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Effect of Educational Attainment on Married Women's Mobility in Rural Bangladesh

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Abstract

This paper aims to find any causal effect of educational attainment on married women's freedom of mobility in rural Bangladesh. Using data from Bangladesh Integrated Household Survey (BIHS) 2015, a mobility index for married women is constructed. Education being arguably endogenous, three instruments run a Two-Stage Least Squares (2SLS) regression. An additional but weak instrument is also used in the second regression and the test for over-identifying restrictions indicating a weak instrument. In all the regressions, educational attainment does not seem to affect physical mobility, but a woman's health status and whether she makes cash earnings positively affect her freedom of mobility. Finally, it is shown that controlling for the husband's attributes indicates that education is no longer endogenous, which leads to the conclusion that any previous endogeneity could result from assortative marriage market selections.

JEL Classification *D13 · I21 · J16*

Keywords *Mobility · Female Education · Rural Bangladesh · Instruments · Two-stage Least Squares*

1 Introduction

Despite commendable achievements in increasing female literacy rate, reducing maternal mortality rates, and encouraging female labor force participation as steps towards fulfilling parts of the eight Millennium Development Goals (MDGs), Bangladesh ranked 111th among 155 countries according to the Gender Inequality Index as reported in the United Nations Development Programme (2016). The

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indicators used to monitor the progress of the third MDG of gender equality and women empowerment include closing the gender gap in education, increasing women's share of paid employment, and increasing the proportion of seats held by women in national parliaments.

Use of employment status, labor force participation, or income-earning opportunities in indices for gender equality and female empowerment (like in Gender-related Development Index and Gender Inequality Index) are often as-associated with higher autonomy over physical mobility. Freedom of movement beyond the household can change women's attitudes and self-worth, expose them to better employment opportunities and enable them to contribute in social and public spheres. Balk (1997) took

Physical mobility one step ahead by coining it as a form of 'non-conformity to institutionalized gender roles and norms in the society. It can be true for many Muslim or Muslim-majority countries like Bangladesh with highly specialized gender roles, especially prevalent in rural areas. The practice of purdah (often by female seclusion) and the patriarchal social system can curtail the freedom of movement of adult women whose responsibilities are restricted to household chores, childbirth, and rearing.

Country-level measures of female empowerment constantly use education as one of their instrumental indicators. However, it is unclear whether education is frequently used in such measures because higher educational attainment has a positive causal effect or is correlated to a higher level of female empowerment. Being more educated can increase a woman's cognitive ability, income-earning opportunities, or employability, which, in turn, can increase her position inside the household and in society and increase freedom of physical mobility. However, the net effect of education on women's empowerment is not so straightforward and is highly context-dependent. For instance, in a society where women are strictly seen in reproductive roles, the reason for educating girls can simply be to make them better mothers or wives or to increase their 'values' in the marriage market. Even worse, Islam & Asadullah (2018) showed that gender stereotyping in primary and secondary level textbooks in four countries- Bangladesh, Pakistan, Malaysia, and Indonesia- was quite common. Stereotyping gender roles through depiction in textbooks can perpetuate gender inequality by further internalizing gender norms. The positive effects of education can thus be conditional on the context in which it is provided and the society in which it is embedded. These constraints obviously do not negate the benefits of higher education but simply suggest the need for caution when making any clear-cut conclusion about the effect of education on women's status.

Previous literature on mobility as an indicator of empowerment and how it is affected by educational attainment show mixed results. For instance, Rahman & Rao (2004) showed that in India, taking physical mobility as a measure of autonomy, women with higher education had more bargaining power inside the family through a channel of exposure and access to more information. However, this can be too naive a measure because mobility is quite often poverty-driven in many developing countries. A woman with little or no education living in extreme poverty roaming around all day from door-to-door begging for food and money will score extremely high in the mobility index, but this in no way is indicative of her well-being or autonomy. Balk (1997) showed an inverse relationship between mobility and autonomy for Bangladeshi women using Demographic and Health Survey (DHS) data from 1994. A possible explanation was that higher education is often associated with better economic and social status. Therefore, the women with more education are probably the ones whose families could afford to send their daughters to schools/colleges and are also the ones who can afford not to work and practice seclusion. Whether or not it is still valid after two decades using a different sample and estimation technique will be discussed here.

In this paper, an index for married women's physical mobility is constructed as a measure of freedom of movement in the context of rural Bangladesh. This individual aspect of freedom in mobility does not encompass her overall autonomy/ empowerment. Nevertheless, for the reasons described above, the extent of physical mobility carries significance in this social backdrop. The paper then investigates whether educational attainment, which is used as a conventional proxy for women's status, has any causal effect on freedom of movement. Section 2 discusses the data set and econometric model used, the possible problem of endogeneity in education, and proposed instrumental variables. In section 3, a brief discussion on how the data was handled along with the analysis of the results are presented. The last section concludes with some possible limitations and recommendations.

2 Data and Methodology

2.1 The Data

The data used in the paper is from Bangladesh Integrated Household Survey (BIHS) 2015 and is a statistically representative sample of rural areas of each of the seven administrative divisions in Bangladesh. The survey was conducted on 6,500 households in 325 primary sampling units (PSUs).

2.2 The Econometric Model

The econometric model used to assess whether educational attainment has any causal effect on the female mobility index takes the generalized form as follows.

$$MI = f(F, Hh, I, FE, e)$$

The MI stands for the mobility index in the function, and its construction will be discussed in the next section. MI is a function of the married woman's attributes F (her age, age at marriage, assets brought to marriage in the form of dowry/bride-price, Body Mass Index as her health status and whether she makes cash earnings), household attributes Hh (whether she has a child under two years of age and spousal age ratio), and social and economic inputs, I, (per capita income and religion).

The variable of interest is female educational attainment, FE. However, education as an explanatory variable for freedom of mobility is arguably endogenous. There can be some unobservable characteristics of the woman, U, which cannot be controlled for in the main equation and which affect both her education and physical mobility, as shown in figure 1. For instance, if a girl grows up in a family where girls are treated equally to boys, she may be more educated because the family is willing to spend more to educate its daughters. Moreover, this girl also can grow up to be more independent in her choice of mobility once she gets married. Another example is when the men who choose to marry more educated women also appreciate gender equality, and the wives need not ask for the husbands' permission when they want to go outside. Both examples are problems of confounders shown by the red arrows, and Ordinary Least Squares (OLS) estimation will give biased results.

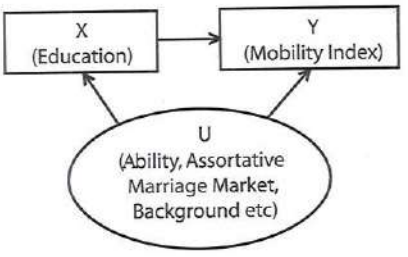
In the case of the endogeneity problem, the error term e might be correlated with FE, and running the Two-Stage Least Squares (2SLS) method with instrumental variable (IV) will give better estimates than OLS. The instrumental variables (Zs) chosen must be correlated with FE but uncorrelated with the error term e as described by the following conditions in Wooldridge (2009).

1. **Exclusion Restriction:** Cov (Z, e) = 0
2. **Relevance Condition:** Cov (Z, e) 6 = 0

An instrument for education can be something that creates variations in schooling for women but is exogenous to the whole system shown in figure 1. Researchers have often used different large-scale educational policy reforms as instruments for educational attainment. For example, Breierova & Duflo (2004) used massive school construction projects in Indonesia, and Osili & Long (2008) used Nigeria's Universal Primary Education program as an instrument for educational attainment. One such reform in Bangladesh was the Female

Secondary School Stipend Programme (FSSSP) which can be used as an instrument. Paternal educations are often used as an instrument for educational attainment as well. A short overview of these three instruments is provided in the following subsection.

Figure 1: Endogeneity in education and biased estimation in OLS



2.3 Instrumenting Education: FSSSP and parental educational attainments

In 1990, the secondary enrolment rate was 33% for girls versus 66% for boys, with a dropout rate of 66% among girls in Bangladesh. Unlike primary education, which was free for all, secondary education cost tuition, examination fees, transport expenses, etc. In a society where girls were married off and sent to their husbands' homes at a very young age, investment in their secondary education seemed futile, especially for rural low-income families.

The FSSSP was introduced in 1992 at Upazila/sub-district levels, the second-lowest tier of the regional administration. There were 490 Upazilas in Bangladesh, 30 of which were metropolitan and never received FSSSP intervention. Any girl residing in the intervention area (460 rural Upazilas) who had successfully completed grade 5 was eligible to receive FSSSP benefits from grade 6 to 10 if she met three conditions: a minimum of 75% class attendance, at least 45% marks on average in the final examinations and she had to remain unmarried until the completion of Secondary School Certificate (SSC) examination after grade 10. The benefits provided by FSSSP were full tuition fees paid directly to the schools, an annual stipend for the girl in two instalments in the form of deposits in a savings account of a national bank which increased by grade, Secondary School Certificate (SSC) examination fees and costs of books and school supplies. The FSSSP's three primary objectives were: (i) to increase female secondary enrolment rate and decrease the dropout rate, (ii) to delay early marriage among teenage girls and reduce fertility, and (iii) to increase employability in the future.

The FSSSP first started in 1992 with only seven pilot rural Upazilas. It expanded pretty quickly in 1994 to cover 441 rural Upazilas in addition. In 1997

all 460 rural Upazilas were under the FSSSP. The programme coverage over time is tabulated in table 1 in the appendix. Because of how it was rolled out, exposure to FSSSP was determined by a girl's birth year and the Upazila she was living in when she was in her secondary school-going age, between 11 and 15 years in Bangladesh for girls attending grade 6 to 10. Older girls born before 1979 had no exposure at all as nationwide FSSSP had not started before 1994 when they were already 15 years old. For girls born between 1980 and 1985, exposure was partial since the programme was still being rolled out when they were in secondary schools. Any girl born in a rural Upazila in 1986 or later received full FSSSP benefit, and no one from the 30 metropolitan Upazilas received FSSSP. The pattern of exposure is shown in table 2 in the appendix.

The validity of FSSSP as an instrument for educational attainment lies in the fact that it was like a natural experiment, and exposure was randomly determined only by birth year and in which Upazila the girls were residing. This makes it entirely exogenous for their unobservable characteristics that cannot be controlled. The programme was not designed to start from the worst-off regions or was not exclusively for poor-income families because the monitoring cost to ensure only girls from lower-income families would get the benefits would surpass the marginal gain. Moreover, it could attach unwanted stigma around the beneficiaries of FSSSP, which the policy-makers did not want. The considerable success of FSSSP in achieving its objective of increasing female secondary school enrolment rate and reducing dropout rate has been well-documented in many studies, e.g., in Hahn et al. (2018) and Schurmann (2009), making it correlated with the educational attainment of the girls. Both these points, as demonstrated below, make FSSSP a valid instrument for the educational attainment of women in Bangladesh.

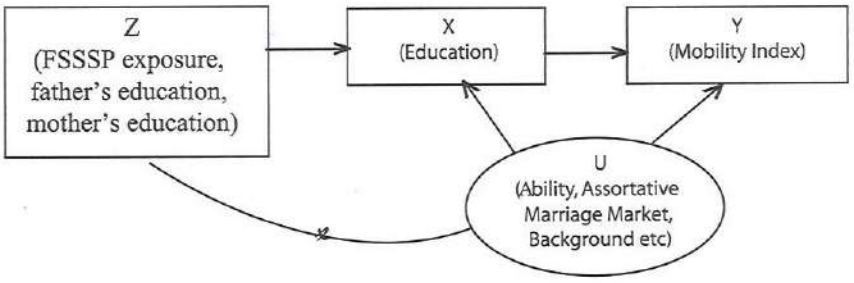
Two more instruments are used for married women's educational attainment-father's education and mother's education. More educated parents are aware of the benefits of educating girls, and in cases where higher education is associated with higher social class, educated parents can also afford to send their daughters to school longer. Parental education need not be associated with mobility once the girl gets married. The use of these three instruments to address endogeneity in education is shown in figure 2.

3 Econometric Estimation

3.1 Descriptive Statistics

Table 3 in the appendix gives a brief description of each variable used. The outcome variable of the mobility index is constructed by a simple summative index of who decided on a woman's mobility in three places- outside the

Figure 2: FSSSP and parental education as instruments for education



community to visit her friends/family, in market-places within the village, and her visits to health care centers. The responses in the survey were recoded so that women who were sole-decision makers on each domain would get the highest score of 2, those who made decisions jointly with husbands/in-laws scored 1, and those who had no say at all in their mobility scored 0. Therefore, the average in three domains could range from a maximum of 2 to a minimum of 0. It must be mentioned here that there were two other places included in the survey- whether she could go to cinema/fair and training programmes. These were intentionally excluded while constructing the mobility index because the number of observations fell from 6286 to 5482, which is a problem since 2SLS can be biased in small samples.

Among the women's attributes were age and age at marriage, which had 39.6 and 16.8 years, respectively. The wife-to-husband's age ratio was on average 0.8. The Body Mass Index (BMI) was calculated from the women's survey data on height and weight to indicate health status, and the mean BMI score was 21.5. The formula used to calculate BMI from height and weight is given below.

$$BMI = \frac{Weight\ (kg)}{Height\ (m^2)}$$

The variable on 'asset brought to marriage' was calculated as the aggregate value (in taka) of the list of all the goods brought from a woman's parents' house as dowry/bride-price, which is a common practice in many South-Asian countries. Since the context is rural Bangladesh, almost 80% of women make cash earnings primarily by contributing to family farms, as shown by the 'work for cash' dummy. The dummy variable 'work outside household' shows that only 30% of

women work outside, and the sample size falls to 4101, which is not desirable in 2SLS estimation. Adding both- 'work for cash' and 'work outside household' variables- gives rise to multicollinearity problems, and one is automatically excluded in regressions. A conscious decision was made to only include 'work for cash' because working outside can itself be endogenous.

Moreover, in the rural agricultural context, most female labor participation is in family farms and not outside. About 16% of the women had a child under two years of age, which is an important variable because mothers, the primary caretakers of younger children, can have lower physical mobility. Average female education was a little lower than their male counterparts (3.24 versus 3.47 years). It should be mentioned here that the survey questionnaire had a list of different degrees completed, and these had to be recoded to appropriate years of education. Only 9% of the husbands' worked in an urban area, as shown by the husband's workplace dummy, which takes the value 1 if the husband worked in an urban area. Data on different income-earning activities of the household's members were available, which were aggregated and then divided by the total number of household members to get each household's per capita monthly income. Almost 90% of the households in the sample had a Muslim household head. The sample excludes all female-headed households since their scores in the mobility index could be driven by necessity rather than choice and will not be appropriate indications of their freedom of mobility.

3.2 Results and Analysis

Table 4 presents the findings from different regressions and standard post-estimation tests that follow the 2SLS method. All standard errors are robust to address any possible heteroscedasticity problem.

Regression (1) is a 2SLS estimation where endogeneity in education is addressed using three instruments: the FSSSP intervention, father's education, and mother's education. All three instruments satisfy the relevance condition and exclusion restriction assumptions of 2SLS. The F statistic from the first stage is well above the 'rule-of-thumb' value of 10, indicating that the instruments have explanatory power. A woman with an additional score in BMI, holding other factors constant, on average has 0.0056 higher score in mobility index at 5% level of significance. Working for cash earnings is also positively associated with mobility at 1% level of significance. The Durbin-Wu- Hausman test for endogeneity indicates that education is in fact endogenous by rejecting the null of erogeneity (with p value of 0.04). Lastly, the p-value of the Sargan test (0.21) cannot reject the null, indicating that the instruments are valid.

An interesting exercise is carried out in regression (2) with one additional but weak instrument- whether the woman was raised in a low-income household. If monetary constraints were strong enough to reduce educational attainment for girls, this would be a valid instrument. However, although BMI and cash earning remain significant in affecting mobility, the p-value (0.08) in the Sargan test rejects the null, indicating that the over-identifying restrictions are not valid. It is expected after checking that the correlation between low-income family history and educational attainment is almost close to zero (-0.09), which violates the relevance condition. Results in these regressions are less reliable as it contains an 'uninformative and redundant' instrument similar to what Andrews et al. (2017) suggested in their paper. Adding more instruments in (2) also leads to a fall in F statistic from 674.3 to 528.4, indicating that more instruments are weaker together.

Regression (3) attempts to control for some of the husband's attributes like educational attainment and a dummy of whether he works in an urban area in a 2SLS regression using the same three instruments as in (1). Surprisingly the Durbin-Wu-Hausman's diagnostic test for endogeneity gives a p-value of 0.14, failing to reject the null that education is exogenous! This could indicate that the source of endogeneity is due to assortative marriage market selection, and if husband's or in-law's attributes are controlled, OLS and 2SLS will both be consistent, but OLS should be used as it will be more efficient, especially in small samples. However, an OLS including only these two husband attributes is not reported because the p-value is not too low (0.14 is just a little above 0.10), and possibly better controls are required to obtain efficient OLS estimates.

It is a good practice to compare 2SLS with OLS estimates. The last regression (4) is simply the OLS version of regression (1). In addition to an F statistic from the first stage being below 10, another manifestation of weak instruments is when the standard errors of 2SLS are much larger than that of OLS. Here, the standard errors in (1) are between 1 to 1.89 times larger than in (4), which is not too high.

In the OLS regression, age and age2 significantly affect mobility- older women tend to have more mobility, but after some certain age, their mobility decrease. The coefficients on education and 'asset brought to marriage' surprisingly switch signs between OLS and 2SLS. The negative sign for the coefficients of education in all three 2SLS regressions is similar to what Balk (1997) found using data from 1994 and explained education as a signal of social class; the women who could afford higher education were also the ones who could afford to practice seclusion. The coefficient on education has a positive sign only in the OLS regression but is still insignificant. However, the inverse relation in the 2SLS regressions is not meaningful as education simply does not affect the mobility index.

4 Conclusion

The results suggest that educational attainment does not affect freedom of mobility for rural women in Bangladesh by using instrumental variables for education to address the possible endogeneity problem. The paper also shows that after controlling for the husband's attributes, the econometric test suggests education is no longer endogenous. This indicates that the source of endogeneity could be some assortative marriage market selection. The variables that show a positive association with women's mobility are her health status and whether she works for cash earnings. The findings of this paper go in line with Balk (1997), where higher education was associated with higher social class rather than female autonomy.

A few points should be mentioned in this context. Firstly, contrary to what this paper assumes for simplification, sole decision-making, in some rare cases, is not always superior to joint decision-making. For instance, a husband who is alcoholic or addicted to gambling, although physically present, may not care for or participate in decisions about the children's health and education. In this case, the wife may be forced to make decisions alone even if it is not her most preferred option. Secondly, educational attainment measured by years of schooling can be very different from secular education. The latter can broaden the mind-set and reduce conformity to gender norms. Therefore, the findings above caution researchers who use years of education as a proxy for women's status. Lastly, without sufficient controls of the husband's and the society's attributes, any causal interpretation should be made with care.

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Appendix

Table 1: FSSSP timeline and coverage (out of total 490 Upazilas)

Year	Upazila covered	Cumulative coverage
1992	7	7
1994	441	448
1997	12	460

Table 2: Exposure to FSSSP determined by birth year and Upazila

Birth year	Upazila type	Exposure to FSSSP
1979 & before	Rural	None
1980-1985	Rural	Partial
1986 & later	Rural	Full
Any	Urban	None

Table 3: Descriptive Statistics of the data

Variable	Observation	Mean	Std. Dev.	Min	Max
Mobility index	6286	0.92	0.587	0	2
Age	5112	39.6	11.436	18	90
Age at marriage	5112	16.8	3.093	8	38
Wife/husband age ratio	4970	0.83	0.077	0.413	1.25
Body Mass Index (BMI)	5220	21.5	3.968	11.186	43.024
Asset brought to marriage	6437	23258	61564	0	2018000
Work for cash	5232	0.78	0.412	0	1
Work outside household	4101	0.3	0.458	0	1
Child under 2 years	6436	0.16	0.364	0	1
Education	5112	3.24	3.537	0	17
Husband's education	5212	3.47	4.102	0	17
Husband's workplace dummy	4945	0.09	0.286	0	1
Per capita monthly income	6436	1673	1861	0	50000
Religion	6656	0.88	0.325	0	1

Table 4: Results from 2SLS and OLS regressions

	IV=3 (1)	(2) IV=4	(3) With controls	(4) OLS
Education	0.0063 (0.0055)	0.0049 (0.0055)	0.0055 (0.0079)	0.0030 (0.0029)
Age	0.0066 (0.0059)	0.0071 (0.0059)	0.0048 (0.0069)	0.0101* (0.0056)
Age squared*	0.0095 (0.0066)	0.0099 (0.0066)	0.0070 (0.0079)	0.0125* (0.0064)
Age at marriage	0.0034 (0.0032)	0.0032 (0.0032)	0.0025 (0.0034)	0.0018 (0.0031)
Asset brought to marriage	0.1544 (1.8491)	0.0315 (1.8537)	0.4074 (1.7930)	0.6561 (1.8432)
Body Mass Index	0.0056** (0.0025)	0.0054** (0.0025)	0.0044* (0.0026)	0.0041* (0.0024)
Child under 2 years	0.0430 (0.0272)	0.0431 (0.0272)	0.0455 (0.0279)	0.0427 (0.0271)
Work for cash	0.0607*** (0.0227)	0.0603*** (0.0227)	0.0618*** (0.0236)	0.0575** (0.0226)
Wife/husband age ratio	0.0785 (0.1297)	0.0752 (0.1296)	0.0025 (0.1368)	0.0628 (0.1286)
Average monthly income (in thousands)	0.0028 (0.0048)	0.0025 (0.0048)	0.0022 (0.0049)	0.0012 (0.0048)
Religion	0.0127 (0.0274)	0.0121 (0.0273)	0.0122 (0.0280)	0.0104 (0.0272)
Husband's education			0.0012 (0.0042)	
Husband's workplace			0.0289(0.0320)	
Observations	4176	4176	3987	4195
Wu	4.30	3.20	2.17	
Wu_pv	0.04	0.07	0.14	
firstF	674.29	528.36	376.23	
firstF	3.00	4.00	3.00	
Sarg	3.12	6.79	3.89	
Sarg_pv	0.21	0.08	0.14	
Sarg_df	2.00	3.00	2.00	

Robust standard errors in parentheses; * p< 0.10, ** p< 0.05, *** p< 0.01

"Age squared=(Age*Age)/100 to obtain presentable estimates and standard errors