**Online Appendix**

**Child marriage and reproductive health of Indian women**

**Appendix Table A1:** **Descriptive statistics of outcome variables by state of residence**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables of Interest | UP-Bihar | | Other States | |  |
|  | Mean | Std. Dev. | Mean | Std. Dev. | p-value |
| Incidence of child marriage | 0.591 | 0.492 | 0.332 | 0.471 | 0.00 |
| Age at marriage (in years) | 16.54 | 2.970 | 18.80 | 3.450 | 0.00 |
| ***Panel A: Family planning & contraceptive usage*** | | | | | |
| Advice modern method | 0.859 | 0.348 | 0.887 | 0.316 | 0.00 |
| Know modern method | 0.288 | 0.453 | 0.447 | 0.497 | 0.00 |
| Likely to use modern method | 0.845 | 0.361 | 0.930 | 0.255 | 0.00 |
| Current use | 0.229 | 0.420 | 0.340 | 0.474 | 0.00 |
| ***Panel B: Birth history*** | | | | | |
| Low fertility pregnancies | 0.658 | 0.474 | 0.767 | 0.423 | 0.00 |
| No spontaneous abortion | 0.858 | 0.349 | 0. 909 | 0.288 | 0.00 |
| Age at first birth more than 18 | 0.753 | 0.431 | 0.798 | 0.402 | 0.00 |
| No lost child | 0.694 | 0.461 | 0.834 | 0.372 | 0.00 |
| ***Panel C: Antenatal care*** | | | | | |
| Register last pregnancy | 0.459 | 0.498 | 0.728 | 0.445 | 0.00 |
| Received antenatal care (ANC) | 0.625 | 0.484 | 0.775 | 0.418 | 0.00 |
| ANC from formal place | 0.768 | 0.422 | 0.969 | 0.173 | 0.00 |
| At least 4 ANC visits | 0.130 | 0.337 | 0.523 | 0.499 | 0.00 |
| ***Panel D: Natal & post-natal care*** | | | | | |
| Formal delivery place | 0.258 | 0.437 | 0.505 | 0.500 | 0.00 |
| Formal delivery conduct | 0.085 | 0.279 | 0.140 | 0.347 | 0.00 |
| Delivery status | 0.058 | 0.233 | 0.116 | 0.320 | 0.00 |
| Check-up within 48 hours | 0.298 | 0.457 | 0.500 | 0.500 | 0.00 |

Note: The p-value reports the results from the t-test that the outcome variables for the two groups of women (those residing in UP & Bihar and in other states) are equal. See footnote of Table 1 for a detailed discussion of the different variables used as the outcome variables.

**Appendix Table A2: Descriptive Statistics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables of Interest | Observation | Mean | Std. Dev. | Min | Max |
| Incidence of Child marriage | 164,975 | 0.391 | 0.488 | 0.00 | 1.00 |
| **Control variables** |  |  |  |  |  |
| Household size | 164,975 | 6.516 | 3.245 | 1.00 | 48.00 |
| Number of females | 164,975 | 3.248 | 1.888 | 1.00 | 28.00 |
| Number of children (aged 5+ to 18 years) | 164,975 | 1.625 | 1.530 | 0.00 | 14.00 |
| Number of adults | 164,975 | 3.240 | 1.705 | 0.00 | 25.00 |
| Highest education (in years) | 164,975 | 7.439 | 3.266 | 0.00 | 25.00 |
| Average education (in years) | 164,975 | 5.547 | 2.520 | 0.00 | 19.50 |
| Religions (Ref: Other religions) | |  |  |  |  |
| Hindu dummy | 164,975 | 0.756 | 0.429 | 0.00 | 1.00 |
| Muslim dummy | 164,975 | 0.071 | 0.257 | 0.00 | 1.00 |
| Christian dummy | 164,975 | 0.079 | 0.270 | 0.00 | 1.00 |
| Caste Category (Ref: General castes) | |  |  |  |  |
| SC dummy | 164,975 | 0.153 | 0.360 | 0.00 | 1.00 |
| ST dummy | 164,975 | 0.177 | 0.381 | 0.00 | 1.00 |
| OBC dummy | 164,975 | 0.354 | 0.478 | 0.00 | 1.00 |
| Asset quintiles (Ref: Poorest) |  |  |  |  |  |
| Poor | 164,975 | 0.162 | 0.369 | 0.00 | 1.00 |
| Middle | 164,975 | 0.235 | 0.424 | 0.00 | 1.00 |
| Rich | 164,975 | 0.296 | 0.456 | 0.00 | 1.00 |
| Richest | 164,975 | 0.218 | 0.413 | 0.00 | 1.00 |
|  |  |  |  |  |  |

**Appendix Table A3: Regression results with full set of controls**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Advice about modern methods | | | |
|  |  | OLS  All Sample | IV  All Sample | OLS  UP & Bihar | OLS  Age Group:  20-24 |
| Variables of Interest |  | |  |
|  |  |  |  |  |  |
| Incidence of Child Marriage |  | -0.101 | -0.001 | 0.010 | -0.003 |
|  |  | (0.112) | (0.006) | (0.010) | (0.011) |
| Household size |  | 0.007\* | 0.007\* | 0.001 | 0.002 |
|  |  | (0.004) | (0.004) | (0.005) | (0.005) |
| Household size squared |  | -0.000\* | -0.000\* | -0.000 | -0.000 |
|  |  | (0.000) | (0.000) | (0.000) | (0.000) |
| Number of females |  | 0.001 | 0.000 | 0.001 | -0.001 |
|  |  | (0.003) | (0.003) | (0.004) | (0.006) |
| Number of children |  | -0.001 | -0.002 | -0.003 | -0.006 |
|  |  | (0.002) | (0.002) | (0.002) | (0.003) |
| Number of adults |  | -0.005\*\* | -0.004\*\* | -0.002 | -0.009\*\*\* |
|  |  | (0.002) | (0.002) | (0.003) | (0.003) |
| Highest education |  | -0.005 | -0.001 | 0.001 | 0.000 |
|  |  | (0.004) | (0.001) | (0.002) | (0.002) |
| Average education |  | -0.005\*\*\* | -0.005\*\*\* | -0.010\*\*\* | -0.008\*\* |
|  |  | (0.002) | (0.002) | (0.003) | (0.003) |
| Religion (Ref: Other religions) | | | | | |
| Hindu dummy |  | -0.006 | -0.010 | -0.064 | -0.024 |
|  |  | (0.015) | (0.014) | (0.059) | (0.025) |
| Muslim dummy |  | -0.004 | -0.016 | -0.094 | -0.013 |
|  |  | (0.023) | (0.019) | (0.062) | (0.032) |
| Christian dummy |  | -0.069\*\*\* | -0.070\*\*\* | -0.008 | -0.086\* |
|  |  | (0.024) | (0.024) | (0.133) | (0.048) |
| Caste Category (Ref: General castes) | |  |  |  |  |
| SC dummy |  | 0.001 | -0.003 | -0.031\*\* | 0.015 |
|  |  | (0.010) | (0.009) | (0.014) | (0.015) |
| ST dummy |  | 0.008 | 0.007 | -0.076 | 0.031\* |
|  |  | (0.012) | (0.012) | (0.055) | (0.018) |
| OBC dummy |  | -0.016\* | -0.019\*\* | -0.042\*\*\* | -0.007 |
|  |  | (0.009) | (0.008) | (0.010) | (0.014) |
| Asset quintiles (Ref: Poorest) |  |  |  |  |  |
| Poor |  | 0.009 | 0.014 | 0.013 | 0.034\* |
|  |  | (0.013) | (0.012) | (0.014) | (0.020) |
| Middle |  | 0.008 | 0.016 | 0.014 | 0.034\* |
|  |  | (0.015) | (0.012) | (0.015) | (0.020) |
| Rich |  | -0.018 | -0.005 | 0.012 | 0.027 |
|  |  | (0.019) | (0.012) | (0.016) | (0.021) |
| Richest |  | -0.014 | 0.002 | -0.001 | 0.046\* |
|  |  | (0.023) | (0.014) | (0.021) | (0.025) |
|  |  |  |  |  |  |
| Constant |  | 0.933\*\*\* | 0.885\*\*\* | 0.988\*\*\* | 1.009\*\*\* |
|  |  | (0.063) | (0.034) | (0.065) | (0.050) |
|  |  |  |  |  |  |
| State-fixed effects |  | Yes | Yes | Yes | Yes |
| Observations |  | 14,650 | 14,650 | 7,428 | 4,466 |
| R-squared |  | 0.026 |  | 0.008 | 0.058 |

Note: Standard errors are clustered at the PSU-level. Clustered standard errors are

presented in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Appendix Table A4: First-stage results (For urban households)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Advice modern method** | **Know modern method** | **Likely to use modern method** | **Current use** |
| *Annual rainfall* | -0.0004\*\*\* | -0.0004\*\*\* | -0.0002\*\*\* | -0.0004\*\*\* |
|  | (0.0001) | (0.0001) | (0.0002) | (0.0001) |
|  |  |  |  |  |
| Observations | 6,322 | 52,008 | 4,018 | 30,372 |
| R-squared | 0.173 | 0.164 | 0.174 | 0.163 |
| F-stat | 7.671 | 60.438 | 0.748 | 32.015 |
|  |  |  |  |  |
|  | **Age at first birth more than 18 years** | **Low fertility pregnancies** | **No lost child** | **No spontaneous abortion** |
| *Annual rainfall* | -0.0004\*\*\* | -0.0003\*\*\* | -0.0004\*\*\* | -0.0004\*\*\* |
|  | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
|  |  |  |  |  |
| Observations | 46,217 | 8,372 | 52,062 | 52,064 |
| R-squared | 0.170 | 0.139 | 0.164 | 0.164 |
| F-stat | 46.691 | 6.755 | 60.832 | 61.032 |
|  |  |  |  |  |
|  | **Register last pregnancy** | **Received ANC** | **ANC from formal place** | **At least 4 ANC visits** |
| *Annual rainfall* | -0.0004\*\*\* | -0.0004\*\*\* | -0.0004\*\*\* | -0.0004\*\*\* |
|  | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
|  |  |  |  |  |
| Observations | 16,183 | 16,185 | 15,027 | 14,838 |
| R-squared | 0.165 | 0.165 | 0.156 | 0.155 |
| F-stat | 25.587 | 25.537 | 20.761 | 19.863 |
|  |  |  |  |  |
|  | **Formal delivery place** | **Formal delivery conduct** | **Delivery status** | **Check-up within 48 hours** |
| *Annual rainfall* | -0.0004\*\*\* | -0.0009\*\*\* | -0.0004\*\*\* | -0.0004\*\*\* |
|  | (0.0001) | (0.0003) | (0.0001) | (0.0001) |
|  |  |  |  |  |
| Observations | 16,152 | 3,295 | 16,183 | 16,184 |
| R-squared | 0.166 | 0.151 | 0.166 | 0.165 |
| F-stat | 24.900 | 10.489 | 25.827 | 25.525 |

Note: State-fixed effects are controlled in each regression. Standard errors are clustered at the PSU-level. Clustered standard errors are presented in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The coefficients related to only the instrumental variable, *Annual rainfall,* is theaverage annual rainfall in the district during 2005 and 2006. These are the coefficients associated with the *Annual rainfall* from the first stage of the respective IV regressions, with the outcomes of child marriage as the dependent variable and *Annual rainfall* as the variable of interest. See footnote of Table 3 for the control variables used in the analysis and footnote of Table 1 for a detailed discussion of the different variables used as the outcome variables.

**Appendix Table A5: Regression estimates for incidence of marriage within 16 years on different outcomes**

|  |  |  |  |
| --- | --- | --- | --- |
| **Panel A: Family planning and contraceptive usage**  Variables of Interest | OLS  All Sample | IV  All sample |  |
| **Advice modern method** | -0.012\* | -0.152 |  |
|  | (0.007) | (0.170) |  |
| Observations | 14,650 | 14,650 |  |
| R-squared | 0.044 |  |  |
|  |  |  |  |
| **Know modern method** | -0.007\*\* | 0.146\* |  |
|  | (0.004) | (0.088) |  |
| Observations | 104,651 | 104,651 |  |
| R-squared | 0.150 |  |  |
|  |  |  |  |
| **Likely to use modern method** | 0.018\*\*\* | 0.189 |  |
|  | (0.007) | (0.129) |  |
| Observations | 11,533 | 11,533 |  |
| R-squared | 0.070 |  |  |
|  |  |  |  |
| **Current use** | -0.007 | -0.248\*\* |  |
|  | (0.005) | (0.126) |  |
| Observations | 55,873 | 55,873 |  |
| R-squared | 0.123 |  |  |
| **Panel B: Birth History**  Variables of Interest | OLS  All Sample | IV  All sample |
| **Low Fertility pregnancies** | -0.036\*\*\* | -0.204 |
|  | (0.007) | (0.160) |
| Observations | 24,955 | 24,955 |
| R-squared | 0.092 | 0.067 |
|  |  |  |
| **No spontaneous abortion** | -0.019\*\*\* | -0.124\*\*\* |
|  | (0.002) | (0.035) |
| Observations | 105,104 | 105,104 |
| R-squared | 0.016 |  |
|  |  |  |
| **Age at first birth more than 18** | -0.526\*\*\* | -0.752\*\*\* |
|  | (0.004) | (0.029) |
| Observations | 90,026 | 90,026 |
| R-squared | 0.445 |  |
|  |  |  |
| **No Lost children** | -0.062\*\*\* | -0.133\*\*\* |
|  | (0.003) | (0.037) |
| Observations | 105,110 | 105,110 |
| R-squared | 0.049 |  |
| **Panel C: Antenatal care**  Variables of Interest | OLS  All Sample | IV  All sample |
| **Register last pregnancy** | -0.029\*\*\* | -0.235\*\*\* |
|  | (0.005) | (0.088) |
| Observations | 39,616 | 39,616 |
| R-squared | 0.148 |  |
|  |  |  |
| **Received ANC** | -0.026\*\*\* | -0.384\*\*\* |
|  | (0.005) | (0.085) |
| Observations | 39,623 | 39,623 |
| R-squared | 0.147 |  |
|  |  |  |
| **ANC from formal place** | -0.002 | -0.029 |
|  | (0.004) | (0.040) |
| Observations | 33,467 | 33,467 |
| R-squared | 0.095 |  |
|  |  |  |
| **At least 4 ANC visits** | -0.023\*\*\* | -0.387\*\*\* |
|  | (0.006) | (0.096) |
| Observations | 33,193 | 33,193 |
| R-squared | 0.292 |  |
| **Panel D: Natal and post-natal care**  Variables of Interest | OLS  All Sample | IV  All sample |
| **Formal delivery place** | -0.048\*\*\* | -0.010 |
|  | (0.006) | (0.110) |
| Observations | 39,524 | 39,524 |
| R-squared | 0.215 |  |
|  |  |  |
| **Formal delivery conduct** | -0.010 | 0.956\*\* |
|  | (0.006) | (0.466) |
| Observations | 17,453 | 17,453 |
| R-squared | 0.074 |  |
|  |  |  |
| **Formal delivery status** | -0.024\*\*\* | -0.178\*\* |
|  | (0.004) | (0.075) |
| Observations | 39,628 | 39,628 |
| R-squared | 0.072 |  |
|  |  |  |
| **Check-up within 48 hours** | -0.049\*\*\* | -0.254\*\* |
|  | (0.006) | (0.107) |
| Observations | 39,629 | 39,629 |
| R-squared | 0.203 |  |

Note: The coefficient of incidence of marriage within 17 years related to the outcome variables has been reported. All regressions also control for the usual control variables such as household size, household size squared, number of females, number of children aged 5-18 years, number of adults in the household, highest education in the household, average education in the household, religion categories (Hindu, Muslim, Christian and Others), caste categories (General, SC, ST and OBC), region categories (urban or rural) and asset quintiles based on the wealth index (poorest, poor, middle, rich and richest). State-fixed effects are controlled in each regression. Standard errors are clustered at the PSU-level. Clustered standard errors are presented in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. See footnote of Table 1 for a detailed discussion of the different variables used as the outcome variables.

**Not for publication: Available only upon request**

**Extra Table 1: Regression results for child marriage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Age at  Marriage (in years) | |
| Variables of Interest | Incidence of Child Marriage | |
|  |  |  |  |  |
| Household size | 0.013\*\*\* | 0.016\*\*\* | -0.142\*\*\* | -0.182\*\*\* |
|  | (0.001) | (0.001) | (0.009) | (0.010) |
| Household size squared | -0.000\*\*\* | -0.000\*\*\* | 0.003\*\*\* | 0.004\*\*\* |
|  | (0.000) | (0.000) | (0.000) | (0.000) |
| Number of females | -0.004\*\*\* | -0.003\*\* | 0.047\*\*\* | 0.050\*\*\* |
|  | (0.001) | (0.001) | (0.009) | (0.009) |
| Number of children | 0.007\*\*\* | 0.008\*\*\* | -0.060\*\*\* | -0.079\*\*\* |
|  | (0.001) | (0.001) | (0.005) | (0.005) |
| Number of adults | -0.004\*\*\* | -0.007\*\*\* | 0.038\*\*\* | 0.054\*\*\* |
|  | (0.001) | (0.001) | (0.005) | (0.005) |
| Highest education | -0.035\*\*\* | -0.036\*\*\* | 0.293\*\*\* | 0.311\*\*\* |
|  | (0.000) | (0.000) | (0.003) | (0.003) |
| Average education | 0.005\*\*\* | 0.004\*\*\* | -0.014\*\*\* | 0.003 |
|  | (0.001) | (0.001) | (0.004) | (0.004) |
| Religion (Ref: Other religions) | | | | |
| Hindu dummy | 0.068\*\*\* | 0.137\*\*\* | -0.534\*\*\* | -1.106\*\*\* |
|  | (0.006) | (0.004) | (0.048) | (0.033) |
| Muslim dummy | 0.085\*\*\* | 0.120\*\*\* | -0.710\*\*\* | -0.757\*\*\* |
|  | (0.008) | (0.007) | (0.064) | (0.049) |
| Christian dummy | 0.006 | -0.017\*\*\* | 0.016 | 0.728\*\*\* |
|  | (0.007) | (0.006) | (0.066) | (0.055) |
| Caste Category (Ref: General castes) | |  |  |  |
| SC dummy | 0.032\*\*\* | 0.029\*\*\* | -0.371\*\*\* | -0.345\*\*\* |
|  | (0.004) | (0.004) | (0.026) | (0.029) |
| ST dummy | -0.002 | -0.003 | -0.097\*\*\* | 0.051 |
|  | (0.005) | (0.005) | (0.037) | (0.036) |
| OBC dummy | 0.032\*\*\* | 0.050\*\*\* | -0.326\*\*\* | -0.421\*\*\* |
|  | (0.003) | (0.003) | (0.023) | (0.025) |
| Asset quintiles (Ref: Poorest) |  |  |  |  |
| Poor | -0.029\*\*\* | -0.029\*\*\* | 0.157\*\*\* | 0.146\*\*\* |
|  | (0.005) | (0.005) | (0.033) | (0.034) |
| Middle | -0.062\*\*\* | -0.077\*\*\* | 0.350\*\*\* | 0.419\*\*\* |
|  | (0.005) | (0.005) | (0.034) | (0.035) |
| Rich | -0.108\*\*\* | -0.137\*\*\* | 0.648\*\*\* | 0.768\*\*\* |
|  | (0.005) | (0.005) | (0.035) | (0.036) |
| Richest | -0.137\*\*\* | -0.176\*\*\* | 0.998\*\*\* | 1.124\*\*\* |
|  | (0.006) | (0.006) | (0.041) | (0.042) |
| States (Ref: Other states) |  |  |  |  |
| Uttar Pradesh & Bihar |  | 0.165\*\*\* |  | -1.440\*\*\* |
|  |  | (0.004) |  | (0.028) |
| Constant | 0.425\*\*\* | 0.506\*\*\* | 18.260\*\*\* | 17.480\*\*\* |
|  | (0.012) | (0.009) | (0.096) | (0.064) |
|  |  |  |  |  |
| State-fixed effects | Yes |  | Yes |  |
| Observations | 164,975 | 164,975 | 164,975 | 164,975 |
| R-squared | 0.190 | 0.161 | 0.293 | 0.239 |

Note: Standard errors are clustered at the PSU-level. Clustered standard errors are

presented in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Extra Figure 1: Plot showing association between district wise average annual rainfall and average household wealth for rural households possessing agricultural land**

**Extra Figure 2: Plot showing association between district wise average annual rainfall and average household wealth for rural households not possessing any agricultural land**