



EFFECTS OF BIRTH ORDER ON EDUCATION AND OCCUPATIONS: EVIDENCE FROM CAMBODIA

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ABSTRACT

Research from developed nations has shown that later-born children tend to have worse outcomes in terms of health, nutrition, and education. However, evidence from developing countries remains mixed. In our research, using data on 423,848 individuals in Cambodia, we investigate how birth order affects not only education but also occupational choices in this country. Our estimates show that, compared to firstborn children, later-born children have fewer years of schooling and lower literacy skills, and are less likely to participate in the labour force and more likely to work as unpaid family workers. Conditional on labour force participation, later-born children are less likely to be employed. Our findings reveal huge economic disparities within a household.

KEYWORDS

Birth Order, Education,
Occupational Choices,
Cambodia

Introduction

Intra-household resource allocation has implications for inequality among siblings in both developed and developing countries. Birth order often leads parents to allocate resources to only a few children (e.g., preference for the eldest son). Previous research from developed nations has shown that children of higher birth order are worse off because of limited attention from parents. For instance, in the context of Norway, Black et al. (2005) show that firstborn children tend to have better educational outcomes than later-born children do. Price (2008) and Pavan (2016) demonstrate that the negative birth order effects are due to parents' limited investment in later-born children. In contrast, the direction of the birth order effects in low- and middle-income countries remains unclear. The findings from some studies are in line with evidence from developed nations in that they show the negative birth order effects (Jayachandran and Pande 2017; Bishwakarma and Villa 2019; Esposito et al. 2020) mainly because parents prefer to invest in the eldest sons or can only afford to send their oldest child to school due to poverty. In contrast, other studies have shown that later-born children have better outcomes (Haan et al. 2014; Coffey and Spears 2021; Emerson and Souza 2008) because older siblings drop out of school and start working to complement parents' income. It might also be due to mother's physical readiness for childbirth in the presence of teenage pregnancy. Existing evidence seems to suggest that the direction of birth order effects in developing countries may not be clear due to these confounding factors, unlike developed nations.

However, little research on birth order effects has been conducted in Southeast Asia. Furthermore, because of the limited data availability, previous studies have mainly focused on the early childhood development of human capital (e.g., infant mortality, nutrition, and education), limiting our knowledge

of the long-term impact of birth order. To fill these gaps in the literature, we examine the long-term impact of birth order on educational attainments and occupational outcomes in Cambodia.

In our research, utilizing representative household surveys in Cambodia, we quantitatively study how birth order affects education and occupational outcomes. Specifically, to isolate the birth order effects, we estimate regressions with mother fixed effects and the fixed effects of children's cohorts. The mother fixed effects control for both observed and unobservable maternal characteristics that affect all children (including the number of children born to the mother and her year of birth) in a household. This means that we exploit within-household variations to identify the effects of birth order on different outcomes. The fixed effects of children's cohorts account for the cohort-level fluctuations in dependent variables (e.g., the financial crisis in Asia).

Our estimates show that firstborn children have better outcomes later in life. First, they have higher educational attainments and are more likely to be literate. For instance, relative to firstborn children, second-born children are 3.3 percentage points less likely to complete primary education. The gap is expanding with birth order. The birth order effects on education are consistently observed for both mothers with no education and those with at least primary education. Second, firstborn children also have better occupational outcomes than later-born children. They are less likely to be inactive in the labour market and work as unpaid family workers. Self-employment is more common among firstborn children. The birth order effects on occupational choices are also observed regardless of the mothers' educational levels. Our findings are robust to the use of a restricted sample of older mothers (who were less likely to give birth after the 2008 census), the omission of households with twins (whose birth order may have different effects on outcomes), and the use of the 1998 census.

Our findings are related to two strands of the literature in development economics. First, our research adds to the growing literature on the causal effects of birth order on economic outcomes. Starting with Black et al. (2005), several studies from developed nations have shown that firstborn children tend to have better outcomes (Bagger et al. 2021; Booth and Kee 2009; Hotz and Pantano 2015; Haan 2010). However, evidence from developing countries remains mixed. While some studies have identified the negative effects of birth order on the childhood development of human capital, others have indicated that later-born children have better outcomes. Furthermore, due to the data limitations, many studies focussed on the early development of human capital but evidence on occupational outcomes remains limited. Using data from Cambodia, we complement this growing literature by providing evidence that firstborn children have better educational outcomes and an advantage in labour markets. Second, our research more broadly contributes to the literature on intra-household resource allocation. Numerous studies have supported the quantity-quality trade-off, meaning that average human capital among children declines with the number of children in the household (Rosenzweig and Zhang 2009). In our research, in the context of Southeast Asia, we provide evidence on the long-term impact of unequal intra-household resource allocation.

Data

We use the 10% samples of the 2008 census (for our main analysis) and the 1998 census (for robustness check) in Cambodia. The data are obtained from Integrated Public Use Microdata Series, International (IPUMS) (Minnesota Population Center 2020). At the time of writing this paper, the 2019 census is not available on IPUMS. IPUMS provides easy access to harmonized census data from around the world. In the censuses, people are asked about their educational attainments, gender, occupation, and housing condition. Also, we have identifiers for parents that allow us to link children with their parents. However, since it only covers 10% of the entire population of the country, we lack data on some children in each household, which poses challenges to identifying birth order in a household.

To overcome this issue, we use children's ages to determine their birth order. For instance, if a mother reports that she has 4 children but we only have two of her children in the dataset, we regard the older child as first-born and the younger child as second-born. Although this may introduce bias if the selection is conditional on some variables, this may not be a huge concern for our analysis as our dataset is a random sample of the census and we include mother fixed effects in regressions. For brevity, we denote the oldest child for each mother as her firstborn child in the discussion below. Since children's age and parents' information are necessary for identification, we remove all individuals that lack these variables from the sample. The resulting sample sizes are 423,848 individuals in the 2008 census and 362,899 individuals in the 1998 census.

Empirical strategy

In this research, we aim to understand the long-term effects of birth order on different outcomes in Cambodia. To identify the causal effects of birth order, we need to isolate its effects from the impact of the number of siblings, children's cohorts, and mothers' characteristics (such as years of birth, education, and occupations). For instance, higher birth order implies that the child is from a bigger family, confounding the effect of birth order with the effect of family size. Furthermore, the children of higher birth order were born later on average and might have benefited from recent economic growth in Cambodia, suggesting that the effect of birth order might be confounded by cohort fixed effects. Related to this, later-born children tend to have older mothers, suggesting that their income may be more stable or they are more experienced in parenting. For these reasons, researchers often utilize the fixed effects of children's cohorts and mother fixed effects although some studies directly control for relevant variables (Bishwakarma and Villa 2019; Esposito et al. 2020).

Given the literature, we will identify the effect of birth order on outcomes by including mother fixed effects to control for common maternal characteristics for all children in each household (e.g., mothers' cohorts and the number of siblings) and the fixed effects of children's cohorts to control for annual fluctuations that affect all individuals in the same cohort. We estimate the following regression for individual i born in year t to mother m :

$$y_{im} = \alpha + \sum_{b=2}^4 (\beta_b \times \text{Order}_{im}^b) + X_{im} \eta + y_t + \delta_m + \varepsilon_{im}$$

The outcome variables consist of educational attainments and occupational outcomes. For educational attainments, I use years of schooling, a binary variable for the completion of primary education, a binary variable for school attendance, and a binary variable for literacy skills. As for occupational outcomes, I first use binary variables for labour force participation. Since there are two questions about labour force participation in the dataset, we create two dummy variables from those two questions. Due to misreporting, there are a few differences, but the results remain almost identical. Conditional on labour force participation, we construct a binary variable for being employed. Additionally, a binary variable is created for working as unpaid family workers, which is not conditional on employment. This is because some respondents report that they are inactive but work as unpaid family workers. In addition, conditional on employment, children's career choices are explored by using a binary variable for being self-employed. Finally, I test the effects of birth order on the conditional probability of working in the agriculture and textile sectors. On the right-hand side, we have binary indicators for birth order. This is a set of binary variables for the child of the corresponding order. In our dataset, birth order is determined by the children's age in each household (i.e., out of all children of a mother in the dataset, the oldest child is considered firstborn, the second oldest child is second-born, and so on) because the exact data on birth order is not available in the dataset. For instance, if Order^2 is equal to 1, it means that the person is the second oldest child among the children observed in the data in each household. Order^4 is equal to 1 if the child is of the fourth or higher order. The reference group consists

of firstborn children. X is a vector of individual-level control variables such as the sex of the respondent. γ and δ show the fixed effects of children's cohorts and mother fixed effects, respectively. The standard errors are clustered at the mother level to account for potential correlation within families. Using this regression, we can interpret β as the effects of being second-born, third-born, and the children of fourth or higher orders, respectively, relative to firstborn children. Since we include mother fixed effects, the effect is identified by within-family variation.

In our analysis, we further estimate the regression for different subgroups. First, we estimate the regression for the children of the mothers who were born before 1969 in the 2008 census. We hypothesise that these mothers are less likely to give birth after the 2008 census as they were 40 years old or older at the time. Second, as an additional robustness check, we omit all households with twins. This is because the birth order may not be clearly determined for twins, and thus, these twins may bias the results. Finally, using the 1998 census, we replicate the same analysis. Given the lasting conflicts and political instability in Cambodia, which led to severe poverty, the 1998 census may reflect the birth order effects more clearly.

Considering the discussion over reproducibility and p-hacking in quantitative research (Brodeur et al. 2016), we will use lower statistical thresholds. Following Benjamin et al. (2018), I will interpret the statistical significance levels of $0.005 < P < 0.05$ as suggestive, and the lower significance levels as statistically significant. This, by definition, significantly reduces the probability of making a Type I error. As suggested by Simmons et al. (2011), the conventional statistical thresholds of 10% or 5% are extremely susceptible to p-hacking and forking. Thus, the use of lower thresholds has the potential to prevent these issues in empirical studies.

Results

Birth order and education

In this section, we present our main results. First, we discuss how birth order affects children's educational attainments.

Table 1: Birth order effects on education (2008 Census)

	Attendance (1)	Primary (2)	Literate (3)	Years of schooling (4)
Second	-0.00325*** (0.00119)	-0.0333*** (0.00175)	-0.00785*** (0.00130)	-0.227*** (0.0102)
Third	-0.0132*** (0.00199)	-0.0531*** (0.00280)	-0.0225*** (0.00218)	-0.390*** (0.0167)
Fourth & higher	-0.0348*** (0.00299)	-0.0501*** (0.00405)	-0.0516*** (0.00324)	-0.448*** (0.0248)
Observations	423,848	423,848	423,848	423,848

Notes: All regressions include mother fixed effects and cohort fixed effects to control for maternal characteristics and cohort variations in educational attainments. The standard errors in the parentheses are clustered at the mother level. +, *, **, and *** indicate significance at 5%, 1%, 0.5%, and 0.1%, respectively.

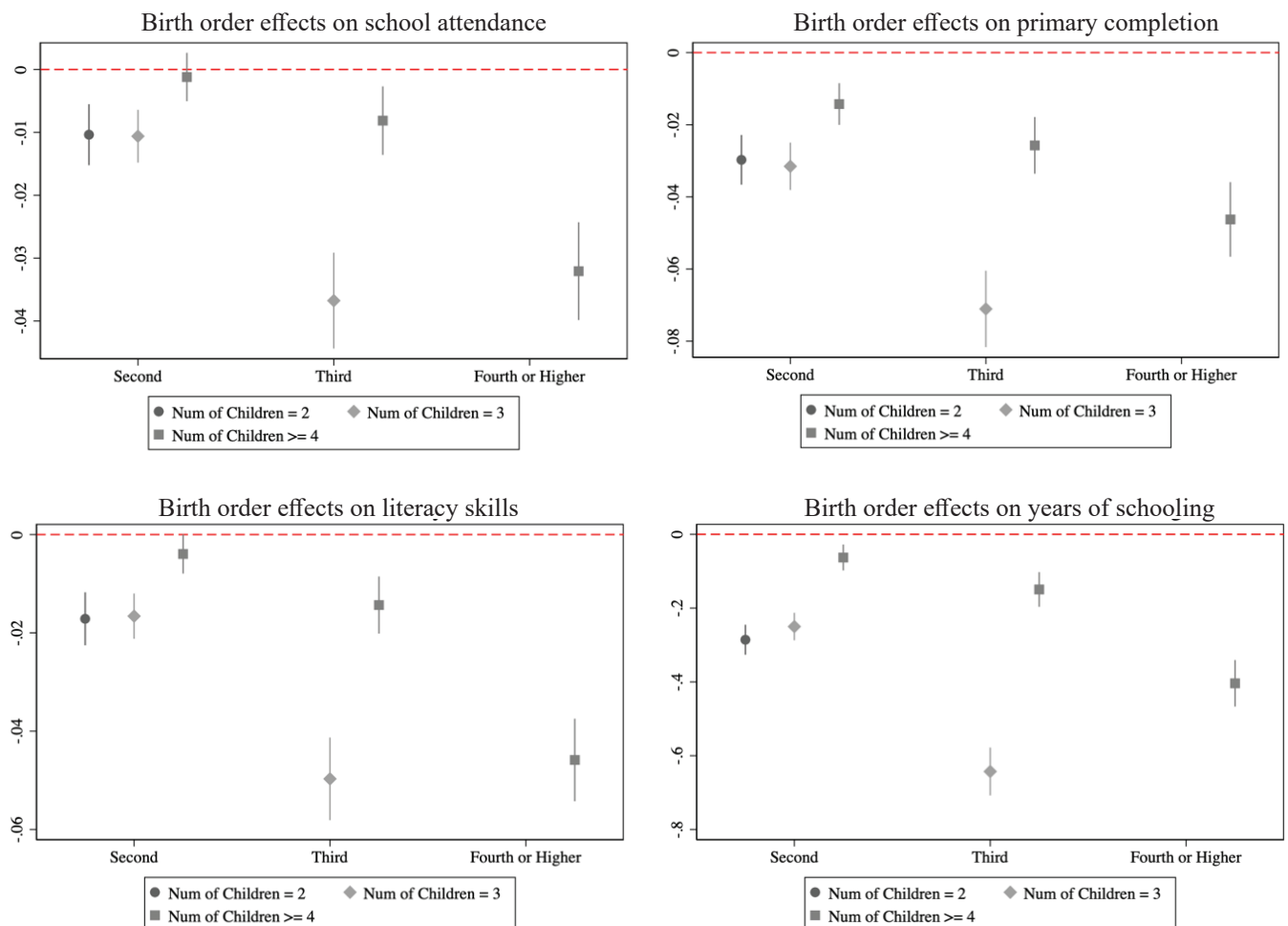
Our main results are presented in Table 1. All regressions include mother fixed effects to control for observable/unobservable characteristics that affect all children born to the same mother, and fixed effects of children's cohorts to control for factors that affect all children in the same cohort. The coefficients show the differences between the outcomes of the firstborn (i.e., oldest) children and those of the children of the corresponding birth order.

The results show a strong impact of birth order on education after accounting for mothers' observed/unobservable characteristics and children's cohorts. First, Column (1) indicates that, relative

to the firstborn children, later-born children are less likely to enrol in school. This means that later-born children face obstacles to primary education, which is the very first step in education. The gap is expanding with birth order. While second-born children are, on average, 0.3 percentage points less likely to attend school, the children of the fourth or higher birth order are 3.5 percentage points less likely to do so, representing a huge gap in school attendance. Column (2) focuses on the gap in the likelihood of completing primary education. Our estimates indicate that, relative to firstborn children, later-born children are still at a disadvantage. They are approximately 5 percentage points less likely to complete primary education than their oldest siblings. This disadvantage in access to schooling is also translated into literacy skills (Column (3)). Later-born children are less likely to be literate, and the gap is expanding with birth order. In line with these findings, Column (4) shows that later-born children have fewer years of schooling, and the gap in this indicator is also expanding with birth order. Clearly, the results indicate a huge advantage for firstborn children relative to their siblings.

Figure 1 shows how the birth order effects change with the number of children. To create these figures, for each outcome, we estimate the regression separately for families with a different number of children. First, we estimate the regression for the families with two children. Then, we do it for the families with three children. Finally, we run the regression for larger families (i.e., with four or more children). For most outcomes, regardless of the number of children, we can see a huge disadvantage for later-born children relative to the firstborn child, and the disadvantage is bigger for children of higher birth order.

Figure 1: Birth order effects in different-sized family



Birth order and occupational choices

Table 2: Birth order effects on occupation (2008 Census)

	Inactive	LFP	Employed	Unpaid worker	Self-employment	Agriculture	Textile & garment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Second	0.0163*** (0.00150)	-0.0115*** (0.00144)	-0.00417*** (0.00139)	0.0183*** (0.00254)	-0.0324*** (0.00253)	-0.00522** (0.00221)	0.00931*** (0.00211)
Third	0.0512*** (0.00252)	-0.0408*** (0.00240)	-0.0113*** (0.00253)	0.0224*** (0.00423)	-0.0470*** (0.00424)	-0.00400 (0.00371)	0.0131*** (0.00367)
Fourth & higher	0.0966*** (0.00365)	-0.0790*** (0.00346)	-0.0224*** (0.00411)	0.0296*** (0.00628)	-0.0648*** (0.00637)	-0.00741 (0.00562)	0.0214*** (0.00566)
Observations	423,848	423,848	100,690	103,674	95,883	95,883	95,883

Notes: All regressions include mother fixed effects and cohort fixed effects to control for maternal characteristics and cohort variations in educational attainments. The standard errors in the parentheses are clustered at the mother level. +, *, **, and *** indicate significance at 5%, 1%, 0.5%, and 0.1%, respectively. LFP stands for labour force participation, and it is equal to 1 if the person is either employed or unemployed (i.e., not inactive). The outcome variable in Column (3) is conditional on the labour force participation. In Columns (5) – (7), outcome variables are conditional on employment.

Following the discussion over the birth order effects on education, we ask whether the gaps within a household are translated into differences in occupational outcomes. Table 2 presents our main findings on occupational outcomes. Overall, in line with the findings on the birth order effects on education, we find a huge disadvantage for later-born children and it is expanding with birth order. In Columns (1) and (2), using the unconditional probability of being inactive or participating in the labour force as outcome variables, we find that later-born children are more likely to be inactive and less likely to participate in the labour force. Compared to firstborn children, the children of fourth or higher order are 9.6 percentage points more likely to be inactive. Since we include the fixed effects of children's cohorts, this result is not due to the fact that later-born children are, on average, younger and more likely to be in school. We obtain similar coefficients in Column (2) though the signs are different (by definition). Please note that these two columns are slightly different as there are some measurement issues in the dataset. These two variables are from two separate questions, so some individuals seem to have provided two inconsistent answers due to misreporting. In Column (3), on the other hand, we condition the probability of being employed on the labour force participation. Among those participating in the labour force, later-born children are much less likely to be employed at the time of the census. Our point estimates indicate that, relative to the first child, second-born child is on average 0.4 percentage points less likely to be employed, third-born child is 1.1 percentage points less likely, and the child of higher birth order is 2.2 percentage points less likely. Consistent with other results, this indicates that there is a huge disadvantage of later-born children in employment outcomes, and its disadvantage is expanding with birth order.

Our estimates also show that birth order affects occupational choices. First, compared to firstborn children, later-born children are significantly more likely to work as unpaid family workers (Column (4)). Since some unpaid family workers are classified as unemployed although they report that they work as unpaid family workers, this outcome variable is conditional on labour force participation (instead of employment). In Columns (5) – (7), in contrast, outcome variables are conditional on employment. We find that later-born children are much less likely to be self-employed whereas they are more likely to work in the textile and garment sectors. Clearly, children's birth order affects their career choices¹.

¹ Children's education is an undesirable control variable in our case as we assume that birth order affects occupational outcomes (at least partially) through educational attainments.

Robustness check

In this section, we present three main robustness tests to support our argument. First, we run the same regressions for the children whose mothers were born before 1969. This means that their mothers were aged 40 or above in 2008. According to the 2008 census, if we obtain the age gap between mothers and their children, we see that only 1.12% of mothers have given birth after age 40. This suggests that we can safely assume women are very unlikely to give birth after age 40. This robustness test is often used to deal with a potential endogeneity concern when mother fixed effects cannot be included in the regression. By restricting the sample to a limited set of households, researchers can assume that the observed number of children is equal to the total number of children these families would eventually reach. Since we include mother fixed effects in the regression, we may not necessarily need this robustness check. However, this analysis indicates how robust our estimates are to different samples. The results are presented in Panel A of Tables 3 and 4.

Table 3: Robustness check for education (2008 Census)

	Attendance (1)	Primary (2)	Literate (3)	Years of schooling (4)
<i>Panel A: Mothers born before 1969</i>				
Second	0.00159 (0.00148)	-0.0158*** (0.00224)	-0.00153 (0.00156)	-0.116*** (0.0138)
Third	-0.00153 (0.00231)	-0.0346*** (0.00340)	-0.00790*** (0.00246)	-0.236*** (0.0209)
Fourth & higher	-0.0160*** (0.00336)	-0.0421*** (0.00476)	-0.0284*** (0.00358)	-0.323*** (0.0297)
Observations	291,089	291,089	291,089	291,089
<i>Panel B: Households without Twins</i>				
Second	-0.00289** (0.00123)	-0.0338*** (0.00180)	-0.00775*** (0.00135)	-0.231*** (0.0106)
Third	-0.0130*** (0.00208)	-0.0536*** (0.00291)	-0.0226*** (0.00227)	-0.398*** (0.0174)
Fourth & higher	-0.0348*** (0.00313)	-0.0496*** (0.00424)	-0.0519*** (0.00340)	-0.452*** (0.0260)
Observations	406,671	406,671	406,671	406,671

Notes: All regressions include mother fixed effects and cohort fixed effects to control for maternal characteristics and cohort variations in educational attainments. The standard errors in the parentheses are clustered at the mother level. +, *, **, and *** indicate significance at 5%, 1%, 0.5%, and 0.1%, respectively.

The coefficients became slightly smaller (especially for educational outcomes) but the direction of the birth order effects is consistent with our previous analysis. For instance, as in Table 1, we find a huge difference in the likelihood of primary completion and years of schooling across siblings. Furthermore, as for occupational outcomes, the resulting estimates are almost identical to the previous estimates. These findings suggest that, although some statistical significance has gone due to a smaller sample size or smaller effects, the results remain almost unchanged in many cases. The smaller birth order effects in this sample can be explained by the political context their children were likely to face throughout the 1970s to the 1990s. Political turmoil throughout this period might have depressed the advantages for firstborn children as educational institutions were completely destroyed as a result of the Pol Pot regime. Nevertheless, even under these severe conditions, firstborn children retained significant advantages in most outcomes (in particular, occupational outcomes).

Table 4: Robustness check for occupation (2008 Census)

	Inactive (1)	LFP (2)	Employed (3)	Unpaid worker (4)	Self- employment (5)	Agriculture (6)	Textile (7)
<i>Panel A: Mothers born before 1969</i>							
Second	0.0219*** (0.00200)	-0.0179*** (0.00194)	-0.00374*** (0.00143)	0.0196*** (0.00272)	-0.0330*** (0.00265)	-0.00465** (0.00230)	0.00839*** (0.00220)
Third	0.0610*** (0.00313)	-0.0527*** (0.00302)	-0.0106*** (0.00259)	0.0240*** (0.00447)	-0.0478*** (0.00438)	-0.00281 (0.00382)	0.0122*** (0.00377)
Fourth & Higher	0.104*** (0.00433)	-0.0897*** (0.00415)	-0.0215*** (0.00417)	0.0306*** (0.00656)	-0.0658*** (0.00653)	-0.00582 (0.00574)	0.0192*** (0.00578)
Observations	291,089	291,089	94,836	95,745	90,340	90,340	90,340
<i>Panel B: Households without Twins</i>							
Second	0.0172*** (0.00155)	-0.0121*** (0.00148)	-0.00428*** (0.00146)	0.0208*** (0.00264)	-0.0335*** (0.00265)	-0.00522** (0.00229)	0.00876*** (0.00220)
Third	0.0528*** (0.00263)	-0.0419*** (0.00250)	-0.0120*** (0.00268)	0.0264*** (0.00441)	-0.0482*** (0.00448)	-0.00489 (0.00386)	0.0131*** (0.00382)
Fourth & Higher	0.0995*** (0.00381)	-0.0812*** (0.00362)	-0.0249*** (0.00441)	0.0334*** (0.00660)	-0.0623*** (0.00673)	-0.00899 (0.00594)	0.0201*** (0.00597)
Observations	406,671	406,671	95,767	98,585	91,243	91,243	91,243

Notes: All regressions include mother fixed effects and cohort fixed effects to control for maternal characteristics and cohort variations in educational attainments. The standard errors in the parentheses are clustered at the mother level. +, *, **, and *** indicate significance at 5%, 1%, 0.5%, and 0.1%, respectively.

Table 5: Birth order effects on education (1998 Census)

	Attendance (1)	Primary (2)	Literate (3)	Years of schooling (4)
Second	-0.0173*** (0.00175)	-0.0204*** (0.00171)	-0.0219*** (0.00185)	-0.208*** (0.0103)
Third	-0.0383*** (0.00292)	-0.0428*** (0.00271)	-0.0494*** (0.00306)	-0.436*** (0.0166)
Fourth & higher	-0.0795*** (0.00425)	-0.0686*** (0.00388)	-0.0982*** (0.00444)	-0.752*** (0.0245)
Observations	362,899	362,899	362,899	362,899

Second, we omit the households with twins to avoid confounding the birth order effects with the effects of unexpected twin birth. The results are presented in Panel B of Tables 3 and 4. They indicate that our estimates remain robust to this, suggesting that the birth order effects are not driven by the effects of unexpected twin births or the assignment of wrong birth order due to twin births.

Table 6: Birth order effects on occupation (1998 Census)

	Inactive (1)	LFP (2)	Employed (3)	Unpaid worker (4)	Self-employment (5)	Agriculture (6)	Textile (7)
Second	0.0277*** (0.00166)	-0.0188*** (0.00157)	-0.0240*** (0.00293)	0.0399*** (0.00346)	-0.0444*** (0.00400)	-0.00267 (0.00265)	0.00156 (0.00145)
Third	0.0513*** (0.00264)	-0.0347*** (0.00248)	-0.0454*** (0.00542)	0.0445*** (0.00604)	-0.0496*** (0.00711)	-0.00125 (0.00486)	0.00213 (0.00257)
Fourth & higher	0.0633*** (0.00379)	-0.0412*** (0.00356)	-0.0684*** (0.00917)	0.0429*** (0.00931)	-0.0562*** (0.0110)	-0.00850 (0.00762)	-0.000621 (0.00451)
Observations	362,899	362,899	56,217	52,882	46,923	46,923	46,923

Finally, we replicate the same analysis in the 1998 census. This is the only other census available on IPUMS at the time of writing this paper. The advantage of using IPUMS is that the variables are harmonized across waves, so we can estimate identical regressions for this alternative sample. The results are presented in Tables 5 and 6. Our estimates from the 1998 census suggest that the advantages of firstborn children are larger in the past. In Table 5, compared to firstborn children, the children of fourth or higher order are 8 percentage points less likely to enrol in primary school, 6.8 percentage points less likely to complete primary education, and 9.8 percentage points less likely to be literate. Furthermore, they have 0.75 fewer years of schooling. In Table 6, although the signs of the coefficients and their statistical significance remain unchanged, some coefficients became larger. In particular, the effects of birth order on the conditional probability of being employed or working as unpaid workers is now much larger than the original estimates in Table 2.

Conclusion

In developing countries, evidence on the birth order effects remains mixed. While some studies have shown negative birth order effects, others have demonstrated positive birth order effects. Furthermore, due to data limitations, many studies have mainly focused on the short-term impact of birth order. Our research contributes to this growing literature by providing evidence on the birth order effects on educational attainments and occupational outcomes in Cambodia.

To identify the causal effects of birth order on these outcomes, we control for mother fixed effects and the fixed effects of children's cohorts, cluster standard errors at the mother level, and set significance thresholds lower than the conventional levels. Combining the regressions with a representative household survey conducted in 2008, we show that later-born children are disadvantaged in both education and the labour market. Specifically, later-born children have fewer years of schooling and are less likely to be literate. Furthermore, they are more likely to be inactive in the labour market and less likely to be employed (conditional on labour market participation). Finally, they are more likely to work as unpaid family workers and less likely to be self-employed. Our estimates also show that later-born children are more likely to work in the textile and garment sectors (conditional on employment). These findings are robust to several robustness checks and replicated in the 1998 census as well. Clearly, higher birth order is closely linked to worse outcomes.

These findings have important policy implications. As in many studies on intra-household resource allocation, we also show that resources are not allocated evenly across children. This suggests that some household members are less likely to get out of poverty than others. Our research shows the important role of birth order in poverty alleviation as it is related to not only human capital development but also labour market outcomes. In particular, it is worth emphasizing the role of birth order in determining whether the person becomes an unpaid family worker or not later in life. Thus, it seems crucial to target specific family members instead of households as a whole when policymakers design a policy.

There are some potential avenues for future research. First, it will be important to use a complete census to replicate our findings. As we mentioned in Section 2, we only have access to the 10% random sample of the census in Cambodia, which may pose a potential threat to the identification. Thus, future research should use the census to test the birth order effects in Cambodia more closely. Second, future research should also investigate whether the effects of policies (e.g., vocational training) differ by their birth order. If some individuals are more likely to work as unpaid family workers due to their birth order, it may be natural to hypothesize that people's responses to policies may differ according to their birth order. For instance, the participation rate may differ by birth order if people are subconsciously aware of the negative birth order effects. Finally, it will be interesting to see how the disadvantages

of later-born children are transmitted across generations. Potential research may investigate how the children of later-born siblings differ from those of firstborn children from the same family, and whether the birth order effects may differ between firstborn parents and later-born parents.

Acknowledgements

I would like to sincerely thank Dr. Vatana Chea and Dr. Phal Chea for their valuable feedback and insightful comments. I would also like to thank all participants in the monthly research seminar at the Cambodia Development Resource Institute for their discussions. Finally, I wish to acknowledge the support from the National Institute of Statistics in Cambodia and the Minnesota Population Center for making the data publicly available for academic research. I declare that I have no relevant or material financial interests that relate to this research. All remaining errors are my own.

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