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Intergenerational effect of education reform: mother's education and children's human capital in Nepal

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Intergenerational effect of education reform: mother's education and children's human capital in Nepal*

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Abstract

We examine a potential intergenerational transfer of human capital by investigating the effect of maternal education on children's educational and labor outcomes in the context of a developing country Nepal. To account for endogeneity of mother's education, we use education reform in the 1970s that had differential impact on women due to their year and district of birth. We also account for birth order effects by implementing a triple-difference strategy. The education reform increased schooling of females that were most affected by the reform. Furthermore, an increase in mother's highest level of schooling increased the child's probability of finishing 5^{th} grade only among mothers from a higher caste households. We find modest effects of mother's education on child labor outcomes, with the IV estimate indicating that a year increase in mother's education reduces a child's weekly work by approximately an hour. A lack of intergenerational impact among relatively lower caste households suggests that exclusionary social structure should be considered when promoting maternal education as a medium to improve children's well-being.

Key words: Intergenerational effect, maternal education, children human capital, schooling
JEL Code: I26, J20, I30

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1 Introduction

An improvement in the living standard from one generation to the next is a desirable feature of development. This improvement partially occurs when parents transmit some fraction of their human capital to their children, which allows the next generation to earn higher income, obtain better health, and attain a higher living standard by utilizing the opportunities created by economic growth (Chen and Feng, 2011; Chou et al., 2010; Currie and Moretti, 2003). Indeed, variation in parental schooling, especially mother's schooling, is often cited as a reason for inequality of opportunity among children (Behrman et al., 2017). Human capital transmissions that occur early in the child's life are particularly beneficial given the theories and findings suggesting that early human capital investment plays a crucial and most important role in determining outcomes later on in life (Becker, 1967; Heckman et al., 2013; Heckman, 2011; Heckman et al., 2010; Olds et al., 1998). In this paper, we study whether an improvement in women's education induced by a policy reform increased their children's human capital by increasing schooling and reducing child labor.

Existing estimates of intergenerational impact of parental education are low. In a recent study using data from four developing countries (Ethiopia, India (two states), Peru, and Vietnam), Behrman et al. (2017) concluded that there is likely to be no human capital accumulation impact of improving parental education at the lower end of the distribution. Also, the authors state that their estimates are likely to be biased upward due to endogeneity occuring from lack of appropriate controls for unobserved partental characteristics. However, this study does not take into account any of the social factors that influence educational outcomes in many developing countries. In many developing countries, barriers created by social class, gender, and geography can be difficult to overcome. Improvements in mother's education may not spillover to the next generation if these cultural factors exert a strong opposite effect, especially for girls (Fors, 2012; Stash and Hannum, 2001) and for individuals belonging to low social class. Nepal provides an interesting case to study integenerational transmission of human capital due to three main reasons: 1) High prevalence of child labor participation; 2) Huge gender disparity in education; and 3) Strong societal hierarchy based on caste that exists until this day. As discussed in greater detail below, these factors complicate the relationship between parental education and children human capital. Therefore, careful consideration of these factors provide a better understanding of educational investment that guides policy discussions.

We also attempt to overcome the empirical challenge inherent in such estimation. One empirical challenge we face is that not all variables that are associated with mother's education and that determine a child's human capital can be observed in a typical dataset. These unobserved variables can be divided into two categories based on whether they have causal effects on mother's education or are the causal outcomes of mother's education. The former set of variables can confound the relationship between the mother's and her child's outcomes through omitted variables. For example, educated mothers are themselves likely born in upper class households with beneficial early life circumstances.[1] As such, these mothers may possess higher ability primarily due to better environment and socio-demographic factors, which they can pass on to their off-springs. In this case, unobserved ability drives both mother's schooling and her child's education and labor. On the other hand, factors that are results of mother's higher education, such as her personal preference, characteristics of her spouse (through assortative matching) and her fertility decisions (Osili and Long, 2008), are parts of the causal mechanism through which mother's education may affect children's well-being. However, these pathways are still likely to be correlated with unobserved characteristics, which initially can determine mother's education (e.g. ability, household characteristics, and endowment). In this paper, we focus on addressing such endogeneity issues to estimate the causal effect of maternal education on children's education and labor outcomes.

We address concerns regarding endogeneity by using a quasi-experimental variation in mother's education created by a dramatic change in education policy in Nepal. Although formal education was introduced in 1951 following the first democracy in Nepal, access to education was discriminated by gender, wealth, and caste (Savada, 1991). To rectify this, the government introduced the National Education System Plan (NESP) in 1971, which was implemented by 1976 (United Nations Educational, Scientific and Cultural Organization, 2015). NESP nationalized education in Nepal with the aim of "counteracting the elitist bias of the inherited system of education by linking it more effectively to productive enterprises and egalitarian principles" (Ministry of Education, 1971). The main thrusts of NESP were: 1) To promote equal access to quality education for all children; 2) The implementation of a standardized textbook and curriculum; and 3) Provision of trained teachers. The Education Act of 1971, a part of NESP, went into effect throughout the nation by 1976. This included a provision of free primary education (grades 1 to 5) with textbooks provided by the government, which was made explicit in late king Birendra Bir Bikram Shah's coronation address in 1975 (Graner, 2006).

We use exposure to NESP as an arguably exogenous source of variation in mother's education. The variation in exposure arises due to mother's year of birth and district of birth. Mothers who were past school-going-age at the time of the reform would not have benefited from the program. Likewise, intensity of mothers' exposure to the reform during their school-going-age varied across districts. Discussed in greater detail in the Empirical Strategy section, we use enrollment rate of 6 to 14 year old males in 1971 (pre-policy) to measure the intensity of the reform. We argue that females in districts with higher male enrollment rate prior to the reform should be more affected by the reform due to provision of relatively better infrastructure, logistical and cultural reasons; and we provide evidence to support our claim. In our identification design,

[1] See Heckman (2011) for a brief review on importance of early child education.

we compare children of mothers who were of schooling age during the reform in high-intensity districts to those past schooling age and those in low intensity district. However, when evaluating children's outcomes, we have to deal with one additional issue. Since we focus on a sample of children between 10 and 15 years of age, children belonging to older cohort (unaffected) mothers are more likely to be of higher birth order. Existing research has shown that birth order affects human capital accumulation.[2] To account for birth order difference, we use multiple years of survey as an additional source of difference and implement a Difference-in-Difference-in-Differences (DDD) specification.

We use data from the Nepal Housing and Population Census 2001 and 2011 (hereafter census 2001 and 2011, respectively) to study the impact of the reform on mothers' and children's educational outcomes and Nepal Living Standard Survey (NLSS) 1996 and 2004 to study labor outcomes. We briefly explain our empirical strategy here using example of census data; our strategy with NLSS is similar with appropriate adjustment for mother's age. In Census 2011, mothers aged 35-44 years (0-9 years old in 1976) are exposed to the reform where as those 45-54 year olds (10-19 years old in 1976) were too old to benefit from the reform. To account for birth order effects, we take an additional difference between children belonging to younger and older mothers of same age groups in census 2001 (35-44 and 45-54 year olds). Note that in 2001, mothers belonging to both groups were too old (10-19 and 20-29 in 1976, respectively) to benefit much from the program. Therefore, any difference in the outcome must be due to district-specific birth order effect. The assumption behind the triple difference strategy is that any unobserved district-specific time varying factors between two survey years should not have differential effects across younger (35 to 44 year olds) and older cohorts (45 to 54 year olds).

We conduct three primary analyses. As a first stage, we evaluate the effect of the reform on educational outcomes among mothers who were of school going age in 1976. Second, we estimate a reduced form model to evaluate the effect of the reform on children's educational and labor outcomes. We focus on children of ages 10 to 15 year olds in the survey year. Third, we use the reform as an instrument to evaluate the causal effect of mother's education on child's education and labor outcomes.

We find that one standard deviation increase in intensity of the reform increases mother's years of schooling by 0.4 years. The effects are more pronounced among mothers from higher castes (Brahmin and Chhetri). The reform increased the likelihood of children completing their fifth grade only among children from higher caste mothers. Using the reform as an instrument, we find that on average one more year of

[2]The studies focusing in developed countries suggest that first-born children tend to have better educational outcomes (Black et al., 2005; Booth and Kee, 2009; Conley and Glauber, 2006; Heiland, 2009; Hotz and Pantano, 2015; Kantarevic and Mechoulan, 2006; Mechoulan and Wolff, 2015; Silles, 2010). However, the results in developing countries show that later-born children have better educational outcomes (De Haan et al., 2014; Ejrnæs and Pörtner, 2006; Tenikue and Verheyden, 2010). Parish and Willis (1993) and Sawada and Lokshin (2009) suggest that older siblings tend to contribute to family income. In contrast, Congdon Fors and Lindskog (2017) find that birth order effects are negative in context of India.

mother's schooling increases a child's likelihood of finishing 5^{th} grade by 0.3 percentage points and such effects are limited to children from Brahmin and Chettri households. We find modest effects of maternal education on child labor. The findings suggest that on average one more year of mother's schooling leads to a reduction in the total number of hours worked by a child in the past week by 0.62 units.

Our study brings additional insights into the current literature on intergenerational transmission of human capital, which we review briefly in section 3. To the best of our knowledge all studies evaluating the possibility of intergenerational human capital transfers in form of education, except the study from Behrman et al. (2017), are based on developed countries.[3] This means that several salient features of developing country setting are ignored in current studies. For one, strictly enforced compulsory education laws ensures that child labor is not widespread in developed countries. Since child labor is detrimental to early human capital development, this study provides insight on linkage between mothers' education and child labor. Also, current studies focus on improvements in higher levels of education rather than at basic literacy and primary schooling. Furthermore, implications of exclusionary social structure such as caste-based inequality are not accounted for in current studies. By addressing these issues, our study provides a better and deeper understanding of intergenerational transmission in a setting that is relevant for other developing countries.

Estimating the impact of mothers' education on children's human capital provides additional insight to potential positive externalities from education. If mothers' education enhances children's human capital development through improvements in educational outcomes and a reduction in child labor, social benefits attached to education is in fact higher than initially realized. Hence, this informs policymakers regarding potential positive externalities associated with improvements in maternal education in the context of developing nations. The findings of this study, which indicates that intergenerational transfer of human capital in forms of education is concentrated among higher caste, provides caution that social structure of a developing nation should be carefully considered when formulating education policies.

Another contribution is that sibling effects are usually ignored in the literature. The existing studies mostly compare older mothers to younger mothers but having children of different birth order. Even if we control for birth order in this situation, differences in marriage and childbearing decisions of mothers belonging to different cohorts may be correlated with determinants of children's human capital. We address such an issue by incorporating a triple difference model, which hinges on a lighter set of assumptions compared to the difference-in-differences model.[4]

The paper is organized as follows. Section 2 discuss mechanisms driving investments in human capital in developing nations, Section 3 provides a literature review, section 4 discusses NESP in detail, and section 5

[3](Behrman and Rosenzweig, 2002; Black et al., 2005; Carneiro et al., 2013; Chevalier, 2004; Oreopoulos et al., 2006)
[4]A detailed discussion of the DDD specification is provided in Empirical Strategy section.

explains data used in the study. This is followed by a layout of empirical strategy in section 6, and discussion of results in sections 7 and 8. Section 9 concludes the study.

2 Investment in Human Capital in Context of Developing Nations

In a standard framework, human capital investment decision is based on comparisons of private marginal benefits of additional investment to private marginal cost. Behrman et al. (2017) discuss the simple framework drawing on Becker (1967). We borrow from their analysis with slight adjustments to fit our context. The marginal benefit curve for investment in human capital is downward sloping due to diminishing returns. The marginal cost curve is inclined upwards as costs associated with an additional unit of investment increases due to rising opportunity costs. With declining marginal benefit and an upward sloping marginal cost, the optimum investment can be found at the intersection of these curves as shown in Figure 1.

How can maternal education change the structure of these curves? In a general context, there are several potential channels. Lack of finance due to imperfect capital markets, especially for investment in human capital, is an important factor that impedes human capital investment in developing countries (Behrman et al., 2017). Improvement in earnings due to higher mother's education relaxes the budget constraint (Card, 1999; Duflo, 2001), which in return shifts the marginal cost curve outwards, leading to a higher equilibrium level of human capital investment in children. Another possibility is that mother's education complements time spent at schooling and increases the benefits of formal schooling (Behrman et al., 2017). Educated mothers may have a lower discount rate, which makes them future-oriented and increases the net present value of future earnings growth due to education (Bauer and Chytilová, 2010; Becker and Mulligan, 1997; Kirby et al., 2002). In that case, educated mothers will invest more in children's early human capital compared to relatively less educated mothers. However, it needs to be acknowledged that in some context societal norms may exert strong influences, complicating the relationship between maternal education and children's human capital investment.

In developing countries such as Nepal, additional factors ought to be considered. First, mothers' earnings channel may not be particularly significant. The labor market for females are not well-developed in context of Nepal. Due to societal norms that depict women as care-takers, women in Nepal are much less likely to work outside of the household. Although 40 percent of women are economically active, the majority of them work in agricultural sector and are used as unpaid family workers. According to the Census Bureau of Statistics (CBS, 2002), 18.9 percent of literate women are engaged in paid work, compared to 30.9 percent of males (Bhadra and Shah, 2007). Due to such reasons, monetary returns to education among women may be very low. In this case, other channels become more important.

Children's human capital formation may be hampered by the household's need to involve them in income-generating activities. Child labor is prevalent in developing nations despite national laws against child labor and ratification of international agreements. According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO), 33.7 percent of children aged 5 to 14 in 2015 were engaged in child labor, including the worst forms of child labor such as sexual exploitation and carpet labor.[5] Potential determinants of child labor include poor education, high unemployment rate, poverty, and traditional societal norms that suppress children's education, especially that of girls. Increases in mother's education may not automatically translate into greater schooling and less labor for her children even if it leads to increase in household wealth. One theory posits that the relationship between child labor and a household's economic condition is non-linear. Bhalotra and Heady (2003) argue that child work increases with an increment in household's landholdings. Therefore, if improvements in mother's education increases landholdings, a major source of wealth in developing nations, it may create an opportunity or even obligations for household members, including children, to participate in agricultural and household activities.

Next, caste hierarchy, a social structure that has significant influence over societal norms, is a strong determinant of human capital outcomes. These cultural factors may lower marginal benefits of early human capital investment for certain caste groups due to prevented access to occupations yielding high returns. Often an individual from lower caste suffers from occupational segregation by caste (Dumont, 1980; Munshi and Rosenzweig, 2006; Nightingale, 2011; Stash and Hannum, 2001; Subedi, 2011).[6] The expected future returns to human capital investment is generally higher for children from higher caste households. This results to a greater human capital investments among children from higher caste households. In this regard, maternal education is more likely to affect human capital investment, say schooling, of children from higher caste households compared to children from lower castes.

Cultural factors also shape preference for education. The societal structure prefers educating individuals belonging to higher caste households (Brahmins and Chettris), whereas allows exclusion of millions of lower caste people in various spheres including access to education and health care (Stash and Hannum, 2001). According to the 1991 Census, Nepal as a whole had a literacy rate of 39.3 percent, whereas the average was only 22.8 percent among the oppressed caste (Dalit).[7] The national literacy increased to 54 percent but

[5] `https://www.dol.gov/agencies/ilab/resources/reports/child-labor/nepal`

[6] Among four broad social classes: *Brahmin*, *Kshatriya*, *Vaishya*, and *Sudras*, *Sudras* represents the lowest ranking in occupational groups and are considered as laborers. In a traditional caste society, people of certain caste are engaged in a respective occupation. For instance, the sole purpose of the *Kami* (blacksmith) is to make metals, the *Damai* (tailors) is to sew cloths, and the *Sarki* (cobbler) is to mend shoes (Subedi, 2011).

[7] The Dalit population comprised of 12.8 percent of the total population of Nepal, according to Census 2001. This statistic is highly contended by researchers as they view that this figure is undervalued. The practice of untouchability is highly common in the nation, where Dalits are not allowed to touch public drinking water when Non-Dalits are in queue. The Dalit populace cannot afford private health care and also are not able to get an easy access to government subsidized health care due to caste-based discrimination (Bhattachan et al., 2009, see). A study conducted on caste-based discrimination in schools concluded that the oppressed caste (Dalit) faced exclusion in school from both teachers and fellow students. The teachers participated in

the literacy rate of Dalit caste remained at 33.8 percent. Besides seclusion in education, children from lower caste households typically have higher opportunity costs of attending school due to severe poverty. Given such societal preferences favoring higher castes, we expect higher returns of NESP on educational outcomes of those children belonging to upper caste households. Such a channel will shift the marginal benefit curve pertaining to individuals of higher caste to the right as shown in Figure 1, leading to a higher equilibrium level of human capital investment.

Societal norms may also directly enter into the cost-benefit calculations of parents, who make all decisions for the child. For instance, one potential reason parents invest more resources in male children is due to the social practice of females being married off to another household. Thus, from parent's perspective, investment in boys have higher returns than females (Stash and Hannum, 2001).

As the economy develops, the monetary returns to education increases, making it more profitable to invest in education of both males and females. Even then, the influence of social structures change very slowly over time. So, caste hierarchy and gender norms may continue to exert stronger influences than monetary cost-benefit calculations inherent in our model. Given such opposing economic channels at play, whether improvements in mothers' education spillover to the next generation remain an empirical question. Considering presence of caste-based hierarchy in the society, we illustrate our analysis by accounting for potential heterogeneity in caste structure.

3 Literature Review

Correlations in educational outcomes between parents and their children have been studied extensively in developed countries. Black et al. (2005) posit two possible explanations for correlation between parental education and their children's outcomes. One is selection - high ability parents have high ability children; another is causality - parents who get more education cause their children to receive more education. Improvements in education of one generation having spillover effects on the next generation creates a scenario of positive externality and faliure to recognize such instances will undervalue social benefits associated with education. One possible alternative to account for positive externality is to increase public investment in education and educate future parents in their youths. However, establishing a causal link is not straightforward mainly due to issues of endogeneity.

Children's schooling and labor supply are affected by family background. Black and Devereux (2010) summarize the literature on intergenerational correlation on socio-economic status. In discussing the methodological difficulty in establishing causal links, the authors note that "as it is often the case that any particular

indirect form of discrimination such as neglect, repeated blaming, and labeling of Dalit students as weak performers (Bishworma, 2010) parental attribute is correlated with a variety of parental characteristics, many of which cannot be observed in the data." Besides studies that show strong correlations between outcomes of parents and children, net set of papers attempt to arrive at causal estimates using three distinct methodologies. One study investigates children's outcomes of twin mothers who share similar genetic and environmental conditions but attain different levels of education (Behrman and Rosenzweig, 2002). Another approach in the literature has been to treat adoption as randomly assigning children to parents and studying the correlation between the parents and adopted children. These studies have exclusively been carried out in developed countries with rich administrative datasets and therefore cannot inform policy in developing countries. Moreover, twin-studies incoporate relatively small sample of individuals and adoption may not be randomly assigned. The third approach uses random variation in parental income and education that are uncorrelated with their unobserved characteristics to study impacts on children. The papers that are particularly relevant to this study use policy-induced changes affecting educational attainment of parents.

Black et al. (2005) use changes in compulsory education laws in Norway in 1960s, which was implemented across municipalities at different times. The study uses exposure to the reform as an instrument for parental education and finds little evidence of a causal relationship between parental education and children's education outcomes. Similar strategy has also been used by Oreopoulos et al. (2006) in the case of U.S. to find that one year increase in parental education reduces the probability of a child repeating a grade by between 2 and 7 percentage points. Likewise, Chevalier (2004) uses a change in the compulsory schooling laws in Britain that occurred in 1972. The author also finds a large positive effect on continued attendance beyond compulsory education.

Exploiting an alternative source of variation in maternal education, Carneiro et al. (2013) use differences in direct and opportunity cost of college at the time the mother was growing up to identify the effect of maternal education on a variety of children's outcomes, including behavioral problems, achievement, grade repetition, and obesity. The authors argue that one causal link between maternal education and children outcome is home environment. The authors highlight the conflicting effects of maternal education. The positive effect arises because education improves the mother's capacity to take care of their children. But in the context of developed countries like the U.S. where this study is based, it also increases maternal employment, which could leave less time for child rearing. Increased maternal education may also lead to better home environment through assortative matching. The empirical strategy in this paper looks at variation in direct and opportunity cost of schooling across countries of mother's birth and cohorts, and uses a limited information maximum likelihood (LIML) method to account for weak instrument. The authors also point out that papers using changes to compulsory education laws estimate the impact among parents who are at the lower end of the education distribution. It has to be noted that these studies focus on developed countries, where compulsory education laws preclude any possibility of child labor.

Child labor is an important barrier for human capital development in developing countries. A large body of literature is concerned with better understanding its determinants. While the role of household poverty is taken as axiomatic (Basu et al., 2010), other studies have found counter-intuitive results. For instance, Bhalotra and Heady (2003) found that child work increases with household's landholdings. Basu et al. (2010) provide a counter-argument that children in the poorest households are unable to engage in employment activities due to lack of employment opportunities close by and not due to lack of incentives. The implication is that local labor markets mediate the relationship between household poverty and child labor. Basu et al. (2010) further posit a U-shaped relationship between landownership and child labor: as land holding grows, child labor increases first and then begins to decline.

A body of empirical literature estimates the impact of income shocks on child labor (Kruger, 2007; Yang, 2008). These studies focus on changes in income due to price shocks or exchange rate shocks. For example, Yang (2008) finds that a favorable exchange rate shock that increased the value of remittances in migrant's household increases the likelihood of schooling and lowers the number of hours worked among overseas Filipinos. Edmonds and Schady (2012) study the relationship between family economic status and child labor using experimental data from Ecuador. The authors evaluate the outcome of an unconditional cash transfer that was randomly allocated to a fraction of the poor households and given to the mother. Despite lack of conditionality, the authors find a large reduction in child labor among recipients of the cash transfer, indicating that household income is an important determinant of child labor. However, Edmonds and Shrestha (2014) find that stopping such transfers also led to resumption of child labor in Nepal. Therefore, reducing child labor would require a permanent increase in household income, which mother's higher education is perhaps able to provide. This raises an important question about the relationship between mother's education and child labor. How large are the effects of mother's education by itself? Or does female education have to be accompanied to employment opportunities that raise household income?

Fafchamps and Wahba (2006) find that proximity to urban areas plays an important role in encouraging child labor in Nepal. The authors make a distinction between wage work in the market and labor supply in the farm to find that proximity to urban market increase the likelihood of wage work by children, but this takes up less time than working in farms. Furthermore, schooling also increases with urban proximity. Another channel through which mother's education may impact child labor is by improving her bargaining position. In general, a greater bargaining position for women has been shown to improve child outcomes (Basu and Ray, 2002).

4 Education reform in Nepal

Although formal education in Nepal was introduced in 1951 after dethroning of the Rana oligarchy and establishment of the first democracy, education was highly correlated by gender, wealth, and ethnicity (Savada, 1991). Even decades after the establishment of formal education, society still viewed educating females and people from marginalized class as unnecessary. Poverty was a major factor that impeded promotion of education (United Nations Educational, Scientific and Cultural Organization, 1987). Furthermore, parents generally prefer educating sons over daughters due to a societal norm that depicts girls as future housewives and mothers. The literacy rate in 1961 was 16.3 percent for males and 1.8 percent for females. The literacy rate for males increased to 34 and 54.5 percent in 1981 and 1991 compared to 12 percent and 25 percent among females in these respective years (Balatchandirane, 2003).

With aims of creating an exploitation-free education system based on egalitarian principles, which could be achieved by "counter-acting the elitist bias" of the prevalent education system, NESP nationalized education in 1971 and was implemented across the country by 1976 (Ministry of Education, 1971). NESP established a framework for universal education and is regarded as the pioneer of education reforms in the country. The reform created an organized structure of education, with primary school extending from grade 1 to 3, lower secondary from class 4 to 7, and secondary from class 8 to 10. The main thrusts of the reform were: 1) Promote equal access to quality education among all children regardless of gender, wealth, and caste; 2) Improve quality of education through provision of trained teachers; 3) Implementation of standardized curriculum across the nation; 4) Provision of standard textbooks free of cost to children attending primary schools in remote areas; and 5) Emphasize vocational education. Although NESP was focused to increase enrollment at all levels, the main focus of the reform was at the primary school level. From 32 percent enrollment rate in 1970, NESP set a target of 64 percent enrollment in three-year primary education by 1976 (United Nations Educational, Scientific and Cultural Organization, 1984).

Public expenditure in education sector increased significantly after the implementation of NESP. The proportion of education development funds reached 12.4 percent of the total budget in 1976 and remained around 9 percent in 1980s (United Nations Educational, Scientific and Cultural Organization, 1984). The total government expenditure on education was NPR 6.3 crores ($611,650 in today's exchange rate) in fiscal year 1971/1972 and increased to NPR 24.4 crores ($2,368,932 in today's exchange rate) in 1975/1976, with implementation of NESP amounting to R.S. 66 crores ($97,087 in today's exchange rate) between 1971 to 1976 (Ministry of Education, 1977). Provision of free primary textbooks and teachers' salaries comprised a significant portion of expenses allocated for education purposes. Between 1970 and 1980, the total number of schools increased by 30.3 percent (7,275 primary schools in 1970 and 10,130 schools in 1980), and the number of teachers increased by 48.9 percent (United Nations Educational, Scientific and Cultural Organization, 1987). The minimum qualification required for a primary school teacher was the School Leaving Certificate (SLC) during this period, whereas in 1950s a typical primary school teacher had only four to six years of schooling (Wood, 1959).[8] To meet the shortage of teachers in rural areas, local teachers were trained and provided allowance that amounted to 110 percent of their salaries.

As a part of NESP, the Institute of Education provided one to two years of training courses, after which individuals completing one-year course was classified as primary school teachers and those finishing two-year course became lower secondary school teachers. The institute also conducted a distant learning program and radio teacher training program, which made it possible for teachers in local communities to remain in their households and continue teaching. The distant learning programs facilitated provision of self-learning materials and followed up with contact sessions for final examinations.

The implementation period of NESP coincided with the coronation ceremony of late King Birendra Bir Bikram Shah Dev in 1975 – the year that marks the declaration of free primary education in the nation (United Nations Educational, Scientific and Cultural Organization, 1987). This provided a significant step to facilitate education among common people. A report published by the Ministry of Education (1977) mentions that primary enrollment rate had reached 59 percent in 1976 and such an increase had been "facilitated to a considerable extent by the implementation of free primary education since 1975." To reduce the wide gap in enrollment between girls and boys, enforcement measures such as distribution of free textbooks to girls and free schooling provision at the secondary level were established. The fifth development plan policies (1975 to 1980) immediately followed the implementation period of NESP. The educational policies indicated in this plan were similar to policies specified in NESP, and the development plan further emphasized the extension of free primary education with an importance given to increase access to education among females. In the final year of the plan, the government increased duration of primary education until the fifth grade (grade 1 to 5) with an objective of providing opportunity to receive higher levels of education, as children could now complete fifth grade free of cost.

5 Data

The data for this study is sourced from the fifteen percent sample of the Nepal National Population Census (census 2001, 2011) and the Nepal Living Standards Survey (NLSS 1996, 2004). The need for using different datasets arise from advantages and disadvantages of each source. The census data is larger and covers all locations in Nepal, which allows exploring the effects by castes, but contains sparse information on

[8] However, it is reported that about one third of teachers did not have the required qualification.

labor market participation.[9] On the other hand, NLSS, modelled after the World Bank's Living Standards Measurement Survey, collected detailed data on labor market activities. However, the data was collected by a stratified random sample methodology and includes approximately 4000 households in each survey. Analysis from both datasets provides a fuller understanding of the relationship between education reform, mother's education, and children's outcomes.

We focus on children aged between 10 and 15 at the time of the survey. This is because the constraints to education start to bind during this age group, as opportunity cost of education increases and access to education becomes difficult. For instance, Azam and Kingdon (2013) find that parents start discriminating between boys' and girls' education during this age group.

5.1 Nepal National Population Census (2001 and 2011)

The dataset includes information on age, gender, education, and other personal characteristics (caste, religion), and economic activity. Questions related to education ask whether an individual ever went to school, current school attendance status, and levels completed. In Nepal, students typically begin schooling at age 6 and attend 5 years of primary school (level 1 to 5), 3 years of lower secondary school (6 to 8), and 2 years of upper secondary school (level 9 and 10). After the 10^{th} grade, each student takes the School Level Certificate (SLC) exam, a national exam that determines eligibility to continue post-secondary schooling. Individuals between 10-15 year olds are usually between levels 5 and 10, although it is not uncommon for students to begin schooling later and/or repeat some levels. When evaluating the effect of NESP on mother's education, we use completion of fifth grade and years of schooling as the main variables of interest. Since the goal of NESP was to improve primary education, we expect the greatest impact to be at the lower end of education distribution. When conducting analyses pertaining to children's educational outcomes, we focus on current attendance and the completion of fifth grade. We drop mothers with missing value for years of schooling (0.4 percent of the sample).

Our analysis from the Census data focuses among children of household heads as we can assign information about mothers by using the relationship codes. We have information on the mother's district of birth and age, which allows us to assess her exposure to NESP. To assist our identification strategy, we restrict the mother's age to be between 35 and 54 at the time of the survey. In the 2011 survey, the younger women within this age range are more likely to benefit from the reform. In the 2001 survey, all the women in this age range were too old to benefit from NESP.

The census collected information on the number of months an individual engaged in various activities

[9] As previously mentioned, caste is a dimension along which severe discrimination persists in Nepal in several grounds, including access to health and education (Gurung, 2005). Therefore, we also present results that investigate caste heterogeneities.

over the last twelve months for individuals over 10 years of age. Unfortunately, due to the lack of detailed data on work-related activities and inconsistency in work-related survey questions across survey years, we are unable to construct proper measures of child labor using the census data. To overcome such drawbacks imposed by lack of data availability regarding detailed measures of work-related activities in the Census (e.g, days worked per week, hours worked), we turn to Nepal Living Standard Survey.

5.2 Nepal Living Standard Survey (1995 and 2004)

We use two waves of NLSS data of survey years 1995 and 2004. The educational variables used pertaining to a mother's educational outcomes are similar to that of the Census. Although NLSS includes smaller sample compared to the census, a notable advantage of using NLSS data is that the surveys contain detailed information regarding employment and economic activity of an individual over 10 years of age. This allows us to construct measures of child labor that defines the intensity of labor. The NLSS presents both monthly and weekly measures of work-related activities. To reduce recall biases, we focus on activities performed in the past week. We focus on three main measures that describes child work: 1) Days worked per week; 2) Hours worked per day in a week; and 3) The total number of hours worked in a week. These variables include work performed in all activities, with the majority of children being deployed in agriculture, livestock farming and household work.

Another benefit of using NLSS data is that it includes detailed information regarding infrastructure composition (e.g., schools, health clinics) in area of residence during the survey year. Nepal underwent the second political revolution in 1991, which led to the establishment of democracy in lieu of the Panchayat regime. Such a political change created a rapid expansion of the number of schools established across the nation. A part of NLSS data collects detailed information regarding schools in the primary sampling area (ward), which includes information on the year of establishment of schools. NLSS also includes information regarding the distance from the household to the nearest school. These variables allow us to properly control for the district-specific effect of the political change on education-related outcomes, while analyzing children's educational and work-related outcomes. Note that these changes are irrelevant while evaluating the effect of NESP on mother's education, as mothers affected by NESP will have completely surpassed the school-going-age in 1991. While conducting analyses pertaining to child outcomes, birth order is of a specific relevance. Edmonds (2006) finds that siblings differ in comparative advantage in household production. NESP survey records maternity history of all married women who have given birth. Using this we control for birth order effects when analyzing child outcomes.

6 Empirical Strategy

Let y_{ihd} be the outcome (education or labor) of a child i in household h belonging to a mother born in district d and m_{ihd} be mother's education for a respective mother born in district d. The relationship between a child's outcome and mother's education is given by:

$$y_{ihd} = \alpha + \beta m_{ihd} + \kappa X_{ihd} + \gamma_h^y + \delta_d + \epsilon_{ihd}^y. \tag{1}$$

Here, X_{ihd} represents observed household specific characteristics, γ_h^y represents a vector of unobserved household characteristics that are correlated with mother's education and child outcomes, δ_d is location specific effect, and ϵ_{ihd}^y is the error term. Parameter β represents the causal impact of mother's education on a child's outcome given that unobserved factors are controlled for. Since we cannot feasibly control for all relevant household characteristics that may both affect mother's education and child's outcome, we identify β by using variations in m_{ihd} created by arguably exogenous factors determining exposure to the reform (e.g., birth year and district of birth).

In our study context, geographic variation in male enrollment rate in 1971, a proxy for variation in intensity of the education reform, is the first source of variation. Likewise, mother's age at the time of the survey is the second variation. Finally, appending samples from the 2001 and 2011 census data (1995 and 2004 for NLSS data) provides the third source of variation.

6.1 Using Geographic Variation in Male Enrollment Rate to Identify the Intensity of NESP

The first source of variation is to compare changes in outcomes between districts that were highly affected by the National Education System Plan (NESP) with districts which were less affected by NESP. The reform was drafted in 1971 and was implemented throughout the country by 1976. Prior to the implementation of NESP, substantial geographic variation in enrollment rate existed. Broadly speaking, enrollment rate was higher for districts located in the Eastern and Central region, and lower in the Far Western region (according to the 1971 Census, 93 and 91 percent of 6 to 14 year olds in Karnali and Seti zones were not enrolled in school, respectively).[10]

We use pre-reform geographic variation in enrollment rate among 6 to 14 year old males pertaining to primary (1-5th grade) and middle school (6-8th grade) in 1971 as an intensity measure. This is because the effect of the reform would be higher for females in districts with higher pre-reform enrollment rate for

[10] `http://cbs.gov.np/nada/index.php/catalog/24`

males. Even after the introduction of formal education in Nepal following the first democracy of 1951, the societal norms viewed educating females as unnecessary (Shrestha et al., 1986; Stash and Hannum, 2001). The literacy rate in 1961 was 1.8 percent for females compared to 16.3 percent for males.[11] Even in 1971, the difference between male and female enrollment rate was substantial. On average, male enrollment rate was 16 percentage points higher than female enrollment. Many districts with high male enrollment rates still had relatively low female enrollment rates, and the relationship between the two was not linear (see Figure 2). The figure reveals that among districts with male enrollment close to 30%, none had female enrollment over 14%. Only a handful of districts had female enrollment over 10%, highlighting the stark gender difference in attitude towards education.

A severe discrimination between sons and daughters explains a historical fact that improvements in female educational outcomes have been trailing males' educational outcomes. Districts with low enrollment rate among males would mean lack of adequate resources necessary to fully absorb the effect of the education reform. Whereas, districts with relatively higher enrollment rate among males would signal adequate resources and infrastructure to better absorb the effect of the reform. In other words, given the severe magnitude of gender discrimination, it is unlikely that education outcomes among females will improve substantially before improvements in male education outcomes (particularly in districts with low enrollment rate among sons). Pre-reform variation in male enrollment rate will proxy for the number of schools in the district, adequacy of infrastructure, and societal preference regarding education, which will mediate the effect of NESP. Hence, the effect of the reform should be concentrated in districts with higher pre-reform enrollment rate among males.

By studying the change in literacy rate between 1971 and 1981, we provide empirical evidence that male education was a necessary condition for improvement in female education. Figure 3 plots difference in literacy rates among 10 to 14-year-old males and females between 1971 and 1981 against male enrollment rate in 1971 (enrollment rate of 6-14 year old males). It is clear from the figure that districts with lower male literacy in 1971 experienced lower increases in female literacy after the reform. In contrast, the gains in male literacy is much higher in districts with low 1971 male literacy rate. The evidence is even more striking in Figure 4, which plots the difference in primary school completion rate between 6-14 (cohort exposed to the reform) and 20-29 (unexposed cohort) year old females in 1981 against male enrollment rate in 1971. The scatter plot and the best fit line shows that an increase in male enrollment rate is postively associated with

[11] Such a huge gender disparity in educational outcomes can be explained by both demand and supply factors. A patriarchal society that regards females responsible for household work, early age marriage, societal restriction on female sexuality and mobility, and the dowry system are some factors that lessens the demand for education for girls. Similarly, schools lacking an adequate number of female teachers, teachers' attitude towards educating females, the availability of appropriate physical facilities (toilets) in schools, and longer home to school distance are some supply side factors that may contribute to an existing gender disparity in literacy.

an increase in the difference. Therefore, a high pre-existing male education was a pre-requisite for females to benefit from the program, and improvements in female education after the reform was greater in districts with higher pre-reform enrollment rate among 6 to 14 year old males.

However, using geographic variation alone to identify the effect of the reform is problematic as pre-reform enrollment rate among males is not randomly assigned. Therefore, females in high male enrollment districts are also more likely to have higher education due to other unobserved differences across district that might later influence our outcome of interest. Figure 2 shows that the correlation between male and female enrollment prior to the program is weak but still positive. Using the 1971 Census data, we find that literacy rate is higher in the Central and Eastern regions of Nepal. Districts that differ in socio-economic status may have different labor market conditions and perception regarding child labor, which can affect the magnitude of children's labor and schooling outcomes. To isolate the effect of such unobserved factors, which are correlated with district enrollment rate prior to the full implementation of the reform and outcome variables, we make use of within cohort differences.

6.2 Variation Within Cohorts

The exposure to the reform also depends on one's year of birth. Precisely, girls who were past the normal school-starting-age would not significantly benefit from the program. Although the program aimed to improve access to education at all levels, as previously mentioned, the main focus of the program was to expand primary education. Older females past a certain age will not only be less likely to attend primary school but additional responsibilities of carrying out household chores will prevent them from enrolling at older age. As such, age in 1976 is another dimension through which the reform will have differential effect. Children in Nepal typically start schooling between 6 and 9 years (Savada, 1991). As our second source of variation we compare cohorts of women who were affected by the reform to those who were too old to benefit. The former group includes women who are born between 1967 and 1976 (aged 0-9 in 1976), and the latter includes women who are born between 1957 and 1966 (aged 10-19 in 1976). These women are of ages 35-54 in 2011 survey, out of which the cohort of 35-44 year olds are more likely to benefit from the program. We restrict our sample to mothers who are 35-54 year olds.

Until now we have two sources of variations including across district variation of reform intensity, measured by pre-reform district specific enrollment rate of 6-14 year old males in 1971, and within cohort variation. Figure 4 provides a descriptive evidence regarding our decision to make use of these two identification variations. The district-specific difference in female primary school completion rate in 1981 between 6-14 year olds (exposed to the reform) and 20-29 year olds (unexposed) is positively and strongly associated with male enrollment rate of 1971. Although Figure 2 shows a weak correlation between male and female enrollment in 1971, Figure 4 shows that cohort of females exposed to the reform and living in districts with high pre-reform male enrollment rate during the time of reform faced much larger increases in primary enrollment rate when measured in 1981 (See Figure 4). In contrast, there is no such pattern when focusing among males (Figure 5).

6.3 Using Within Cohort Variation Across Survey Years

In situations when the variable of interest is not systematically different between exposed and unexposed mothers, estimation could be carried out using a single cross-sectional data. However, comparing children's outcome such as schooling and child labor in any given survey year between mothers aged 0-9 and 10-19 in 1976 is problematic as the older cohort will have older children during the survey years. For any given survey year, only 26% of the sample are children of mothers from the older cohort. This could lead to endogeneity concerns due to birth order effects and sample selection. If the analysis is restricted to a single survey, the children of older cohort that are in our sample are likely to have higher birth order (i.e., they already have older siblings and they are 2^{nd}, 3^{rd}, 4^{th}... child). Having an older sibling engaged in labor market may reduce the likelihood of child labor given that the older child contributes to household income (Parish and Willis, 1993; Sawada and Lokshin, 2009). On the other hand, younger or exposed mothers are more likely to have children engaged in child labor due to birth order effects. This means that our sample includes a mix of children with various birth order which is systematically related to exposed and unexposed cohort. It is particularly problematic if such systematic differences between younger and older cohorts differ across high and low intensity districts as it violates the DD assumption.

To account for such systematic differences in birth order among children from mothers in older and younger cohorts, we use multiple cross-sectional surveys and employ a triple-difference strategy. We describe the intuition behind our identification strategy in Table 1 with a simple 2x2x2 framework.[12] If we use a single survey, then we could compare children of Cohort A and Cohort C in 2001 survey, or Cohort B and Cohort D in 2011 survey. We can estimate a difference-in-differences (DD) model by comparing Cohort B and Cohort D in 2011 survey, but mothers in Cohort B will have much younger children with lower birth order than Cohort D. Hence, comparing child labor and schooling outcomes of children belonging to mothers of these two cohorts may be problematic.

Now, consider another sample where mothers in relevant age groups are unexposed to the program (Cohorts C and E in survey year 2001) but are of similar age groups as of Cohorts B and D. Since neither

[12] Note that this pertains to census data but the strategy is similar when using NLSS data, except age adjustments to mothers from respective survey years (1995 and 2004).

of the cohorts C and E were exposed to the program (as individuals in these groups had surpassed school-going-age during the time of the reform), we should not find direct effects of NESP. However, we can use Cohorts C and E to difference out systematic differences between older and younger cohorts due to birth order effects resulting from using a single cross-sectional survey of 2011. This leads to a difference-in-difference-in-differences specification. Thus, mother's cohorts, across district variation in program intensity by mother's district of birth, and two survey years will help isolate the direct impact of mother's education on child outcomes.

6.4 Difference-in-Differences

We begin with a difference-in-differences (DD) specification, in which we compare Cohort B to Cohort D. Assuming linearity, mother's education can be written as a function of intensity of the reform and her exposure to the reform, which depends on her age during the time of reform. We estimate the following specification.

$$E_{icd} = \alpha + \beta Exposed_c * Intensity_d + \gamma birthyear_i + \lambda district_d + \eta X_{icd} + \epsilon_{icd}, \tag{2}$$

where E_{icd} denotes educational outcomes of mother i (completion of 5^{th} grade and the highest level of schooling) of cohort c, born in district d. $Exposed_c$ is an indicator variable taking a value 1 if an individual i belongs to younger cohort in 2011 survey (Cohort B), which is interacted with geographic differences in intensity of the reform, denoted by $Intensity$ and measured by enrollment rate at the primary (1-5^{th} grade) and middle school (6-8^{th} grade) levels of 6 to 14 year old males in 1971. Variables $birthyear_i$ and $district_d$ represents year of birth and district of birth fixed effects, respectively. X is a vector of other exogenous factors that influences educational outcomes (caste and religion). Both of these variables are strong predictors of education. As previously mentioned, due to caste-based discrimination, higher caste individuals enjoy greater privileges, including access to education. Note that $Exposed_c$ is collinear with birthyear dummies and is not included by itself. The above equation is estimated by using the OLS and standard errors are clustered at the district level. The coefficient of interest is β, which presents the difference-in-differences estimate.

Parameter β represents the causal estimate of the reform under an assumption that educational outcomes among younger and older mothers across districts that were highly affected by the reform and districts less affected by the reform would follow a similar trend in absence of the reform. One potential concern is that districts that were highly affected by the reform may have experienced improvements in female educational outcomes prior to the reform and educational outcomes may already have been upward trending. To provide a suggestive empirical test regarding this assumption, in spirit of Duflo (2001), we expand equation 2 to form a case study analysis as given below.

$$E_{ijd} = \alpha + \beta_j \sum_{j=0}^{17} [Age\_1976_{ij} * Intensity_{id}] + \gamma birthyear_i + \lambda district_{id} + \eta X_{icd} + \epsilon_{icd}, \tag{3}$$

where the analysis is restricted to individuals of ages 35 to 54 year olds in 2011 survey year, giving us individuals of ages 0 to 19 in 1976. Age indicator in 1976 (Age_1976_{ij}) is interacted with the intensity measure. The comparison group is 18 and 19 year olds in 1976. If the identification strategy outlined above is valid, the magnitude of β_j should be a decreasing function of age, decline sharply for $j = 10$, and remain close to 0 for $j > 10$.

However, in the DD specification, exposed and unexposed groups belong to Cohorts B and D, respectively, when using 2011 survey year. As previously mentioned, it is problematic if systematic differences in children of mothers from younger and older cohorts due to differences in birth order are correlated to child outcomes and reform intensity. To alleviate such concerns, we use the difference-in-difference-in-differences (DDD) as our preferred specification.

6.5 Difference-in-Difference-in-Differences (DDD)

By using Cohorts C and E as shown in Table 1, we incorporate the third level of variation created by cohorts unaffected by the reform in 2001 survey year. Both these groups were too old to benefit from the policy, and therefore, their education level should not be systematically different across low and high intensity districts between the two survey years.[13] This allows us to estimate a difference-in-difference-in-differences (DDD) specification, which is more robust than the DD specification as it captures systematic differences, which originates in the DD specification given by equation 2, when comparing child outcomes from mothers of younger and older cohorts in survey year 2011. To operationalize the identification strategy, we first estimate the following DDD model, where the dependent variable used is mother's educational outcomes similar to equation 2.

$$E_{idcs} = \beta Exposed_c * Intensity_d * Survey\_2011 + \delta_{cd} + \tau_{cs} + \phi_{sd} + e_{idcs}. \tag{4}$$

Subsequently, we estimate a reduced form to evaluate the effect of the reform on children's education and labor outcomes, which is given as follows:

$$y_{idcs} = \beta Exposed_c * Intensity_d * Survey\_2011 + \delta_{cd} + \tau_{cs} + \phi_{sd} + e_{idcs}. \tag{5}$$

[13]We show that such is the case in an auxiliary specification. Results are not shown but are available upon request.

where, y_{idcs} is child outcome (education or child labor) of a child i who belongs to a mother born in district d, of cohort c, and in survey year s. $Exposed_c$ takes a value 1 if an individual is 35-44 year olds (Cohorts B and C as shown in Table 1) and 0 if 45-54 year olds (Cohorts D and E), and is interacted with reform intensity of mother's district of birth (d) and survey year (2011). The equation includes a full set of double interaction between cohort and mother's district of birth denoted by δ_{cd}, which captures cohort specific effect within a district; τ_{cs}, interaction between cohort and survey year; and ϕ_{sd} represents interaction between survey year and mother's district of birth. It is not necessary to include mother's district of birth fixed effects by itself once δ_{cd} is included. Also, it is unnecessary to include survey year and cohort fixed effects individually due to collinearity. β is the coefficient of interest, which measures the effect of reform on outcome variables for 35-44 year olds in 2011 survey year relative to 2001. We consider the above specification (DDD) as our preferred model as it differences out systematic differences within mothers from older and younger cohorts in 2011 survey, which may be correlated with reform intensity and child outcomes by using unaffected mothers from 2001 survey year but of similar age groups. As previously mentioned, given the rigidity of caste structure in Nepal that significantly affects access to education, we estimate the above specifications separately for Brahmins and Chettris (higher caste) when using both educational and child labor outcomes as the dependent variable. Robust standard errors are obtained from clustering at mother's district of birth.

The identifying assumption for the DDD specification is that there are no district-cohort specific changes between 2001 and 2011 survey years that are correlated with the reform and district-cohort specific child outcomes, conditional on the covariates we include in the model. In other words, any unobserved time varying district specific changes between two survey years affecting high and low intensity districts differently should not systematically affect child outcomes of 35-44 and 45-54 year old mothers.

6.6 Potential threats to identification by DDD

Any changes between 2001 and 2011 that will disproportionately impact children of younger mothers in high intensity districts in 2011 will lead to possible bias in the result. There were some important economic and political changes that took place in Nepal in the first decade of 2000. The most important of these is perhaps the end of a decade long civil war and restoration of democracy in 2006. While the 1990s was the period of economic decline in manufacturing sector, the 2000s brought in a wave of low-skilled temporary labor migration to the Middle East and Malaysia. If these changes had differential effects on children belonging to younger cohort mothers in districts with high program intensity, then our estimate will pick up these effects. These concerns are discussed in more detail below.

6.6.1 Boom in labor migration

Were there changes in economic conditions in Nepal between 2001 and 2011 that may be correlated with 1971 male enrollment rates and affected children of younger mothers differently? Labor market conditions were vastly different between the two surveys. In the context of Nepal, labor migration to the Middle East and Malaysia for low-skilled jobs expanded rapidly in the first decade of 2000s. Therefore, children in 2011 were facing different family circumstances and labor markets than children in 2001. Remittances from foreign migration may have reduced the need for child labor at home. Furthermore, households maybe were able to afford the direct and opportunity cost of schooling. On the other hand, absence of household member (most of the migrants are male) may have led to labor shortages, requiring greater use of child labor in family farms. Figure A2a in the appendix shows the correlation between fraction of district population absent in 2011 and 1971 male enrollment rate. We see a positive relationship, indicating that any effects of the boom in labor migration may be picked up by our measure of reform intensity. To account for boom in labor migration, we control for the triple interaction of district-specific total count of foreign migrants in 2011 interacted with exposed cohort and the survey year 2011 in a set of specifications.

6.6.2 Civil War (1996-2006)

A decade long civil war between the Communist Party of Nepal (Maoist) and the government of Nepal led to a massive destruction of property and human lives. It is estimated that more than 17,000 people (including both civilians and armed forces) were killed during the conflict and more than 100,000 individuals were displaced.[14] Empirical evidence suggests that the conflict had positive impact on female education (Valente, 2013). In Appendix Figure A2b, we see that conflict was slightly less intense in areas with high male enrollment rate in 1971. So, the positive effect of low conflict may confound the impact of higher reform. To account for the effect of the war, we control for the triple interaction term between district-specific count of displaced individuals (per 10,000), exposed cohort, and the survey year 2011.

6.7 Summary statistics

Tables 2 shows the summary statistics divided by samples in two survey years using the census and NLSS data, respectively. As expected mothers have higher educational outcomes in 2011 (2004 in NLSS) compared to individuals in 2001 survey year (1996 in NLSS). Mostly importantly, other characteristics such as ethnicity, religion, child's age, and gender are virtually similar across two waves, suggesting that sample composition across waves are similar (on observed characteristics).

[14] https://www.insightonconflict.org/conflicts/nepal/conflict-profile/

7 The Effect of NESP on Mother's Education

Our first set of results show that NESP had a strong impact on mother's education. We estimate the impact of NESP in three ways. First, following the traditional DD method, we use a single cross section (2011 and 2001 survey years separately) and exploit variation across age (cohort) and reform intensity. In 2011, the exposed cohort include mothers aged 35-44 and the unexposed cohort include mothers aged 45-54. Similarly, in 2001 survey year exposed and unexposed cohorts are 25-34 and 35-44 year olds, respectively. These results are reported in Table 3. In the second DD estimate, we define exposed and unexposed cohort differently. In this case, the exposed cohort include women aged 35-44 in 2011, whereas the unexposed cohort include women aged 35-44 in 2001. This classification allows us to compare women of the same age group (and hence with same family structure).[15] In the third approach, we combine multiple survey years and within cohort variation obtained from each survey year along with variation in intensity of the reform across districts and estimate a DDD specification. This is our preferred specification and is used as a first-stage estimation of instrumental variable technique.

7.1 Results from Single-Survey-Year Difference-in-Differences Estimation

The estimates from using a single cross-sectional data and using variation within age cohorts and reform intensity to identify the effect of NESP for a full sample are shown in Table 3. The first four columns (Columns 1 to 4) uses the survey year 2001 and Columns 5 to 8 uses the survey year 2011. The odd columns present results without additional district-level control variables, whereas the even columns include district-level control variables. For the full sample, the results show that a percentage point increase in male school enrollment rate in 1971 increased the likelihood of 5^{th} grade completion and the highest level of education of younger cohort by 0.41 percentage points and 0.038 units (Columns 2 and 4), respectively, after controlling for personal and district characteristics. The results are comparable across both 2001 and 2011 survey years.

By using a case study method as shown in equation 3 but after pooling both survey years together, we estimate the effect of the reform for individuals of each age in 1976 from 0 to 17 year olds (comparison group is 18 and 19 year olds). The age-specific estimates of the effect of the reform are plotted in Figure 6. The coefficients show a decreasing trend over age, falls sharply for 10 year olds in 1976, after which they remain close to zero. We also conduct case studies by using each survey year individually. The coefficients on the interaction terms are plotted in Appendix section, Figure A4, for survey year 2011. The results remain similar. Such results pertaining to 2001 survey year are virtually identical to the findings of 2011 survey and are not presented, but are available upon request.

[15] This approach yields similar results as to the former one. For the sake of brevity, discussion of this approach is presented in the Appendix section.

Next, we turn to a difference-in-difference-in-differences (DDD) specification that utilizes three different variations as discussed in the previous section: 1) Across district variation in reform intensity; 2) Between survey year; and 3) Exposure to the reform, determined by age in 1976. The DDD specification relies upon a lighter set of assumption than difference-in-differences (DD) model. We provide a detailed discussion in the next section.

7.2 Results from DDD

Table 4 presents the results from the DDD specification that shows the effect of NESP on female's educational outcomes by using the Census data. Columns (1), (2), (5) and (6) include people from all caste, whereas other Columns restrict the sample to Brahmins and Chettris (mothers from higher caste households). The DDD estimates are positive and statistically significant at the 1 percent level across all columns. For instance, Columns (2) and (6) suggest that one unit increase in standard deviation of reform intensity increases the probability of completing fifth grade by 3.9 percentage points and increases the highest years of schooling by 0.36 units. The F-Statistic pertaining to test that the DDD estimate is significant equals 25.17 when the highest years of schooling is used as the dependent variable in Column (6). This is much larger than the critical F-Statistic of 10, which is used to access the strength of instruments. The DDD estimates are larger in magnitude when the sample is restricted to Brahmins and Chettris. This suggests that the effects of NESP on educational outcomes are higher among mother's from higher caste. The F-Statistic associated with significance of the DDD estimate when using the highest years of schooling as the dependent variable in the restricted sample equals 13.07 (in Column 8). Similarly, Table 5 presents the DDD estimates estimated in a similar way as shown in Table 4 but by using NLSS data. The DDD estimates are similar in magnitude to the DD estimates (as shown in 3), and also the DDD estimates from both datasets (Census and NLSS) are of comparable magnitudes.

As previously mentioned, the validity of the DDD estimates rest on a lighter assumption compared to the underlying assumption governing the unbiasedness of the DD estimates. The stricter DD assumption that in absence of the reform, trends in educational outcomes between exposed (35 to 44 in 2011) and unexposed (45 to to 54 in 2011) cohorts across low and high intensity reform districts should not vary systematically is no longer required. In the DDD specification, unobserved cohort-specific factors which are correlated with the reform intensity are allowed to affect exposed (35 to 44 in 2011) and unexposed (45 to 54 in 2011) cohorts across low and high intensity districts differently. These effects are captured by the district-cohort fixed effects. Any unobserved changes within cohort across districts are absorbed by district-cohort fixed effects. Similarly, any common changes affecting younger cohort differently compared to older cohort between two survey years are captured by cohort-survey fixed effects. The underlying assumption now is that unobserved factors correlated with the reform intensity will not affect younger (35 to 44 year olds) and older (45 to 54 year olds) cohorts differently in a district between two survey years. Any cohort-specific unobserved differences between younger and older cohorts in 2011 survey year in a particular district will be differenced out by using unexposed cohorts but of same age groups in 2001 survey, given that unobserved changes affect both cohorts in a district similarly between two survey years.

As stated in section 5.6 of the identification strategy, we note two main possible threats to the DDD estimates: 1) Loss due to civil war; and 2) Increase in migration between 2001 and 2011. We note that these changes are unlikely to affect mother's educational outcomes since mother's education is predetermined during the onset of these events, but these events surely pose concerns while using child outcomes as the dependent variable. To address these concerns we include the following triple interaction between (a) count of displaced individuals between 1996 and 2006 (per ten thousand people) interacted with survey year (2011) and cohort (35-44 year olds); and (b) the total count of district specific migrants in 2011 interacted with survey year and cohort.

The results obtained after including these interaction terms are presented in Columns (2), (4), (6) and (8) in Table 4 and Table 5. Although these controls address potential omitted variable bias, we caution that these given control variables could be endogenous. For instance, migration could be determined by education, with improvement in education leading to an increase in migration. In contrast, lack of education can increase migration for low-skilled jobs as well. Similarly, educational status of a district can determine intensity of the civil war. It is reassuring that the results shown in Tables 4 and 5 are robust after including these district-specific controls.

It is problematic if NESP also affected males' educational outcomes similar to females' education as in such a case it would be difficult to isolate effect of mother's education on child outcomes from improvements in father's educational outcomes. For robustness check, we carry out the same DD and DDD procedure for male household head or spouse of household head. The estimates are plotted against age category in Appendix Figure A3. The results show that male education is not differentially impacted by intensity of the reform, confirming our earlier claim using district-level data (see Figure 3). The coefficients for all age categories are statistically not different from zero and close to one another. This increases our confidence that any impact of the program on the education of next generation would come from improvement in female education.

8 Effect of NESP on Child Outcomes

8.1 Reduced Form Estimates

Table 6 presents reduced form estimates of the effect of NESP on children's educational outcomes from the DDD specification by using the Census data. All columns include controls for the double interaction terms between survey-cohort, cohort-district, district-survey fixed effects, and personal characteristics. Columns (1), (2), (5) and (6) presents estimates using the whole sample, whereas Columns (3), (4), (7) and (8) restricts the sample to Brahmins and Chettris. Additionally, the even columns include district-specific controls given by the set of district-level triple interaction terms used in Table 4.

Referring to the findings from the previous section that NESP improved status of maternal education, we may expect to see an increase in educational outcomes and a decrease in child labor among children belonging to mothers affected by NESP. However, findings in Table 6 that pertains to the whole sample indicate that NESP had no effect on children's educational outcomes given by the status of attending school and completion of fifth grade. Our estimates supporting a null hypothesis of no effect is surprising at first hand compared to prior literature demonstrating positive effects of maternal education on child outcomes including health outcomes (Chou et al., 2010; Currie and Moretti, 2003).

As discussed previously, we emphasize that caste hierarchy, a social concept that has profuse influence over determining societal norms, may be influential in explaining child outcomes. It is particularly important to understand the caste structure of Nepal in this context to understand the results supporting the null hypothesis of no effect in Table 6.

Briefly, Nepali caste system is dependent on the varna model of social stratification based on birth. There are four major varnas (classes) defined as: 1) Brahmin (priests, scholars, and educators); 2) Kshatriya (soldiers, governors, kings); 3) Vaishya (merchants, farmers, and artisans); and 4) Sudra (laborers, artisans, and service providers). Severe discrimination persists in the nation across these castes in context of education, health, and occupation. As discussed previously, the structure of caste system inherently fixes occupation of an individual, making it difficult for people from lower caste to be involved in occupation yielding higher returns. Although Nepal's constitution of 1990 guarantees equality by stating that the State will not discriminate against citizens based on "religion, color, sex, caste, ethnicity or belief," such rights are bounded by the clause that traditional practices at religious places should not be considered discriminatory (Gurung, 2005). This means that untouchables still have no access to religious places and shrines. Hence, the 1990 constitution of Nepal reaffirms the confinement with Hindu ideology of the caste system.

This variation in education by caste is clearly depicted in Figure 7. The figure shows age-education profile for males and females of low and high caste born in districts with high and low intensity of NESP reform.[16] We provide separate figures pertaining to 2001 (7a) and 2011 survey years (7b). Several salient points of Nepali education is evident from the graph. First, male education was higher than female education among the oldest cohort, but low caste males had more education than high caste females. Progress in male education over time is approximately linear in both low and high intensity districts. The gain in education is most pronounced for high caste females who were of school-going-age during the time of reform in high intensity districts, whereas the trend for low caste females does not appear to be very different across the two categories of districts.

As discussed in section 2, we expect to see positive effects of NESP on childen's educational outcomes among children belonging to mothers of higher caste mainly because they typically face lower direct and opportunity costs of schooling, which lowers the marginal costs of human capital investments at every level of return as shown in 1. Similarly, the expected benefits from additional levels of human capital investment is higher for people of higher caste, which is likely to increase the equilibrium level of human capital investments.

Columns (3), (4), (7) and (8) in Table 6 presents the DDD estimates for Brahmins and Chettris, mothers who belong to a higher spectrum in the caste-hierarchy, hence, not exposed to caste-based discrimination. The estimates shows that NESP reform had a positive effect on children's completion of fifth grade. The DDD coefficients from Columns (7) and (8) indicate that one standard deviation increase in intensity of the reform results to an average increase of a child's fifth grade completion by 1 and 1.5 percentage points, respectively. These estimates are modest in magnitude but are statistically significant at the 5 percent level.

Now we turn to the reduced form estimates of the impact of NESP on child labor, which is estimated by using the NLSS survey. The results from analyses are presented in Table 7. To be consistent with Table 6, we perform analyses by including people from all caste (Panel A) and also restrict the sample to Brahmins and Chhetris (Panel B). NLSS contains both monthly and weekly (past week) variables pertaining to work-related involvement in agricultural and household activities. We note that recall bias is lower in variables pertaining to the past week, hence, we prefer weekly variables in favor of monthly variables. We focus on three weekly variables: 1) Days worked in the past week; 2) Hours worked per day in the past week; and 3) The total number of hours worked in the past week. These variables are listed in Table 7. The DDD estimates presented in Table 7 are negative across all columns and are consistent with the belief that education reform reduces child labor. For instance, the DDD estimate in Columns (2), (4) and (6) in Panel A suggests that one standard deviation increase in reform intensity reduces days worked per week, hours worked per day in the past week and the total weekly hours worked by 0.25, 0.2 and 1 units, respectively. Such reductions are of a modest size. The control variables included in the model are similar to the variables used in Table 6. However, only the coefficients pertaining to the number of days worked per week is statistically significant

[16] High caste comprises of Brahmins and Chettris.

at the 5 (Column 1) and 10 (Column 2) percent levels. The reduced form estimates in Panel B pertaining to Brahmins and Chhetris are similar to the respective magnitudes in Panel A, except that the coefficients pertaining to total weekly hours worked are larger in magnitude and statistically significant at the 5 percent level.

8.2 IV Estimation

To understand the relevance of the reduced-form estimates, we turn to instrumental variable estimates. The estimates are reported in Table 8 (using the Census data) and 9 (using NLSS data) for children's education and labor outcomes, respectively.

Table 8 instruments mother's highest level of schooling by using the reform and presents both OLS and IV estimates. Panels A and B pertains to the whole sample and Panels C and D represents estimates for mothers from Brahmin and Chettri households. The odd columns exclude district level controls and the even columns include them. The OLS estimates treat mother's schooling as exogenous, whereas the IV estimates treat it as endogenous and uses the interaction between cohort, survey year and reform intensity as the instrument. The estimates shown in 4 and 5 when using mother's years of schooling as the dependent variable represents the first stage.

The OLS estimates show that increases in maternal years of schooling is associated with an increase in probability of attending school and completion of fifth grade. In contrast, the IV estimates pertaining to whole sample (Panel B) are close to zero and statistically insignificant at any conventional levels. This lends support to the null hypothesis that increases in mothers years of schooling has no effect on children's educational outcomes when people from all castes are included. There are two main explanations to such differences between the OLS and IV estimates. First, IV estimates do not represent the average treatment effect but reflects the local average treatment effect (LATE). In this context, the IV interpretation is limited to the effect of mother's education on child outcomes only among those mothers affected by NESP. Educated mothers who were not affected by NESP can potentially share different family background compared to mothers affected by NESP. They would have been educated regardless of NESP and are likely to be from the higher spectrum of socio-economic background. The OLS estimate picks up effect of these mothers as well, whereas the IV estimation is precisely concerned with mothers who were affected by NESP. Second, the OLS estimates are likely to be driven by other unobserved factors correlated with both child labor and mother's education.

When turning to educational outcomes of children from mothers belonging to higher caste in Panel D, IV estimates have positive signs. Although positive, the IV estimate pertaining to school attendance is not statistically significant at any conventional levels for specification including district-level interaction terms (Panel D, Column 2). The IV estimate referring to completion of fifth grade is positive and statistically significant at a 5 percent level in both Columns (3) and (4). Specifically, the IV estimate in Column (4) suggests that an increase in mother's schooling by a year on average increases the likelihood of a child's completion of fifth grade by 3 percentage points among mothers affected by the reform and belonging to higher caste. The IV estimates in Columns (5) and (6) suggest that an increase in mother's level of schooling on average increases a child's highest level of schooling attainment among Brahmins' and Chettris' households but the estimate is not statistically significant at the conventional levels after including interactions of district level controls in Column (6). The magnitude of IV estimates in Panel D are comparable in size with the OLS estimates as shown in Panel C. To access whether the standard errors are underreported in the second stage, additionally we estimate standard errors from 200 bootstrap replications. The results remain similar.[17]

Table 9 shows the effect of mother's highest level of schooling on comprehensive measures of child labor outcomes in the past week by presenting both the OLS and IV estimates from NLSS data. Both the OLS and IV estimates in Table 9 suggest that increases in mother's schooling reflects less time spent on child labor. Although the IV estimates have much larger standard errors compared to the OLS estimates in Panel B, the estimates pertaining to hours per day and the total weekly hours (Columns 4 to 6) are statistically significant at a 1 percent level. We note that the magnitude of IV estimates reports to a modest reduction in hours worked in the past week. For instance, Column (6) in Panel B indicates that an additional year of an increase in mother's education on average reduces child's total number of hours worked in the past week by 0.62 units. When pertaining to Panel D, for Brahmins and Chhetris, the IV estimates suggest that mother's education does not reduce the total number of working days in week (Columns 1 and 2) but reduces the number of hours worked in a given day, as shown in Columns 3 and 4.

9 Conclusion

The current literature on intergenerational effect of parents' schooling on children's education outcomes is focused on developed nations. Due to compulsory education laws and strict enforcement of laws, children's basic schooling and labor is rarely an issue in these settings. The situation of children's human capital investment is still problematic in developing countries, and this issue requires serious attention given a strand of literature suggeting that early human capital investment is the most important factor in determining one's human capital development later on in life. In this study, we estimate the intergenerational effect of the Nepal Education System Plan (NESP), which enhanced education outcomes among females who were of

[17]The results are not shown but are available upon request from the authors.

school-going-age during the implementation period of the reform (1976), on children's education and labor outcomes. Subsequently, using exposure to the reform as an instrument, we identify the effect of mother's education on children's education and labor outcomes. Our study provides an answer to the broader question of whether improvements in maternal education determines the level of human capital investment among children in a context of a developing nation. Throughout the study we highlight salient features of caste based discrimination, which is prevalent until this day in Nepal.

Our preferred identification strategy is based on difference-in-difference-in-differences (DDD) specification, which uses three sources of variations for identification: 1) Intensity of the reform across districts, 2) Mother's age at the time of reform, and 3) Survey years. This identification strategy allows us to difference out unobserved differences between children belonging to younger and older cohorts, such as birth order and family structure, which may arise from using only one cross-sectional survey. Thus, we address the concern that comparing parents of different ages (older versus younger) while evaluating intergenerational effects is likely to suffer from endogeneity due to differences in birth order between children from younger and older parents.

We find that mothers exposed to the reform were more likely to complete fifth grade and attain a higher level of schooling. Among mothers exposed to the reform, one standard deviation increase in reform intensity on average increased the probability of completing fifth grade by 3.9 percentage points and increased the highest years of schooling by 0.36 units. Given that the average years of schooling among females in the sample is 1.43 and only 15 percent of mothers had completed fifth grade (from 2011 Census), the effect of the reform is economically significant. Furthermore, the reform is more effective among mothers belonging to privileged caste status (Brahmin and Chhetri). When evaluating the effect of NESP on children's education outcomes we find no effect in the whole sample and the intergenerational effect on children's education persists only among children born to mothers who belong to higher castes (Brahmins and Chhetri). The IV estimates indicate that mothers' education leads to an increase in children's likelihood of completing fifth grade but again the results are restricted to mothers from higher caste households. Improvement in mothers' education creates a modest reduction in children's total hours worked in the past week by approximately an hour.

The findings reported here are a matter of interest for policy as they show that implementation of a universal education system can be successful in generating higher educational outcomes, which can follow through to younger generation. Specifically, improvements in mothers' education can spillover to children's educational attainment as a form of intergenerational human capital transfer in context of a developing nation. Moreover, improvements in mother's education can lead to a modest reduction in hours spent working as a child. However, in the context of our study, caste hierarchy is a specific matter of concern when evaluating intergenerational transfer of education and homogeneous implementation of policies framed to enhance education would be relatively less useful if rigid caste structure is not accounted for. Caste-based exclusion persists in many parts of South Asia besides Nepal including India, Bangladesh, and Sri Lanka. Given the findings, we caution that policies designed to improve access to education in developing nations such as Nepal should thoroughly consider societal structure when implementing such policies.

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10 Tables

Table 1: Illustration of identification strategy

	Age in 2001	Age in 2011
Treated in 1976 (Aged 0-9)	25-34	35-44
	(Cohort A)	(Cohort B)
Not treated in 1976 (Aged 10-19)	35-44	45-54
	(Cohort C)	(Cohort D)
Not treated in 1976 − Placebo group	45-54	55-64
(Aged 20-29)	(Cohort E)	

Note: Cohorts A and B are exposed to the reform, whereas individuals belonging to Cohorts C, D, and E had surpassed their school-going-age during the implementation of the reform as a whole in 1976.

Table 2: Summary statistics of key variables

	Mean	SD	Mean	SD
Panel A: Nepal census				
	2001 (N=179,449)		2011 (N=242,714)	
5th grade complete (mother)	0.0787	0.269	0.15	0.357
Highest level of schooling (mother)	0.71	2.396	1.428	3.256
Attending school (child)	0.788	0.409	0.885	0.319
5th grade complete (child)	0.416	0.493	0.599	0.49
Brahmin	0.18	0.384	0.176	0.381
Chhetri	0.139	0.346	0.103	0.304
Hindu	0.805	0.396	0.799	0.401
Buddhist	0.121	0.326	0.103	0.304
Child age	12.58	1.705	12.69	1.703
Child gender	0.478	0.5	0.495	0.5
Birth order (child)	2.433	1.16	2.355	1.135
Male school enrollment (1971)	22.93	9.764	21.79	8.913
displacement (per 10,000)	32.41	137.3	55.52	286.7
Total number of absentee	29902.1	21797.7	28603.6	21575.2
Panel B: NLSS				
	1996 (N=2,147)		2004 (N=2,303)	
5th grade complete (mother)	0.0923	0.289	0.142	0.349
Highest level of schooling (mother)	0.882	2.644	1.31	3.08
Days worked (per week)	1.495	2.689	1.775	2.749
Hours worked (per day)	1.262	2.479	1.135	1.888
Total hours worked (weekly)	7.198	15.19	5.392	10.07
Chhetri	0.196	0.397	0.18	0.384
Brahmins	0.177	0.382	0.147	0.354
Hindu	0.848	0.359	0.824	0.381
Buddhist	0.0685	0.253	0.108	0.31
Child age	12.39	1.682	12.42	1.721
Child gender	0.478	0.5	0.473	0.499
Birth order	2.993	1.455	2.749	1.413
Male school enrollment (1971)	24	10.97	23.48	10.53
Displacement (per 10,000)	51.6	290.6	35.19	163.4
Total number of absentee	33187.7	24601.1	31320.9	22599.2

Table 3: Difference-in-Differences (Effect of NESP on Mother's Education Using Individual Survey Year in a Full Sample)

	Census 2001	Census 2001	Census 2001	Census 2001	Census 2011	Census 2011	Census 2011	Census 2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	m5grade	m5grade	highest_educa	highest_educa	m5grade	m5grade	highest_educa	highest_educa
Cohort*Intensity	0.00397***	0.00407***	0.0373***	0.0384***	0.00445***	0.00480***	0.0416***	0.0444***
	(0.000637)	(0.000719)	(0.00621)	(0.00689)	(0.000788)	(0.000887)	(0.00708)	(0.00811)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	641154	641154	641154	641154	680149	680149	680149	680149

Note: All model specifications control for cohort and district of birth fixed effects, caste and religion fixed effects. Additionally, specifications with district level controls (even Columns) include district-specific total absentee count and the number of individuals displaced (per ten thousand people) due to the civil war interacted with exposed cohort indicator. Robust standard errors clustered at mother's district of birth are presented in parenthesis. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 4: DDD (Effect of NESP on Female Education, Using Census 2001 and 2011)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	m5grade	m5grade	m5grade	m5grade	highest_educa	highest_educa	highest_educa	highest_educa
2011*Exposed*Intensity	0.00322***	0.00392***	0.00542***	0.00502***	0.0295***	0.0360***	0.0553***	0.0490***
	(0.00101)	(0.000982)	(0.00164)	(0.00175)	(0.00967)	(0.00930)	(0.0169)	(0.0174)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	422163	422163	125004	125004	422163	422163	125004	125004

Note: Columns (1), (2), (5) and (6) include people of all castes and Columns (3), (4), (7) and (8) restricts the sample to Brahmin and Chhetri households. All specifications include a full set of double interaction terms between cohort and mother's district of birth, cohort and survey year, and survey year and mother's district of birth fixed effects. Addtionally, all specifications include caste and religion fixed effects. The specifications with district level controls (even Columns) include triple interaction terms between the total number of absentee due to migration, cohort, and survey year; and the total number of displaced individuals (per ten thousand people), cohort, and survey year. Robust standard errors clustered at mother's district of birth are presented in parenthesis. * p<0.1, ** p<0.05, *** p<0.01

Table 5: DDD (Effect of NESP on Female Education, Using NLSS 1995 and 2003)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	m5grade	m5grade	m5grade	m5grade	highest_educa	highest_educa	highest_educa	highest_educa
2011*Exposed*Intensity	0.00507**	0.00524***	0.00959***	0.00976***	0.0440**	0.0445**	0.0824**	0.0835**
	(0.00195)	(0.00196)	(0.00300)	(0.00295)	(0.0170)	(0.0169)	(0.0367)	(0.0368)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	4450	4450	1555	1555	4450	4450	1555	1555

Note: Columns (1), (2), (5) and (6) include people of all castes and Columns (3), (4), (7) and (8) restricts the sample to Brahmin and Chhetri households. All specifications include a full set of double interaction terms between cohort and mother's district of birth, cohort and survey year, and survey year and mother's district of birth fixed effects. Additionally, all specifications include father's literacy status, caste, religion fixed effects, and interaction between the total number of schools present during the survey year extracted from community level files, cohort, and survey year. The specifications with district level controls include triple interaction between the total number of absentee due to migration, cohort, and survey year; and the total number of displaced individuals (per ten thousand people), cohort, and survey year. Robust standard errors clustered at mother's district of birth are presented in parenthesis. * p<0.1, ** p<0.05, *** p<0.01

Table 6: DDD (Effect of NESP on Children's Education, Using Census 2001 and 2011)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	attending	attending	attending	attending	level5	level5	level5	level5
2011*Exposed*Intensity	0.00000694	0.0000200	0.000756*	0.000486	-0.000121	0.000118	0.00125**	0.00145**
	(0.000303)	(0.000345)	(0.000397)	(0.000530)	(0.000377)	(0.000411)	(0.000548)	(0.000669)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	420954	420954	124338	124338	422163	422163	125004	125004

Note: All specifications include a full set of double interaction terms between cohort and mother's district of birth, cohort and survey year, and survey year and mother's district of birth fixed effects. Columns (1), (2), (5) and (6) include people of all castes and Columns (3), (4), (7) and (8) restricts the sample to Brahmin and Chhetri households. Additionally, all specifications include child's age, birth order fixed effects, gender, caste and religion fixed effects. The specifications with district level controls include triple interaction terms between the total number of absentee due to migration, cohort, and survey year; and the total number of displaced individuals (per ten thousand people), cohort, and survey year. Robust standard errors clustered at mother's district of birth are presented in parenthesis.
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

TABLE 7: DDD (Effect of NESP on Child Labor, NLSS sample)

	(1)	(2)	(3)	(4)	(5)	(6)
	days_perweek	days_perweek	hours_perday_weekly	hours_perday_weekly	total_hours_weekly	total_hours_weekly
Panel A: All Caste						
2011*Exposed*Intensity	-0.0262**	-0.0259*	-0.0163	-0.0172	-0.0979	-0.0973
	(0.0126)	(0.0132)	(0.0125)	(0.0131)	(0.0727)	(0.0761)
Controls	No	Yes	No	Yes	No	Yes
N	4450	4450	4450	4450	4450	4450
Panel B: Brahmins and Chhetri						
2011*Exposed*Intensity	-0.0266	-0.0231	-0.0331	-0.0345	-0.251*	-0.242*
	(0.0234)	(0.0240)	(0.0244)	(0.0249)	(0.127)	(0.129)
Controls	No	Yes	No	Yes	No	Yes
N	1555	1555	1555	1555	1555	1555

Note: All specifications include a full set of double interaction between cohort and mother's district of birth, cohort and survey year, and survey year and mother's district of birth fixed effects. Additionally, all specifications include caste, gender, child's age, birth order fixed effects, religion fixed effects, and interaction between the total number of schools present during the survey year extracted from community level files, cohort, and survey year. The specifications with district level controls include triple interaction between the total number of absentee due to migration, cohort, and survey year; and the total number of displaced individuals (per ten thousand people), cohort, and survey year. Robust standard errors clustered at mother's district of birth are presented in parenthesis. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

TABLE 8: OLS and IV Estimates of the Effect of Mother's Education on Child Outcomes using the Census Data

	(1) attending	(2) attending	(3) level5	(4) level5	(5) level	(6) level
	Panel A: All Caste, OLS					
OLS	0.00808***	0.00807***	0.0208***	0.0208***	0.153***	0.153***
	(0.00123)	(0.00123)	(0.00101)	(0.00101)	(0.00775)	(0.00775)
Controls	No	Yes	No	Yes	No	Yes
N	420954	420954	422163	422163	420339	420339
	Panel B: All Caste, IV					
IV	-0.000499	-0.000183	-0.00632	0.00162	-0.0472	-0.0278
	(0.0103)	(0.0117)	(0.0129)	(0.0141)	(0.0673)	(0.0858)
Controls	No	Yes	No	Yes	No	Yes
N	420954	420954	422163	422163	420339	420339
	Panel C: Brahmin and Chhetri, OLS					
OLS	0.00241***	0.00239***	0.0150***	0.0150***	0.112***	0.112***
	(0.000297)	(0.000299)	(0.000667)	(0.000671)	(0.00390)	(0.00390)
Controls	No	Yes	No	Yes	No	Yes
N	124338	124338	125004	125004	124605	124605
	Panel D: Brahmin and Chhetri, IV					
IV	0.0137*	0.00878	0.0226**	0.0263**	0.107**	0.0812
	(0.00717)	(0.00959)	(0.00990)	(0.0121)	(0.0439)	(0.0611)
Controls	No	Yes	No	Yes	No	Yes
N	124338	124338	125004	125004	124605	124605

Note: Panels A and B include all castes, whereas Panels C and D restrict the sample to mothers from Brahmin and Chhetri households. All specifications include a full set of double interaction terms between cohort and mother's district of birth, cohort and survey year, and survey year and mother's district of birth fixed effects. Additionally, all specifications include child's age, birth order fixed effects, gender, caste and religion fixed effects. The specifications with district level controls include triple interaction terms between the total number of absentee due to migration, cohort, and survey year; and the total number of displaced individuals (per ten thousand people), cohort, and survey year. Robust standard errors clustered at mother's district of birth are presented in parenthesis. * p<0.1, ** p<0.05, *** p<0.01

Table 9: OLS and IV Estimates of the Effect of Mother's Education on Child Labor Outcomes using NLSS Data

	(1)	(2)	(3)	(4)	(5)	(6)
	days_perweek	days_perweek	hours_perday_weekly	hours_perday_weekly	total_hours_weekly	total_hours_weekly
			Panel A: All Caste, OLS			
OLS	-0.108***	-0.108***	-0.0687***	-0.0688***	-0.405***	-0.405***
	(0.0149)	(0.0149)	(0.0128)	(0.0128)	(0.0684)	(0.0685)
Controls	No	Yes	No	Yes	No	Yes
N	4450	4450	4450	4450	4450	4450
			Panel B: All Caste, IV			
IV	-0.0970*	-0.0967*	-0.161***	-0.161***	-0.627***	-0.626***
	(0.0571)	(0.0571)	(0.0307)	(0.0307)	(0.182)	(0.182)
Controls	No	Yes	No	Yes	No	Yes
N	4450	4450	4450	4450	4450	4450
			Panel C: Brahmin and Chhetri, IV			
OLS	-0.0695***	-0.0694***	-0.0448**	-0.0448**	-0.290***	-0.290***
	(0.0191)	(0.0192)	(0.0205)	(0.0205)	(0.0749)	(0.0756)
Controls	No	Yes	No	Yes	No	Yes
N	1555	1555	1555	1555	1555	1555
			Panel D: Brahmin and Chhetri, IV			
IV	0.00478	0.00727	-0.123**	-0.124**	-0.326	-0.317
	(0.0925)	(0.0922)	(0.0595)	(0.0590)	(0.267)	(0.268)
Controls	No	Yes	No	Yes	No	Yes
N	1555	1555	1555	1555	1555	1555

Note: Panels A and B include all castes, whereas Panels C and D restrict the sample to mothers from Brahmin and Chhetri households. All specifications include a full set of double interaction terms between cohort and mother's district of birth, cohort and survey year, and survey year and mother's district of birth fixed effects. Addtionally, all specifications include child's age, birth order fixed effects, gender, caste, religion fixed effects, and interaction between the total number of schools present during the survey year extracted from community level files, cohort, and survey year. The specifications with district level controls include triple interaction terms between the total number of absentee due to migration, cohort, and survey year; and the total number of displaced individuals (per ten thousand people), cohort, and survey year. Robust standard errors clustered at mother's district of birth are presented in parenthesis. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

11 Figures

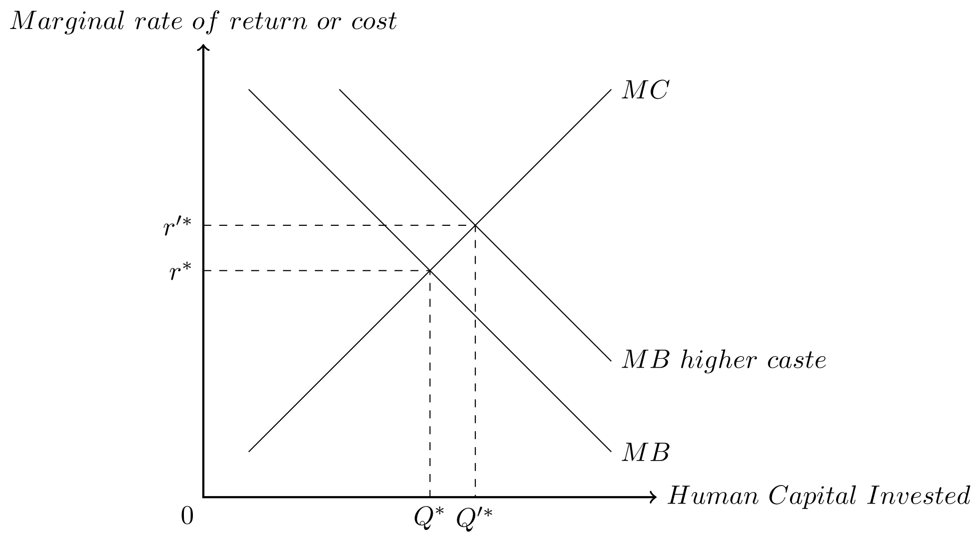


Figure 1: Demand and Supply for Investment in Human Capital from Becker (1967)

Figure 2: Correlation between Male and Female Enrollment in 1971

Source: Nepal Census 1971. The figure shows correlation between males' and females' enrollment rates, aged 6-14 in 1971.

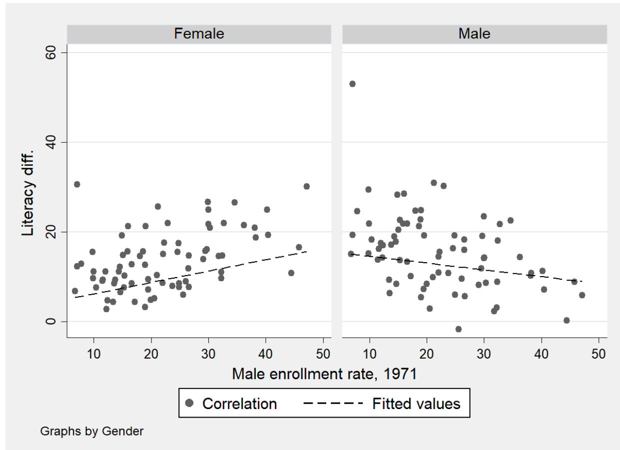


Figure 3: Change in Literacy Rate among 10-14 Year Olds between 1971 and 1981 by 1971 Male Enrollment Rate

Source: Nepal Census 1971 and 1981. The vertical axis plots the percentage point difference in literacy rate of 10 to 14 year old males and females between 1971 and 1981. The horizontal axis plots enrollment rates of males aged 6-14 in 1971.

Figure 4: Difference in 1981 Primary School Completion Rate between Females 6-14 and 20-29 by Male's Enrollment Rate in 1971

Source: Nepal Census 1971 and 1981

Figure 5: Difference in 1981 Primary School Completion Rate between Males 6-14 and 20-29 by Male's Enrollment Rate in 1971

Source: Nepal Census 1971 and 1981.

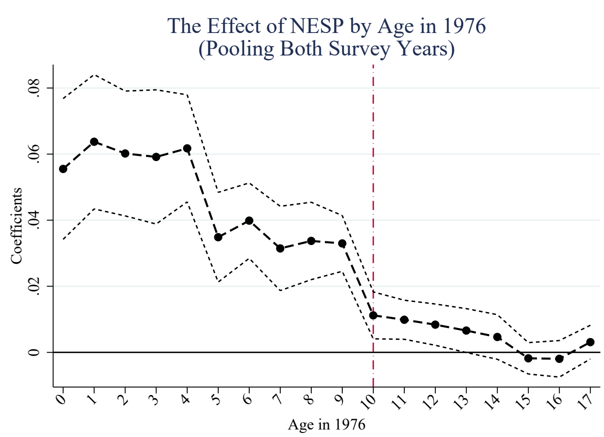
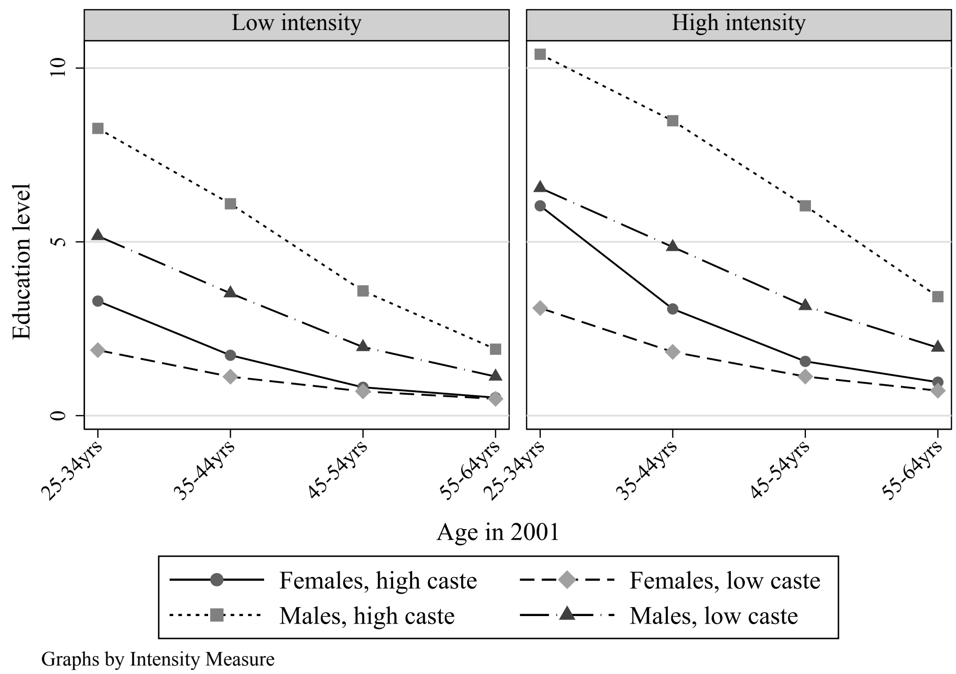
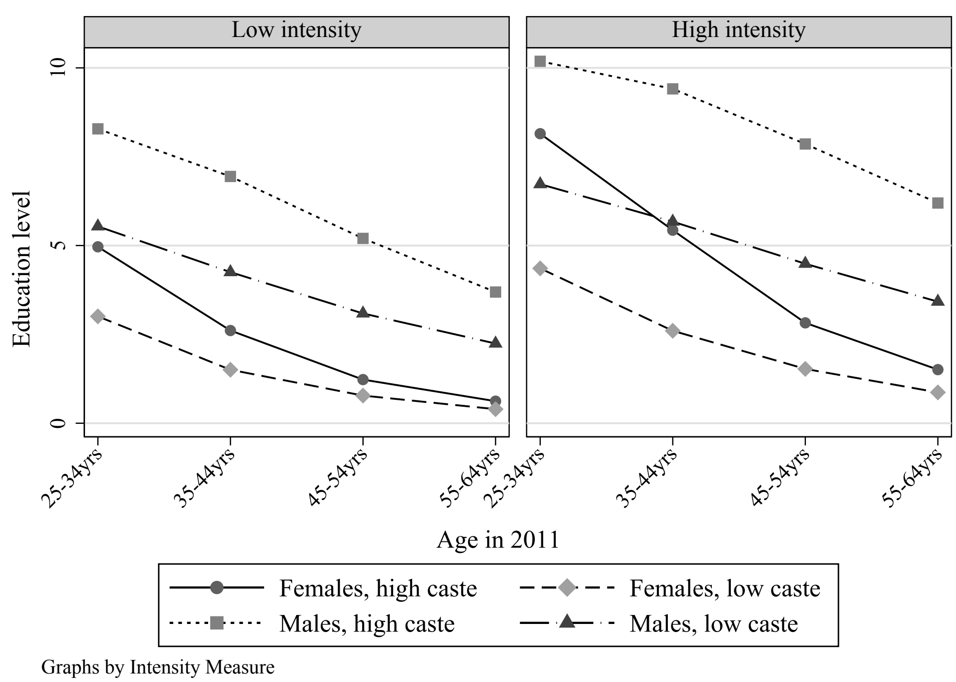


Figure 6: The Effect of NESP by Age (pooling across surveys 2001 and 2011)

Note: The figure show coefficients on the interaction term after estimating equation 3 by using both 2001 and 2011 survey years from the census.



(A) Census 2001



(B) Census 2011

FIGURE 7: Education Levels of Age Cohorts for Females and Males of High and Low Caste by Reform Intensity. The cutoff for low versus high intensity is the median district-level enrollment rate of 21%.

Appendix

11.1 Results from DD Estimation Combining Multiple Surveys

As previously discussed, relying upon a single cross-sectional survey is problematic when evaluating child outcomes due to systematic differences in family structure between the exposed and unexposed mother's households. Table A1 shows the effect of NESP on females' completion of fifth grade and the highest level of schooling obtained after using between survey and across district variation of reform intensity in a slightly different way than depicted in Equation 2. Here, the exposed cohort is obtained from the 2011 survey year and are 35 to 44 year olds (0-9 year olds in 1976), whereas the unexposed cohort comprises of 35 to 44 year olds but come from 2001 survey year (10-19 year olds in 1976). This allows us to compare outcomes from exposed and unexposed individuals of same age groups. The specifications shown in Columns (1) and (3) include the survey year fixed effects and mother's district of birth fixed effects and personal characteristics. The specifications in Columns (2) and (4) include additional control variables such as the district-specific total absentee count and the total individuals displaced (per ten thousand people) interacted with 2011 survey year, respectively. Since the main objective is to analyze child outcomes, the sample from hereon is restricted to mothers with children of ages 10 to 15.

The coefficient of interest, which is the interaction between 2011 survey year and intensity, as shown in Table A1, is positive and statistically significant at the 1 percent level across all columns. Moreover, the magnitude of the coefficient is economically relevant. The standard deviation of the reform intensity is 9.8. Specifically, the coefficients in Columns (2) and (4) suggest that one standard deviation increase in reform intensity increases completion of fifth grade by 7 percentage points and improves the highest level of schooling attained by 0.6 units. To further investigate the validity of our findings we estimate the case study specification as shown in equation 3. The age-specific estimates of the reform are plotted in Figure A1. The trend in coefficients on β_j, as shown in Figure A1, is similar to the trend shown in Figure 6, which lends support to the validity of identification strategy used.

Results

Table A1: Difference-in-Differences (Effect of NESP on Mothers Education Combining Two Survey Years)

	(1)	(2)	(3)	(4)
	m5grade	m5grade	mlevel	mlevel
2011*Intensity	0.00582***	0.00651***	0.0575***	0.0630***
	(0.000908)	(0.00107)	(0.00878)	(0.0105)
Controls	No	Yes	No	Yes
N	301631	301631	301631	301631

Standard errors in parentheses

* p¡0.1, ** p¡0.05, *** p¡0.01

Note: All model specifications control for survey year and district of birth fixed effects, caste and religion fixed effects. Note that survey year fixed effects are perfectly collinear with cohort fixed effects. Additionally, specifications with district-level controls include district-specific total absentee count and the number of individuals displaced (per ten thousand people) due to the civil war interacted with 2011 survey year indicator. Robust standard errors clustered at the district of birth are presented in parenthesis. * p<0.1, ** p<0.05, *** p<0.01

Figures

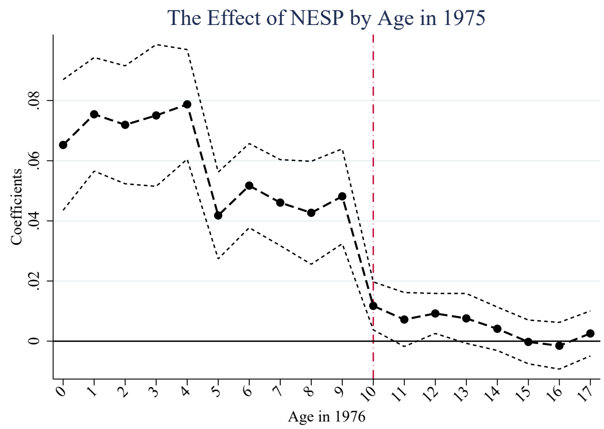
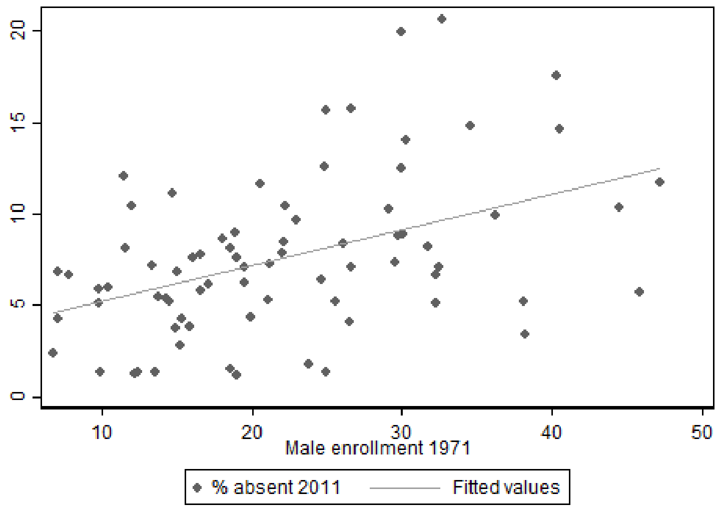
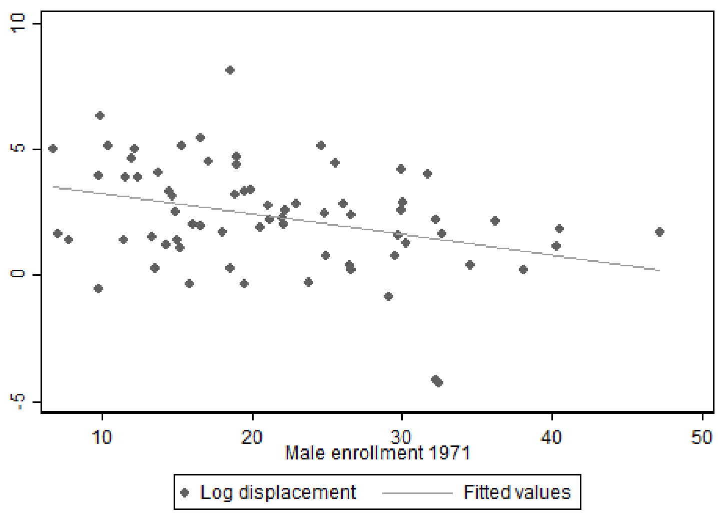


Figure A1: The Effect of NESP by Age

Note: The figure show coefficients on the interaction term from a case study where exposed and unexposed groups come from 2011 and 2001 survey years, respectively, and are 35-44 year olds during the time of survey. The estimation strategy is similar to equation 3 except that we use Cohort B as exposed cohort and Cohort C as unexposed cohort (in Table 1).

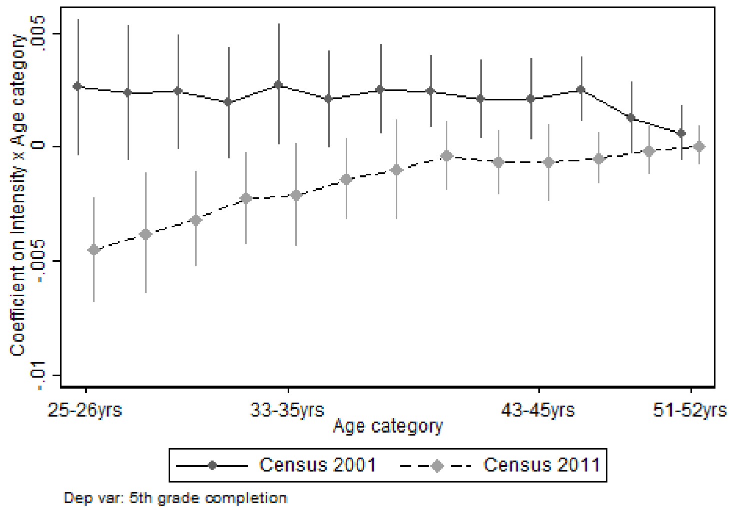


(A) Proportion of absent population (Source: Census 2011)

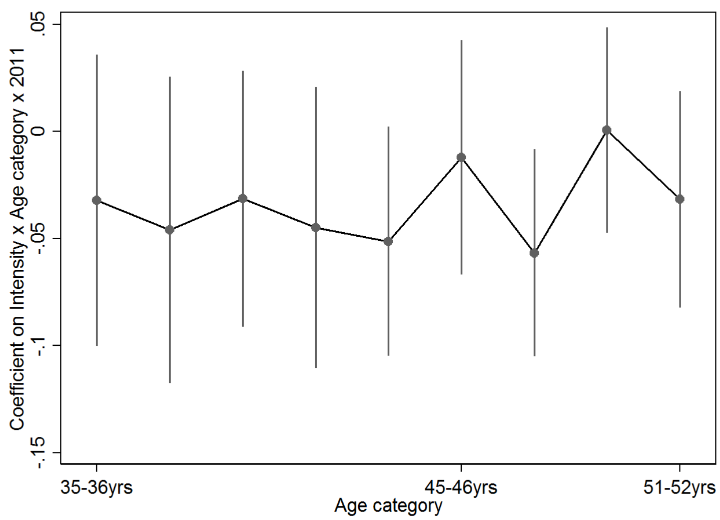


(B) Conflict-related displacement 1996-2006 (Source: INSEC)

Figure A2: Correlations between school enrollment rate in 1971 and recent changes in migration and conflict-related displacement



(A) Coefficients estimates from single year DD



(B) Coefficients estimates from DDD

Figure A3: Coefficient estimates of DD and DDD strategy using sample of male household heads

Figure shows coefficients obtained from regressing education level on (1) interaction between reform intensity and age category for panel (A) and (2) interaction between reform intensity, age category and year 2011 dummy for panel (B), controlling for appropriate fixed effects. The model excludes other control variables.

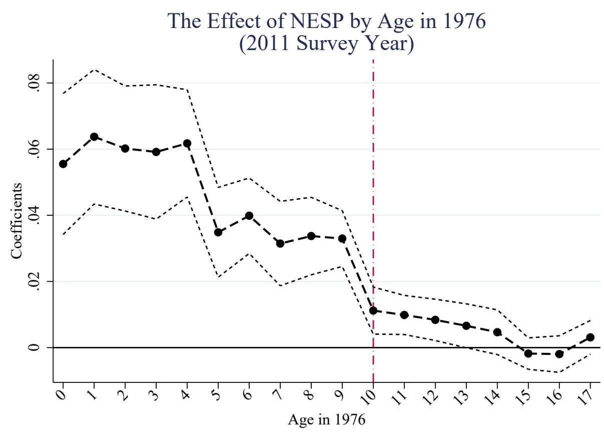


Figure A4: The effect of NESP by age (using 2011 survey)

Note: The figure show coefficients on the interaction term after estimating equation 3 and uses only 2011 survey year from the census.

12 Education in Nepal - gender, caste, and geography

Data on the prevalence of education system before NESP, particularly on caste-based discrimination aspect, is not readily available. In this section, we attempt to shed some light into this by looking at educational outcomes of individuals aged above 45 in 2001. These individuals obtained their formal education in a system that was prevalent in the 1950s and 1960s. Their educational outcomes can provide some insights regarding the degree to which caste and gender played a role in providing access to education prior to NESP. To carry out this analysis, we compile data on individuals born between 1940 and 1952 from Census 2001 and summarize the salient features of those that attained higher levels of education.

Several points become clear:

- There was a big gap in male and female education in Nepal prior to NESP. This is evident from Figure A5. The first two bars show the percentage of males and females in respective age groups with at least primary education, and the third bar shows the percentage point difference between them. The gap between males and females continued to rise (reading from right to left) over time. It was only after age cohort 40-45 and younger that this gap began to stabilize and eventually fell starting with the 25-29 cohort. The reduction of male-female primary education gap coincides with the introduction of NESP program.

- Caste was another important factor in governing access to education in Nepal. In 2001, Hill Brahmins, Chhetris, and Newars together comprised 57% of individuals with primary education aged 25-65, even though their share in overall population was only 37%. Among those aged 45 or above in 2001, the rate of male primary education was 27%, 46% and 40% respectively for these castes. There are some other castes with higher *proportion* of primary school completion than Brahmins, Chhetris, and Newars, but they represent a very small fraction of overall population. The horizontal axis in Figure A6 shows the variation in male education across castes. The role of caste system in schooling and labor market outcomes have been explored in Munshi and Rosenzweig (2006). The authors argue that traditional caste systems, which determine labor market options particularly of its male members, also affect decisions on human capital investment. Empirically, this manifests in lower rates of modern English-language based education for boys from lower castes in India, although no such affects are found for girls.

- Combining the dimensions of gender and caste, we can also see in Figure A6 that male-female gap is consistently large across all major castes. The rate for males belonging to "Terai Brahmin" caste group is at almost 60%. Even then, the female rate does not go above 18%.

- Yet another determinant of education in Nepal is location. Development was uneven and greatly concentrated in the Kathmandu valley. Therefore, one's location of birth also determines educational attainment. Among the older cohort, the median district had 22% primary completion rate for males and 3% for females. But the variation was large, ranging between 3% to 51% for males and between 0 to 19% for females.

- Some castes in Nepal are concentrated in some districts, while others are found in different districts. Chhetris and Hill Brahmins are the most ubiquitous, making up the highest share of population in 22 and 10 districts, respectively. Even within a caste there exists considerable variation across districts in primary education. This could be an outcome of both supply and demand. On the supply side, districts tend to have variations in availability of schooling infrastructure including quality of schools. On the demand side, castes born in different districts may exhibit different set of preferences for education or different levels of opportunity costs owing to local labor markets. Hence, we should be aware that both demand and supply factors played a role in the observed outcomes.

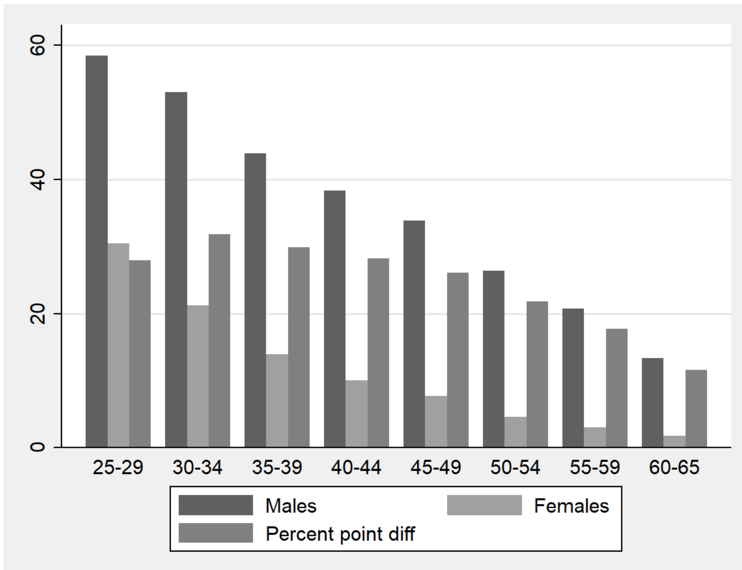


FIGURE A5: Percent with primary education by age category in 2001. Source: Authors' calculations from Census 2001

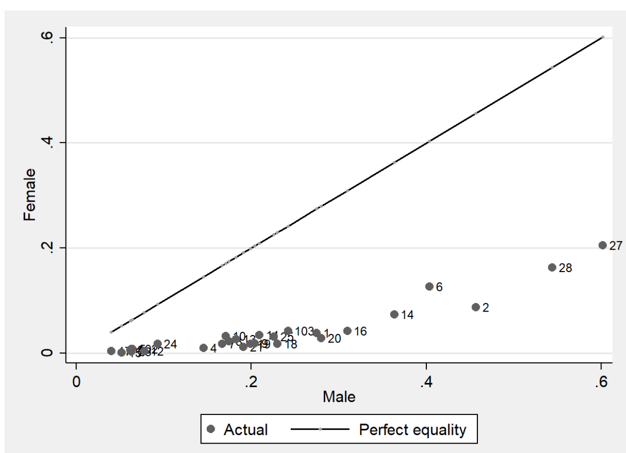


FIGURE A6: Correlation in male and female grade 5 completion rate across castes. Source: Authors' calculation from Census 2001. Sample includes individuals born aged 45 or above in 2001. Only caste groups with at least 1000 observations in the relevant sample is included.