by the authors in four subdistricts of Bangladesh: Savar and Dhamrai in Dhaka District; Gazipur Sadar and Kaliakur in Gazipur district.[4] For each surveyed household, we gathered information about the schooling history of all offspring of the household head and spouse: age that the child began schooling, timing and length of any interruptions in schooling, and eventual years of completed education. These data allow us to construct a binary variable for whether a child was enrolled in school in a given year, from ages 5 to 18.

As described in section 3.2, part of our identification strategy exploits the fact that 44 of our villages are within commuting distance of a garment factory and 16 were not.[5] Since garment industries are not placed randomly, it important to acknowledge the pre-treatment differences between garment villages and non-garment villages. Table 1 provides summary statistics of some

[3] This is particularly true before US Senator Tom Harkin proposed the Child Labor Deterrence Act in 1993. See 3.2 for some evidence that the garment industry had differential impacts on enrollment before and after the proposed Act.

[4] For more details on the survey, see Heath (2011)

[5] This distinction was made by a knowledgeable industry affiliate. As a check of that the classification does actually reflect the villages in which workers can live at home to work in garment jobs, 1.9 percent of women ages 16 to 30 work in the garment industry in non-garment villages; 40.4 percent of women in that age group work in the garment industry in the garment villages. Of course, to the extent that parents in non-garment villages also responded to the arrival of garment jobs, our estimates represent an underestimate of the effects of the arrival of garment jobs.

Table 1: Pre-treatment differences, garment vs. non-garment villages

	Garment villages	Non-Garm villages	P-value for diff	N_G	N_{Non}
INDIVIDUAL LEVEL					
completed education, females 50+	0.824	0.537	0.232	176	80
completed education, males 50+	3.486	1.943	0.002***	222	88
age at marriage, females 50+	14.788	14.462	0.604	85	39
age at first birth, females 50+	19.286	21.162	0.090*	84	37
VILLAGE LEVEL					
distance to Dhaka (km)	1.795	6.813	< 0.001***	44	16
distance to a girls' secondary school (km)	5.659	6.375	0.662	44	16
distance to a boys' secondary school (km)	6.932	10.000	0.160	44	16
male agri wage (peak season, in taka)	27.559	27.997	0.802	44	16
female agri wage (peak season, in taka)	22.563	22.701	0.945	44	16

*Stars indicate significance: *** p<0.01, ** p<0.05, * p<0.1. Only respondents who were born in the village of current residence are included.*

differences between garment and non-garment villages before the takeoff of the garment industry in the early 1980's. The garment villages are on average 1.7 km away from Dhaka, versus an average distance of 6.8 km for non-garment villages. There are also differences in educational attainment of adults over 50 (who would have finished school before the garment industry began), though they are stronger for males. Specifically, males over 50 in garment villages have an average of 3.48 years of schooling (vs. 1.94 in non-garment villages), while females in garment villages have an average of 0.82 years of schooling (vs. 0.54 in non-garment villages).

However, if these baseline differences in are captured by a dummy variables for garment village (and an interaction of that dummy with an indicator for female) then we can still recover estimates of the effects of the growth in the garment industry on enrollment. Identification would only be threatened by differential enrollment trends in garment vs. non-garment villages. Section 4.1 provides some evidence against such trends.

3.2 Identifying the Effects of Garment Jobs

Our identification strategy uses sibling fixed effects to compare the difference in enrollment in siblings with relatively greater exposure to garment sector jobs to those with less exposure, as captured by the interaction of an indicator for living in a garment village with the number of

jobs available in a given year. While ideally our measure of exposure would be the number of jobs available in garment factories in each village in each year, to the best of our knowledge there are no records available of employment more finely disaggregated than a nationwide level. Accordingly, we assume that garment jobs in each village grew at the nationwide rate. This strategy would be valid under the assumption that no other variables that affect school enrollment changed in garment villages at the time of arrival of garment jobs on the national level. Since this assumption would be invalidated, for instance, if garment factories are attracted by newly built roads or other infrastructure which would also facilitate schooling, we can exploit the fact that the garment industry represented a more fundamental change in the economic environment for females. That is, we can do a triple difference that compares changes in girls' enrollment to changes in boys at the time of the arrival of garment sector jobs.

Specifically, we include sibling fixed effects and year fixed effects interacted with a dummy for female, allowing there to be flexible gender-specific time trends in enrollment. We also allow there to be different baseline enrollments for females in garment villages by including an interaction between a female dummy and an indicator for garment village. So for child i in family f living in village v at year t:

$$\begin{aligned} Enroll_{ivft} =& \beta_0 + \delta_f + \lambda_t + \lambda_t \times Female_{ivft} + \beta_1 Age_{ivft} + \beta_2 Female_{ivft} \\ &+ \beta_3 Female_{ivft} \times Age_{ivft} + \beta_4 Garment\ Village_{ivft} \times Female_{ivft} \\ &+ \gamma_1\ log(Garment\ Jobs)_t \times Garment\ Village_{ivft} \\ &+ \gamma_2\ log(Garment\ Jobs)_t \times Garment\ Village_{ivft} \times Female_{ivft} + \varepsilon_{ivft} \end{aligned} \tag{1}$$

γ_2 is the parameter of interest, reporting the effects of garments jobs on girls enrollment (relative to boys) in response to the number of garment jobs available. This parameter is an unbiased estimator of the effect of garment jobs on girls school enrollment if there are no other factors influencing girls enrollment, relative to boys, that occur in garment villages at the same time as increases in the number of garment jobs. Two potential threats to this condition are reverse causality and an omitted variable correlated with both girls' school enrollment and the arrival of garment jobs. Reverse causality would be an issue if factories expanded their labor force in response to increases in girls' schooling. While this is a possibility, interviews we did with factory owners have lead

us to conclude that this concern is likely second order. They reported that the two most common reasons for choosing a location are proximity to roads and other infrastructure and the convenience of using buildings already owned by the individual or family members. That is, while on the margin factory owners may prefer to locate in areas with a more skilled female labor force, the state of infrastructure and land/property markets in Bangladesh is such that these are the primary concerns in the decision to locate in a particular area.

Potential omitted variable that threaten identification are variables that might both attract new garment factories and differentially increase girls' schooling relative to boys'. For instance, new roads may differentially have been built in the areas closer to Dhaka where garment factories are located. To allay this concern, we allow for baseline trends in enrollment and girls' enrollment to be different in garment versus non garment villages.

3.3 Identifying the Effects of the Girls' School Subsidy Program

Since all of the villages in our sample received the program in 1994, we cannot include year fixed effects. Instead, we use a regression discontinuity to estimates the discrete change in girls' enrollment in that year. We again use sibling fixed effects.

$$\begin{aligned} enroll_{ivft} =& \beta_0 + \delta_f + \beta_1 Age_{ivft} + \beta_2 Female_{ivft} + \beta_3 Female_{ivft} \times Age_{ivft} + \lambda_1 t + \lambda_2 t^2 + \lambda_3 t \times Female_{ivft} \\ &+ \lambda_4 t^2 \times Female_{ivft} + \gamma_1 Post1994 + \gamma_2 Post1994 \times Female_{ivft} + \varepsilon_{ivft} \end{aligned} \tag{2}$$

The estimated $\hat{\gamma}_2$ captures the effects on enrollment if the program did not affect boys. Then the regression discontinuity is valid if the overall and female-specific quadratic time trend accurately models the time trend in schooling for both genders.

However, boys' enrollment may have been affected by the program, either positively through income effects or negatively through substitution effects. If so, we can consider the effects of a *Post* 1994 dummy variable after repeating regression 2 just including girls.

4 Results

4.1 The Effects of Garment Jobs on School Enrollment

Table 2 shows the results from equation (1) which assesses the effects of garment jobs on girls' enrollment. The first column shows that in garment villages, overall girls' enrollment increases by 0.71 of a percentage point (relative to boys in the same family) when there is a 10 percentage point increase in the number of garment jobs available. The estimated effect is borderline significant (P = 0.180). Column 2 shows that the garment industry had statistically significant positive effects on enrollment of younger girls. Specifically, the interaction of growth in garment jobs and age with an indicator for female is negative and significant, suggesting that garment jobs increase enrollment by less for older girls than for younger girls. Accordingly, the estimated effect of a 10 percentage point increase in garment jobs on the probability that a 5-year-old girl is in school is 1.26 percentage points. The effect declines by 0.13 percentage points by each year of age, so that by age 14 the estimated effect is zero. These results are consistent with the possibility that some older girls drop out to access jobs right away, while others remain in school to increase their potential to access the better jobs within the factory.

Columns 3 and 4 provide further evidence on whether children drop out of school to access garment jobs. Specifically, we test whether the arrival of garment jobs had a differential effect on enrollment after 1993, when U. S. Senator Tom Harkin proposed the Child Labor Deterrence Act, which sought to prohibit the importation of manufactured and mined goods into produced by children under the age of 15. Even though the Act did not pass, the threat of bad publicity lead many garment factories in Bangladesh to stop the use of child workers (Steele January 2 1998; Rahman et al. 1999). After allowing the effect of the growth in garment jobs to differ after 1993 in column 3, we see that positive effect of garment jobs on girls' schooling is coming entirely after 1993. That is, it does appear that giving factories a disincentive to hire child labor strengthened the positive effect of garment jobs on girls' school enrollment. Column 4 shows suggestive evidence that the effect of the Harkin Act was stronger among younger girls: the interaction between age and the post 1993 interaction is negative, although insignificant. A negative term is what we would expect if the potential of younger girls to gain secure garment employment was especially hurt by the Act.

Table 2: Sibling FE regressions: effects of the arrival of garment jobs on enrollment

Dep. Var	(1) enroll	(2) enroll	(3) enroll	(4) enroll
$log(\text{Garment Jobs})_t \times$ Garment Village	0.0115	0.0060	0.0195	0.0144
	[0.0588]	[0.0625]	[0.0716]	[0.0721]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Female	0.0714	0.1286**	-0.0096	-0.0171
	[0.0532]	[0.0602]	[0.0741]	[0.0754]
Garment Village $\times$ Female	-0.0281	-0.0154	-0.1206	-0.1237
	[0.0441]	[0.0456]	[0.0903]	[0.0914]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Age		0.0017		
		[0.0058]		
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Age $\times$ Female		-0.0136*		
		[0.0081]		
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993			0.0072	0.0988
			[0.1566]	[0.1779]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993 Female			0.2328	0.2935
			[0.1852]	[0.1987]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993 $\times$ Age				-0.0077
				[0.0083]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993 $\times$ Age $\times$ Female				-0.0078
				[0.0088]
Observations	10,433	10,433	10,433	10,433
R-squared	0.119	0.121	0.121	0.122

*Standard errors in brackets, clustered at the level of the family; Stars indicate significance: *** p<0.01, ** p<0.05, * p<0.1*

Regressions include also female, age, female $\times$ age

Table 3 checks for preexisting enrollment trends in garment areas by adding gender-specific pre-1980 time trends in garment villages. In each case, the coefficients of interest remain roughly the same as without the time trends and if anything the pre-garment industry trend in girls schooling in garment villages (the Garment Village $\times$ Year $\times$ Pre 1980 $\times$ Female term) is negative.

4.2 The Effects of the Female Stipend Program on School Enrollment

Table 4 shows the results from estimating equation 2. When we include a quadratic time trends that differ by gender, we find that overall schooling levels increased in 1994: the coefficient on the *Post*1994 dummy shows a statistically significant increase of 8.80 percentage points in enrollment, above the prevailing quadratic time trend, in 1994. However, the *Post*1994 $\times$ *Female* interaction is insignificant and very close to zero. So while overall schooling does appear to have jumped in 1994, there is no evidence that female schooling increased relative to male.[6]

Figure **??** provides further suggestive evidence on the effect of the FSP. It compares the actual effect of the FSP in 1994 to the estimated effect of placebo "programs" beginning in the years 1990 to 2000. The graph that compares the overall effects on girls enrollment (the sum of *Post*1994 and *Post*1994 $\times$ *Female*) shows that while the estimated effects are largest when the actual program began in 1994, the estimated effects are very similar in 1994 and the year immediately before and after.

5 Conclusion

This paper has compared the effects of two different programs on girls schooling in Bangladesh: a Female Stipend Program which decreased the direct cost of schooling for girls and the arrival of garment jobs which increased households' demand for schooling through increased incomes or returns to education. We found that the garment industry had sizeable effects on enrollment. By multiplying the actual growth in garment jobs by our estimated marginal effect of an increase in garment jobs on girls schooling, we estimate that in villages within commuting distance to

[6] Fuwa (2001) and Khandker et al. (2003) identify a different parameter relating to the FSP and examine a different geographic area to ours (118 rural thanas in Bangladesh). They estimate program effects separately in both cross sectional household survey data and school-level panel data. Both datasets indicate that the stipend program increased girls schooling. The cross-sectional data suggests that boys schooling was unaffected by the stipend program, while the school level panel data suggests that boys schooling may have decreased as a result of the program.

Table 3: Sibling FE regressions: robustness checks on the effects of the arrival of garment jobs on enrollment

Dep. Var	(1) enroll	(2) enroll	(3) enroll	(4) enroll
$log(\text{Garment Jobs})_t \times$ Garment Village	0.0176	0.0139	0.0086	0.0015
	[0.0588]	[0.0625]	[0.0738]	[0.0742]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Female	0.0696	0.1243**	0.0191	0.0123
	[0.0528]	[0.0596]	[0.0769]	[0.0787]
Garment Village $\times$ Year $\times$ Pre 1980	0.0022	0.0021	0.0024	0.0027
	[0.0031]	[0.0030]	[0.0032]	[0.0032]
Garment Village $\times$ Year $\times$ Pre 1980 $\times$ Female	-0.0067*	-0.0065*	-0.0060*	-0.0060
	[0.0035]	[0.0035]	[0.0036]	[0.0037]
Garment Village $\times$ Female	-0.0180	-0.0059	-0.0795	-0.0819
	[0.0430]	[0.0443]	[0.0885]	[0.0897]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Age		0.0013		
		[0.0058]		
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Age $\times$ Female		-0.0131		
		[0.0082]		
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993			0.0429	0.1415
			[0.1614]	[0.1842]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993 $\times$ Female			0.1510	0.2039
			[0.1849]	[0.2010]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993 $\times$ Age				-0.0082
				[0.0084]
$log(\text{Garment Jobs})_t \times$ Garment Village $\times$ Post1993 $\times$ Age $\times$ Female				-0.0067
				[0.0089]
Observations	10,433	10,433	10,433	10,433
R-squared	0.121	0.122	0.121	0.122

*Standard errors in brackets, clustered at the level of the family; Stars indicate significance: *** p<0.01, ** p<0.05, * p<0.1*

Regressions include also female, age, female $\times$ age

Table 4: Effects of the school subsidy program on girls' schooling

Dep. Var is $enroll_{ivft}$	
post1994	0.0880***
	[0.023]
post1994 × Female	-0.0109
	[0.030]
year × Female	-0.0258
	[0.018]
year^2 × Female	0.0002*
	[0.000]
Observations	36668
R-squared	0.291

*Standard errors in brackets, clustered at the family level; Stars indicate significance: *** p<0.01, ** p<0.05, * p<0.1; regressions include year and year squared, female, age, female*age*

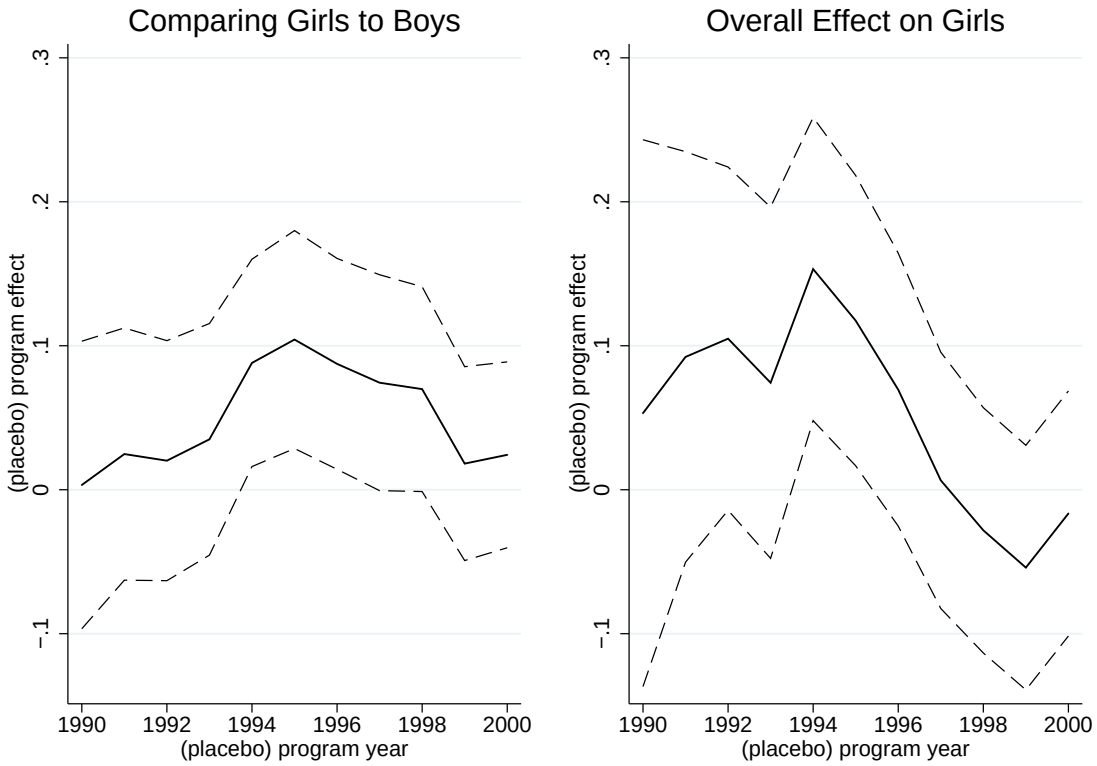

Figure 4: Placebo FSP results

garment factories, the garment industry has lead to a 13.29 percent increase in the probability that a girl is in school. By contrast, in our study area the FSP had little effect on girls' schooling.

While much policy attention has been devoted to interventions such as the FSP that decrease the cost of education, policy can affect demand-side factors as well. For instance, trade policy or domestic industrial policy can promote the arrival of jobs that require education. More broadly, our results suggest that policymakers interested in increasing education should devote more attention to why households in developing countries whose children are not enrolled in school may not find education valuable.

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