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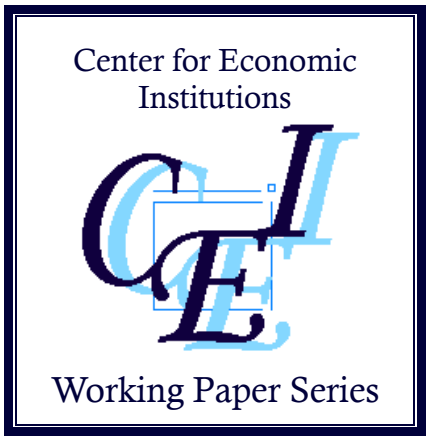

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Impacts of Institutional Changes in Cambodia under the Pol Pot Regime *

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Abstract

This paper presents an econometric analysis of impacts of the communist revolution by the Khmer Rouge (1975-'79) in Cambodia on economic behaviors of survivors after 1979. Specifically, we compare forced marriages in the Pol Pot regime with regular marriages after its collapse, and make econometric evaluations of their educational investments for children. Our econometric results are interpreted as meaning that forced-marriage couples invested less in their children's education than the regular-marriage couples. We consider those results, by reflecting upon social and political structures of Cambodia under and after the Pol Pot regime.

Key words: educational investments for children, family organizations, institutions, norms, political economy, violence

JEL Codes: I24, N35, O12, P26

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1 Introduction

We present an econometric analysis of impacts of the communist revolution by the Khmer Rouge in Cambodia on economic behaviors of survivors after 1979. The Pol Pot regime built by the Khmer Rouge ruled Cambodia in a form of primitive communism from 1975 to 1979, and totally changed the former Cambodian social system before 1975. It is well known that the Pol Pot regime led the entire country into genocidal situations. It destroyed socioeconomic and cultural lives of people, e.g., complete denials of private ownerships and also marriages forced by the state; it affected all citizens severely in many ways. It is widely believed that this period has had long-term effects on economic behaviors of the citizens. In this paper, we study such long-term effects on economic behaviors of the citizens, specifically educational investments for children.[1]

We focus on forced marriages in the Pol Pot regime, and examine the difference in educational investments for children between forced marriages in the Pol Pot regime and regular marriages after 1979. Although forced marriage sounds little related to the complete denials of private ownerships, it resulted from the socioeconomic principles of the Pol Pot regime. The denials included not only material private possessions of, say, lands, houses, and tools, but also possessions of one's own family members: spouses and children were owned by the state (Short 2004, pp. 316-317).

Forced marriage took place in significant proportion to the total in the period of the Pol Pot regime. The number of women forced into marriages in the Pol Pot regime was about 250 thousands, while the total population was about 7.3 million (Immigration and Refugee Board of Canada 2003, Ross 1987). The forced marriages formed a great majority of marriages in the Pol Pot regime.[2] A primary purpose of marriage in the Pol Pot regime was to produce "pure" children serving the state, not to form family unit (Dy 2007, p. 35; Short 2004, p. 325). Forced marriage stopped after the collapse of the Pol Pot regime in 1979, and regular marriage (mostly marriage arranged by parents) was reintroduced.

Since 1979, the Cambodian society has returned to a regime with parental ownerships of children, where educational investments for children by parents are as important as in other countries. School reopened in 1979 under the new government (Vickery 1986, pp. 154-159). This regime is coherent to the standard economics literature on family and educational investments, which we call the *post* Pol Pot regime. A study of a comparison between forced marriages in the Pol Pot regime and regular marriages in the post Pol Pot regime may be suggestive for considerations of long-term impacts of the communist revolution by the Khmer Rouge in Cambodia. In this paper, we study differences in educational investments for children between forced-marriage couples in the Pol Pot regime and regular-marriage couples in the post Pol Pot regime.

The standard economics approach is based on very different presumptions on private ownerships and individual attitudes toward children. In the scope of parental ownerships of children, parents are assumed to be altruistic in the sense that parental utility depends on that of children (cf., Becker

[1] In the Pol Pot regime, many intellectuals were executed by the Khmer Rouge; how human capital has been accumulated since the collapse of the Pol Pot regime is one of the most important issues for economic development of Cambodia.

[2] If the proportions of women age 15-24 is 9.4 percent, which is the proportion of women age 15-24 at the time of the 1998 Cambodian Census, and if a half of them are already married, then about 343 thousands women would be candidates for marriage. According to those assumptions, about 73 percent (250/343) of the women of those ages were forced into marriages.

1981; Rosenzweig and Stark 1997; Browning, Chiappori, and Weiss 2011). This is plausible since children belong to a husband/wife; their happiness is a variable in one's utility function. On the other hand, in the Pol Pot regime, children were owned by the state and completely separated from parents after around age 5; the altruism assumption is not applied to one's utility function.

The sets of data for our study are from the post Pol Pot regime; educational investments were made by either forced- or regular-marriage couples after the collapse of the Pol Pot regime in 1979. Nevertheless, if people's behaviors have inertial aspects, then following the basic principles of the Pol Pot and post Pol Pot regimes, these two data sets are expected to show some differences in educational investments for children. Indeed, the parental behaviors differ statistically between the two groups, and such inertial aspects are indispensable for interpretations of our results.

We take the samples of forced- and regular-marriage couples from the complete data set of the 1998 General Population Census of Cambodia. We adopt proximate couples of forced- and regular-marriage couples since it does not have the direct information of identification of the couples. Our samples of forced-marriage couples are couples who had first child under the Pol Pot regime, while those of regular-marriage couples are couples who had first child after it. We will describe how and why we select those couples in the next section.

We provide graphical and econometric analyses, using those samples. In our econometric analyses, we employ an econometric method of program evaluation, which is often used for the evaluation of effects of program or treatments (cf., Imbens and Wooldridge (2009) for a comprehensive survey). We regard the forced-marriage couples as treatment groups and the regular-marriage couples as control groups. Since these two couples are not randomly assigned to one of the two groups, we use a nonexperimental econometric method, specifically *inverse probability weighting* (IPW) *estimation* (cf., Wooldridge 2007; Hirano and Imbens 2001). We will describe this estimation approach in Section 4.

Our results from the graphical and econometric analyses suggest that the forced-marriage couples invested less in their children's education than the regular-marriage couples. We consider those results, by reflecting upon social and political structures of Cambodia under and after the Pol Pot regime. We provide interpretations of those results, by giving discussions of why educational investments for children differ between the forced- and regular-marriage couple and of how those differences are persistent over time after the collapse of the Pol Pot regime in 1979. Those are coherent with our graphical and econometric analyses as well as historical documents on the Pol Pot and post Pol Pot regime in Cambodia.

The paper is organized as follows: Section 2 describes the samples of the forced- and regular-marriage couples used in our study. Section 3 provides graphical analyses. Section 4 presents econometric analyses. Section 5 provides the analyses for the two social classes, newly created in the Pol Pot regime. Section 6 concludes.

2 The Samples of Forced and Regular Marriages

We take the samples of forced and regular marriages from the complete data set of the 1998 General Population Census, which was conducted by the National Institute of Statistics, Ministry of Planning, Cambodia. The 1998 Census micro-data contain information on basic socioeconomic characteristics of households/individuals (e.g., age, education, and housing conditions), but do not include the direct

information of the identification of forced- and regular-marriage couples; we adopt proximate couples of forced- and regular-marriage couples. In this section, we describe the core idea of how we select such couples, and give a brief description of the resulting samples. In Table 13, Appendix, we report the detailed procedures for developing the samples of forced- and regular-marriage couples.

Table 1: Age Tables

Year	A. Children Age 16-20					B. Women Age 34-38				
1971						7	8	9	10	11
1972						8	9	10	11	12
1973						9	10	11	12	13
1974						10	11	12	13	14
1975						11	12	13	14	15
1976						12	13	14	15	16
1977						13	14	15	16	17
1978					0	14	15	16	17	18
1979				0	1	15	16	17	18	19
1980			0	1	2	16	17	18	19	20
1981		0	1	2	3	17	18	19	20	21
1982	0	1	2	3	4	18	19	20	21	22
1983	1	2	3	4	5	19	20	21	22	23
1998	16	17	18	19	20	34	35	36	37	38

Notes: The table consists of two age tables. Panel A shows the ages of children age 16-20 from 1978 to 1983, while Panel B shows those of women age 34-38 from 1971 to 1983. The Pol Pot regime began on April 17, 1975 and fell on January 7, 1979.

We use the information of mother's age and the age of first child as our criteria for selecting forced- and regular-marriage couples.[3] Using Table 1, we explain how we select those couples based on those criteria. Table 1 shows the ages from 1971 to 1983 of children age 16-20 (panel A) and of women age 34-38 (panel B). As shown, since women age 34-38 are 10-14 years old in 1974 (one year before the Pol Pot regime begins), it appears too early to get married before the Pol Pot regime. Thus, if the women had first child under the Pol Pot regime, then they must have got married under it.

We select couples whose wife is 34-38 years of age and first child is 19-20 years of age (born in 1979 and 1978) for forced-marriage couples,[4] and couples whose wife is 34-38 years of age and first child is 16-17 years of age (born in 1982 and 1981) for regular-marriage couples.[5] We exclude couples whose wife is 34-38 years of age and first child is 17 years of age (born in 1980) from the samples of regular

[3]Actually, the age of first child is not available from the 1998 Census micro-data. In our sampling, we address this as follows. First, we regard the child with the oldest age in a household as a candidate of the first child. We then restrict households to those where the number of mother's own children alive is equal to that of children living together in 1998 and all the children have never married. Since any children in those households do not live separately from their parents, the child with the oldest age in the households would be their first child. In our sampling, we assume such child to be first child. For more details, see Table 13, Appendix.

[4]According to the Cambodian Demographic Health Survey (CDHS) 2000, the percentage of women age 35-39 who first married by age 15 is only 1.9; it is certain that the women age 34-38 in 1998 who had first child in 1978-'79 got married under the Pol Pot regime.

[5]Since the 1998 Census was conducted with midnight of March 3, 1998 as the reference time, child age 16 and 17 were born between March 3, 1981 and March 2, 1982, and between March 3, 1980 and March 2, 1981, respectively. Based on these, when calculating the time interval between the collapse of the Pol Pot regime (January 7, 1979) and their birth, we obtain 2.2-3.1 years for child age 16 and 1.2-2.1 years for child age 17. Since, according to the CDHS 2000 micro-data, 50 percent of women age 35-39 had first child within about 1.5 years after marriage, most of our samples of regular-marriage couples have more than 1.5 years of time interval between the collapse of the Pol Pot regime and their birth. Thus, it is probable that the couples with first child age 16 and 17 got married in the post Pol Pot regime. Nevertheless, there is a possibility that forced-marriage couples are included in the samples of regular-marriage couples, particularly with first child age 17. To address this concern, we will examine the difference in educational investments for children between those two groups and show no difference in their children's educational outcomes.

marriages because they might include a high proportion of forced-marriage couples. In selecting those couples, we impose various conditions to reduce unobservable factors affecting educational outcomes. For details, see Table 16, Appendix.

In Table 2, we summarize the resulting samples. From our sampling, we obtain 5,897 forced-marriage couples and 34,994 regular-marriage couples. In column 1, we also give the number of the forced- and regular-marriage couples by different timing of having had first child. As shown, the number of the forced-marriage couples turns out to be much smaller than that of the regular-marriage couples, though Pol Pot wanted to increase population (Short 2004, p. 321).[6] This may imply that it was difficult to give birth to a child and raise a child under the Pol Pot regime.[7]

In column 2-4, we examine mother's marital status of the resulting samples. Since marriage forced by the state is no longer legally binding after the collapse of the Pol Pot regime, one may expect divorce rates to be higher in the forced-marriage couples than in the regular-marriage couples. However, we find that the two groups have similar divorce rates. In our analyses, we restrict the samples to the "married" couples: 5,394 forced-marriage couples and 32,196 regular-marriage couples are used in our analyses. The summary statistics of the samples are presented in Table 17, Appendix.

Table 2: The Samples of Forced and Regular Marriages

	Observations	Married	Divorced	Widowed
	(1)	(2)	(3)	(4)
Forced-marriage couples	5,897	0.915	0.027	0.058
Forced-marriage couples 1978	1,403	0.909	0.027	0.064
Forced-marriage couples 1979	4,494	0.917	0.027	0.057
Regular-marriage couples	34,994	0.920	0.032	0.048
Regular-marriage couples 1981	16,836	0.920	0.032	0.048
Regular-marriage couples 1982	18,158	0.921	0.031	0.048
Total	40,891			

Notes: The table describes the resulting samples of forced and regular marriages. In column 1, we report the number of forced- and regular-marriage couples by the timing of having first child. In column 2-4, we report the proportions of mothers by marital status for the forced- and regular-marriage couples. The couples whose mother's marital status is "never married" or "separated" are already excluded from the samples. Their proportions are very small in both samples.

[6]Our sampling method also partly contributes reduce the number of forced-marriage samples more than that of regular-marriage samples. As mentioned, in our sampling, we focus on the child with the oldest age in a household as a candidate of the first child, and select the households which satisfy the conditions that all children do not live separately from their parents and none of them have married. In imposing those conditions, for the following reasons, it appears that the reduction of the number of the samples is larger in forced-marriage couples than in regular-marriage couples. In our samples, the age of first child of the forced-marriage couples is 19-20, while that of first child of the regular-marriage couples is 16-17. From this difference, the number of first child who had already got married by 1998 should be larger in forced-marriage couples than in regular-marriage couples. In particular, female first child of forced-marriage couples would be more likely to get married because female tends to get married earlier than male: such households would be more likely to be excluded from our samples. Indeed, as shown in Table 14, Appendix, the forced-marriage couples have lower proportions of female first child than the regular-marriage couples. However, such difference in the sex ratio is not seen for the children age 6-14.

[7]This may also imply that the first child of the forced-marriage couples was born under poorer health status than that of the regular-marriage couples. This can result in lower educational outcomes of the first child of the forced-marriage couples (cf., Currie and Madrian 1999). Indeed, we find that the educational outcomes of first child are lower in the forced-marriage couples than in the regular-marriage couples. However, we will argue that the result is not primary driven by the difference in health status at birth.

3 Graphical Analyses

This section presents graphical analyses of educational investments for children by the forced- and regular-marriage couples. In the analyses, we focus on the first child and children age 6-14. According to standard Cambodian education system, children age 6-14 receive 9-year compulsory education; the former already finished it, and the latter currently receive it. Thus, those considerations allow us to explore how educational investments for children differ between the forced- and regular-marriage couples over time after the collapse of the Pol Pot regime. In this section, we first consider educational attainments of their first child, and then look at educational outcomes of their children age 6-14. We also provide some econometric analyses that complement findings from the graphical analyses.

3.1 Educational Attainments of First Child

Figure 1 shows distributions of the educational attainments of the first child of the forced- and regular-marriage couples, which reveals several interesting findings. First, we find a high proportion of children who do not complete any grade. This can be seen for any cohorts, but the children born in 1978 of the forced-marriage couples have a particularly large proportion of grade 0 relative to the other cohorts. As mentioned, in the Pol Pot regime, private ownerships were completely denied and spouses and children were owned by the state. Under this social insitution,[8] parents had no incentives to invest in their children's education. Since the forced-marriage couples with first child in 1978 were subject to the socioeconomic principle of the Pol Pot regime for a longer period of time, they may be most strongly affected by it; thus, they may have less incentive to invest in their children's education than the other couples.

Second, we find an interesting shape of the distributions in grade 1-9, which corresponds to the course of compulsory education in Cambodia. In the course of primary school education (grade 1-6), the proportions of children gradually increase at grade 1 through 5, but sharply drop at grade 6. In the course of lower secondary school education (grade 7-9), they again increase at grade 7 through 8, and then drop at grade 9. We find such distributional features for any cohort, but the first child born in 1978 of the forced-marriage couples appear to have a sharp drop in the proportion between grade 5 and 6 relative to the other cohorts.

Those differences may result from their different behavioral responses to a core ideology of the Pol Pot regime. In the Pol Pot regime, intellectuals were regarded as enemies of the society and ones who should be exterminated from the society. Many of them were, indeed, victimized in the genocides. Interestingly, in the Pol Pot regime, all who had more than basic primary school were considered to be intellectuals (Vickery 1999, p. 39). Thus, given that having basic primary schooling means completion of grade 6, the sharp drop in the proportions of children between grade 5 and 6 may imply that a substantial proportion of the couples, particularly the forced-marriage couples with first child in 1978, stopped sending their children to school just before finishing primary school; they behave as if they avoid having intellectual children. Overall, our findings in Figure 1 might be interpreted as meaning that the forced-marriage couples with first child in 1978 are more likely to behave so as to conform to the *rules* of the Pol Pot regime than the regular-marriage couples.[9]

[8] Money currency and markets were also abolished in the Pol Pot regime (e.g., Dy 2007, p. 2). People engaged in forced labor without any payment.

[9] In the Pol Pot regime, people were forced to conform to the rules of the Pol Pot regime. Since the forced-marriage

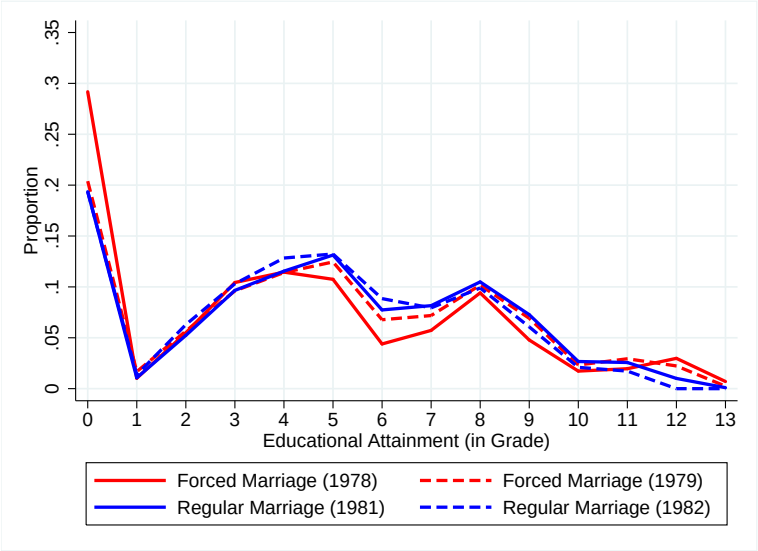


Figure 1: Distribution of Educational Attainments of the First Child

Notes: The figure shows distributions of educational attainments of the first child. The red line of Forced Marriage (1978) shows the distribution for the first child born in 1978, and the red dashed line of Forced Marriage (1979) shows the distribution for the first child born in 1979. On the other hand, the blue line of Regular Marriage (1981) shows the distribution for the first child born in 1981, and the blue dashed line of Regular Marriage (1982) shows the distribution for the first child born in 1982. In the figures, we assign grade 13 to the children who have grades of higher education (more than grade 13).

To more formally examine those differences, we estimate the following regression equation,

$$GradeN_i = \beta_0 + \beta_1 ChildBornin1978_i + \beta_2 ChildBornin1979_i + \gamma' X_i + \epsilon_i, \quad (1)$$

for grade 0-9 separately.[10] $GradeN_i$ is a dummy variable equal to 1 if the first child of couple i attains grade N and equal to 0 otherwise. $ChildBornin1978_i/1979_i$ is a dummy equal to 1 if the first child of couple i was born in 1978/1979 and equal to 0 otherwise; β_1 and β_2 are interpretable relative to the first child born in 1981-82 of the regular-marriage couples. X_i is a vector of covariates of child and household characteristics, such as female dummy, parental age and education, and housing conditions. For details, see the text of Table 3.

Table 3 presents the estimation results. In grade 0, we find significant difference in the proportions between the children born in 1978 and those born in 1981-82. In grade 1-5, we find few significant differences in the proportions between the two groups. However, in grade 6-9, we find many significant

couples experienced the direct control of family organizations by the Khmer Rouge under the Pol Pot regime, they may internalize social norms of how family organization should behave under the Pol Pot regime more strongly than the regular-marriage couples; they may tend to behave so as to conform to the social norms relative to the regular-marriage couples. Those behavioral tendencies may be particularly strong in the forced-marriage couples with first child in 1978 because they were under direct control of the Khmer Rouge for a longer period of time and thus they strongly internalize the social norms relative to the other couples.

[10]In Figure 1, we also see some difference in the proportions of grade 12-13 between the children of the forced- and regular-marriage couples; the children born in 1978 seem to have slightly higher proportions of grade 12-13 than those of the regular-marriage couples. However, for the following reason, those differences would not be driven by the difference in parental behaviors between the two groups. According to the standard Cambodian education system, the maximum grade that child born in 1981 and 1982 can attain is grade 12 and 11, respectively, while child born in 1978 and 1979 can attain grade 13. From this difference, the difference in the proportions of grade 12-13 between the two groups should be due to the difference in their ages. In our econometric analyses, we do not use the highest grade completed as our outcome. We use the indicator variables for completing primary education and for having never attended school. These two outcome measures are less influenced by the difference in age between the two groups.

differences in the proportions between the two groups. The difference is relatively large in grade 6. These results suggest that the children born in 1978 are more likely to have never attended school and less likely to attain more than basic primary school than those born in 1981-82; these strengthen our arguments given above.

Table 3: Difference in Proportions of the First Child at Grade 0-9 between the Forced and Regular Marriages

		Primary School						Lower Secondary School		
	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child born in 1978	0.093***	-0.001	-0.003	0.006	0.000	-0.016*	-0.036***	-0.023***	-0.012	-0.027***
	(0.012)	(0.003)	(0.007)	(0.009)	(0.009)	(0.009)	(0.006)	(0.007)	(0.009)	(0.006)
Child born in 1979	0.020***	0.006***	0.001	0.001	0.000	-0.002	-0.014***	-0.010**	-0.009*	-0.009**
	(0.007)	(0.002)	(0.004)	(0.005)	(0.006)	(0.006)	(0.004)	(0.005)	(0.005)	(0.004)
Observations	36,118	36,118	36,118	36,118	36,118	36,118	36,118	36,118	36,118	36,118
Proportion in the reference group	0.19	0.01	0.06	0.10	0.12	0.13	0.08	0.08	0.10	0.07

Notes: Robust standard errors are reported in parentheses. All coefficients are interpretable relative to the first child born in 1981 and 1982 of the regular-marriage couples, which are omitted in the regressions. The mean of the dependent variable in the reference group is given in the bottom row. The regressions include a dummy for female child, mother's age and education, father's age and education, a dummy for female headed household, dummies for better housing conditions (light, fuel, water and toilet), dummies for number of children (two, three, four, five, and more than six children), a dummy for whether a couple has child less than 6 years, and regional dummies, interacting provincial dummies with a dummy for urban area.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

In Table 3, we also find significant differences in the proportions of grade 0-1 and 6-9 between the children born in 1979 and those born in 1981-82. The patterns of their significant differences are similar to those found between the children born in 1978 and those born in 1981-82, although the magnitude of the coefficients are relatively small. These suggest that their parents may also tend to behave so as to conform to the rules of the Pol Pot regime relative to those of the children born in 1981-82, although their behavioral tendencies are not as strong as the ones of the parents of the children born in 1978.

3.2 Educational Outcomes of Children Age 6-14

We next look at educational outcomes of the children age 6-14. In Figure 2, we present two educational outcomes. One is the proportion of having never attended school (left-hand side graph) and the other is the proportion of attending school (right-hand side graph). It is found that the educational outcomes are lower in the forced-marriage couples with first child in 1978 than in the regular-marriage couples at any age. Those differences are coherent with that found in their first child in Figure 1.

We now formally examine those differences by estimating the following equation,

$$Outcome_{ij} = \beta_0 + \beta_1 FirstChildBornin1978_j + \beta_2 FirstChildBornin1979_j + \gamma' X_{ij} + \epsilon_{ij}, \qquad (2)$$

for each age cohort separately. $Outcome_{ij}$ is two types of outcomes: (1) a dummy variable equal to 1 if child i (age 6-14) of couple j has never attended school and equal to 0 otherwise; (2) a dummy variable equal to 1 if child i (age 6-14) of couple j was attending school and equal to 0 otherwise. $FirstChildBornin1978_j/1979_j$ is a dummy equal to 1 if the first child of couple j was born in 1978/1979 and equal to 0 otherwise; β_1 and β_2 are interpretable relative to the children of the regular-marriage couples. X_{ij} is a vector of covariates of child and household characteristics, which are mostly same as those used in the estimations of equation (1). For details, see the text of Table 4.

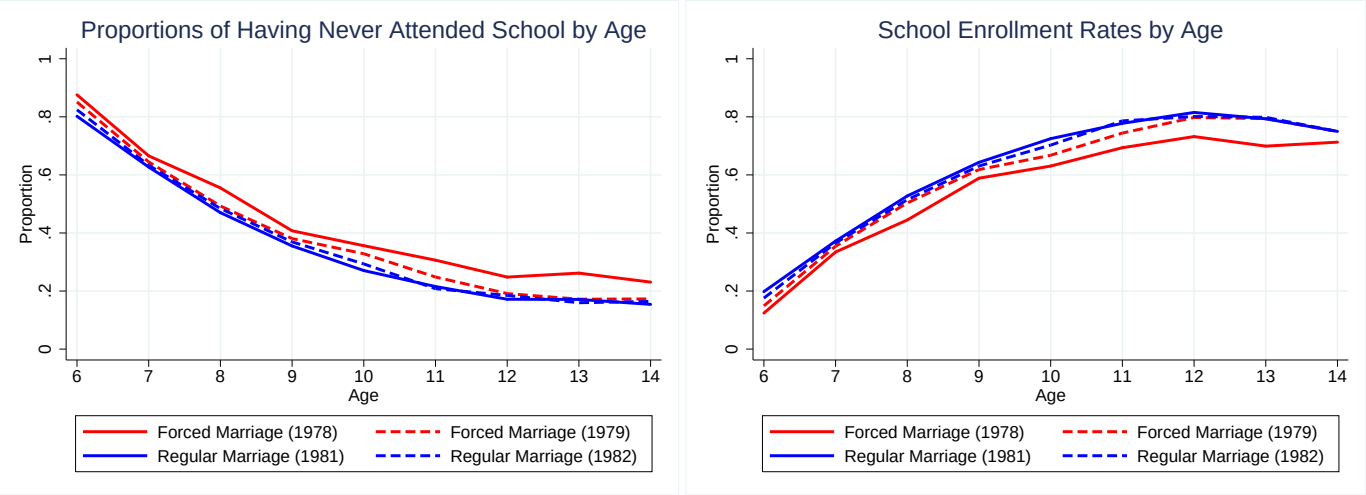


Figure 2: Educational Outcomes of the Children Age 6-14

Notes: The figure on the left-hand side shows the proportions of the children age 6-14 who have never attended school by age, while the figure on the right-hand side shows the proportion of the children age 6-14 attending school by age. In the figures, the red line of Forced Marriage (1978) shows those outcomes for the children age 6-14 of the couples with first child in 1978, and the red dashed line of Forced Marriage (1979) is for the children age 6-14 of the couples with first child in 1979. On the other hand, the blue line of Regular Marriage (1981) shows those outcomes for the children age 6-14 of the couples with first child in 1981, and the blue dashed line of Regular Marriage (1982) is for the children age 6-14 of the couples with first child in 1982.

Table 4 reports the estimation results. Panel A and B show the results for outcome (1) and (2), respectively. The results in Panel A and B show that the educational outcomes of children age 6-14 are lower in the forced-marriage couples with first child in 1978 than in the regular-marriage couples. In both young and old age cohort, we find many significant differences in the two outcomes between the two groups. The results in Panel A and B also show that the educational outcomes of children age 6-12 are slightly lower in the forced-marriage couples with first child in 1979 than in the regular-marriage couples. In age 6-7 and 10-11, we find significant differences in the outcomes between the two groups. Together with the results of first child, these results might be interpreted as meaning that forced marriages have persistent negative effects on educational investments for children, particularly of the couples with first child in 1978, over a long period of time after 1979.

Table 4: Difference in the Educational Outcomes of the Children Age 6-14 between the Forced and Regular Marriages by Age

	Age 6 (1)	Age 7 (2)	Age 8 (3)	Age 9 (4)	Age 10 (5)	Age 11 (6)	Age 12 (7)	Age 13 (8)	Age 14 (9)
Panel A. Differences in the Proportions of Having Never Attended School									
First child born in 1978	0.052**	0.026	0.056**	0.047	0.035	0.071**	0.053**	0.085***	0.046**
	(0.021)	(0.028)	(0.026)	(0.030)	(0.022)	(0.027)	(0.021)	(0.022)	(0.021)
First child born in 1979	0.032**	0.028*	0.011	0.007	0.035***	0.024*	0.011	-0.006	0.001
	(0.013)	(0.016)	(0.016)	(0.016)	(0.014)	(0.014)	(0.011)	(0.011)	(0.011)
Observations	9,230	9,811	10,663	9,124	12,322	9,886	12,065	11,781	12,216
Proportion in the reference group	0.81	0.63	0.48	0.36	0.28	0.21	0.18	0.17	0.16
Panel B. Difference in the Proportions of Attending School									
First child born in 1978	-0.052**	-0.026	-0.053**	-0.050*	-0.045**	-0.063**	-0.062***	-0.081***	-0.003
	(0.021)	(0.028)	(0.026)	(0.030)	(0.023)	(0.027)	(0.022)	(0.023)	(0.023)
First child born in 1979	-0.032**	-0.029*	-0.012	-0.008	-0.035***	-0.023	-0.01	0.009	0.02
	(0.013)	(0.016)	(0.016)	(0.016)	(0.014)	(0.014)	(0.012)	(0.012)	(0.013)
Observations	9,230	9,811	10,663	9,124	12,322	9,886	12,065	11,781	12,216
Proportion in the reference group	0.19	0.37	0.52	0.64	0.71	0.78	0.81	0.80	0.75

Notes: Robust standard errors are reported in parentheses. All coefficients are interpretable relative to the children age 6-14 of the regular-marriage couples, which are omitted in the regressions. The mean of the dependent variable in the reference group is given in the bottom row. The regressions include a dummy for female child, mother's age and education, father's age and education, a dummy for female headed household, dummies for better housing conditions (light, fuel, water and toilet), dummies for number of children (three, four, five, and more than six children), a dummy for whether a couple has child less than 6 years, a dummy for whether first child is female, and regional dummies, interacting provincial dummies with a dummy for urban area.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

4 Econometric Analyses

This section provides econometric analyses based on an econometric method of program evaluation. We regard the forced-marriage couples as treatment groups and the regular-marriage couples as control groups. Since forced-marriage couples were not randomly formed in the Pol Pot regime, we use a nonexperimental method of program evaluation, specifically *inverse probability weighting* (IPW) *estimation*. In this section, we first discuss the parameter of interest, assumptions for the identification, and the estimation approach. We then present the estimation results and robustness checks.

4.1 Econometric Framework

Let D_j denote the status of forced marriage: $D_j = 1$ if couple j was formed by forced marriage in the Pol Pot regime, while $D_j = 0$ if couple j was formed by regular marriage in the post Pol Pot regime. Let $Y_{ij}(1)$ and $Y_{ij}(0)$ denote the two potential educational outcomes of child i of couple j: $Y_{ij}(1)$ and $Y_{ij}(0)$ are the outcomes that would be realized by child i of couple j if couple j was formed by forced marriage and regular marriage, respectively. The parameter of interest is given by the *average treatment effects on the treated (ATT)*,[11]

$$\begin{aligned} \tau_{ATT} &= E[Y_{ij}(1) - Y_{ij}(0) \mid D_j = 1] \\ &= E[Y_{ij}(1) \mid D_j = 1] - E[Y_{ij}(0) \mid D_j = 1]. \end{aligned}$$

This parameter shows the difference between the average educational outcomes of the children of the forced-marriage couples, $E[Y_{ij}(1) \mid D_j = 1]$, and the counterfactual average educational outcomes they would have attained if the couples were formed by regular marriage, $E[Y_{ij}(0) \mid D_j = 1]$. However, we cannot observe $Y_{ij}(0)$ for $D_j = 1$.

To address this missing data problem, we infer $Y_{ij}(0)$ for $D_j = 1$ using data of children's educational outcomes of the regular-marriage couples. In doing this, we impose two assumptions. First, we assume that the children's educational outcomes of the regular-marriage couples, $Y_{ij}(0)$, is independent of the status of forced marriage, D_j, conditional on covariates, denoted by X_{ij}:

Assumption 1 (Conditional Independence)

$$Y_{ij}(0) \perp D_j \mid X_{ij}.$$

Second, we assume that for all possible values of the covariates, X_{ij}, the probability of being forced into marriage is less than one:

Assumption 2 (Overlap)

$$Pr(D_j = 1 \mid X_{ij}) < 1.$$

[11] We focus on ATT because we examine effects of a historical event, which occurs less frequently. Moreover, how forced-marriage couples have suffered from since the collapse of the Pol Pot regime is one of the important issues of crime against humanities in Khmer Rouge Trial, which started in 2006.

This assumption implies that a counterfactual outcome can be found for all children of the forced-marriage couples. Under Assumption 1-2,[12] the ATT can be identified:

$$\begin{aligned}
\tau_{ATT} &= E[Y_{ij}(1) - Y_{ij}(0) \mid D_j = 1] \\
&= E\{E[Y_{ij}(1) - Y_{ij}(0) \mid X_{ij}, D_j = 1] \mid D_j = 1\} \\
&= E\{E[Y_{ij}(1) \mid X_{ij}, D_j = 1] - E[Y_{ij}(0) \mid X_{ij}, D_j = 1] \mid D_j = 1\} \\
&= E\{E[Y_{ij}(1) \mid X_{ij}, D_j = 1] - E[Y_{ij}(0) \mid X_{ij}, D_j = 0] \mid D_j = 1\}.
\end{aligned}$$

We now discuss our estimation approach. Since our units exposed to treatment (couples) are different from those of their outcomes (children), the standard econometric methods based on propensity score may be difficult to be used. In our analyses, we employ the *inverse probability weighting* (IPW) *estimation*, which combines regression and propensity score weighting (cf., Wooldridge 2007; Hirano and Imbens 2001).

We assume that X_{ij} consists of two components: $X_{ij} = (T_{ij}, Z_j)$, where T_{ij} are variables determining the educational outcomes of child i of couple j, and Z_j are variables affecting the status of forced marriage for couple j. We assume that some variables, such as parental age and education, are shared in T_{ij} and Z_j. We can now rewrite the probability of couple j being forced into marriages in the Pol Pot regime as

$$\begin{aligned}
Pr(D_j = 1 \mid X_{ij}) &= Pr(D_j = 1 \mid T_{ij}, Z_j) \\
&= Pr(D_j = 1 \mid Z_j).
\end{aligned}$$

We next explain the procedures of IPW estimation. The IPW estimation is done in two steps. First, we estimate a logit model for the status of forced marriage for couples by maximum likelihood estimation,

$$Pr(D_j = 1 \mid Z_j) = \frac{(Z_j^{'}\gamma)}{1 + exp(Z_j^{'}\gamma)}, \tag{3}$$

and obtain the estimated propensity scores, $\hat{p}(Z_j) = Pr(D_j = 1 \mid Z_j)$.[13] Z_j includes parental age and education and dummies for administrative zones under the Pol Pot regime.[14]

We then estimate a weighted least squares model for educational outcomes of the children using the estimated propensity scores, $\hat{p}(Z_j)$, as weights:

$$Y_{ij} = \beta_0 + \tau_{ATT} \cdot D_j + \beta_1^{'} T_{ij} + \beta_2^{'}(T_{ij} - \overline{T}_1) \cdot D_j + \epsilon_{ij}, \tag{4}$$

where weights are

$$\lambda_{ij} = \begin{cases} 1 & \text{if } D_j = 1, \\ \frac{\hat{p}(Z_j)}{1-\hat{p}(Z_j)} & \text{if } D_j = 0, \end{cases}$$

[12] Our samples of the forced- and regular-marriage couples had first child in different years. To compare those samples, we also assume that having first child in the Pol Pot or the post Pol Pot regime is unrelated to the positional educational outcome of child i.

[13] We also obtain the estimated propensity scores, $\hat{p}(X_{ij}) = Pr(D_j = 1 \mid X_{ij})$. We use them so that our estimations satisfy the overlap assumption.

[14] Figure 6 shows administrative zones of the Pol Pot regime in 1977. In the estimations, we control for dummies for the West, Southwest, East, Central, North, and Northeast zones and Kompon Som, Kratie, Mondul Kiri. A dummy for the Northwest zone is dropped as the base case.

and $\overline{T}_1$ is the sample average of T_{ij} for the children of the forced-marriage couples.

We conduct the IPW estimation for the first child and children age 6-14 separately. In each estimation, we use two outcome measures: the outcome measures of the first child are the indicator variables for completing primary education (Primary school) and for having never attended school (No schooling); the outcome measures of the children age 6-14 are the indicator variables for attending school (Attending school) and for having never attended school (No schooling). In those estimations, we control for child characteristics (age and sex),[15] parental characteristics (age, education, and female head), economic conditions (housing conditions), household compositions (number of children, existence of child age less than 6),[16] and regional difference. For details, see the text of Table 5.

4.2 Econometric Results

Table 5 reports results of the IPW estimations. In Panel A and B, we examine effects of forced marriages on the children's education of the couples with first child in 1978 and 1979, respectively. The estimates show that forced marriages had negative effects on children's education in both couples. The estimated negative effects are large in the couples with first child in 1978. For instance, forced marriage decreased the proportion of the first child born in 1978 who completed primary school education by 6.9 percentage points. In contrast, the corresponding impact for the first child in 1979 is 2.0 percentage points. These effects are both statistically significant at the 1 percent level. Except one estimate, the other estimates are also statistically significant at conventional levels.

Table 5: IPW Estimates of Effects of Forced Marriages on Children's Education

	First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)
Panel A. Forced Marriage 1978 vs. Regular Marriage				
Forced marriage 1978	0.086***	-0.069***	0.046***	-0.042***
	(0.012)	(0.012)	(0.011)	(0.011)
Observations	31,949	31,949	86,590	86,590
Mean in the control groups	0.18	0.39	0.34	0.64
Panel B. Forced Marriage 1979 vs. Regular Marriage				
Forced marriage 1979	0.012*	-0.020***	0.013**	-0.010
	(0.007)	(0.008)	(0.006)	(0.006)
Observations	34,869	34,869	94,022	94,022
Mean in the control groups	0.18	0.39	0.34	0.64

Notes: The table reports IPW estimates. For the estimates of first child, robust standard errors are reported in parentheses. For the estimates of children age 6-14, robust standard errors, adjusted for clustering by household, are reported in parentheses. The regressions include child age, square of child age, a dummy for female child, mother's age, father's age, mother's education, father's education, a dummy for female headed household, dummies for better housing conditions (light, fuel, water, and toilet), dummies for number of children (two, three, four, five, and more than six children), a dummy for whether first child is female, and regional dummies, interacting provincial dummies with a dummy for urban area. The regressions of first child, however, do not include child age, square of child age, a dummy for whether a couple has two children, and a dummy for whether first child is female. All regressions use estimated propensity scores from logit model of equation (3) as weights. Mother's age, father's age, mother's education, father's education and dummies for administrative zones in the Pol Pot regime are used in the estimations. These results are available from the author upon request. Each regression also uses estimated propensity scores from the logit model that employ all covariates used in the estimations of equation (3) and (4) in order to satisfy the overlap assumption.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Next, we check the robustness of the estimation results. In Table 6, we estimate equation (4) using

[15] In the estimations of the first child, we do not use age as a covariate.

[16] In the estimations of the children age 6-14, we also control the sex of the first child in their households.

five different specifications. We conduct those specification tests for the forced-marriage couples with first child in 1978 in the upper table and for those with first child in 1979 in the lower table. We report the results for the two outcomes of first child in Panel A and B and for those of children age 6-14 in Panel C and D. For comparative purposes, we give the estimates of Table 5 in column 1. Recall that in the baseline estimations, we control for child characteristics (age and sex), parental characteristics (age, education, and female head), economic conditions (housing conditions), household compositions (number of children, existence of child age less than 6), and regional difference. In column 2, we control for the child, parental characteristics, and regional difference only. In column 3, we add controls for the economic conditions. In column 4, instead of housing conditions, we control for parental occupation as a proxy of household income. In column 5, we add controls for the household compositions; except for housing conditions, the covariates used in the estimations are same as those used in the baseline estimation. In column 6, we control for both housing conditions and parental occupation as a proxy of household income; the covariates used in the estimations are those used in the baseline estimations plus controls for parental occupation. The estimates are similar in magnitude and statistical significance across the six different specifications; our results are robust across the different specifications.

In Table 7, we further examine robustness to other alternative specifications. One concern in the previous specifications is that parental age at first birth systematically differs between the forced- and regular-marriage couples because of our choice of the samples; it is younger in the former than in the latter by 2-4 years of age. In our samples, most of the couples had first child in teenage years, and some previous studies suggest that there is negative relationship between teenage childbearing and educational attainments of children (cf., Currie and Madrian 1999); our previous specifications may lead to overestimate of negative effects of forced marriages.

To address this concern, we re-conduct the IPW estimations by using six alternative specifications. The results are reported in column 1-6, respectively. In the estimations of column 1-6, we use the same set of covariates used in those of column 1-6 in Table 6 except that parental age is replaced with parental age at first birth. We find that the estimates in column 1-6 are similar in magnitude to those in the corresponding columns in Table 6 and all the estimates are statistically significant; these suggest that negative effects of forced marriages on children's education are not driven by the difference in parental age first birth between the forced- and regular-marriage couples.

Finally, we examine the difference in educational investments between the couples with first child in 1981 and 1982. Since they both were formed by regular marriage in the post Pol Pot regime, there should be no difference in parental behaviors between the two groups. To examine this, we assume the couples with first child in 1981 to be "placebo" forced-marriage couples, and conduct the IPW estimations with six different specifications.

Table 8 reports the estimation results. In the estimations of column 1-6, we use the same sets of covariates used in those of column 1-6 in Table 6. In Panel A, C, and D, we find that the magnitude of the estimates is close to zero in all specifications, and almost all the estimates are statistically insignificant. However, only in Panel B, we find significant positive effects of "placebo" forced marriages on the proportion of their first child who completed primary school education in any specification.

We now show that those differences are not driven by their different behaviors, but by the difference in age of their first child. In Figure 4, we present two graphs. One is distributions of

Table 6: Specification Tests

Specification Tests for Panel A in Table 5						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable:	No Schooling (First child)					
Forced marriages 1978	0.086***	0.080***	0.083***	0.080***	0.083***	0.085***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Observations	31949	33258	31949	33250	33250	31941
Mean in the control groups	0.18	0.19	0.18	0.19	0.19	0.18
Panel B. Dependent variable:	Primary School (First child)					
Forced marriages 1978	-0.069***	-0.066***	-0.067***	-0.065***	-0.066***	-0.068***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Observations	31949	33258	31949	33250	33250	31941
Mean in the control groups	0.39	0.38	0.39	0.38	0.38	0.39
Panel C. Dependent variable:	No Schooling (Children Age 6-14)					
Forced marriages 1978	0.046***	0.052***	0.052***	0.052***	0.045***	0.046***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Observations	86590	90153	86590	90080	90080	86519
Mean in the control groups	0.34	0.35	0.34	0.35	0.35	0.34
Panel D. Dependent variable:	Attending Schooling (Children Age 6-14)					
Forced marriages 1978	-0.042***	-0.048***	-0.049***	-0.049***	-0.041***	-0.042***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Observations	86590	90153	86590	90080	90080	86519
Mean in the control groups	0.64	0.63	0.64	0.63	0.63	0.64
Specification Tests for Panel B in Table 5						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable:	No Schooling (First child)					
Forced marriages 1979	0.012*	0.012*	0.011*	0.012*	0.013**	0.012*
	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)
Observations	34869	36293	34869	36291	36291	34867
Mean in the control groups	0.18	0.19	0.18	0.19	0.19	0.18
Panel B. Dependent variable:	Primary School (First child)					
Forced marriages 1979	-0.020***	-0.020***	-0.020***	-0.016**	-0.016**	-0.018**
	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Observations	34869	36293	34869	36291	36291	34867
Mean in the control groups	0.39	0.38	0.39	0.38	0.38	0.39
Panel C. Dependent variable:	No Schooling (Children Age 6-14)					
Forced marriages 1979	0.013**	0.020***	0.019***	0.019***	0.013**	0.012**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	94022	97891	94022	97884	97884	94015
Mean in the control groups	0.34	0.35	0.34	0.35	0.35	0.34
Panel D. Dependent variable:	Attending Schooling (Children Age 6-14)					
Forced marriages 1979	-0.01	-0.017***	-0.016***	-0.016***	-0.009	-0.009
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	94022	97891	94022	97884	97884	94015
Mean in the control groups	0.64	0.63	0.64	0.63	0.63	0.64

Notes: See notes to Table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

educational attainments of the children who are not attending school (left-hand side graph) and the other is those of educational attainments of the children who are attending school (right-hand side graph). In our data, the percentages of the children born in 1981 (age 17) and 1982 (age 16) who are attending school are 41 percent and 52 percent, respectively. The left-hand side graph shows that the number of children with grade 3-9 is larger in the children born in 1981 than in the children born in 1982. The right-hand side figure, on the other hand, shows that the number of children with grade 2-8 is larger in the children born in 1982 than in the children born in 1981. The difference is particularly

Table 7: Specification Tests

Additonal Specification Tests						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable:	No Schooling (First child)					
Forced marriages 1978	0.076***	0.070***	0.071***	0.070***	0.075***	0.075***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Observations	31949	33258	31949	33250	33250	31941
Mean in the control groups	0.18	0.19	0.18	0.19	0.19	0.18
Panel B. Dependent variable:	Primary School (First child)					
Forced marriages 1978	-0.080***	-0.081***	-0.077***	-0.079***	-0.082***	-0.076***
	(0.019)	(0.019)	(0.018)	(0.018)	(0.019)	(0.019)
Observations	31949	33258	31949	33250	33250	31941
Mean in the control groups	0.39	0.38	0.39	0.38	0.38	0.39
Panel C. Dependent variable:	No Schooling (Children Age 6-14)					
Forced marriages 1978	0.049***	0.057***	0.053***	0.056***	0.052***	0.048***
	(0.016)	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)
Observations	86590	90153	86590	90080	90080	86519
Mean in the control groups	0.34	0.35	0.34	0.35	0.35	0.34
Panel D. Dependent variable:	Attending Schooling (Children Age 6-14)					
Forced marriages 1978	-0.047***	-0.056***	-0.051***	-0.055***	-0.051***	-0.046***
	(0.016)	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)
Observations	86590	90153	86590	90080	90080	86519
Mean in the control groups	0.64	0.63	0.64	0.63	0.63	0.64
Specification Tests for Panel B in Table 4						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable:	No Schooling (First child)					
Forced marriages 1979	0.019**	0.016**	0.015**	0.016**	0.020***	0.019**
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)
Observations	34869	36293	34869	36291	36291	34867
Mean in the control groups	0.18	0.19	0.18	0.19	0.19	0.18
Panel B. Dependent variable:	Primary School (First child)					
Forced marriages 1979	-0.029***	-0.026***	-0.027***	-0.026***	-0.027***	-0.028***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	34869	36293	34869	36291	36291	34867
Mean in the control groups	0.39	0.38	0.39	0.38	0.38	0.39
Panel C. Dependent variable:	No Schooling (Children Age 6-14)					
Forced marriages 1979	0.017**	0.028***	0.025***	0.027***	0.020***	0.017**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Observations	94022	97891	94022	97884	97884	94015
Mean in the control groups	0.34	0.35	0.34	0.35	0.35	0.34
Panel D. Dependent variable:	Attending Schooling (Children Age 6-14)					
Forced marriages 1979	-0.016**	-0.027***	-0.024***	-0.026***	-0.018**	-0.015**
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Observations	94022	97891	94022	97884	97884	94015
Mean in the control groups	0.64	0.63	0.64	0.63	0.63	0.64

Notes: See notes to Table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

large at grade 5. This means that the number of children who are currently attending class 6 is much larger in the children born in 1982 than in the children born in 1981. In our data, they are not regarded as those who complete primary school education; one-year age difference substantially affects the proportion of children completing primary school. Thus, significant positive effects of "placebo" forced marriages may be driven by their age difference.

To confirm this, we re-conduct the IPW estimations by regarding the children having more than grade 5 as those who complete primary school. Table 9 reports the estimation results. We use

Table 8: Falsification Tests

Falsification Tests						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable: No Schooling (First child)						
Forced marriages	0.003	0.005	0.004	0.005	0.004	0.004
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	30931	32194	30931	32194	32194	30931
Mean in the control group	0.18	0.19	0.18	0.19	0.19	0.18
Panel B. Dependent variable: Primary School (First child)						
Forced marriages	0.024***	0.022***	0.022***	0.023***	0.025***	0.024***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	30931	32194	30931	32194	32194	30931
Mean in the control group	0.37	0.37	0.37	0.37	0.37	0.37
Panel C. Dependent variable: No Schooling (Children Age 6-14)						
Forced marriages	-0.006	-0.006	-0.003	-0.006	-0.009**	-0.006
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	84146	87596	84146	87596	87596	84146
Mean in the control group	0.35	0.35	0.35	0.35	0.35	0.35
Panel D. Dependent variable: Attending Schooling (Children Age 6-14)						
Forced marriages	0.006	0.005	0.003	0.005	0.009**	0.006
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	84146	87596	84146	87596	87596	84146
Mean in the control group	0.63	0.63	0.63	0.63	0.63	0.63

Notes: See notes to Table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

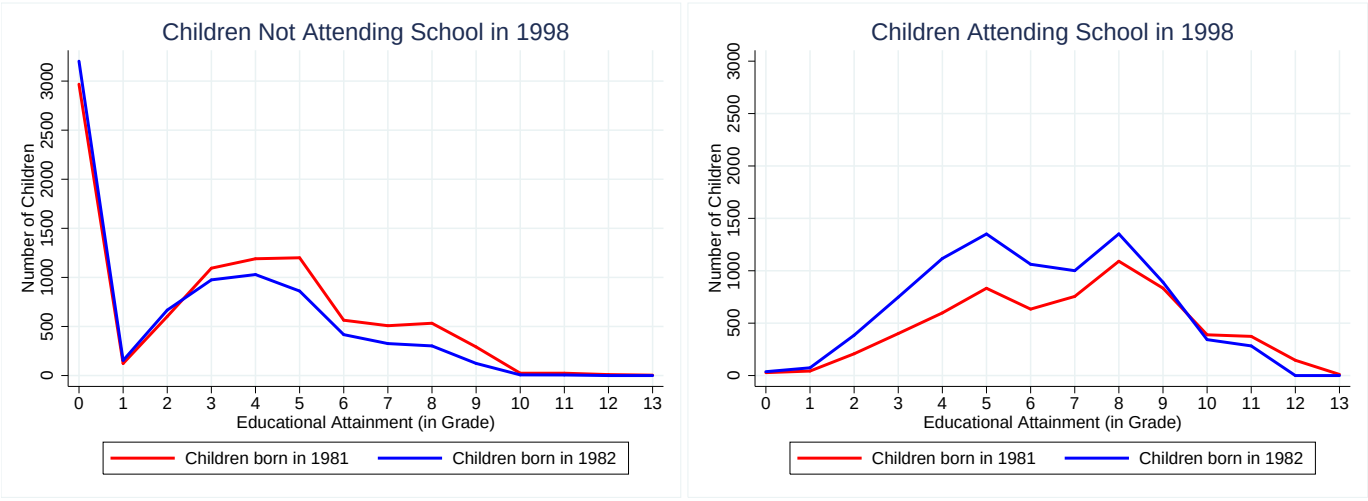


Figure 3: Distribution of Educational Attainments of First Child for Regular-Marriage Couples

the same sets of covariates used in Table 8. We now find that the magnitude of the coefficients of forced marriages is close to zero in all specifications and none of the estimates are statistically significant; we conclude that there is no difference in educational investments for children between the regular-marriage couples with first child in 1981 and 1982. This further strengthens our finding that educational investments for children differ between the forced- and regular-marriage couples.

Table 9: Falsification Tests

Falsification Tests						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Primary School (First child)						
Forced marriages	-0.001	-0.004	-0.003	-0.003	-0.001	-0.001
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	30931	32194	30931	32194	32194	30931
Mean in the control group	0.45	0.45	0.45	0.45	0.45	0.45

Notes: See notes to Table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

5 Analyses for New and Base People

In the last two sections, we presented graphical and econometric analyses; these suggest that the forced-marriage couples invested less in their children's education than the regular-marriage couples. For those findings, we have argued with the historical evidences of the social system under the Pol Pot regime that they may tend to behave so as to conform to the rules of the Pol Pot regime more than the regular-marriage couples after its collapse. This section considers those results, by reflecting upon social and political structures under and after the Pol Pot regime.

5.1 New and Base People

We first focus on two social classes in the Pol Pot regime: *new* and *base people* (cf., Dy 2007, pp. 30-32; Kiernan 2008, p. 164). We examine heterogeneity in effects of forced marriages on their children's education between the two social groups. In the Pol Pot regime, all the citizens were classified as either new or base people. In April 1975, when the Khmer Rouge took control of the country, city dwellers were forced to relocate to countryside to engage in agricultural works. Such urban people were called new people. On the other hand, those who had lived in rural areas controlled by the Khmer Rouge prior to April 17, 1975 were called base people. Those who were born in rural areas and migrated to cities were, however, classified as new people. In the Pol Pot regime, new people were regarded as enemies of the society and were persecuted by the Khmer Rouge, while base people were considered innocent and treated favorably relative to new people. Forced marriage took place for both new and base people in the Pol Pot regime. In the next subsection, we will describe the samples of forced- and regular-marriage couples of new and base people.

5.2 The Samples of New and Base People

From the samples used in the previous analyses, we develop the samples of new and base people. Based on the wives' social classes in the Pol Pot regime, we develop those samples. However, our data do not include the direct information of the identification of the two groups. We address this limitation as follows. As mentioned, in the Pol Pot regime, urban and rural people generally belonged to new and base people, respectively. We select couples whose wives were born in Phnom Penh or a provincial town for the samples of new people. Their birth place corresponds to urban areas in Cambodia; they would be regarded as new people in the Pol Pot regime. On the other hand, we select couples whose wives born in neither Phnom Penh nor a provincial town, i.e., rural areas, and

first child was born in their native districts for the samples of base people. Such women appear to have never migrated to cities before the Pol Pot regime ruled the country; they would be based people in the Pol Pot regime.

In Table 10, we describe the resulting samples of new and base people. In column 1, we give the total number of the forced- and regular-marriage couples by the timing of having had first child. Note that the sample size is smaller than that of the original samples. In column 2 and 4, we give the breakdown for new and base people, respectively.[17] In column 3 and 5, we examine the proportions of husbands, whose birthplaces are either Phnom Penh or a provincial town, i.e., urban areas, for the two groups, respectively. These proportions are approximate ones of husbands of new people. If we assume those husbands to be new people, then about 60 percent of new women of both the forced- and regular-marriage couples get married with new men, while almost all base women of the two groups married base men. When examining those proportions separately for the forced-marriage couples with first child in 1978 and 1979, we find that the new women with first child in 1978 are more likely to marry new men. In the samples of base people, on the other hand, we see no difference between the two groups. In the Pol Pot regime, marriage between new and base people was not permitted at first and was approved in 1978, though this varied by locality (Short 2004, p. 382). The difference in the proportions between the two groups of new people may reflect the change in the marriage policy in 1978.

Table 10: The Samples of New and Base People

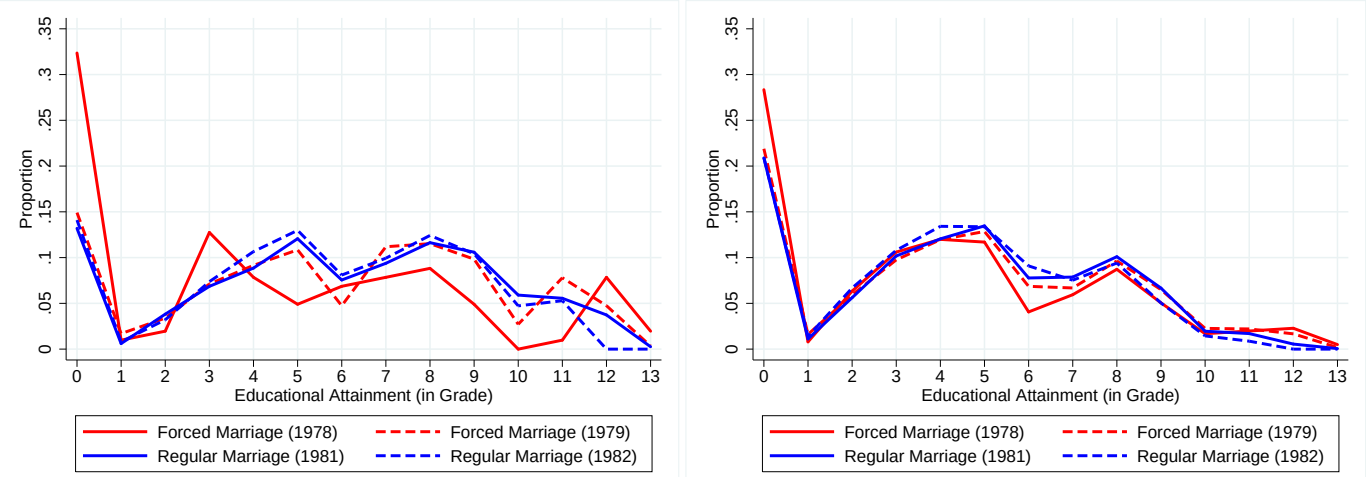
		New People		Base People	
	Total	Observations	Urban Men	Observations	Urban Men
	(1)	(2)	(3)	(4)	(5)
Forced-marriage couples	4,759	397	0.617	4,362	0.013
Forced-marriage couples (1978)	1,111	102	0.696	1,009	0.013
Forced-marriage couples (1979)	3,648	295	0.600	3,353	0.013
Regular-marriage couples	27,939	2,400	0.585	25,539	0.013
Regular-marriage couples (1981)	13,462	1,152	0.583	12,310	0.013
Regular-marriage couples (1982)	14,477	1,248	0.588	13,229	0.014
Total	32,698	2,797		29,901	

Note: "Forced-marriage couples (1978)" means couples having first child in 1978, while "Forced-marriage couples (1979)" means couples having first child in 1979. We classify fathers as "Urban men" if they were born in Phnom Penh or a provincial town.

5.3 Graphical and Econometric Analyses

We look at educational outcomes of the first child and children age 6-14 of the forced- and regular-marriage couples in the samples of new and base people (referred to simply as new and base people in the rest of the paper). Figure 4 provides the distributions of educational attainments of the first child, and Figure 5 shows the proportions of the children age 6-14 having never attended school and attending school by age. The figures for the new and base people are depicted on the left- and right-hand sides, respectively. These figures reveal that the differences in the educational outcomes of the first child and children age 6-14 between the forced-marriage couples with first child 1978 and the regular-marriage couples are particularly large in the new people.

[17]From the samples shown in column 1 in Table 2, we also develop the samples of new and base people, including not only "married", but also "divorced" and "widowed" mothers. Then, we examine the difference in divorce rates between the forced- and regular-marriage couples in the samples of new and base people, respectively. We find that



Notes: We assign grade 13 to the children who have grades of higher education (more than grade 13).

Figure 4: Distribution of Educational Attainments of First Child, New People and Base People

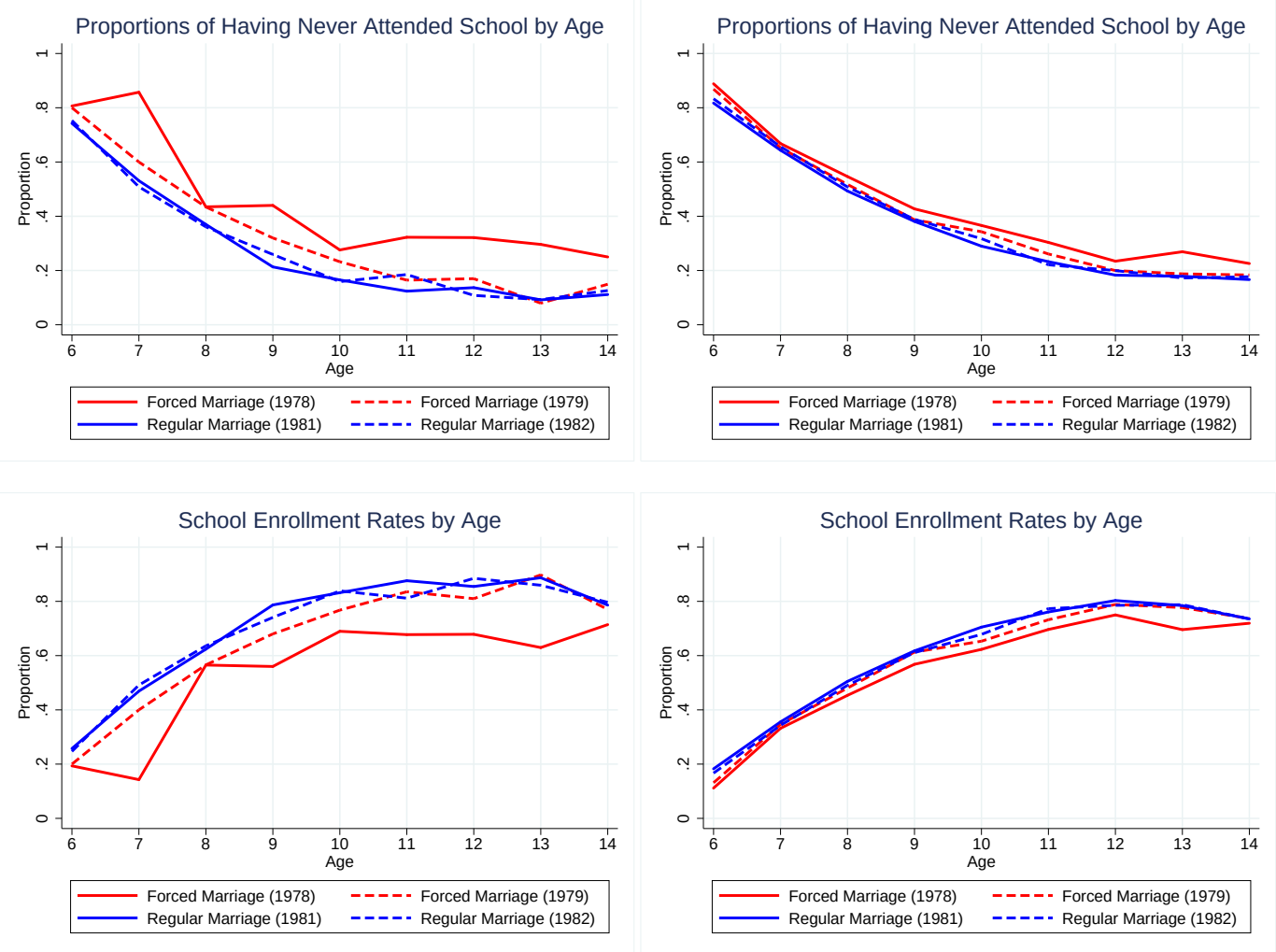


Figure 5: Educational Outcomes of Children Age 6-14, New and Base People

In Table 11, we present results of the IPW estimations for the new and base people. Panel A

they have similar divorce rates in both samples.

and B show the results for the forced-marriage couples with first child in 1978 and 1979 of the new and base people, respectively. As expected, in Panel A, we find that effects of forced marriages on children's education are heterogeneous between the new and base people. For instance, in the new people, forced marriages are estimated to have increased the proportion of the children age 6-14 having never attended school by 13.4 percentage points. In contrast, in the base people, the corresponding estimated impact is 3.6 percentage points. These effects are both statistically significant at conventional levels.

Table 11: IPW Estimates of Effects of Forced Marriages on Children's Education (New and Base People)

	New People				Base People			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Forced Marriage 1978 vs. Regular Marriage							
Forced marriage 1978	0.133***	-0.061*	0.134***	-0.129***	0.065***	-0.066***	0.036***	-0.030**
	(0.035)	(0.033)	(0.027)	(0.028)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	2093	2093	5454	5454	25370	25370	69268	69268
Mean in the control groups	0.13	0.54	0.25	0.73	0.20	0.35	0.36	0.62
	Panel B. Forced Marriage 1979 vs. Regular Marriage							
Forced marriage 1979	0.026	-0.009	0.038**	-0.032*	0.010	-0.022***	0.012*	-0.008
	(0.019)	(0.027)	(0.019)	(0.019)	(0.008)	(0.009)	(0.007)	(0.007)
Observations	2549	2549	6638	6638	27645	27645	75113	75113
Mean in the control groups	0.13	0.54	0.25	0.74	0.20	0.35	0.36	0.62

Notes: See notes to Table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

5.4 Analyses by Administrative Zone in the Pol Pot Regime

We next focus on administrative zones of the Pol Pot regime, where the control of the central government systematically differed under the Pol Pot regime. We examine heterogeneity in effects of forced marriages on their children's education across zones. In this subsection, we first describe the administrative zones of the Pol Pot regime. Second, we provide a brief summary of how the central government controlled the zones under the Pol Pot regime. Third, we provide the econometric analyses and their results. Finally, we provide interpretations of those results and additional analyses and their results.

5.4.1 Administrative Zones of the Pol Pot Regime

Figure 6 shows the administrative divisions of Cambodia (Democratic Kampuchea) in 1977. They consist of seven geographical zones (Northwest, West, Southwest, East, Central, North, and Northwest zones) and three autonomous regions (Kratie, Mondul Kiri, and Kompong Soam).[18] Each zone

[18]There was some changes in administrative division in the Pol Pot regime: The Central zone was newly established in 1977. This zone was named North zone before 1977. The new North zone, depicted in Figure 6, was created in 1977 when the Central zone was established (Dy 2007, pp. 23-25). Before 1977, this zone was autonomous regions, comprising of Siem Reap-Oddar Meanchey and Preah Vihear regions. Kratie and Mondul Kiri were formerly parts of the Northwest zone (Dy 2007, pp. 23-25).

incorporates two or more old provinces or some parts of them, while three autonomous regions correspond to old provinces before the Pol Pot regime. In our analyses, we focus on the Northwest, West, Southwest, East, Central, and North zones.[19]

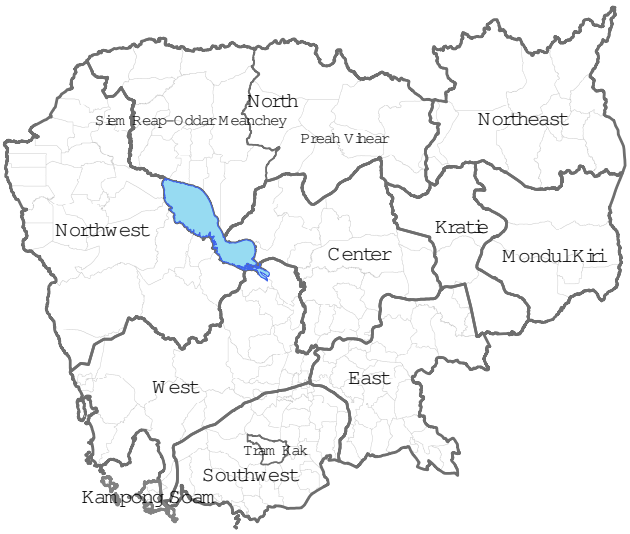


Figure 6: Administrative Zone in the Pol Pot Regime

Notes:
The figure shows the Democratic Kampuchea (DK) zone in 1977 and the 1998 districts. This map is developed by the author with ArcGIS based on the digital layer provided by the website of Cambodian Genocide Program at Yale university (http://www.yale.edu/cgp/). The geographical codes used in the 1998 Census micro-data are not based on the DK zone. To match the present district codes with the DK zone, we first calculate the center of each district with ArcGIS. We then match the centers with the DK zones. To develop the samples of each zone, we use the information of the birth district of first children.

5.4.2 The Zone Politics in the Pol Pot Regime

When the Pol Pot regime began, the zone secretaries, assigned from the central committee, governed their zones; they held power in their zones. However, from mid-1976, the central government started to purge political suspect zone secretaries and their associates so that it could take a firm grip on power across the zones. Such political purges happened in every zone except for the Southwest zone, the power base of the central government.[20] These political purges resulted in change in political structures of the zones, which can be divided into two different patterns.

The first is that the former political structures were completely destroyed. This occurred in the Northwest and East zones and Siem Reap-Oddar Meanchey region (parts of the North zone).[21] From

[19]We do not focus on the Northeast zone and the three autonomous regions because their sample size is small.

[20]Ta Mok, secretary of the Southwest zone from 1968, had consolidated power in the zone by placing his family members in important political positions (Kiernan 2008, pp. 87-88).

[21]The secretaries and cadres in the zones and region were unreliable to the central government. This was triggered by the following events. In the Northwest zone, since a large number of people were deported from Phnom Penh and the Southwest zone in 1975, living conditions deteriorated (Short 2004, p. 369). The central government, however, ascribed this to the zone secretary and cadres (Kiernan 2008, pp. 236-237; Short 2004, p. 369). They were regarded as enemies who undermined party policy (Kiernan 2008, pp. 236-237; Short 2004, p. 369). Secretary of the Northwest zone, Ruos Nhim, was arrested in June 1978 (Kiernan 2008, p. 417). In the East zone, Chan Charkrey, commander of first Eastern zone division, attempted to poison Pol Pot (Kiernan 2008, p. 321). He was arrested in May 1976 and he and his networks were suspected of having connections with the Vietnamese, external enemies of the Pol Pot regime (Kiernan 2008, pp. 322-323). Then, the East zone cadres were regarded as enemies; this led to "great" purges

1976, the central government dispatched the Southwest zone cadres and troops, who were considered reliable, to take over the zones/region. They purged the zone/region secretaries and cadres, and the local political positions were replaced with the Southwest zone officials.[22] Thus, these zones were occupied by outside cadres particularly in 1977-'78.

The second patter is that the former political structures were partly destroyed. This happened in the West and Central zones.[23] In these zones, the former zone secretaries were replaced by the deputies, and their networks were completely destroyed and replaced by those of the deputies.[24] Thus, these zones were under the control of the rivals of the former zone secretaries after the purges. Compared to the Northwest and East zones and Siem Reap-Oddar Meanchey region, the political structures in these zones were relatively stable.

5.4.3 Econometric Analyses

We now present econometric analyses of effects of forced marriages on their children's education by the zones. We look at only base people, since the sample size of the new people is small. Later, we also provide some analyses for the new people. We divide the base people into six subsamples based on the information of the birth district of the first child.[25] We conduct the IPW estimations for each sample separately.

Table 12 reports the estimation results. We find that effects of forced marriages on children's education are heterogeneous across the zones. Interestingly, in the zones with a similar pattern of change in political structures, we find similar results: First, in the Northwest and East zones,

in 1977-78. Secretary of the East zone, So Phim, committed suicide in May 1978 to avoid arrest (Kiernan 2008, pp. 392-400). In Siem Reap-Oddar Meanchey region, the region secretary, Pa Thol, had plotted a coup in conjunction with Koy Tuon, secretary of the former North zone (Kiernan 2008, p. 340). Pa Thol was arrested in February 1977 (Kiernan, 2008, p. 340), and Koy Thuon was arrested in 1976 (Kiernan 2008, p. 325).

[22]See Kiernan (2008, pp. 216-246) about the purge of the Northwest zone, Kiernan (2008, pp. 205-210) about the purge of the East zone, and Kiernan (2008, pp. 340-348) about the purge of the Siem Reap-Oddar Meanchey region. The West zone cadres and troops were also dispatched to the Northwest zone for the purges (Kiernan 2008, pp. 416-423), while the Central zone troops led by Ke Pauk, the Central zone military commander, and the Center troops led by Son Sen, minister of defense, were dispatched to the East zone for the purges (Kiernan 2008, pp. 369-376). There were some rebellions in the zones and region (see Kiernan 2008, p. 245 about the Northwest zone; Kinernan 2008, pp. 392-405 about the East zone; Kiernan 2008, pp. 340-345 about the Siem Reap-Oddar Meanchey region). In particular, in the East zone, troops of Heng Samrin, the East zone military commander, resisted Son Sen's Center and Southwest zone troops and Ke Pauk's Central zone forces after So Phim's death. However, the purges in the East zone were further intensified by Son Sen's and Ke Pauk's troops, and Heng Samrin and his associates fled to Vietnam. They later formed the United Front of the National Salvation of Kampuchea, and, together with Vietnamese troops, overthrew the Pol Pot regime on January 7, 1979.

[23]The secretaries in these zones were regarded as enemies of the central government. In the West zone, the zone secretary, Chou Chet, allowed former Lon Nol soldiers, enemies of the Pol Pot regime, to run cooperatives in his base region (Kiernan 2008, p. 347). Nuon Chea, deputy secretary, considered this situation to be "no way to build socialism" (Kiernan 2008, p. 347). In the Central zone, former North zone, Koy Thuon, secretary of former North zone, had plotted a coup (Kiernan 2008, p. 340).

[24]In the West zone, Chou Chet was arrested in March 1978 (Short 2004, p.384). As a result, his deputy, Sem Pal, and Paet Soeung, the zone military commander, seized power in the zone (Kiernan 2008, p. 392, 416). In former North zone, Koy Thuon was arrested in 1976 (Kiernan, 2008, p. 325). After his arrest, Ke Pauk, his deputy and the zone military commander, consolidated power in the zone (Kiernan 2008, p. 338). Then, Ke Pauk became secretary of the Central zone, newly established in 1977 (Kinernan 2008, p. 339).

[25]With ArcGIS, we calculated the center of gravity of each district, which is used for the identification of the zones.

where the former political structures were completely destroyed, we find significant negative effects of forced marriages only for the first child of the couples with first child in 1978;[26] this suggests that persistence of effects of forced marriages is not strong in the Northwest and East zones.

Second, in the West and Central zones, where the former political structures were partly destroyed, we find the significant negative effects for both the first child and children age 6-14 of the couples with first child in 1978; this suggests that persistence of effects of forced marriages is strong in the West and Central zones.

Third, in the Southwest zone, where there was no substantial change in political structures, we find the significant negative effects for the first child and children age 6-14 of both the couples with first child in 1978 and 1979; this suggests that persistence of effects of forced marriages is particularly strong in the Southwest zone.

In sum, together with the historical evidences of political situations under the Pol Pot regime, the results in Table 12 may imply that forced marriages had persistent negative effects on educational investments for children in the zones where the political structures were relatively stable in the Pol Pot regime. In the next subsection, we will consider those results by reflecting upon how political structures formed in the Pol Pot regime changed after its collapse.

5.4.4 Interpretation and Discussion

When the Pol Pot regime was overthrown by Vietnam forces and the forces of the United Front for the National Salvation of Kampuchea in January 1979, its leaders, including Pol Pot, prime minister, fled to Thailand. However, the Southwest and Central zone secretaries, Ta Mok and Ke Pauk, who were two principal military supporters of Pol Pot, remained in Cambodia and continued to fight against the new government army in guerrilla warfare until the 1990's.[27] Mok had his base in Mout Aural in the West zone and commanded his troops in the West and Southwest zones,[28] while Ke Pauk had his military headquarters in Kompong Tom (in the Central zone) and commanded his troops in the Central zone (Short 2004, p. 412); they and their troops had lasting influence in their zones after 1979. Under the threat of violence by the Khmer Rouge,[29] the forced-marriage couples in these zones may still be motivated to follow the rules of the Pol Pot regime for fear of future executions by the Khmer Rouge.[30]

[26]The North zone appears to belong to this group, but we do not find similar results. We will discuss this later.

[27]Their guerrilla activities were backed by China and Thailand (Short 2004, pp. 402-406). Ke Pauk defected to Hun Sen, current prime minister, in 1998 (Short 2004, p. 452), while Ta Mok was arrested in 1999 (Short 2004, p. 454). With Mok and Pauk, minister of defense, Son Sen also remained in Cambodia. He was killed as a traitor on Pol Pot's orders in 1997 (Short 2004, p. 458).

[28]Originally, the West zone was part of the Southwest zone (Kiernan 2008, pp. 87-89). Ta Mok was the secretary and Chou Chet, who later became secretary of the West zone, was his deputy (Kiernan 2008, pp. 87-88). Mount Aural was Mok's old base (Short 2004, p. 398).

[29]In fact, there are some anecdotal evidences reported on the violence by the Khmer Rouge against ordinary people after 1979; the Southwest zone cadres who fled during an invasion by Vietnamese forces returned and killed base people who disobeyed the rules of the Pol Pot regime (Kiernan 2008, p. 455).

[30]People in these zones might feel that their behaviors are monitored by the Khmer Rouge and others, who might report them to the Khmer Rouge when they come back; such "social pressure" might lead the forced-marriage couples to behave so as to conform to the rules of the Pol Pot regime. In the Pol Pot regime, the Southwest zone was its power base and called the zone of "Pol Pot-ism" *par excellence* (Vickery 1999, p. 93); people in this zone were most deeply embedded in the social system of the Pol Pot regime. Thus, such "social pressure" might be particularly strong in

Table 12: IPW Estimates of Effects of Forced Marriages on Children's Education by Zone (Base People)

	Northwest Zone				East Zone			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forced marriage 1978	0.052	-0.067**	-0.028	0.030	0.046**	-0.050**	0.013	-0.006
	(0.033)	(0.032)	(0.034)	(0.034)	(0.021)	(0.024)	(0.019)	(0.020)
Observations	2998	2998	8300	8300	6277	6277	16528	16528
Mean in the control groups	0.20	0.31	0.39	0.59	0.17	0.38	0.33	0.65
Forced marriage 1979	0.015	-0.023	0.004	-0.016	0.001	0.001	-0.01	0.014
	(0.022)	(0.026)	(0.021)	(0.022)	(0.012)	(0.015)	(0.012)	(0.012)
Observations	3243	3243	8923	8923	7053	7053	18384	18384
Mean in the control groups	0.20	0.31	0.39	0.59	0.18	0.38	0.33	0.65
	West Zone				Central Zone			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forced marriage 1978	0.118***	-0.115***	0.066**	-0.063**	0.094***	-0.079***	0.083***	-0.074***
	(0.042)	(0.036)	(0.032)	(0.032)	(0.032)	(0.030)	(0.029)	(0.029)
Observations	2806	2806	7735	7735	3691	3691	10005	10005
Mean in the control groups	0.19	0.34	0.38	0.60	0.23	0.34	0.38	0.60
Forced marriage 1979	-0.025	-0.006	0.023	-0.011	-0.004	-0.020	0.003	0.005
	(0.023)	(0.029)	(0.022)	(0.022)	(0.017)	(0.019)	(0.016)	(0.016)
Observations	2966	2966	8163	8163	4221	4221	11359	11359
Mean in the control groups	0.19	0.34	0.38	0.60	0.23	0.34	0.38	0.60
	Southwest Zone				North Zone			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forced marriage 1978	0.109***	-0.089***	0.105***	-0.095***	0.006	0.010	0.012	-0.008
	(0.032)	(0.033)	(0.030)	(0.031)	(0.039)	(0.032)	(0.037)	(0.037)
Observations	7370	7370	20590	20590	1736	1736	4887	4887
Mean in the control groups	0.15	0.41	0.32	0.66	0.43	0.15	0.54	0.44
Forced marriage 1979	0.048***	-0.060***	0.075***	-0.069***	0.012	-0.047**	0.000	-0.001
	(0.016)	(0.020)	(0.015)	(0.015)	(0.029)	(0.020)	(0.023)	(0.023)
Observations	7799	7799	21734	21734	1958	1958	5487	5487
Mean in the control groups	0.15	0.41	0.32	0.66	0.43	0.16	0.54	0.44

Notes: See notes to table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

In contrast, in the Northwest, East, and North zones, threat of violence by the Khmer Rouge decreased after 1979. When Vietnam forces invaded Cambodia, in the Northwest zone, villagers rebelled against the Khmer Rouge, and the Khmer Rouge fled for fear of being revenged (Kiernan 2008, p. 453).[31]

In the East zone, Son Sen's forces fought against Vietnam forces, but his headquarters were soon overrun (Short 2004, p. 395). Son Sen escaped capture and transferred his headquarters to Paet Um, near the borders of Thailand and Laos, in 1980 (Short 2004, p.412). After the Khmer Rouge left the East zone, former East zone cadres, who had fled to Vietnam to escape the purges in the Pol

this zone. In footnote 8, we give a detailed discussion of how and why parental behaviors differ between the forced- and regular-marriage couples.

[31]To escape revenge, some pretended victims of the East zone, who were targeted for executions in 1977-78, by wearing the blue scarves, which were uniforms of the East zone (Kiernan 2008, p. 453).

Pot regime, resumed power in the zone (Kiernan 2008, p. 455).

In the North zone, Paet Soeung, one of the replacements for Chou Chet, had been assigned as the secretary of the North zone since August 1978 (Kiernan 2008, pp. 422-423).[32] He was killed in attacks by Vietnamese forces during an invasion, and his troops were also broken (Kiernan 2008, p. 453). Thus, the forced-marriage couples in the Northwest, East, and North zones may first behave so as to conform to the rules of the Pol Pot regime, but then deviate from the behaviors as time passes.[33]

5.4.5 Further Analyses

This section further provides two additional analyses. First, we focus on the Southwest zone, specifically Tram Kok and the other districts, and examine heterogeneity in effects of forced marriages on their children's education between Tram Kok and the other districts in the zone. Tram Kok was home district of Ta Mok and was designated as a model district in the country. It was the heartland of "the Pol Pot zone" (Kiernan 2008, p. 180)[34]; the forced-marriage couples in Tram Kok might tend to behave so as to conform to the rules of the Pol Pot regime more than those in the other districts.[35] We expect that forced marriages had larger negative impacts in Tram Kok than in the other districts.

Second, we look at the new people. Based on our previous findings, we divide the new people into those in the West, Southwest, and Central zones (Zone 1) and those in the Northwest, East, and North zones (Zone 2). In Zone 1, political structures were relatively stable in the Pol Pot regime, while Zone 2 was occupied by the Khmer Rouge of Zone 1 in 1977-78, who completely destroyed original political structures of Zone 2. We examine heterogeneity in effects of forced marriages between these two groups. We expect that persistency of effects of forced marriages is stronger in Zone 1 than in Zone 2 because the forced-marriage couples in Zone 1 were under threat of violence by the Khmer Rouge more than those in Zone 2 after the collapse of the Pol Pot regime in 1979.

Tram Kok vs. Other Districts in the Southwest Zone

In Table 13, we examine heterogeneity in effects of forced marriages on their children's education between Tram Kok and the other districts in the Southwest zone.[36] To secure the number of observations of forced-marriage couples, we use aggregated data of the couples with first child in 1978 and 1979 as treatment groups in the analyses. In column 1-4 and 5-8, we report the results in Tram Kok and the other districts, respectively. We find that forced marriages had larger negative impacts in Tram Kok than in the other districts: The magnitude of the coefficients of forced marriage in

[32]The former zone secretary was Kang Chap, former Southwest zone official. He was arrested in August 1978 (Kiernan 2008, pp. 422-423).

[33]In 1977-78, these zones were occupied by the outside cadres. They were enemies for people in these zones; they were not deeply embedded in the social system of the Pol Pot regime in the sense that they were not close to the Khmer Rouge in 1977-78. Thus, the social pressure that behaviors are monitored by the Khmer Rouge and others might be less severe in these zones.

[34]Tram Kok had a "model cooperative" and accepted foreign delegations (Kiernan 2008, p. 185).

[35]Social pressure that behaviors are monitored by the Khmer Rouge and others might be stronger in Tram Kok than in the other districts.

[36]We divide the samples of the Southwest zone into those of Tram Kok and the other districts based on the birth district of the first child.

Tram Kok is roughly twice as large as that in that of the coefficients of forced marriage in the other districts. All estimates are statistically significant at conventional levels.

Table 13: IPW Estimates of Effects of Forced Marriages on Children's Education (Base People in the Southwest Zone)

	Tram Kok District				Other Districts			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forced marriage	0.092*	-0.269***	0.167***	-0.149***	0.057***	-0.048**	0.075***	-0.069***
	(0.051)	(0.053)	(0.052)	(0.052)	(0.016)	(0.019)	(0.015)	(0.015)
Observations	564	564	1580	1580	7369	7369	20454	20454
Mean in the control groups	0.10	0.44	0.30	0.70	0.15	0.41	0.32	0.66

Notes: Robust standard errors are reported in parentheses.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

To gain more insight into those results, we next examine how educational investments by the forced- and regular-marriage couples differ between Tram Kok and the other districts, respectively. We divide the samples of Tram Kok and the other districts into those of the forced- and regular-marriage couples, respectively, and then estimate the following regression equation,

$$Y_{ij} = \beta_0 + \beta_1 TramKok_j + \gamma^{'} X_{ij} + \epsilon_{ij}, \tag{5}$$

by the first child and children age 6-14 couples. Y_{ij} is the educational outcomes of child i of couple j. $TramKok_j$ is a dummy equal to 1 if the first child of couple j was born in Tram Kok district and equal to 0 otherwise; β_1 is interpretable relative to the other districts. X_{ij} is a vector of covariates of child, household characteristics, and region dummies.

Table 14 reports the estimation results. In column 1-4 and 5-8, we present the results of the forced- and regular-marriage couples, respectively. Interestingly, in the forced-marriage couples, three out of four estimates show that the educational outcomes are lower in Tram Kok than in the other districts, though two out of three estimates are not statistically significant. In contrast, in the regular-marriage couples, the estimates suggest that there is no difference in the educational outcomes between the two groups; the magnitude of all coefficients of Tram Kok is close to zero and none of them are statistically significant. These results may imply that the forced-marriage couples in Tram Kok have behavioral tendencies to conform to the rules of the Pol Pot regime more than those in the other districts. However, those differences do not exist between the regular-marriage couples in the two groups.

Heterogeneous Effects Across the Zones for New People

Table 15 presents results of the IPW estimations for the new people in Zone 1 (column 1-4) and those in Zone 2 (column 5-8). Panel A and B show the results for the forced-marriage couples with first child in 1978 and 1979, respectively. The results show that effects of forced marriages are heterogeneous between Zone 1 and 2: forced marriages had larger negative impacts on their children's education in Group 1 than in Group 2. These results imply that persistent negative effects of forced

Table 14: Difference in the Educational Outcomes Between the Forced and Regular Marriages

	Forced Marriage				Regular Marriage			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tram Kok	-0.055	-0.129*	0.065	-0.046	-0.013	0.014	-0.008	-0.008
	(0.066)	(0.074)	(0.069)	(0.069)	(0.016)	(0.023)	(0.016)	(0.016)
Observations	695	695	1795	1795	7219	7219	20239	20239
Mean in the other districts	0.19	0.30	0.39	0.60	0.15	0.51	0.32	0.66

Notes: Robust standard errors are reported in parentheses.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

marriages are particularly strong in the zones, where the Khmer Rouge still had lasting influence after 1979. This is coherent with the finding in the base people.

Table 15: IPW Estimates of Effects of Forced Marriages on Children's Education by Zone (New People)

	West, Southwest, and Central Zones				Northwest, East, and North Zones			
	First child		Children Age 6-14		First child		Children Age 6-14	
	No schooling	Primary school	No schooling	Attending school	No schooling	Primary school	No schooling	Attending school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. Forced Marriage 1978 vs. Regular Marriage							
Forced marriage 1978	0.143***	-0.153***	0.241***	-0.272***	0.071	-0.067	0.027	-0.025
	(0.018)	(0.027)	(0.020)	(0.021)	(0.046)	(0.044)	(0.038)	(0.031)
Observations	797	797	2224	2224	837	837	2195	2195
Mean in the control groups	0.06	0.66	0.18	0.81	0.20	0.43	0.30	0.67
	Panel B. Forced Marriage 1979 vs. Regular Marriage							
Forced marriage 1979	0.035	-0.034	0.055**	-0.050**	-0.014	0.040	0.055*	-0.054*
	(0.022)	(0.038)	(0.023)	(0.023)	(0.033)	(0.043)	(0.029)	(0.029)
Observations	1231	1231	3188	3188	978	978	2566	2566
Mean in the control groups	0.06	0.67	0.18	0.81	0.19	0.43	0.30	0.68

Notes: See notes to Table 5.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

6 Conclusions

This paper presented an econometric analysis of the communist revolution by the Khmer Rouge in Cambodia on economic behaviors of survivors after 1979. We focused on forced marriages in the Pol Pot regime and regular marriages in the post Pol Pot regime, and made econometric evaluations of their educational investments for children. We presented both graphical and econometric analyses; these suggest that the forced-marriage couples invested less in their children's education than the regular-marriage couples. This together with the historical evidences could be interpreted as meaning that the forced-marriage couples tended to behave so as to conform to the rules of the Pol Pot regime more than the regular-marriage couples because they internalized the social norms of family behaviors under the Pol Pot regime more strongly.

We then considered those results, by reflecting upon social and political structures under and after

the Pol Pot regime. We found that the difference in educational investments for children between the forced- and regular-marriage couples was persistent in the zones where the Khmer Rouge had lasting influence after 1979. On the other hand, the persistence of those differences was not strong in the zones where they did not. These could be interpreted as meaning that the forced-marriage couples in the former were motivated to follow the rules of the Pol Pot regime for fear of future violence by the Khmer Rouge over a long period of time after its collapse.

Our study contributes to a growing literature of effects of historical institutions on contemporary economic development (see Nunn (2009) for a comprehensive survey). The existing literature mainly focuses on effects of either formal institutions (e.g., Acemoglu et al. 2001, Banerjee and Iyer 2005, Dell 2005) or cultural norms/beliefs (e.g., Guiso et al. 2007, Tabellini 2007, Nunn and Wantchekon 2011). Our study considers effects of both formal institution and social norms. Our findings are coherent with those in the existing literature: extractive institutions have negative effects on economic performance.

Regarding mechanisms underlying persistence of institutions, our study is related to Munshi and Rosenzweig (2006), who examine how the Indian caste system affects schooling choices as modernization proceeds. One difference between their study and ours is that they focus on institutions, already existed, but ours focuses on institutions, newly emerged under a primitive communism. Thus, our study focuses on the origins of institutions and examines their persistence.

Unlike the existing literature, our study examines heterogeneity in effects of institutions on economic behaviors among various social groups with difference experiences, by reflecting upon historical contexts and social environments. As is emphasized in Gintis (2009), Greif (2006), Kaneko and Kline (2008), and North (2010), these considerations enable us to have better understandings of the way of human behaviors and of underlying mechanism of how institutions have persistent effects on human behaviors over time.

Our study also contributes to a literature on effects of conflict on economic development (see Blattman and Miguel (2010) for a comprehensive survey). In the existing literature, little is known about how institutions emerged during conflicts and how they are persistent after them. Our study provides these discussions, based on historical evidences and empirical data, and examines their effects on economic behaviors.

The findings presented in our study are also important in the context of Cambodia. The inequality in children's education resulting from forced marriages in the Pol Pot regime may lead to subsequent income inequality.[37] This may further cause persistence of economic inequality across generations. We need more studies to take those issues seriously. This is left for our future studies.

[37]See Card (1999) for a review on the causal relationship between education and earning.

Table 16: Sampling Results

No.	Description of Condition	Obs.
(0)	Total number of households in the complete set of the 1998 Census micro-data	2,188,177
(1)	Mother's age is 34-38 and the age of child who is oldest in the households is 16-17 or 19-20.	77,981
(2)	The number of mother's own children alive is equal to that of children living together at the time of the 1998 Census.	63,088
(3)	If the age of i^{th} child is same as that of $i+1^{th}$ child, then the birth district of the i^{th} child is also same as that of the $i+1^{th}$ child.	62,957
(4)	Households are "normal/regular" ones (not "homeless", "boat", "transient" ones).	62,786
(5)	Households do not include grandfather, grandmother, grandchild, other relatives, and non-relatives.	48,104
(6)	Mother's marital status is either "married" or "divorced" or "widowed" (not "never married" or "separated").	47,834
(7)	If mother's marital status is "married", then the households include father.	44,827
(8)	All household members were born in Cambodia.	43,645
(9)	All household members have never lived outside Cambodia.	43,196
(10)	All household members speak "Khmer" (Cambodian) as their first language.	41,875
(11)	All household members believe in "Buddism".	41,481
(12)	All children in the households have never got married.	40,975
(13)	All household members have the information about education.	40,891
(14)	Mother's marital status is "married".	37,590

Note: The table shows the detailed results of sampling. There were 2,188,662 households in the original micro-data of the 1998 Census. We excluded all the duplicated households except one of them. The result was 2,188,177 households, which became the initial data for our sampling.

Table 17: Descriptive Statistics

	Forced Marriage 1978		Forced Marriage 1979		Regular Marriage 1981		Regular Marriage 1982	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(A) Household characteristics								
Female head	1.00	0.052	1.00	0.043	1.00	0.045	1.00	0.046
		(0.222)		(0.203)		(0.207)		(0.208)
Mother's age	1.00	36.776	1.00	36.916	1.00	36.498	1.00	36.185
		(1.337)		(1.198)		(1.271)		(1.334)
Father's age	1.00	42.471	1.00	41.236	1.00	39.698	1.00	38.972
		(5.529)		(4.476)		(4.203)		(4.270)
Mother's education	1.00	2.176	1.00	2.330	1.00	2.188	1.00	2.105
		(2.652)		(2.689)		(2.634)		(2.606)
Father's education	1.00	4.018	1.00	4.274	1.00	4.001	1.00	3.754
		(3.242)		(3.228)		(3.217)		(3.168)
Light	0.99	0.127	0.99	0.138	0.99	0.126	0.99	0.123
		(0.333)		(0.345)		(0.332)		(0.328)
Fuel	1.00	0.047	0.99	0.054	0.99	0.049	0.99	0.051
		(0.212)		(0.226)		(0.216)		(0.219)
Water	0.98	0.284	0.98	0.296	0.97	0.280	0.98	0.274
		(0.451)		(0.457)		(0.449)		(0.446)
Toilet	1.00	0.133	1.00	0.133	1.00	0.128	1.00	0.115
		(0.339)		(0.339)		(0.334)		(0.319)
Number of children	1.00	5.508	1.00	5.480	1.00	5.182	1.00	4.921
		(1.768)		(1.714)		(1.552)		(1.503)
Children age less than 6	1.00	0.640	1.00	0.631	1.00	0.688	1.00	0.696
		(0.480)		(0.483)		(0.463)		(0.460)
Number of observations	1,275		4,119		15,481		16,715	
(B) Characteristics of first children								
Child age	1.00	20.000	1.00	19.000	1.00	17.000	1.00	16.000
		0.000		0.000		0.000		0.000
Female	1.00	0.384	1.00	0.404	1.00	0.493	1.00	0.499
		(0.486)		(0.491)		(0.500)		(0.500)
Primary school	1.00	0.317	1.00	0.388	1.00	0.400	1.00	0.366
		(0.465)		(0.487)		(0.490)		(0.482)
No schooling	1.00	0.284	1.00	0.198	1.00	0.189	1.00	0.189
		(0.451)		(0.399)		(0.391)		(0.391)
Number of observations	1,275		4,119		15,481		16,715	
(C) Characteristics of children Age 6-14								
Child age	1.00	10.193	1.00	10.192	1.00	10.169	1.00	10.270
		(2.562)		(2.557)		(2.539)		(2.605)
Female	1.00	0.481	1.00	0.486	1.00	0.494	1.00	0.491
		(0.500)		(0.500)		(0.500)		(0.500)
Attending school	1.00	0.565	1.00	0.613	1.00	0.637	1.00	0.630
		(0.496)		(0.487)		(0.481)		(0.483)
No schooling	1.00	0.419	1.00	0.370	1.00	0.344	1.00	0.350
		(0.494)		(0.483)		(0.475)		(0.477)
Number of observations	3,130		10,359		40,963		46,638	

Notes: The odd columns show proportion of nonmissing. The even columns show mean and the standard deviation. The standard deviations are reported in parentheses.

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