Analysis of Development Policies for Women's Empowerment and Children's Welfare in MENA Countries

PhD Thesis

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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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Overview

The welfare of women and children is an essential ingredient of development. Therefore, this issue has been at the centre of policies concerning economic development. Since 2000, United Nations's commitment to achieving development goals through gender equality, reducing child mortality, improving maternal health and access to education has been reflected within the Millennium Development Goals (MDGs) until 2015. The progress made in line with attaining the MDGs carried on with implementing the Sustainable Development Goals (SDGs) that again emphasise the importance of gender equality, empowerment of all women and girls, health and well-being at all ages, access to quality education and lifelong learning.

This dissertation contributes to the existing literature by studying the importance of countries' historical treatment in empowering women both in social and economic spheres and improving their well-being. In addition to the historical treatment, the development policies in line with achieving the MDGs, such as Universal Primary Education (UPE) and Universal Health Coverage (UHC) in Sudan and Jordan, are analysed. In a nutshell, this dissertation provides an overview of the development efforts by referring to different cases in countries that belong to the Middle East and North Africa (MENA) region where informal institutions such as norms and traditions play an important role in shaping indi-

viduals' behaviour.

The first chapter aims at highlighting the importance of historical institutions on women's empowerment by studying the case of Ottoman existence in Egypt. Egypt serves as an excellent example because, during its existence between the years 1517-1798, Ottoman authorities settled down only in particular regions of Egypt. Their existence had shaped the social norms and traditions, which leads to differences in women's behaviour in these specific geographical regions. The differences in women's attitudes are identified using Spatial Regression Discontinuity Design (RDD), where the outcomes on women's development are identified and compared at the geographical level. The results depict an overall picture of women's position within the regions occupied and dominated by Ottoman institutions. The results indicate that women's domestic autonomy outcomes that refers to women's power in decision-making and standing against domestic violence, are better on Ottoman side of the Border. The autonomy over earnings and participation in the labour force that are the indicators of economic empowerment are higher on the Ottoman side of the border. Also, educational attainment in years is significantly higher for those women.

The second chapter handles educational development in Sudan, which is a highly conservative society. The study provides an overall picture about the effectiveness of compulsory education policies and discusses the reasons why such policies may fail to improve some of the desired development outcomes. The results suggest that the policy was effective in intensive margin as it encourages completion of primary education yet fails in extensive margin as it does not increase the participation in education.

The third chapter touches on the effectiveness of Universal Health Policies (UHP) which is the matter in hand, by studying the free health insurance policy for children under the age of six in Jordan. This chapter scrutinises the causal effect of free health insurance coverage on healthcare utilisation and wasting among children aged between 0 and 12. The results show significant differences between the treatment and control group in terms of health utilisation and children's welfare.

The dissertation also provides three different applications of the RDD that is one of the most reliable econometric tools of policy analysis while using observational data. It is a quasi-experimental method and helps to overcome the selection bias and endogeneity issues while dealing with observational data. The first chapter uses the Geographical Boundaries RDD, also known as Spatial RDD, that is a sharp design. The second chapter uses birth-date related RDD that the birth cohorts are reason of discontinuity, and the third chapter employs age-related RDD where age in months is the running variable. The last two chapters use the fuzzy design by the nature of the policies analysed. Overall, by using the RDD approach, this paper analyses the paths that lead to better development outcomes in the MENA region and explores the tools that should accompany policy changes.

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Chapter 1

The Persistence of Ottoman Institutions and Their Influence on Women's Attitudes in Today's Egypt

The history of countries plays a vital role in shaping current development outcomes. The case of the Ottoman hegemony in Egypt, which lasted from 1517 to 1798, is an excellent example to support this claim. After the invasion of Egypt, the Ottomans established their authority in specific regions of the country. This paper defines the border that separates those areas from the ones less influenced by the Ottoman Rule and uses data from the 2014 Egypt Demographic Health Survey. It employs a Spatial Regression Discontinuity Design to assess whether the Ottomans' sovereignty led to different outcomes in women's empowerment in the regions dominated by the Ottomans and those free from their influence. Variables such as female labour supply, education and the experience of and attitudes towards domestic violence are explored to compare the position of women

on either side of the border. The results indicate that women are more empowered in the regions that were dominated by the Ottomans. Ottoman influence persists through established institutions and culture, providing more flexibility to women.

1.1 Introduction

There is a growing body of literature concerning how historical events can shape today's economic outcomes. Institutions and institutional reforms help to explain the widely disparate economic performance of different societies over the last 500 years. There is a strong need to understand the historical origins of current institutions as they are likely to persist and cause significant disparities in long-run development outcomes (Nunn, 2009). The case of Ottoman hegemony in Egypt that lasted from 1517 to 1798 is a remarkable example to support the claim that the history of the countries plays a determinant role in their process of economic development.

Robinson and Acemoglu (2012, pp. 81-120) indicate that the Ottoman Empire, which existed from 1299 to 1922, spread over four continents and ruled some countries for over 200 years, was founded on extractive institutions that allow politically powerful groups such as elites to be involved in the process of governing so that can exploit the rest of population to pursue their best interest. However, this might not be the case on any ground. During the 16^{th} century when the Ottoman Empire started to establish its hegemony in the Arab world, the Arab provinces enjoyed remarkable stability and relatively good government (Kissling et al., 1997, p.97). Also, the Ottoman rule possessed several features that favoured the women by providing them with flexibility in education, property

ownership, greater scope for divorce and rights within the marriage. Ottoman women had the right to inherit and control property and manage their wealth. They actively took part in the textile industry and agriculture, worked as tax farmers that is the duty of collecting tax mainly given to the private sector or individuals in exchange for a fee, and managed public baths. Many non-Muslim women living in Ottoman territories converted to Islam because Ottoman judges granted women more flexibility to terminate their unwanted marriages (Ebeling et al., 2008).

The historical imprints of the empires persist, causing variations across or even within the countries. The persistence of Ottoman institutions, Egypt can be an excellent example because the Ottoman Empire did not settle down in all parts of Egypt. During its 270 years presence, Ottoman Empire kept Lower Egypt under its sovereignty due to geopolitical reasons and established its Sharia Courts to maintain the order there. Meanwhile, they have left the rule of Upper Egypt to Arab Tribes that mainly relied on customary laws. The difference in the governance of the regions allows looking at the discrepancies in women's attitudes towards violence, economic and domestic autonomy, property ownership and educational attainment across the border that separates the Ottoman regions from the areas governed by the Arab tribes.

Despite the efforts and expenditures of the Egyptian government to reduce gender inequality and improve the status of women, the country still ranks 115 out of 189 countries in United Nations Development Program (UNDP's) Gender Inequality Index (GII). According to the Egypt Report of UNDP (2005), Egyptian women face several issues, including social, legal, economic, political, institutional, and cultural challenges. Social issues include unequal access to education and a high

level of illiteracy which further raises already existing challenges such as lack of understanding of social rights and choice over her body and her life. Additionally, a discriminatory legislative framework led to the violation of women and girls' rights. Egyptian women also do not possess enough awareness of their economic rights, which results in the persistent and increasing burden of poverty on women and a high rate of female unemployment. In less developed countries, huge differences can be observed within the regions of the country in terms of the behaviour of women rather than a pattern. The aim of this paper is to address the reason why the awareness for those issues differs across or even within the regions of Egypt.

The historical analysis of Ottoman Egypt reveals that the differences between Upper and Lower Egypt are rooted in the application of unique Ottoman legacy incorporated into Sharia rules which had granted many rights mentioned earlier enhancing and protecting women's position within the society, marriage and household. For instance, Sharia allows men to marry many women, but this is not the case for women; men can divorce relatively easy; however, women's ability to initiate divorce is more complicated and sometimes carried a financial penalty. Ottoman legacy did not practice the actual Sharia code and put more favourable conditions for women to end unwanted marriages. Also, polygamy was not prevalent among Ottoman families as it was socially disapproved so that 95% of men had only one wife (B. G. Smith, 2008, p. 375). Ottomans also introduced progressive reforms in systematization at work in judicial life, preparation and archive of legal documents, they established more waqfs which were supporting the infrastructure, education and health services, also regulated waqfs to prevent any misuse (İnalcık, 1983, pp.562-66). Waqfs are Islamic charitable endowments such as donated funds, buildings or lands. They were acting as intermediaries

between localities and the government (Babacan, 2011).

The hypothesis is that the legal system of the Ottoman Empire, which recognised extensive rights to both Muslim and non-Muslim women reshaped Egyptian society and persisted through the attitudes of women. These rights include the right to life, property, fair trial, and social protection (Aral, 2017). Also, the Ottoman Empire introduced their education system in Egypt, which promoted their rule and introduced Ottoman culture after taking over the reign. Ottomans did not only establish new educational buildings but also continue to support and maintain the existing ones (Abdullah, Abdul Jamil, and Muhtar, 2013).

This paper aims to propound empirical evidence that empowerment of women shows different patterns in the regions which were influenced by the Ottoman Sovereignty from the ones which were ignored during the Ottoman Rule. The empirical estimations are obtained by employing the Spatial Regression Discontinuity Design (RDD) approach and using Egypt 2014 Demographic Health Survey (EDHS) data. By using ArcGIS, the historical map of Egypt that shows the Ottoman settlement and the border is digitised. The EDHS GPS provides the cluster location of interviewed households. The distance of each cluster to the border is calculated by using the ArcMap and, this allows for the comparison of the responses across the cut-off. The border separating Ottoman occipied regions fro the rest of Egypt is recognised as a sharp cut-off point, and the treatment effect is estimated by comparing these two regions. The paper shows how women's behaviour differs across the border and points out that development outcomes such as decision-making power, economic autonomy, tolerance of violence, and participation in education are better in Ottoman-occupied regions. The outcomes suggest that overall women's decision-making power, economic empowerment and

well-being are higher within the Ottoman side of the border, and these results are explained by referring to historical resources.

RDD relies on some identification assumptions. RDD assumes that there is no difference between the individuals across the cut-off that cannot be explained by the treatment, which is the existence of Ottoman institutions in this case. The paper focuses on the Ottoman policies that are likely to affect women's behaviour, so men's outcomes are used as a placebo to make sure that in the absence of the treatment, there would not be any difference in results. All relevant factors other than the treatment should also be similar or vary smoothly across the boundary. The paper checks the elevation, religion, and age of the respondents. The paper conducts the same analysis by using EDHS 2005 data to make sure that the results are consistent every year. It is essential to validate the location of the border. Hence, the same analysis is done by choosing a random border. There may be an argument that the observations can relocate around the border. To address this issue, the donut test is conducted that removes the observations within the 5 and 15 km around the border.

1.2 Literature Review

1.2.1 Gender, Institutions and History

This article explores the impact of historical institutions that were the imprint of empires that ruled countries for hundreds of years by examining the 250-year existence of the Ottoman Empire in Egypt. This section focuses on how historical institutions can define and determine gender roles within a society.It is essential to understand the factors that influence the gender roles because as indicated by Sharma and Sanchita (2016), gender equality is an important channel that fos-

ters economic growth and development. The empowerment of women is essential for economic growth and development because it can feed into the economy in many ways. Empowered women translate into greater investment in children's health, education and nutrition. Economic freedom is one of the indicators of empowerment that enable women to fulfil their needs and wants and have more decision-making power. According to a study conducted in Brazil, when women control the household income increases the chances of a child's survival increases by 20%. Another study points out that the GDP of India could increase by 8% if the female/male ratio of workers rise by 10% (OECD, 2010). As Mason and H. L. Smith (2003) indicate, gender equality plays a pivotal role in poverty reduction, children's well-being, and mortality. The role of women in achieving better development outcomes has raised the interest to explore the determinant factors of women's empowerment that strengthen their role of women within society such as access to education and employment, laws and regulations to eliminate the discrimination and social institutions which shape the role of women (O'Neil, Domingo, and Valters, 2014).

As indicated by North et al. (1990, p.3), institutions shape human behaviour and determine their interactions. Institutions play an important role in explaining development outcomes. Damjanovic and Selvaretnam (2020) indicate that gender balance within a society depends on religious traditions, legal systems and social norms that evolve over time and varies across countries. Gender inequalities exist in education, health, economic and political participation. Gender inequalities are the result of gender roles that evolve from institutions that determine human behaviour. Especially the social institutions such as the long-lasting norms, values and codes of conduct are highly related to gender inequality. Institutions are humanly devised and rooted in the culture and history (Branisa, Klasen, and

Ziegler, 2010).

The historical background of the countries can play an important role in shaping the social norms that determine gender inequality. Dalton and Leung (2014) study the role of the slave trade to understand the differences in polygyny rates across Western Africa. They suggest that the transatlantic slave trade cause abnormal sex balances due to high male mortality as a result of dangerous occupations and warfare. The sex imbalances altered beliefs about the acceptability of polygyny. Wars could also permanently change gender roles in societies. One of the most well-known examples is World War II (WWII). Historians suggest that the high mobilisation of men during World War in the United States significantly altered the gender roles (Chafe, 1972). Acemoglu, Autor, and Lyle (2004), find that this mobilisation persistently caused variations in the female participation in the labour force across the states but also changed the wage structure and put upward pressure on female wage growth. WWII broadened women's participation in the labour force, and in the United States, both the demand and wages for the female labour force increased rapidly. Women started to work in the factories which were producing the machinery for the war, as nurses, drivers, evacuation officers and they were assigned many other important roles while men were serving the military duties. Women had to replace men in the labour force, and this contributed significantly to gender equality as during the war women were in control of both the private and public space (Santana, 2016). This paper suggests that it was the invasion of the Ottoman Empire as a historical event and its persistent institutions that led to positive outcomes in women's empowerment through the active role of women in economic activities and the provision of educational opportunities.

Another historical event that has changed the status of women in the Middle East is the Arab Spring. During the uprisings, women were quite effective, especially in Tunisia, and they demanded more inclusion in the political system. Regardless of their socioeconomic background, women in Tunis and Egypt participated in activist movements against the regimes in these countries despite the violent oppression (Johansson-Nogués, 2013). The representation of Tunisian women in the parliament is now one of the highest in the Arab region but, the women in parliament still has to comply with the state's definition of women's rights due to the unequal power distribution. Therefore, there is no place for women who were too radical, too Islamist or too feminist in parliament. Although in the Tunisian constitution, progressive rights and freedoms are given to women, they still face constraints by the state's norms and traditions (Tamaru and O'Reilly, 2018). improvements in the status of women within society in these countries, the uprisings did not produce the desired results because of the legal and institutional barriers . The persistent institutions such as inheritance laws and women's labour rights, such as the wage gap, have yet to be addressed in Tunisia. Although the proportion of women in parliament has increased, women human rights defenders in Egypt are subject to judicial harassment, arbitrary arrests, harsh punishments, and imprisonment (Heideman, 2016).

Institutions are the key to changing the gender roles within the society and obtain a more equal outcome. Establishing effective mechanisms and introducing institutional reforms can reduce gender inequality by empowering women which is an important factor to foster economic development (United Nations, 2010). The existence of persistent informal institutions can explain why the establishment of Women's Policy Agencies (WPA) does not lead to the expected institutional change. It is because of the restrictions imposed by the unwritten rules such as the

norms, traditions and cultures. Changing informal institutions takes the form of riots, rebels and sometimes even violence (Waylen, 2014). Sharma and Sanchita (2016), identify the social norms and traditions which hinder the empowerment of women. These factors include patrilocality which is a culture established particularly in the Middle East and North Africa where parents tend to invest more in the education of their sons. In patrilinear families, the properties and other family assets pass on to the male child. The belief in female purity and safety creates a perception that women are weak and need protection. This perception constructs an environment that disapproves the participation of women in the labour force and restricts their mobility. One of the reasons which prioritise the sons may be the dowry system which is a social institution and includes transferring the belongings and rights from the inheritance of the bride to the groom upon marriage. During the marriage, the husband becomes in control of the properties. This social institution supports male dominance and results in women's disempowerment and has serious negative consequences in women's participation in education as families tend to invest more in their sons (Rajeev Kumar, 2020). As indicated by Cislaghi and Heise (2020), social institutions, history and gender norms coevolve together. History shapes the social institutions and social institutions define the gender roles in the society. This paper also provides sound evidence of how history influenced contemporary development in Egypt, through institutions such as educational facilities and the existence of occupations suitable for women of the time, such as the silk industry, and in terms of the legal structure that punished domestic violence and facilitated divorce.

1.2.2 Institutions of the Ottoman Empire

Islam is generally associated with economic underperformance. Kuran (2018), indicates that the multi-religious countries, regardless of whether Muslims make

up the minority or majority of the population, tend to suffer from this economic underperformance. However, at the same time Islam grants inheritance rights to women this had been the case even when Western religions denied the right of women to inherit property (Radford, 1999). Women also could buy and sell property freely, and without her consent, her property could not be managed by her husband, father or any other relatives (R. C. Jennings, 1975).

Ottoman Empire was implementing complementary regulations to the Islamic law to limit its negative aspects not only in economic but also in social life. Islam's original institutions did not include the "waqf system" which can be defined as the private provision of public or semi-public goods like schools, mosques and libraries. Especially during the Ottoman time, waqfs gained a significant economic implication, and almost one-third of the productive lands belonged to waqfs. According to Islam, both men and women must attain an education. Özcan (2015), indicates Ottoman families were putting great importance on bringing up their daughters. There were schools known as "basic schools" where boys and girls between the ages of 6-12 could attend together to attain knowledge on reading and writing, mathematics and the Quran. Waqfs were essential providers of education, particularly primary education (Sonmez, 2013).

The legal pluralism of the Ottoman Empire is one of the aspects mentioned by Kuran (2018). It was an effective tool that facilitates the assimilation of non-Muslim populations into the Islamic court system. Non-Muslim individuals living in Ottoman territories could choose amongst the existing legal jurisdictions and they also allowed the local customs to exist along with the jurisdictions (Barkey and Gavrilis, 2016). For instance, the Millet System, which allowed for the continuation of the Jewish, Armenian, Greek Orthodox identities through imperial

toleration, arose as a result of the multi-religious and multi-cultural structure. This system allowed the non-Muslim community to perform their religion freely and provided them with autonomy to a certain extent. They were subjected to different social, cultural and political codes. Sharia law was applied to them only in particular cases such as the disputes involving Muslims. The Millet system also provided protection for non-Muslims' lives and properties against fiefs. The minority status was given based on their religions such as Orthodox Christians, Catholic Christians or Jews, not ethnicities (Aral, 2004). Coptic Christians in Egypt were one of those minorities who benefitted from legal pluralism. Non-Muslims living under Ottoman rule were subjected to jizya which is the tax imposed on non-Muslim subjects of the Ottoman Empire until 1856, but they were also given the administrative role to be tax farmers. In Egypt during Ottoman rule, both Copts and Jews had their religious institutions for the issues regarding family and marriage. Yet, the divorce issues were taken to Islamic courts as this was not allowed at Coptic church (Henderson, 2005).

In Ottoman Empire, there was the tradition of *mehr* was contradicting with the *dowry* which was dominant in other cultures. Islam protects women within the marriage by imposing mehr which is the money that the groom has to pay the bride to spend however she wants and if the men decide to divorce her, she still keeps the mehr. Relying on the records of Kayseri Court, R. C. Jennings (1975) puts forth that women frequently visited the courts because of the issues concerning the custody of children, property and divorce and the courts treated men and women equally. Although divorce was generally initiated by men, there is a case known as 'khul' that women can request to terminate the marriage without having to provide reasons by returning the mehr paid by the husband. The court records from Kayseri, Cyprus, Aleppo, Damascus and Sofia suggest

that legal pluralism allowed non-Muslim women to seek protection and relief in Islamic courts especially to terminate their unwanted marriages and gain rights in inheritance issues (Barkey, 2013). Egger (1997) indicates that Islamic courts were frequently used by Jewish and Coptic Christian women in Egypt who wanted to terminate their unwanted marriages.

1.2.3 Similar Studies

It is not so easy to recover from the persistent effects of historical institutions imposed by Empires that had ruled the countries for hundreds of years. Dell (2010) examines the long-run impact of the forced labour system MITA institution, which was in force in Peru and Bolivia between 1573 and 1812 by identifying the channels of persistence. MITA existed in more than 200 local communities which obliged to send one-seventh of their adult male population to work in the Potosí silver and Huancavelica mercury mines in Bolivia and Peru. The districts within the MITA region had distinctive features like an insecure property right system, only a few landowners, insufficient provision of public goods and lack of access to education. Although, MITA was abolished approximately 200 years ago, by using Multidimensional Spatial Regression Discontinuity Design Dell, demonstrates that in villages which are within the historical MITA region, average household consumption is 25% lower and the prevalence of stunting in children is 6% higher compared to exempted districts. Today, the MITA districts are still less integrated into road networks. Also, the recent agricultural census proves that the long-run MITA impact increases the prevalence of subsistence farming where the residents are substantially more likely to be at a minimal level of agriculture with restricted access to the market.

Nunn and Puga (2012), shows that geography and history can shape today's

economic outcomes. Their work puts forth that despite the disadvantages of rugged terrain, it had a positive indirect influence on the income of Africa. By employing country-fixed effects, they show that the countries with rugged terrain tend to have better economic performance than the flatter countries as their rugged terrain protected against the negative long-term effects of slave trades. Enslavement could happen through raids of external forces or kidnapping within the region by other ethnicities or even from the same ethnicity. Rugged terrain protected the regions against the raids by providing caverns for hiding and the aptitude to look out the lowlands and entering paths. Their results suggest that the rugged areas have higher GDP per person and better rule of law.

Acemoglu, Garcıa-Jimeno, and Robinson (2012), study one of the major historical institutions, slavery by focusing on the regions with gold mines in Colombia as gold mining was a major source of demand for slave labour. This institution was established by the Spanish Empire. They have obtained the historical data and identified the regions with gold mines and compared them to the neighbour cities and also looked at the cities where the slave population was dense. By employing the neighbour fixed effects, they explore contemporary development outcomes such as secondary school enrolment, poverty rates, vaccination rates, electricity and aqueduct coverage and their findings suggest that the presence of slavery results in higher rates of poverty, land inequality and lower provision of public goods which have negative implications on economic performance.

Ochsner and Roesel (2017) explore the roots of the anti-Turkish arguments in Vienna by studying the historical facts which had been effective in shaping those views. They suggest that in the East Austrian villages which were exposed to Ottoman sieges during the 16th and 17th centuries, the right-wing The Free-

dom Party of Austria (FPÖ) started having higher shares of votes when they strengthen anti-Turkish propaganda in 2015. By initiating the anti-Turkish propaganda in 2015 and making celebrations for the 333rd anniversary of the end of sieges in 1683 they managed to activate the collective memory. They employ the Differences-in-Differences approach and compare the pre-post campaign vote shares of the right-wing parties in pillaged and non-pillaged villages. They also use the Spatial Regression Discontinuity by drawing a border along the Danube river because south of the Danube River was heavily affected by Ottoman attacks. By using the distance to the Danube as the running variable, they show that the municipalities in pillaged villages are taken by the FPÖ.

Campa and Serafinelli (2019) employ RDD to exploit the differences in attitudes of women who lived in East and West Germany. Their results indicate that the women who lived under the state-socialist regime are less likely to be placed under the traditional gender roles as these regimes promoted women's inclusion in economic activities. The results from the 1990 German Socioeconomic Panel (GSOEP) suggest that women in East Germany are 11 percentage points (pp) more likely to report that career success is important than the women in the West. The men's outcomes do not indicate a significant difference between the East and West.

This is the first study to provide empirical evidence of causality between the persistence of Ottoman institutions and contemporary developmental outcomes for women. The paper draws on historical sources to provide an understanding of the Ottoman and pre-Ottoman eras in Egypt, and incorporates the literature on RDD as a useful tool for analysing the causal effect between history and current development outcomes. The paper contributes to the existing literature by not

only providing solid empirical evidence of the impact of Ottoman institutions on current development outcomes, but also by providing a detailed application of RDD and any robustness checks that should be conducted to obtain accurate and generalizable results.

1.3 Historical Background

Mamluks ruled Egypt and Syria from 1250 to 1517, and their rule in Egypt came to an end when the Ottomans entered Egypt from the Sinai Desert and marched until Raydaniyah that is immediately outside Cairo where they defeated Mamluk forces on the 23^{rd} of January 1517. The elimination of the Mamluk Sultanate improved the position of the Ottoman Empire as the leader of the Muslim community and provided the empire with resources to undertake its sieges to Vienna and west to the Strait of Gibraltar (Hess, 1973).

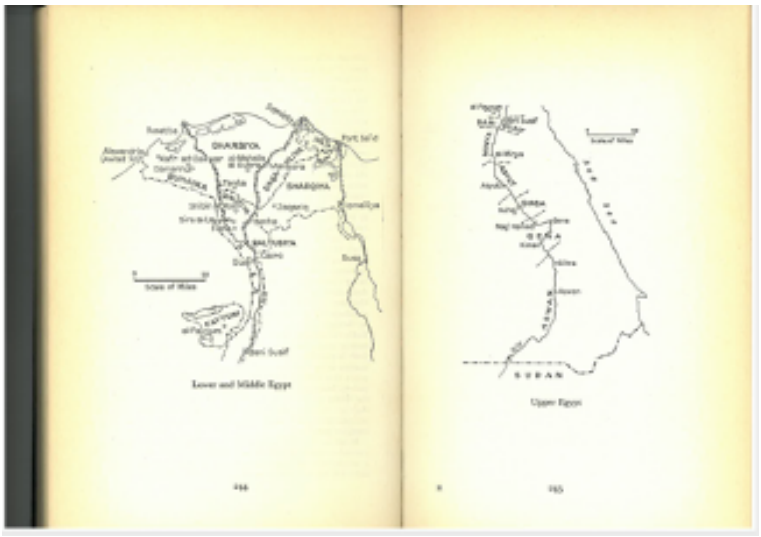
Before the conquest, Ottoman Sultan Selim I made some attempts to negotiate with the Mamluk Sultan Tuman Bay. The intention of Selim was to leave the rule of Egypt to the Mamluks under the suzerainty of the Ottoman Empire. Raydaniyah Battle was the result of the retraction of Selim's offer. On the 23rd of January 1517, the Ottomans entered Cairo. Ottomans assigned a governor who was settled in Cairo who was ruling the delta and middle Egypt, and the rule of Upper Egypt was granted to Arab tribal sheikhs where they enjoyed a high degree of autonomy (Marsot, 1985, pp.38-43).

After the conquest, Sultan Tuman Bay II managed to flee but was pursued and finally captured in the Nile Delta. Sultan Tuman Bay started gaining increasing support of Mamluks and Beduins and gathered his forces under the Pyramids of

Giza. He possessed considerable support that put Ottoman sovereignty in Egypt in jeopardy, so the Ottoman Army had to progress until middle Egypt (Winter, 2003, p.7). The border is defined, taking into account the closest district to the point where Tuman Bay was caught, which is Bani Suwayf (Beni Suef).

The historical map in Figure 1.1 is taken from Baer (2016, pp.244-245) and shows the Ottoman border in Egypt. It also clearly identifies the border that separates Lower Egypt from Upper Egypt is the Ottoman border. It can be seen that Beni Suef is divided and the lower part was under Ottoman control, and the upper part was left to the domination of Arab tribes. The attempts of the Ottoman Empire to replace the Arab shaykhs, that is a pre-Islamic honourable title given to the people who are the head of a tribe. In Upper Egypt failed (Winter, 2003, pp.100). Arab tribes kept ruling their community according to their customary laws that were quite restrictive, given that most of the members and the ones who rule the tribes are generally illiterate (Stewart, 1987).

Figure 1.1: The Historical Map of Egypt



Source: Baer (2016, pp.244-245)

There are other sources that support the border defined in this paper is valid. Shaw (2015, p.13) explains that the Ottoman Empire left the governance of cities from Minya to Jirja in the hands of Arab tribes and their customary laws gained more strength in Upper Egypt after the collapse of the old administration as Ottoman authority was mainly established in lower Egypt. Baldwin (2012) studies the role of the Sultan in Ottoman Egypt and mentions that during 1698-99 the people of Bani Suwayf and al-Bahnasã in Upper Egypt sent a petition to Istanbul complaining that they were suffering frequent loots of tribes which indicates the lack of Ottoman autonomy in Upper Egypt.

Aforementioned, Ottoman Empire did not settle down in all parts of Egypt. During its 270 years presence, Ottoman Empire kept Lower Egypt under its sovereignty due to geopolitical reasons and established its Sharia Courts to maintain the order there. The geopolitical importance of lower Egypt is primarily caused by the Alexandria port which was pivotal for the Ottomans' Mediter-

ranean trade (Reimer, 1994). Meanwhile, they have left customary rules to dominate Upper Egypt. This allowed looking at the differences in women's attitudes towards violence, economic and domestic autonomy between the regions under the Ottoman sovereignty and non-Ottoman regions. Historical analysis of Ottoman Egypt reveals that the differences between Upper and Lower Egypt are rooted in the application of unique Ottoman legacy incorporated into Sharia rules which had granted many rights mentioned earlier enhancing and protecting women's position within the society, marriage and household. Ottomans also introduced progressive reforms in systematization at work in judicial life, preparation and archive of legal documents, they established more waqfs which were supporting the infrastructure, education and health services, also regulated waqfs to prevent any sort of misuse (İnalcık, 1983).

1.4 Data, Estimation Framework and Identification Strategy

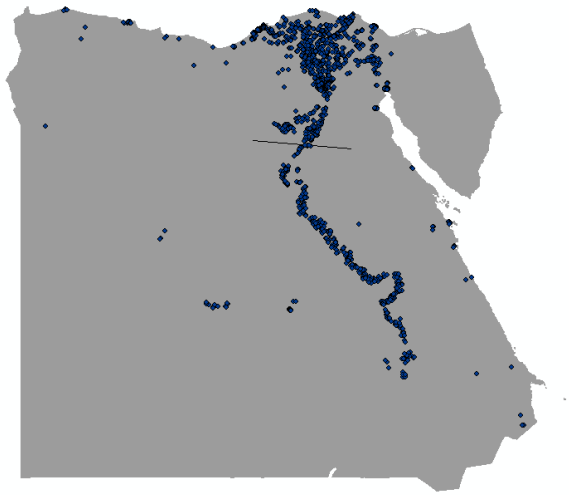
For the main results, the paper uses the USAID 2014 Egypt Demographic Health Survey (EDHS). EDHS consist of data both on the household and individual level. The data set is highly representative as it has large sample sizes and, allows comparisons over time because it is conducted every five years. The main data set used in this paper is the individual questionnaire, which includes survey data on ever-married women aged between 15 and 49. This age group is retained for analysis because it is highly relevant to the outcome variables of interest, which are concerned with women's empowerment and wellfare. This data set provides information on decision-making power, economic autonomy, the experience of domestic violence, their attitudes towards domestic violence and the educational attainment of women. The initial estimates are made by using 2014 EDHS, and

for a part of the robustness checks, 2005 EDHS data is used. Estimating the empowerment of women is highly challenging and must be measured and interpreted by taking into account the economic and social context. The Estimates can be done by using both proxy variables such as education, employment or direct measures such as the participation in decision-making within the household or attitudes towards violence (Richardson, 2018; Malhotra, Schuler, and Boender, 2002).

The availability of cluster location data of randomly selected households for interview in the EDHS 2014 data set allows for Spatial Regression Discontinuity Design (RDD). RDD is a quasi-experimental and statistical modelling approach, and the Spatial RDD is a special case that recognises geographic borders as sharp cut-off points. Spatial RDD requires matching each observation which is the location of households to its nearest neighbour. The near feature is the border that separates the regions Ottoman Empire settled its authorities from the regions left to the rule of Arab tribes. The digitised map that shows the border and the clusters are illustrated in Figure 1.2. Using ArcGIS, the distance of each cluster to the border is calculated. After obtaining the differences between the outcomes across the border, the methodology involves regressing differences in outcomes on differences in eligibility that is treatment status. Positive distances are assigned to the eligible observations that are on the Ottoman side of the border, and negative distances are assigned to the ineligible observations. The bandwidths of 30 km, 50 km, and 75 km are chosen as the distance to the cut-off point, which is the boundary between Ottoman-occupied territories and the rest of Egypt. These distances are chosen to ensure that the analysis included enough observations that are also close enough to the boundary to reduce potential bias and provide valid estimates. Including greater distances from the border allows

for observing differences in treatment effect at greater distances from the border. Using RDD to estimate the difference in attitudes of women who live in Ottoman occupied regions and the rest of Egypt enables overcoming the potential concern of bias due to local unobserved heterogeneity.

Figure 1.2: Digitised Map of Egypt with Clusters



Spatial RDD which is a relatively new and sound methodology of estimating causal effects from observational data is built upon a crucial assumption that indicates that the observation on either side of the cut-off are exchangeable around the cut-off that indicates that they must be similar in absence of the treatment (L. M. Smith et al., 2017). This study proves that the individuals on either side of the border are similar in the absence of the treatment. The baseline factors which may threaten this assumption that are the elevation of the terrain, religion and the ages of respondents who were interviewed is checked. As indicated by Eggers, Tuñón, and Dafoe (2021), placebo checks are important to ensure that research findings obtained by using causal inference methods are sound. These controls involve estimating the treatment effect on outcomes that are expected

to be minimally or not at all affected by treatment. The policies analysed are mainly affecting women, it is essential to make sure that there are no discontinuous jumps at the cut-off when men's outcomes such as participation in the labour force and years in education are taken into account. Therefore, placebo checks are conducted by checking men's outcomes. It is essential to validate the location of the border, and this is done by conducting the same analysis with a placebo border. As this paper is about the persistence of almost 210 years old institutions, the results should be the same in other waves of surveys as well, and this is checked by using the 2005 survey data. There is a possibility that the individuals may move across the border, because of migration, changing jobs, or to live in places with better institutions. To check this, as suggested by (Eggers, Fowler, et al., 2015), the paper implements the *"Donut Design"* that removes the observations within the 5 and 15 km of the border.

By the nature of the Spatial Regression Discontinuity which recognises the geographic borders as sharp cut-off points, the identification strategy is Sharp RDD where the treatment status is a deterministic function of the discontinuity is employed.

$$D_i = \begin{cases} 1, & \text{if } x_i \geq \mathrm{x}_0 \\ 0, & \text{if } x_i < x_0 \end{cases} \tag{1.1}$$

x_0 is the cutoff and the function above means that the observations beyond the cut-off definitely receive the treatment and, the observations below the cut-off point definitely do not receive the treatment (Angrist and Pischke, 2008, p.189). In this case, the Ottoman settlement is the treatment, and it is the deterministic function of the outcomes. RD approach is employed to estimate the persistent effects of Ottoman presence in a certain part of Egypt. The basic regression form:

$$W_i = \alpha + \gamma_{ottoman} + \theta_{distance} + \epsilon_i \tag{1.2}$$

W_i is the outcome variable of interest for the observation "i" in the individual women in households along the Ottoman border. a is the constant. $\gamma_{ottoman}$ is the dummy variable that equals to 1 if the individuals are located within the Ottoman regions and 0 if otherwise and $\theta_{distance}$ is the running variable which is the distance that controls for the geographic location. To estimate the treatment effect, the analysis is limited to samples within the 30, 50 and 75 km of the border (Table 1.2). This method takes into account the observations very close to the cut-off with sufficient observations to eliminate the bias, and this increases the precision in estimating the treatment effect. To estimate the treatment effect and how it changes as observations further from the cut-off are considered, the analysis is limited to samples within the 30 km, 50 km and 75 km of the border regressed separately (Table 1.2).

1.5 Results

This paper explores the causal effect of Ottoman institutions on outcomes such as the attitudes towards domestic violence, the decision making power for her personal life and within the household, participation in the labour force, years in education and remarriage to estimate the differences in women's empowerment outcomes across the border. These variables aim to provide an overall picture of women's domestic and economic empowerment, educational attainment, and the findings are justified by drawing examples upon Ottoman Institutions and the cases from Ottoman courts in Egypt. The results are represented in three steps: descriptive and summary statistics, graphical form and OLS regressions.

Table 1.1: Summary & Descriptive Statistics

	Whole Sample		**Treatment**		**Control**	
Panel A: Baseline Factors	**Mean (s.d)**	**Obs. (N)**	**Mean (s.d)**	**Obs. (n)**	**Mean (s.d)**	**Obs. (n)**
Age of Respondent	33.024 (8.423)	21,762	33.270 (8.370)	15,197	32.454 (8.517)	6,565
Currently Married	0.939 (0.240)	21,762	0.939 (0.239)	15,203	0.938 (0.240)	6,569
Husband/Partner's Education in Single Years	9.096 (5.455)	21,758	9.230 (5.510)	15,196	8.783 (5.312)	6,562
Husband/Partner's Currently Working	0.974 (0.161)	21,751	0.972 (0.163)	15,191	0.976 (0.153)	6,560
Respondent is Muslim	0.960 (0.196)	21,756	0.978 (0.147)	15,191	0.919 (0.272)	6,565
Panel B: Outcome Variables						
Justifies Domestic Violence	0.338 (0.473)	21,760	0.255 (0.436)	15,198	0.533 (0.499)	6,562
Can visit family and relatives	0.631 (0.483)	20,425	0.678 (0.468)	14,189	0.522 (0.500)	6,236
Participation in Decision Making	0.769 (0.421)	21,770	0.814 (0.389)	15,203	0.663 (0.473)	6,567
Autonomy Over Income	0.123 (0.123)	21,770	0.133 (0.340)	15,203	0.097 (0.296)	6,567
Participation in Labour Force	0.157 (0.364)	21,734	0.174 (0.379)	15,167	0.119 (0.324)	6,567
Respondent who owns land	0.067 (0.079)	21,762	0.069 (0.253)	15,198	0.064 (0.245)	6,564
Experience of domestic violence	0.766 (0.424)	21,760	0.761 (0.426)	15,198	0.776 (0.417)	6,562
Years in Education	8.335 (5.416)	21,756	8.753 (5.342)	15,195	7.365 (5.460)	6,561
Divorce/seperated	0.031 (0.173)	21,770	0.031 (0.174)	15,203	0.030 (0.170)	6,567

Notes: The table shows the mean, standard deviation, and the number of observations from the 2014 Egypt Demographic Health Survey women sample. The columns indicate the mean and standard deviation of the whole sample, treatment group that includes the Ottoman regions and control group that includes the non-Ottoman regions respectively Baseline factors indicate the main characteristics of the women in the data set such as age, marital status, religion,husband's educational attainment and employment status. A Detailed variable description can be found in Table 1.9 Appendix (Section 1.9).

Table 1.2: OLS Regressions

	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & -50km	-75km & 75km
Domestic Autonomy									
	Justifies wife beating			**No Permission to visit family**			**Participation in decision making**		
Treatment	-0.346***	-0.374***	-0.253***	0.168*	0.188**	0.099	0.120*	0.150**	0.170***
	(0.086)	(0.067)	(0.057)	(0.080)	(0.064)	(0.054)	(0.056)	(0.055)	(0.045)
Mean	0.388	0.434	0.439	0.744	0.707	0.709	0.830	0.820	0.806
SD	0.487	0.496	0.496	0.437	0.455	0.454	0.376	0.385	0.395
Obs.	867	1,558	2,135	815	1,476	2,023	867	1,558	2,135
Economic Empowerment									
	Autonomy over earnings			**Participation in labour force**			**Property ownership**		
Treatment	0.103*	0.144**	0.071	0.026	0.111*	0.085*	-0.033	-0.002	0.004
	(0.049)	(0.042)	(0.036)	(0.068)	(0.052)	(0.044)	(0.032	(0.026)	(0.022)
Mean	0.119	0.107	0.111	0.172	0.178	0.177	0.035	0.038	0.039
SD	0.324	0.309	0.314	0.378	0.383	0.381	0.183	0.191	0.193
Obs.	867	1,558	2,135	867	1,558	2,135	867	1,558	2,135
Well-being Indicators									
	Experience of domestic violence			**Divorce/Separated**			**Years in education**		
Treatment	-0.048	-0.014	-0.012	0.015	0.004	0.007	2.113*	6.068***	4.195***
	(0.077)	(0.060)	(0.050)	(0.027)	(0.020)	(0.016)	(1.011)	(0.772)	(0.657)
Mean	0.752	0.746	0.749	0.023	0.022	0.019	7.076	6.410	6.477
SD	0.432	0.436	0.434	0.150	0.146	0.136	5.838	5.742	5.707
Obs.	867	1,558	2,135	867	1,558	2,135	867	1,558	2,135

Note: Data is from the women module of the 2014 Egypt Demographic and Health Survey, and the table reports the results with distance to the Ottoman border as the running variable. The results are reported within bandwidths of 30 km, 50 km and 75 km. The Robust standard errors are parentheses. *** p<0.01, ** p<0.05, * p<0.1

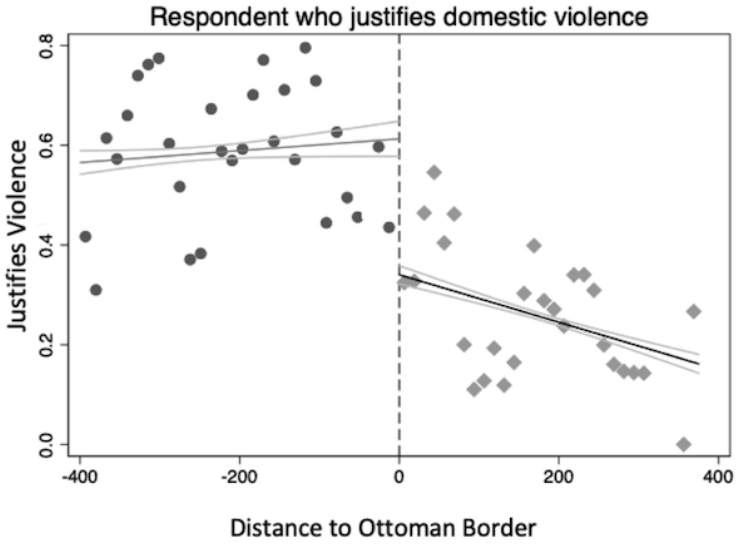
1.5.1 Domestic Empowerment

Beating Justified Questions

The beating justified questions assess whether the respondent justifies being beaten for going out without asking her husband, neglecting children, refusing to have sex, burning food and arguing with her husband. Summary statistics in Table 1.1 shows that only 26% of women on the Ottoman side of the border justifies being beaten by their husbands or partners for different reasons while in the rest of Egypt this figure is 53%. Figure 1.3 illustrates the significant jump at the cut-off, which is the border that separates the Ottoman regions from non-Ottoman regions. It can be seen that there is a negative discontinuous jump at the border as the 95% confidence bands do not overlap at the cut-off. The negative discontinuity at the border alludes that the women are less likely to accept violence if they are living within the regions influenced by Ottoman institutions. The result is well-supported by Islamic Law and the court records. R. C. Jennings (1975) who studies the women in the Ottoman Empire states that the Ottoman women considered marriage as a flexible institution granting women wealth and greater scope for divorce than in Europe during the same period. The greater extent of

divorce enabled women to be less tolerant of domestic violence. A. Sonbol (2003), investigates the cases that Ottoman women carried to the courts and suing for divorce due to physical and verbal abuse constituted an essential percentage of cases brought by women to court.

Figure 1.3: Respondent Who Justifies Domestic Violence



The estimations in Table 1.2 show the change in treatment effect within the 30, 50 and 75 km of the border. The results all indicate that women are significantly less tolerant of domestic violence (at a 1% level). Within the 30 km, the women are 35 pp less likely to accept the violent behaviour of their husbands/partners. This coefficient is almost the same for the 50km around the border (37 pp) further from the cut-off the coefficient decreases to 25 pp.

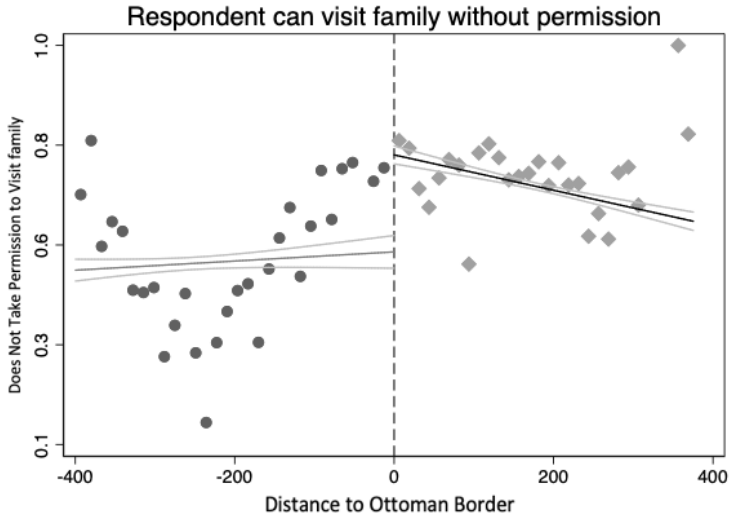
Needs Permission for Family Visits

This section explores women's freedom to make decisions without taking their husbands' consent to participate in social life or to meet their own needs. Being

able to make autonomous decisions identify women's position within the household, and is an essential indicator of empowerment. In the whole of Egypt, 63% of women make their decisions about family visits either alone or jointly with their husband to make family visits without a need for permission, as indicated in Table 1.1. The descriptive statistics in Table 1.1 indicate that in the regions dominated by the Ottoman Empire, 68% of the women are autonomous when it comes to making family visits, yet this number is only 52% in the non-Ottoman regions.

One of the main features of Ottoman households is the patriarchal structure. The man of the household that can be the father of husband had control over the family members (A. E.-A. Sonbol, 2020, p. 47). Despite the dominance of men within the household, Ottoman women were autonomous and were engaging in social life actively. Women's mobility was limited, yet they could interact with fellow women and family members. For instance, gatherings of women at bathhouses were one of the leading social rituals (Inal, 2011). However, during the Mamluk reign, women were missing from the historical account mainly because of being dominated by men in every aspect of life (Fay, 2001, p. 95). Figure 1.4 illustrates a positive discontinuous jump, that indicates that the women in ottoman part of the border does not need the permission of their husbands or partners to make family visits.

Figure 1.4: Respondent Who Can Visit Family and Friends without Permission of Her Husband

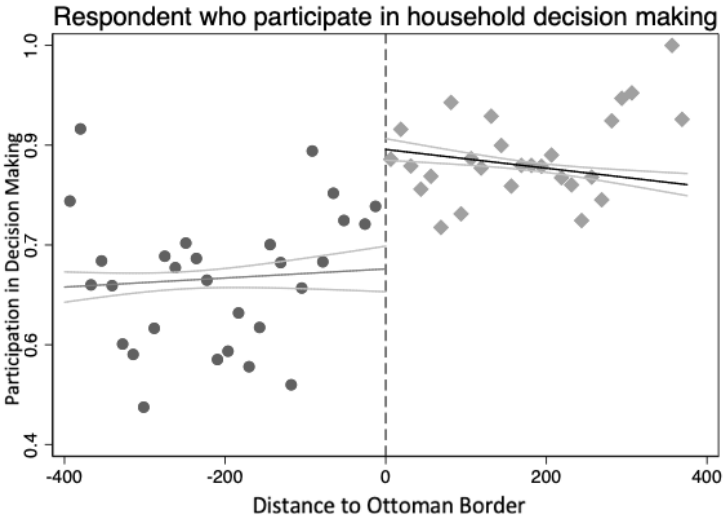


The regression outcome in Table 1.2, which shows a 17 pp significant change across the border, the effect is more robust when 50 km distance is considered (19 pp). As indicated by Cattaneo and Titiunik (2021), there may be a trade-off between bias and variance. Distances closer to the cut-off tend to reduce the misspecification error in the approximation and hence the bias. However, with a very small bandwidth, a large fraction of observations must be discarded, reducing the sample size and resulting in estimators with larger variance. In this case, observations within the 30 km may not be sufficient to capture the true treatment effect, and there may be other events that cannot be controlled for that occur farther from the cut-off. The coefficient for 75km is 9.9 pp and is not significant. This distance includes larger and more populated cities with a variety of people and different cultures. The result could be due to stronger and more prevalent patriotic behaviour in these cities.

Decision Making Power within the Household

The decision-making questions in the survey are good indicators of women's status and empowerment. USAID indicates that the women who can make their decisions either alone or jointly with their husbands/partners are considered as empowered. This section looks at women's participation in decision making regarding large household purchases and healthcare spending. According to Table 1.1, 77% of women can participate in decisions concerning household spending. The descriptive statistics in Table 1.1 indicates that 81% of women within the Ottoman regions can participate in decision making, while this ratio is 66% in the rest of Egypt. The positive jump across the threshold is also illustrated in Figure 1.5.

Figure 1.5: Respondent Who Participates in Household Decision Making



The OLS Estimations in Table 1.2 also support the significant jump by putting forth significant results. Within 30 km, the coefficient shows that women are 12 pp more able to participate in decision making, the magnitude of the coefficient

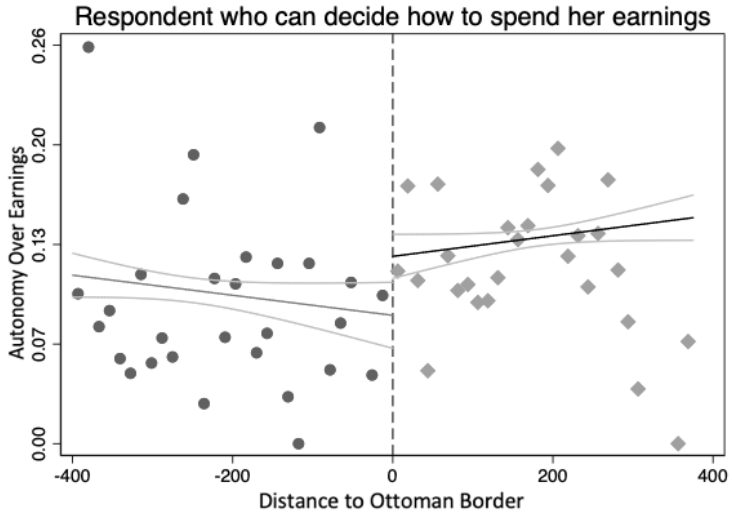
increases as more observations are included in the analysis by increasing the distance. Ottoman culture identifies men as the head and the primary decision-maker of the households (Aral, 2004). Islam assigns men the responsibility to take care of women and, men are considered as more rational and able to distinguish right from wrong. Although men are considered as better decision-makers, the Ottoman legacy does not annihilate the decision-making power of women within the household but especially on the issues concerning healthcare and fertility, women must possess the ability to decide on their own which is also observed in the case of Egypt.

1.5.2 Economic Empowerment

Autonomy over her earnings

The economic empowerment of women also differs across the regions. The summary statistics in Table 1.1 indicates that only 12% of women have autonomy over their earnings and the descriptive statistics in Table 1.1 indicates that the autonomy of women within Ottoman regions is 3% higher. The RDD pathway in figure 1.6 provides a clear picture of the positive jump. The regression results (Table 1.2) also show a positive 10 pp increase in women's autonomy over their earnings. The coefficient is larger for 50 km because there are more observations leading to a smaller variance. The coefficient for 75 km is 7.1 pp and is not significant, which could be due to cultural diversity caused by large and populous cities.

Figure 1.6: Respondent Who Possess Autonomy Over Her Earnings



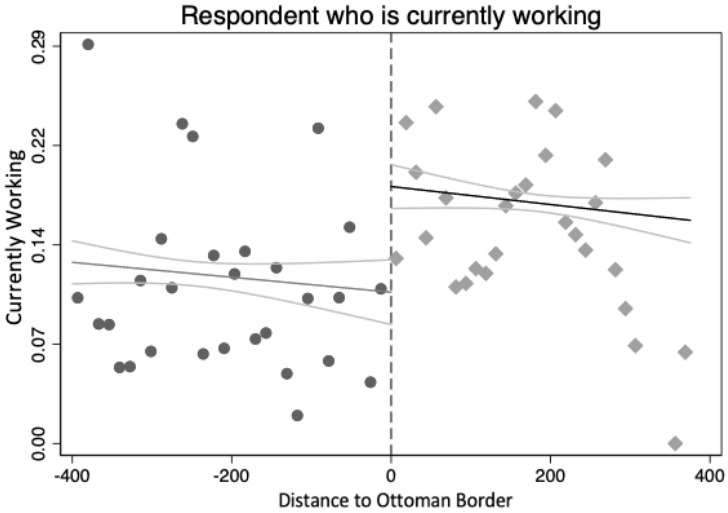
Ottoman women actively participated in the job market. Ottoman empire was not industrialised, so women were mainly employed in the textile industry or worked as weavers, dyers and embroiderers (Zarinebaf-Shahr, 2001). Women had been free to participate in the labour force and to manage their properties. Autonomy was granted to women in Egypt during the Ottoman period as well. Fay (1997), highlights the differences between the pre-Ottoman household structure during the Mamluk and Ottoman period. She indicates that women were suppressed in Mamluk households, and the Mamluk system has been depicted as entirely male. Possessing autonomy over earnings is used as an indicator of economic empowerment and given the women's ability to make an independent decision over their possessions during the Ottoman period reflected positively on this outcome. In Ottoman households, women's property ownership, their power to support men's succession to power, and their role as the guarantors and symbols of households' continuity had been prominent (Fay, 2001, p. 96).

Participation in Labour Force

In Egypt, just like the other MENA countries, women face several challenges in the labour market such as negative attitudes toward women in the workplace, lack of mobility, legal barriers, persistent wage gaps, sexual harassment in the workplace, and poor enforcement of anti-discrimination laws. As indicated in the report of OECD (2017), the underlying reason for women's lack of access to the labour market is gender-based social institutions.

The summary statistics in Table 1.1 reflect the highly gendered labour market, as only 16% of women are currently in the labour force. Table 1.1 also indicates that the labour force participation in the Ottoman side of the border is 5% higher. Figure 1.7 shows the positive jump, and the historical treatment of women can be useful in comparing the women's participation in the labour force (Mammen and Paxson, 2000). Ottoman women always were in the labour force as they were recruited in the silk and carpeting industry to work in factories (Quataert, 2001).

Figure 1.7: Respondent Who is Currently Working



The OLS regressions in Table 1.2 put forth some interesting results. Within the 30 km of the border, the treatment effect is small and insignificant; the effect increases as getting further away from the border. The reason may be the existence of bigger and more developed cities such as Suez and Cairo which provide suitable job opportunities for women.

Property Ownership

Women's property ownership is an ongoing problem in the MENA region. The variable used for the analysis consists of the women who own land and house either alone or jointly with someone else. The summary statistics suggest that only 7% of women own land in Egypt. Despite the slightly high percentage in the mean of women owning land in the Ottoman part of Egypt, the small regression coefficients do not put forth any significant results which indicate that this outcome does not show any change across the border.

Sharia grants rights to women to manage their property. These rights include to inherit, own, buy or sell properties, and control her mehr. Ottoman women could inherit and apportion property, and they often played an active role in managing their wealth (Fay, 1997). The properties that a daughter inherited, a wife acquired before or during the marriage were exclusively theirs to manage, cultivate or rent and their fathers or husbands could not make use of these properties without the consent of the women. Also, women could buy and sell properties without any restriction also could give or receive properties as a gift. In most cases, Ottoman judges guarded women's legal and property rights. Non-Muslim Ottoman women frequently used Qadi courts because they were more favourable in treating issues of concern to women (B. G. Smith, 2008, p. 375).

1.5.3 Welfare Indicators

Experience of Domestic Violence

In Egypt, domestic violence against women is prevalent. This section looks at exposure of women to severe and less severe physical violence. The Ottoman Sharia Court records of Cyprus provides an overview of Ottoman marriage contracts. Marriage contracts were established on some conditions that the husband had to satisfy. The grooms had to take an oath on not taking the second wife, not taking a concubine, not drinking wine or not beating his wife (R. Jennings, 1993, p. 19). The summary statistics in Table 1.1 suggests that 77% of women in Egypt experience gender-based violence. The descriptive statistics in Table 1.1 shows that within the Ottoman influenced regions, the experience of domestic violence is 77% while on the other side of the border it is 76%. The OLS regressions in Table 1.2 shows that the coefficients are very small and insignificant, however, the negative coefficients indicate that across the border exposure to physical violence is less. Within the 30 km of the border, the women are 5 pp less likely to experience domestic violence.

Divorce Rate

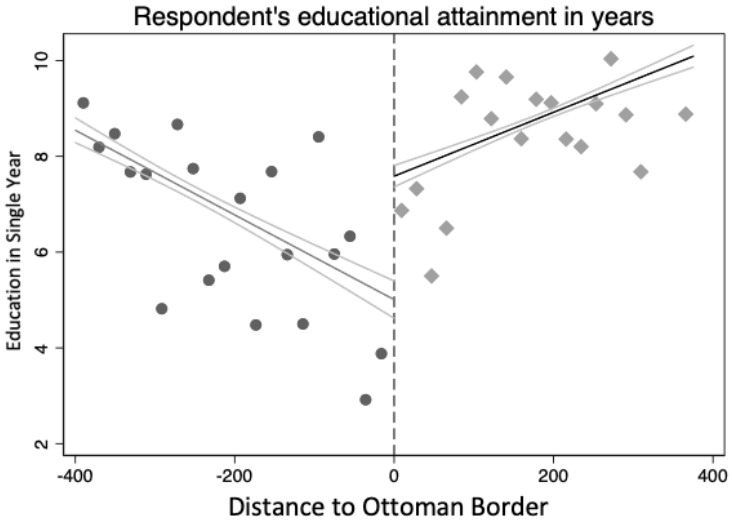
This section investigates the likelihood of divorce, and the variable of interest consists of the women who are either divorced or separated from their husbands. Being able to divorce can be an indicator of welfare and empowerment in conservative societies because of social stigma. In Arab countries, divorced women have to confront discrimination and humiliation, and this social stigma along with the financial difficulties as a result of the inferior social status causes many women to bear with their husbands' violent behaviours or extramarital affairs (Mendoza, Tolba, and Y. Saleh, 2020).

In 1929, no-fault divorce, khul, which was introduced during the Ottoman era, was abolished in Egypt which made it much harder for women to divorce as they were required to provide proof to the court to free from exploitative marriages. In the Ottoman period, women were granted rights that empowered them within the marriage; however, this section does not designate any significant results which may be attributed to the lack of inclusion of divorced women in the sample. The figures in Table 1.1 show that only 3% of the women reported as divorced/separated. Divorce rates in Egypt are not that low in reality. For instance, in 2017, the divorce rate was 60.7% and 39.3% in urban and rural regions of Egypt, respectively (Mendoza, Tolba, and Y. Saleh, 2020). The regression results in Table 1.2, show very small changes across the border, yet the coefficients are positive, which indicates that divorce is slightly higher within the Ottoman regions.

Years in Education

Islam never restricts the girls' educational attainment and compels all men and women to participate in education. Mother and father were responsible for their children's education when they gained a better understanding and became more aware of the world that surrounded them (Sonmez, 2013). Ottoman state was encouraging the participation of girls in schools. In primary schools, boys and girls commonly attended the classes together, sitting separately at different desks inside one room. In addition to this, there were schools in which only girls and only boys continued their education (ibid.). There were also foreign schools within the Ottoman territories, and although Ottoman schools were accepting a limited number of girls, female students from Muslim families could attend these foreign schools (Lewis, 1970).

Figure 1.8: Respondent's Educational Attainment in Single Years



To evaluate the educational attainment of women, the years in education as a continuous variable is taken into account. As indicated by the summary statistics in Table 1.1, on average, the women stay in education for 8.3 years. Table 1.1 indicates that there is a 1.5 year difference across the regions where the years spend in education within Ottoman region. This difference is reflected in the discontinuous jump of the figure 1.8. As indicated in Table 1.2, within 30 km of the border, girls' years in education is 2.1 years higher on the Ottoman side of the border.

1.6 Robustness Checks

1.6.1 Non-Parametric Estimations

Table 1.3: Non-Parametric Estimations

Indicator	Treatment	N	N left	N right	h
Domestic Autonomy					
Justifies wife beating	-0.212*	21,770	485	1,788	85.292
	(0.091)				
Visits family without permission	0.110*	20,425	772	3,000	133.134
	(0.049)				
Decision making power	0.107**	21,770	745	2,222	119.822
	(0.035)				
Economic Empowerment					
Autonomy over earnings	0.070*	21,770	667	1,942	105.510
	(0.035)				
Participation in labour force	0.128*	21,734	696	2,008	109.229
	(0.052)				
Respondent who owns land	-0.007	21,770	859	3,638	116.591
	(0.016)				
Well-being Indicators					
Years in education	3.776***	21,756	768	2,680	127.035
	(1.072)				
Divorce/Separated	0.001	21,770	584	1,788	92.940
	(0.019)				
Experience of Domestic Violence	-0.044	21,770	1,054	5,441	154.750
	(0.040)				

Notes: Table 1.3 reports the non-parametric estimations that use the *rdrobust* command developed by Calonico, Cattaneo, and Titiunik (2015). *rdrobust* produces bias corrected estimates robust to large bandwidth choices. The standard errors are in parenthesis. * p<0.05, ** p<0.01, *** p<0.001.

Non-parametric estimations are provided in Table 1.3 as a robustness check by using the *"rdrobust"* command. This estimation framework uses the local polynomial methods and allows for bias-corrected estimations. The optimal bandwidths

selected by the command are larger than the ones chosen for the OLS estimations which enable to check whether the results are robust when larger bandwidths are considered. For the variable about the attitudes towards domestic violence, the non-parametric estimations in Table 1.3 check the treatment effect within a bandwidth of 85.292, and the coefficient is consistent with the OLS estimations in Table 1.2. For the variable about the permissions for family visits, the non-parametric estimations use the bandwidth of 133.134, which has sufficient observations for a valid estimate, and the outcome of 11 pp is consistent with the OLS estimations. The non-parametric estimations of the variables, decision-making power within the household, autonomy over earnings, participation in the labour force, property ownership, educational attainment in single years, divorce and experience of domestic violence are all based on larger bandwidths and the results are consistent with the OLS estimations. This indicates that the OLS estimations based on the bandwidths within 30, 50 and 75 km are robust to larger bandwidths.

1.6.2 Baseline Covariates

Table 1.4: Baseline Factors

	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & 50km	-75km & 75km
	Muslim			**Age of repondents**			**Elevation**		
Treatment	0.029	0.025	0 .034	2.257	2.255	1.789	13.52	-5.28	-18.525
	(0.023)	(0.016)	(0.017)	(1.540)	(1.540)	(1.208)	(15.259)	(11.218)	(1.186)
Mean	0.990	0.984	0.980	32.321	31.834	31.760	21.956	18.177	26.479
SD	0.101	0.124	0.141	8.415	8.540	8.487	26.862	24.983	35.792
Obs.	867	1,558	2,135	867	1,558	2,135	68	124	169

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The identifying assumption of RDD is that all potentially relevant variables besides the treatment variable and outcome variable are continuous at the point where the treatment and outcome discontinuities occur. The factors that may threaten this assumption, such as the elevation or the baseline covariates including the religion of respondents, the age of respondents who were interviewed are

checked in this section. For instance, the difference in the religion of the respondents across the border could be the reason that leads to discontinuous jumps as it can play a direct role in women's attitudes towards violence, decision making power and participation in the economy. Table 1.1 shows that 96% of the surveyed sample is Muslim and there is a 6% difference when two parts across the border are compared as shown in Table 1.1. The age of respondents matters in the sense that the presence of more mature respondents on either side of the border may affect the results of participation in the labour force and years in education. The average age of the dataset is 33 (Table 1.1). As indicated in Table 1.1, there is not a big difference in the average age of the respondents when the Ottoman and non-Ottoman regions are compared. Estimating the difference in elevation across the control and treatment group is also important because it may be the reason for the discontinuity rather than the Ottoman institutions. To calculate elevation, the difference the elevation map is used in ArcGIS and, raster values of clusters which indicate the elevation. The elevation map is illustrated in Figure 1.9. Table 1.4 indicate the non-parametric estimates of the baseline covariates and the result for religion and age of respondents have insignificant coefficients. The elevation results indicate large coefficients as Egypt is a rugged country; however, the estimates do not put forth and significance, hence there is no significant difference in elevation across the border.

1.6.3 Placebo Checks

Table 1.5: Placebo Checks: Men's Outcomes

	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & 50km	-75km & 75km
	Men in employment			**Education in single years**		
Treatment	0 .0128	-0.0005	0.002	1.101	1.119	2.737
	(0.025)	(0.018)	(0.0156)	(1.633)	(1.597)	(1.482)
Mean	0.980	0.982	0.982	8.869	8.934	8.683
SD	0.139	0.133	0.134	5.412	5.375	5.413
Obs.	867	1,558	2,135	867	1,558	2,135

Robust standard errors in parentheses.*** p¡0.01, ** p¡0.05, * p¡0.1

Do jumps occur at any cut-off or for the individuals not affected by the treatment status? To check that the paper conducts placebo checks. The policies of religious and autocratic regimes are mainly concerned with women's behaviours and rights (Lorch and Bunk, 2016). The Ottoman policies discussed in this paper are mainly concerned with women, therefore, for this paper, men's outcomes are used for the placebo checks. For instance, men could divorce in line with Sharia laws, but the Ottomans introduced khul for women to be able to divorce their husbands. Therefore, for placebo checks, men's outcomes, including participation in the labour force and education, are taken into account. Men's educational attainment and participation in the labour market as these outcomes were not the focus of policy intervention during the Ottoman period. Table 1.1 suggests that men are likely to complete 9.1 years of education on average and the difference in men's education across the border is five months. In terms of the men's participation in the labour force, 97% of the men are in the labour force, and when the regions are compared, the difference is only 0.4%. The small and insignificant changes that can be seen in Table 1.5 shows that the outcomes of participation in the labour force and educational attainment in single years do now show and change across the border.

Table 1.6: Estimations of the Random Border

	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & 50km	-75km & 75km	-30km & 30km	-50km & 50km	-75km & 75km
Domestic Autonomy									
	Justifies wife beating			**Needs Permission to visit family**			**Decision making power**		
Treatment	0.041	0.059	0.060	-0.011	0.023	-0.02	-0.047	-0.073	0.074
	(0.059)	(0.044)	(0.043)	(0.056)	(0.041)	(0.034)	(0.056)	(0.048)	(0.040)
Mean	0.441	0.416	0.416	0.698	0.711	0.698	0.816	0.821	0.811
SD	0.497	0.493	0.493	0.459	0.454	0.459	0.387	0.383	0.391
Obs.	1,507	1,824	2,221	1,507	1,824	2,221	1,507	1,824	2,221
Economic Empowerment									
	Autonomy over earnings			**Participation in labour force**			**Property ownership**		
Treatment	0.034	0.000	-0.018	0.047	-0.009	-0.015	0.002	-0.015	-0.015
	(0.039)	(0.029)	(0.022)	(0.048)	(0.035)	(0.027)	(0.026)	(0.018)	(0.016)
Mean	0.119	0.117	0.111	0.202	0.189	0.174	0.048	0.043	0.053
SD	0.324	0.322	0.314	0.401	0.392	0.379	0.215	0.202	0.223
Obs.	1,507	1,824	2,221	1,507	1,824	2,221	1,507	1,824	2,221
Well-being Indicators									
	Experience of Domestic Violence			**Divorce/Separated**			**Years in Education**		
Treatment	0.024	0 .036	-0.007	-0.019	-0.017	-0.018	-0.704	-0.996	-0.972
	(0.052)	(0.039)	(0.031)	(0.018)	(0.014)	(0.011)	(0.721)	(0.667)	(0.653)
Mean	0.741	0.742	0.742	0.023	0.024	0.025	6.864	6.883	6.864
SD	0.438	0.438	0.437	0.149	0.153	0.157	5.664	5.657	5.664
Obs.	1,507	1,824	2,221	1,507	1,824	2,221	1,507	1,824	2,221

The Robust standard errors are parentheses. *** p<0.01, ** p<0.05, * p<0.1

Another placebo estimation is based on a random border. The aim is to check if there are any discontinuities at placebo cut-offs because the jump in outcomes is simply caused by the border that separates the regions that were occupied by the Ottoman Empire from the ones left to Arab tribes. The randomly drawn border is illustrated in Figure 1.10. The regression outcomes are shown in Table 1.6. The results show small and insignificant coefficients.

1.6.4 Other Waves of survey

Table 1.7: Parametric and Non-parametric 2005 EDHS Estimations

	Parametric EDHS 2005 Estimations								
	30 & 30	-50 &50	-75 & 75	-30 & 30	-50 & 50	-75 & 75	-30 & 30	-50 &50	-75 & 75
	Beating justified			**Years in Education**			**Autonomy over earnings**		
Treatment	-0.113**	-0.089**	-0.104**	1.429*	2.166***	2.370***	0.225*	0.256*	0.237*
SD	(0.043)	(0.038)	(0.036)	-0.657	-0.487	-0.418	-0.106	-0.106	-0.101
Mean	0.697	0.643	0.628	4.390	4.188	4.097	0.545	0.562	0.564
St. Deviation	0.460	0.479	0.483	5.339	5.268	5.450	0.499	0.497	0.496
Obs.	1,254	2,418	3,618	1,254	2,418	3,618	178	313	466

	Non-Parametric EDHS 2005 Estimations					
	Treatment	**s.e**	**N**	**N left**	**N right**	**h**
Beating justified	0.161**	0.048	19,442	573	1,850	50.927
Education in single years	1.290***	0.373	19,442	943	2,830	88.542
Autonomy over earnings	0.205*	0.104	2,948	111	357	81.412

Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

The main results of the paper are obtained by using the EDHS 2014. It is essential to check that the other waves of the survey produce similar results. Therefore, the estimates from EDHS 2005 are included to make sure that the results are consistent by looking at some of the significant outcomes. As some of the questions either differ or do not exist in EDHS 2005, the variables of justifying domestic violence, autonomy over earnings and years in education were selected to provide an overview about each of the sections of domestic autonomy, economic empowerment and welfare. As can be seen from the OLS and *rdrobust* estimations in Table 1.7, the results of the outcomes of interest are consistent with the main results. The justification of domestic violence has a negative and significant coefficient while years in education and autonomy over earnings have positive and significant coefficients indicating higher domestic and economic autonomy and better welfare outcomes for women within the Ottoman influenced regions.

1.6.5 Donut Design

Table 1.8: Donut Design

	-30 & 30	-50 & 50	-75 & 75	-30 & 30	-50 & 50	-75 & 75	-30 & 30	-50 & 50	-75 & 75
	Justifies wife beating			**No Permission to visit family**			**Participation in Decision Making**		
Treatment	-0.346***	-0.374***	-0.253***	0.168*	0.188**	0.099	0.120*	0.150**	0.170***
	(0.086)	(0.067)	(0.057)	(0.080)	(0.064)	(0.054)	(0.056)	(0.055)	(0.045)
Donut coef.(-5km&5km)	-0.304*	-0.350**	-0.225*	0.171*	0.189**	0.090	0.155**	0.146**	0.166***
	(0.138)	(0.110)	(0.086)	(0.085)	(0.067)	(0.056)	(0.059)	(0.055)	(0.047)
Donut coef.(-10km&10km)	-0.951***	-0.595***	-0.300***	0.325	0 .259**	0.082	0.217*	0 .238**	0.228***
	(0.181)	(0.098)	(0.074)	(0.171)	(0.095)	(0.070)	(0.102)	(0.077)	(0.059)
	Autonomy over earnings			**Participation in labour force**			**Years in Education**		
Treatment	0.103*	0 .144**	0 .071	0 .026	0.111*	0.085*	2.113*	6.068***	4.195***
	(0.049)	(0.042)	(0.036)	(0.068)	(0.052)	(0.044)	(1.011)	(0.772)	(0.657)
Donut coef.(-5km&5km)	0.088*	0.108**	0.044	0.030	0.120*	0.092*	2.279*	6.469***	4.388***
	(0.041)	(0.037)	(0.031)	(0.073)	(0.054)	(0.045)	(1.077)	(0.798)	(0.672)
Donut coef.(-10km&10km)	0.320**	0.237***	0.084*	0.369*	0.297***	0.178**	13.584***	13.184***	6.995***
	(0.103)	(0.051)	(0.039)	(0.148)	(0.078)	(0.057)	(2.050)	(2.050)	(0.831)

Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1

This method excludes the observations around the cut-off to mitigate the short-run selection concerns (Hausman and Rapson, 2018). To be more specific, this design ignores the data that immediately surrounds the cut-off that may manipulate the results. In this paper, it may be the case that the clusters of respondents located within the 5 km and 10 km of the cut-off can move across the border to change the results hence, these observations are removed. The estimations are shown in Table 1.8. The table compares the initial estimations in Table 1.2 to the donut coefficient and indicates the number of observations after removing the observations within the 5 and 10 km around the cut-off. The results are robust to the donut estimation, neither the magnitude of the coefficients nor the significance levels show large changes after removing observations. Removing the observations within the 5 km almost yield the same results both in terms of the coefficients and level of significance. Removing the observations within 10 km causes the coefficients to be higher than the OLS coefficients because the bias of the donut estimator is larger than the naïve estimators (Davezies and Le Barbanchon, 2017).

1.7 Discussion

This paper is primarily concerned with the historical determinants of empowerment and, by employing the Spatial RDD, it attempts to estimate whether the legal institutions from the past can shape the norms and traditions within the society by looking at the attitudes and empowerment outcomes of women in Egyptian society.This section aims to clarify the institutional characteristics of the Ottoman Empire that led to the results mentioned in the previous section, in order to establish a link between the results and the institutions.

Chapter 1. The Persistence of Ottoman Institutions and Their Influence on Women's Attitudes in Today's Egypt

It can be argued that Ottoman Empire was founded on Islamic rules and Islam does not favour women. According to Islam, women is to compliment men thus, their participation is social and economic life, as well as the freedom of movement are restricted. However, the main argument is that the legacy of the Ottoman Empire that was incorporated into the Islamic law had unique features that favoured women and in Egypt, this has led to better development outcomes for the women. This paper compares the Ottoman institutions and legacy that was more centralised and based on written rules to the previous rule of Egypt and Arab tribes that were governed in line with the traditions that vary among each tribe.

The institutions of the Ottoman Empire were different from the institutions of previous rules of the Middle East. Ottoman Empire had a more centralised bureaucratic system, tax standardisation and private property. The most crucial reform of the Ottoman Empire was the introduction of a constitution and a parliament which helped to form the legacy of the empire that was incorporated into Sharia laws. The focus of this paper is the status of women in Ottoman Empire and Ottoman Sharia records reflect the reality of Muslim women who are depicted as downtrodden and exploited. It turns out that even in early periods, Ottoman women were independent, in control of their property and actively engaged in social and economic life (Ze'Evi, 1998).

After gaining independence, Egypt started reversing some of the laws introduced by the Ottomans and Khul' is a crucial example. Khul' is defined in Islamic law, and it is the right given to women to divorce without any valid reason by returning her mehr or in other words, giving up on her financial rights. According to Qadi records, khul' was put in place during Ottoman Empire and even

non-Muslim and Christian women could divorce their husbands at Sharia courts in the case of breaching the marriage contract (Sonneveld, 2019). Khul' was reintroduced in 2000 in the personal status law that granted women the right of unilateral divorce, improving women's status in divorce (Sonneveld, Nadia, 2010).

In Egypt, the introduction of Islamic law in real terms occurred during Ottoman rule. For instance, the implementation of khul, which is described in the Quran, came into force during the Ottoman era (Sonneveld, 2019). Khul law enabled women to divorce their husbands without having to state any reason. Legislation in 1985 eliminated the khul, which had been in place since Ottoman rule, and only authorised women to divorce in the cases of harm and if the women could testify that. However, in 2000, women were again given the right of khul (Bernard-Maugiron, 2008). The Ottoman Empire was not only established upon Sharia laws but there were qanuns which were complementary to the Sharia and aimed at rationalising and unifying the administration of the judicial system. What can be described as Ottomanisation tightened the legal control and administration over the country (Fahmy & Peters, 1999). The Ottoman Empire also had a unique family system consisting of both nuclear and extended families. Kavas (2013) assessed how the Turkish family structure evolved from the Ottoman Empire and emphasises that despite the progress towards eliminating the gender inequality within the family, men always have the dominant role, especially in decision-making. Although the majority of husbands support their wives' participation in the labour force, the earnings of women are not considered as a source of family income.

The results in section 1.6 suggest that women's domestic empowerment regarding the issues of domestic violence, family visits and participation in decision-making

is greater in the regions of Ottoman influence. Domestic empowerment is important in the sense that it prevents domestic violence and promotes women's well-being to a large extent. Also, it conveys a picture of the women's position within society (Mujahid-Mukhtar, Mukhtar, and Abbink, 1991). Civil rights and social norms such as easy access to divorce, which reduced the tolerance for violent husbands and encouraged participation in social life that has become a tradition persisting from the Ottoman rule have shaped the behaviour of women. Ottoman women were capable of obtaining and the rights that were available to them. Women in the Ottoman Empire tended to be less tolerant of domestic violence because they could divorce easily in the event of beating (Öztürk, 2014, p. 64).

Economic empowerment of women is particularly important in challenging societies such as those of the MENA region, given that they are disempowered compared to their peers. It is important to highlight the role of culture in identifying these differences. In such conservative societies, to empower women economically, the income-generating programs that encourage handicraft work as a source of income is perceived as socially appropriate (Paterson, 2008). The Ottoman women were mainly needed and employed in the textile and silk industry which may have encouraged their participation in employment and established the culture of working women. Despite the results put forth significant outcomes in autonomy over income and participation in the labour force, property ownership does not show any significance. The reason may be that only 7% of women have a property in their possession. This may have many reasons; in Egypt, the inheritance system is based on Islamic law and men inherit double what a woman can receive which was the case in the Ottoman Empire as well.

Education is strongly correlated with the well-being of women. It does not only improve the labour market outcomes and income growth, but it also leads to improved health and well-being. Domestic violence is one of the biggest social issues in Egypt and this has negative health consequences. In Muslim countries, domestic violence is widespread. In the MENA region 37% of the women have been abused, yet this percentage of women, those who have suffered from intimate partner violence is not low and is almost 25% . Therefore, gender-based violence is a common issue and needs to be addressed. Aforementioned, education of girls was never discouraged in Ottoman Empire. The significantly higher educational attainment in Ottoman regions that is presented in Table 1.3, may also have an effect on empowerment of women which reduces their tolerance to violent behaviour.

In highly conservative societies, the ability of women to divorce their husbands is restricted due to the socially constructed norms which may lead to tolerating husbands' abusive behaviour, thereby decreasing the welfare of women. When the regions across the border are compared by looking at these variables, the Ottoman part of Egypt tends to perform better in terms of women's welfare as well. The outcome for divorce does not indicate a significant difference across the border, yet this largely because of the dataset which is mainly focused on married women.

1.8 Conclusion

Ottoman society was established on Sharia rules which were incorporated into the Ottoman Legacy. In the paper, it is argued that the Ottoman legacy laid the foundations of favourable treatment for women in Egypt, which was previ-

ously controlled by the Mamluk Empire. The Ottoman Empire relied on written laws and regulations in governance, and even when compared to the Western empires, the Ottoman Empire provided women with better rights to divorce and inherit. The results indicate that women living in regions formerly occupied by the Ottomans have relatively better outcomes in terms of domestic and economic autonomy and participation in education. The findings contribute to the existing literature by propounding empirical evidence on how empires leave their imprints on the countries that they rule for decades. Also, the paper make a clear contribution by providing a solid analysis on how historical institutions shape the current development outcomes. Although it is argued that the empires were founded on extractive institutions that do not promote development outcomes but rather prioritise powerful elites, in certain cases such as the Ottoman existence in Egypt, where decentralised tribal rules prevailed, they had laid solid foundations that can lead to better development outcomes.

A country's laws and regulations can influence factors such as education, violence, and divorce. The introduction of khul and imprisonment for abuse during the Ottoman period could be useful in that sense. The aim of the paper is not to support or justify the treatment of women in the Ottoman Empire, which had many inequalities between men and women in social and legal spheres. However, these factors are interpreted as unfavourable considering women's rights in today's environment. Historically, the Ottoman Empire granted progressive rights regarding property ownership, marriage, divorce and participation in economic and social life. In the context of Egypt, Ottoman laws laid the foundation for women's rights.The paper highlights the positive laws and institutions that the Ottoman Empire introduced in Egypt and establishes a causal link between their existence and today's development outcomes by relying on the geographic loca-

tion in which they had supremacy.

This paper argues that Egypt experienced a stable period under Ottoman rule and that women were better off during the Ottoman era, which had a positive lasting impact on women's development outcomes in today's Egypt as well. This study relies on historical resources to justify the empirical findings. Using historical resources may be controversial as the information may be different in each resource; hence a sound and well-established methodology is employed to conduct the analysis. The robustness of the results and the assumptions of the model are checked to make sure that the estimates are valid. The results indicate that, overall, women possess more economical and domestic power, and the educational attainment is also significantly higher in regions that were influenced by the Ottoman institutions. It is important to understand the overall position of women in a society and the problems they face. However, in order to implement policies that provide accurate solutions and improve women's development outcomes, such as the experience of domestic violence, participation in the workforce, autonomy over income, and educational attainment, it is essential to recognise regional differences and the roots of those regional differences. Identifying the reasons for regional differences and understanding which regions perform better on desired outcomes helps policymakers identify the solution they want to address. In the case of Egypt, it is important to design policies that encourage participation in education, which would help women exercise their rights and potentially lead to better autonomy outcomes. In addition, the right to divorce should be well established and women should be well informed about the cases in which they should divorce and how, so that they can be less tolerant of domestic violence and restrictions on their freedom.

1.9 Appendix

Table 1.9: Description of Variables

Variable	Description
Beating justified	There are five questions that ask women if they justify being beaten by their husbands or partners for going out without permission, neglecting children, burning the food, arguing and refusing to have sex with them. This variable consists of the women who answer 'yes' to any of these questions.
Needs permission for family visits	This is a dummy variable. This survey question asks who decides on visits to family or relatives. The variables take "1" if the respondent can decide on her own or with her husband/partner.
Participation in household decisions	This outcome looks at whether the respondent is able to participate in decisions concerning the household, such as the purchase decisions and healthcare spending. If the respondent can make large household purchase decisions and healthcare spending decisions either alone or with her husband/partner, this variable takes the number 1.
Autonomy over earnings	This is a dummy variable. The questions ask who decide how to spend the respondent's earnings. The variable is "1" if the answer is "respondent and her husband/partner".
Respondent who is currently working	This question asks whether the respondent is currently working or not. The variable is "1" is the answer is yes.
Property ownership	This variable consists of the house and land ownership, and it is a dummy variable. If the respondent owns land or a house alone, jointly or both alone and jointly, the variable is defined as 1.
Experience of physical violence	This is a dummy variable. It combines exposure to less severe physical violence and severe physical violence. The question asks whether the respondent has experienced physical violence. If the answer is "yes", the variable takes the number 1.
Divorce/Separated	This is a dummy variable that consists of the women who are either divorced or separated from their husbands.
Years in Education	This is a continuous variable. The variable consists of respondents' educational attainment in single years.

Figure 1.9: The Elevation Map of Egypt

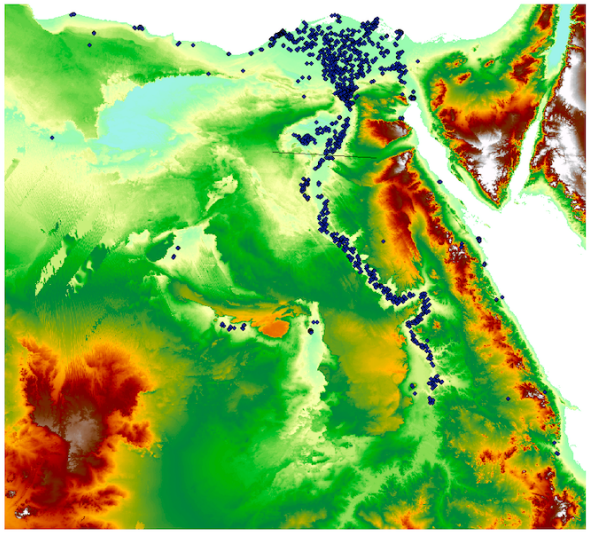
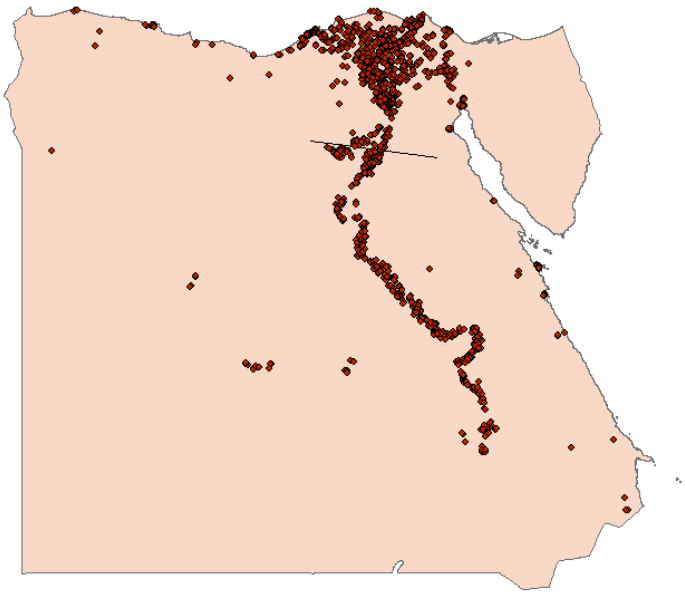


Figure 1.10: The Placebo Border



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Chapter 2

Republic of Sudan Education System Reform: The Causal Effect on the Welfare of Women and Children

This paper examines a change in the education law in Sudan to estimate the causal effect of compulsory education on the welfare of women and children. The policy extended the duration of primary education from five to eight years, made it compulsory and reduced the entry age from seven to six years. These changes were proposed in 1995 and implemented in 1998 and affected individuals born in July 1993 and after. The birth date related RDD is used to investigate the pre- and post-policy impacts on completion of primary education and outcome variables of interest by using the UNICEF Multiple Indicator Survey Data. The results suggest that the policy reduced the drop-out rates and increased the participation of women in the labour force but did not increase the participation in education. Moreover, there is limited evidence of the policy impact on the welfare. The

paper also investigates the reasons the policy remains ineffective in increasing the participation rate.

2.1 Introduction

Women make up 60% of the world's population thus, education of women is the key to development and prosperity. Educating women paves the way to their empowerment and income generation, which helps to overcome the vicious cycle of poverty. Also, access to education, which is a fundamental right for everyone, creates awareness about women's rights and challenges the gender roles shaped and imposed by society in the name of tradition (Channawar, 2016; Kaur, 2018). The role of education in women's empowerment is well established, as education is strongly associated with shaping women's identity, decision-making capability, mobility, and contribution to the socio-economic development of household, community and nation (Nowak, Dahal, and Hossain, 2016). Empowerment enables women to have greater control over resources in the family, and they are more likely to allocate resources to nutrition, children's health care, and education than men. Therefore, it is fundamental for development and poverty reduction (Tembon and Fort, 2008). It is crucial to identify the paths that lead to economic development and prosperity, especially for the developing and the Least Developed Countries (LDCs). The lack of access to jobs for women, gender-based pay gaps, under-defined women's rights are some of the standard features of these countries and improving the women's position in such counties may lead to prosperity and improved development outcomes.

As Lochner (2011) indicates, one possible channel is that education improves decision-making abilities, which can lead to better health decisions and more ef-

ficient use of health care services. In addition, educated people are better able to cope with stress and develop healthier behaviors. Better-educated individuals are also more likely to have healthier jobs, live in healthier neighborhoods, and interact with healthier peers and friends. Education may also lead to better health outcomes because it raises income levels (Brunello et al., 2016). Educational attainment is one of the strongest predictors of life expectancy, and it is essential to improve adolescent health and reduce health disparities. V. Raghupathi and W. Raghupathi (2020) puts forth that adults with higher levels of education have better health and longevity compared to their less educated peers. In particular, tertiary education has a decisive influence on infant mortality, life expectancy, child immunisation coverage and school enrollment rates.

UNICEF (2015a) reports that Sudan, as a low-income country, is the third country with the highest gender gap after Yemen and Djibouti. Despite considerable efforts to improve Sudan's education system and reduce the gender gap in education in collaboration with UNICEF, the World Bank and the Global Partnership for Education, the progress has been slow. Given the importance of primary education for girls' and women's empowerment, the Millennium Development Goals (MDG) 2 calls for Universal Primary Education (UPE) which targets the completion of a full course of primary education regardless of the nationality and gender of the children. In Sudan, especially the high dropout rates at the primary school level have been an important factor that severely restricts women's participation in the labour force (House, 1988). To achieve desired development outcomes, in 1995, UNICEF organised a symposium in Barcelona which identified Sudan's most urgent problems. The symposium's participants agreed to extend their help in providing fundamental healthcare, education and training. As a result of the support of UNICEF, In 1998, the Sudanese government had

reformed the education system, making primary education between the ages of 6 and 13 free and compulsory. The policy change took effect in the 1990/200 school year. Prior to this reform, education was neither compulsory nor free (UNESCO, 2018). In highly conservative societies which shape their laws and regulations by relying primarily on the informal institutions such as their customs, traditions and social norms, encouraging women's education may be quite challenging even with the introduction of laws and regulations. In addition, educating women may have little to no impact in producing results favourable to development. King and Hill (1993, p. 148) propose that in predominantly Muslim societies such as those in the MENA region, compulsory education policies are not likely to yield the expected outcomes, such as girls' equal access to education, unless they are accompanied with massive investment.

This paper attempts to provide empirical evidence regarding the effectiveness of education policies in a conservative society based on Islamic principles. Sudan serves as a useful example to understand the impact of education policies in encouraging girls' education in a highly conservative Muslim society where informal institutions are dominant. The paper evaluates the impact of policy on participation in and completion of basic education using the UNICEF Multiple Indicator Cluster Survey (MICS) Data that provides all women information required to conduct the analysis. The availability of data and discrete policy change allows for the implementation of birth date related Regression Discontinuity Design (RDD). RDD is a commonly used methodology for analysing the policy changes, and it requires milder assumptions in comparison to the other non-experimental methodologies (Lee and Lemieux, 2010). In this paper, treatment status is assigned based on the individuals' month and year of birth. The treatment group consists of the women born after the threshold of July 1993, and

the control group consists of the women born before July 1993. This methodology allows for the comparison between the cohorts born one month apart, and it relies on the assumption that the treatment and control should exhibit no systematic differences other than being subject to different compulsory schooling laws.

The results suggest that the policy played a significant role in increasing completion rates, therefore, those who attend school are more likely to complete the primary education. However, the impact of policy in increasing the participation rates remained limited. Thus, the second stage outcomes do not demonstrate any improvement in the outcomes of interest other than the participation in the labour market, and violence against children.

RDD is based on four main assumptions; there is a discontinuity at the cut-off; the value of the forcing variable is not manipulated, exposure groups are exchangeable at the cut-off, and the probability of the outcome is continuous at the cut-off in the absence of the intervention (L. M. Smith et al., 2017). The identification assumption of the RDD proposes that everything else apart from treatment should vary smoothly at the cut-off. To ensure that these assumptions are not violated placebo checks are carried out at different birth date cut-offs. There is a small and insignificant change in the treatment status for the completion rates at different cut-offs. For further robustness checks, non-parametric estimations are conducted to ensure that all results align with the parametric estimations.

The paper contributes to the existing literature by providing a detailed analysis of the free and compulsory education policy in an underdeveloped country where customs and norms take precedence over formal rules. It explores the issues that

compulsory education policy managed to address, identifies the reasons why it has remained ineffective in some respects and discusses the potential policies that should accompany this compulsory education reform. This is the only paper that employs RDD to estimate the causal effects of the compulsory basic education policy of Republic of Sudan on women's empowerment and child well-being outcomes. As mentioned by Cunningham (2021, p. 243) RDD is a popular method used for program evaluations as it can convincingly eliminate the selection bias. In the paper all the identification assumptions of RDD is checked by employing the robustness checks to validate the results. The paper not only provides an empirical analysis and depicts a clear picture of the issues addressed by the policy and the limitations of the policy, but also highlights the problems that need to be addressed and makes suggestions for improving the effectiveness of the policy.

2.2 Literature Review

2.2.1 The Impact of Education on Empowerment and Well-being

The effect of education on women's empowerment has been receiving more and more attention from researchers. Empowerment equips women with the necessary skills to control their lives, and demand their rights (Young et al., 1993, p. 194). According to the World Bank's definition, empowerment is the process of increasing the capability of individuals to make choices into preferred actions and outcomes. Therefore, empowering women aims at changing and transforming the power relationships in favour of women (Batliwala, 2007). Moghadam and Senftova (2005) define the empowerment of women as a process of developing basic capabilities, legal rights and involvement in economic, social, political and

cultural fields.

Gender Empowerment Measure (GEM) consists of three indicators; share of women in national parliaments, percentage of women who hold administrative or managerial positions and the ability of women to take part in economic decision making and the female income share. Nonetheless, these measures cannot identify the progress made in women's empowerment in most of the countries, especially in developing and least-developed countries (LDCs). There may not be any improvement in any of these indicators in developing countries or LDCs. Yet, in such countries, reduction in violence against women, better women rights or increase in educational attainment are considered as empowerment of women (Cueva Beteta, 2006). Therefore, the Standardized Index of Gender Equality (SIGE) provides a better indication of equality. It consists of five indicators; educational attainment, life expectancy, labour market participation, share in higher labour market occupations/positions and share in parliament (Klasen and Schüler, 2011).

The extent of empowerment that women possess or obtain in each country may differ, but the paths that lead to better outcomes are the same, and the most crucial channel of empowerment is education. For instance, today, the Netherlands is amongst the Western countries with the highest participation in the labour force. In the 1970s, female labour participation was only 32% which reached 75.8% in 2017, bringing about economic prosperity which could not be attained by population growth only (Nientker and Alessie, 2019). The improvement in women's labour force participation is linked to the institutional change, especially the reforms in the education system that encouraged women's participation in higher education (Vinkenburg, 2015). In most of the MENA and sub-Saharan coun-

tries such as Egypt, Algeria, Morocco, Turkey, Sudan the female participation in the labour force is low, 22.18%, 15.23%, 24.96%, 32.37%, 23.63% respectively as reported by the World Bank (Ortiz-Ospina, Tzvetkova, and Roser, 2018). Higher participation in the labour force may also be misleading. For instance, in Ethiopia, 95.81% of the women are in the labour force yet, they are engaged in agricultural activities, non-professional and low paying jobs due to poverty and they do not possess any assets such as land, oxen or access to loans. Ethiopia is an LDC; women are economically, socially, politically and culturally disadvantaged and do not even have decision making power about their fertility or attain education. To empower women and overcome poverty, the Ethiopian government emphasizes the increasing importance of education (Ogato, 2013).

On the one hand, it is argued that education is an important channel for empowering women and United Nations (UN) provides training programs for women for training, acquiring practical skills to empower them economically and increase the awareness of women's rights (UN, 2011). On the other hand, another line of research suggests that educational opportunities are unlikely to bring about direct and immediate empowerment. Still, indeed, they generate opportunities for women to increase their consciousness (Kabeer, 1999). Indisputably, education helps women to notice the vital role they play within the society and brings about occupational success, self-awareness, self-esteem, ability to make decisions and rights for equal treatment as men (Ajbani, 2019). Two out of eight MDGs are focused on stimulating development by educating girls. MDG 2 proposes universal education for all and, MDG 3 is about empowering women and eliminating gender inequality which includes the elimination of discrepancies in education too. The Sustainable Development Goals (SDGs), which later replaced the MDGs, 4 and 5 also suggest equal access to quality education and gender

equality and empowerment of women (Bergman et al., 2018). Education leads to better health and well-being outcomes for women, equip them with the necessary skills to participate in the labour force and increase their decision-making power. Furthermore, it leads to better development outcomes (Turquet, Watt, and Sharman, 2008). Roudi-Fahimi and Moghadam (2006) also indicate that educating women contribute to development and well-being; it reduces child mortality, improves family health, and increases secondary school enrolment and participation in the labour force which contributes to household and national income. When the earnings of women increase, this improves child nutrition and their children, especially daughters, are more like to be educated.

Women stay with their violent husband due to a lack of access to some primary resources such as housing, legal support, employment, funds, education, childcare and social support (Pyles, 2008). Sen (1998) indicates that education is strongly associated with the termination of violent relationships. Her results suggest that women with formal education for more than five years do not tolerate violent relationship. Education enables them to exert control over their lives and deal with violent behaviour. She also highlights the importance of the employment status of women is important as it provides an opportunity for being self-sufficient in the case of leaving or being left by an abusive husband.

In the countries where the social norms are strong and dominant, the acceptable behaviour for women is to stay at home and only engage in unpaid housework. This approach is particularly common in Northern Africa, The Arab States and Southern Asia (OECD, 2018). Taylor and Pereznieto (2014) define economic empowerment as a power that enables women to obtain access to economic resources and increased control over decision making. Economic empowerment is

one of the most powerful routes for women to achieve their potential and advance their rights (Golla et al., 2011). Hunt and Samman (2016) identify the factors which directly influence women's economic empowerment and these include education, skills development and training, access to quality, decently paid work, access to property, assets and financial services, collective action and leadership. Keats (2018) indicates that free primary education in Uganda reduced the rate of teen pregnancy which in turn increases female participation in the labour force. S. Mbugua et al. (2014) find that in Kenya, maternal education health improvements and the children of mothers without education are three times more likely increases awareness of childhood diarrhoea and increased child suffer from diarrhoea than the children of mothers who with higher education and above.

Nagar, Bamkar, and Tønnessen (2017) define child marriage as a form of official or unofficial union where one or both sides are under the age of 18, and they report that each year 15 million girls get married before the age of 18. It is a human rights issue and has substantial negative consequences for social and economic development which is generally the case in low-income countries and rural regions. Out of school girls who marry at early ages are considered as incapable of making decisions by their husbands and have limited bargaining power within the household (Parsons et al., 2015). Making education mandatory, monitoring the participation closely and preventing drop-out can be powerful in reducing child marriages. If a girl stays longer in education, she is less likely to get married before the age of 18 (Girls Not Brides, 2017).

Kim (2016), highlights the importance of education in making fertility decisions for women as educated women are more likely to know their health and physical condition to give birth and availability of contraception methods. Salvanes, Prop-

per, and Monstad (2008) indicate that increased education reduces the probability of teenage motherhood yet, their results do not show any significant evidence on the number of children educated women are likely to have. This may be because their study is based in Norway where the government is providing all sort of support for child-raising including financial support and public daycare and also the fertility rates are not as high as other countries. In developing countries like Turkey, compulsory schooling laws have led to a reduction in fertility rates as well, along with the decrease in teenage marriage (Kırdar, Dayıoğlu, and Koç, 2018). Maternal education has important implications on neonatal outcomes. Using the data from national African American, Mexican American, and European American birth cohorts, Gage et al. (2013) indicate that maternal education significantly decreases the maternal mortality and increases the birth-weight among normal birth.

2.2.2 Education Policies and Outcomes

As indicated by Cerna (2013), Education policies are not one size fits all, and depends on the context that these policies are being implemented. The main issue in developing countries is that the authorities responsible for education generally fail to address the ways to improve their education system despite the large amount of money they spend, almost $260 billion. As higher levels of education promote economic growth and development, the developing counties should make an effective allocation of resources in increasing educational attainment. The most effective use of the funds spent on education is to achieve an increasing return on human capital (Glewwe, 2002). This section describes education policies and their outcomes implemented in different countries.

In Algeria, education has been free and compulsory since 1962, for children aged

between 6-16 and the girls turned out to take full advantage of this policy. For instance, in 1995 the number of girls enrolled in high school exceeded the number of boys. Also, girls are more likely to attend university than boys due to their success rates (Zahia, 2018). In Morocco, compulsory education has been in place since 1963, and today, in urban areas, the enrolment rate of girls is almost 86%, and boys' enrolment rate is 93%. Nevertheless, there are huge disparities between the urban and rural areas, and only 22% of girls and 50% of boys can participate in education (Al-Bataineh and Nur-Awaleh, 2005).

The governments in some countries like India, Pakistan, Sri Lanka, and South Africa have implemented funding schemes. For instance, the government in India prioritise funding to the regions with high out-of-school ratios which led to an improvement in girls' access to primary education. As a result, the primary school completion rate of girls from poor households living in rural areas was only 42% in 2006, and this number increased to 80% in 2016. Tembon and Fort (2008) indicates that low-income countries have also witnessed an increase in primary enrolment rates from 87% to 94% from 1990 to 2004. In Africa, patriarchy is dominant, and women lag behind men in almost every domain of life. Women lag behind men in the household, educational attainment and income generation (Danjuma, Muhammad, and Alkali, 2013). Poverty and location are strongly associated with gender, and this issue begins in primary education. In almost half of the Commonwealth countries, particularly in sub-Saharan Africa, fewer than 50 out of every 100 girls from a poor rural background complete a primary cycle. For instance, the countries like Cameroon and Malawi, the participation of girls of poor households in education has decreased over time because the government mainly prioritises post-secondary education due to limited resources (Gordon et al., 2019).

Investing in women and empowering them economically and socially is key to development as it leads to a rise in human capital. A state of Brazil, Pernambuco, enacted a program addressing rural women as public policies were not sufficient to promote gender equality. The program has trained more than 50000 women and consist of three components. The women must participate in a compulsory three-month course on 'public policies' which inform them about their rights. Then they can choose from the available vocational training courses, including in non-traditional jobs like welding, soldering, electrical work and taxi driving, which provide them with access to a growing employment market. Also, the state government negotiated with training colleges to lower the bar for women's entry into courses, citing their historical disadvantage and exclusion, giving thousands of women access to an education previously denied to them (Cornwall, 2016).

As mentioned earlier, Sudan adopted a policy of free and compulsory primary education for the 1999/2000 school year. This education policy made primary education free, lowered the age of entry from seven to six years, and increased the duration of primary education from five to eight years. The context in Sudan is similar to that in Algeria, as both countries are Muslim, but differences in informal institutions have led to different outcomes. The contexts of Cameroon and Malawi are also similar to Sudan in terms of the level of development. In these countries, education policies have not produced the expected results due to lack of implementation.

2.2.3 Similar Studies

Regression discontinuity (RD) are increasingly being used to evaluate education-related policy interventions obtain unbiased impact estimates (Schochet, 2008).

This paper employs fuzzy RDD where treatment probability are exploited by using the legal cut-off point as an instrumental variable (Cordero, Cristóbal, and Santın, 2018). This section discusses the papers that employ fuzzy RD to evaluate the education policies.

Gulesci and Meyersson (2013) explore the impact of the compulsory education law in Turkey, which was implemented in 1998 increased the mandatory years of education from 5 to 8 years, bounding up the individuals form from September 1986 onwards. The policy increased the average years of schooling by one year on the welfare and empowerment of the women bounded up by the policy. They employed birth date related RDD using Turkey Demographic Health Survey Data 2003. The effect of increased years of schooling varied depending on the socio-economic background of the women. In rural regions, increased schooling years led to significant empowerment effects in decision making, household wealth, and less conservatism in social and religious terms. In addition to these factors, women's labour market participation has also increased. Overall, their results suggest that the reform reduced the gender gap in education by half and significantly affected secularism, reducing the women's tendency to wear a headscarf, attend Quranic study, and pray regularly. The increase in average years of schooling did not affect welfare outcomes like the age of marriage or birth or even the number of children. However, it increased the decision-making power about marriage, fertility, led to increased labour market participation. The study provides a clear overview of how education changes women's attitudes towards religion and within the society in a 99.8% Muslim country. Their results also suggest that women with increased years of education tend to live in wealthier households. The approach used in this article is similar to the method used in this paper in that both use birth date in birth month and year as a running variable.

Odunowo (2019) employs fuzzy RDD by Nigerian Demographics and Health Survey (NDHS) to estimate the effects of maternal education on child education in Nigeria. The paper assesses the Nigerian Government's progress towards achieving Universal Primary Education (UPE) due to the compulsory education reform implemented in 1976, which aimed at providing free primary education and reduced the stat age from seven to six. The reform caused a discrete jump in the educational attainment of the women born in 1970. The results suggest that maternal education improves child because it increases the value that the parents place on their children's schooling, so they are more concerned about their children's education.

Samarakoon and Parinduri (2015) employ fuzzy RDD to estimate the reform which changed the academic year in 1978 by using the Indonesia Family Life Survey (IFLS). The academic year was from January to December, and this was changed to January to July. To achieve this, the 1978 academic year lasted until June 1979, and for this extended academic term, tuition fees were reduced by 50% for the students in public schools. The women who were born in 1971 or earlier were exposed to the more extended academic year. The study shows some significant effects of increased years of schooling in reducing women's fertility, use of contraceptives, and improving reproductive health. It also increases the like hood of breastfeeding by 16% and tetanus injection by 57%.

Wild and Stadelmann (2020) investigate the effects of Burundi's free primary education (FPE) on women's fertility, literacy and employment by employing fuzzy RDD year of birth as the assignment variable and using the data from Burundi DHS. Their findings show that women who belong to the poorer segment

of the population benefit from this and tend to have higher literacy, employment as well as reduced fertility, however, there is no effect of additional education for the women who do not belong to the poor segment.

2.3 Background and Motivation

In terms of women's education, Sudan performs poorly, and the country has made a little progress concerning the educational attainment of girls. UNICEF reports that 49% of the girls are missing out of primary school in Sudan mainly due to the unequal views on women. The inequality is rooted in the legal system, which is a rigorous form of Sharia shaped the culture and customary laws (Lehewych, 2018).

One of the most critical factors that keeps girls out of school is child marriage. It is considered as a human rights violation and adversely influences women's and children's rights to access education, freedom from violence, and exploitation (Nagar, Bamkar, and Tønnessen, 2017). Sudanese family law was codified in 1991 and is founded on Islamic rules. The minimum age for marriage is when both parties have reached puberty, so child marriage is legal by law, and no regulation provides protection against early or forced marriage. Also, the husband is obliged to give the bride a dowry that becomes the property of the wife and her family (Roald and Tønnessen, 2007, p. 22). This law encourages the families to marry their daughters at early ages instead of sending them to schools to have one less mouth to feed and get dowry from the groom. Sudan is currently the 29^{th} country with the highest rate of child marriage, and almost 38% of girls get married before the age of 18 and 11% before the age of 15 (Nagar, Bamkar, and Tønnessen, 2017).

In Sudan, mixed-gender schools also discourage girls' participation in education.

Due to the lack of infrastructure, there are no separate latrines in most mixed-gender schools, discouraging the families from sending their daughters to the school. Also, the opportunity cost of sending a girl to school is labour forgone, which means she could contribute at home doing housework (UNICEF, 2015b). Chrostowsky and Long (2013) investigates 200 Dubai Cares supported schools in the Northern States of Sudan, and he concludes that the completion rates of boys and girls are almost the same and as low as 35%, but when the single-sex schools are considered only, the completion rates of girls increase up to 60% while this increases only up to 48% for boys.

Sudan has been suffering from chronic underdevelopment, and the process of development has been interrupted by multiple events; as Natsios (2012, p. 135) indicates, the first civil war from 1955 to 1972 and the Second Civil War from 1983 to 2005 led to the establishment of South Sudan and followed by the independence of that country in 2011. There was also a persistent famine problem through the 1980s and into the 1990s, which led to a large drop in employment and agricultural income. Through this period, women from some villages engaged in housekeeping jobs in urban regions, a type of nontraditional employment in Sudanese culture (Teklu, Von Braun, and Zaki, 1992). During the civil wars, Sudanese women acquired the household head's role, and now women's leadership is considered an alternative for family survival (J. A. Duany and W. Duany, 2001). During the coup d'etat, which took place on the 11th of April in 2019, women again played an active role with 70% participation, showing that women can effectively change undesired political conditions. These cases prove that there is a strong need for women to take an active role in the economy to reduce poverty and social life to change society progressively. Therefore, it is essential to identify the path that enables women to take an active role within society, and education

can be the power that Sudanese women need.

The role of women's empowerment in economic growth and development has been studied in detail, yet; little attention has been paid to the position of women how the position of women can be improved in such a conservative society where customary laws are strong and cannot be shaped by formal institutions. Education can eradicate social norms that consider women inferior to men, hinder their participation in economic activities, and leave them with worse welfare outcomes. Ethnic and religious groups are strong and dominant in Sudan, and they devalue education, particularly when compared to the need for labour on family farms/herds, so the girls are kept out of school or not encouraged to attend (UNICEF, 2014b). Women in Sudan have to confront many difficulties rooted in Sudanese norms and traditions. For instance, they consider reproduction the primary role of women where a childless woman is regarded as a failure. The prerequisite for women to gain employment in an urban-based economy is formal education, yet women lack far behind men in school attainment (House, 1988).

Development can be achieved when a nation can manage its available resources efficiently and effectively. Human capital is one of the essential resources, and women make more than half of it and educating women is the key to attain this resource. Furthermore, education plays a pivotal role in eliminating gender inequalities and without removing the barriers for girls to access education, no country can fully make progress in economic and social development (Jackson, 2009). Therefore, almost every country continuously reforms its education system to attain better outcomes. Achieving gender equality in education has been one of the Sustainable Development Goals (SDG), yet the progress is slow, especially in low-income countries Invalid source specified.. The Middle East

and North African countries (MENA) have made significant progress in terms of increasing primary school enrolment, attendance and completion (Roudi-Fahimi and Moghadam, 2006). In most MENA countries, the improvements in education outcomes are the results of the reforms such as centralised management of education and vocational training (Kirchberger et al., 2001). The reforms concerning education lead to different outcomes in every country, and this paper attempts to analyse how compulsory education policies and increased completion rates result within the Sudanese Context.

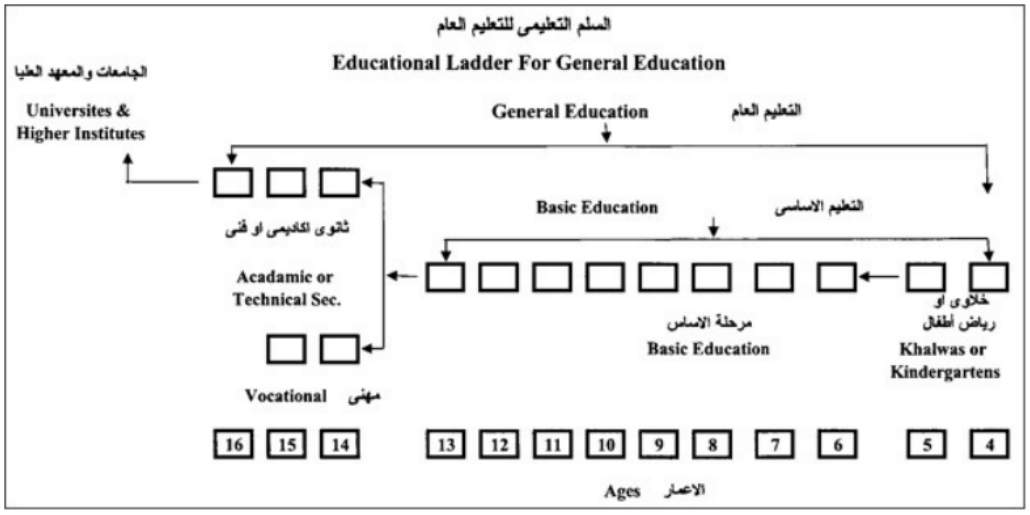
2.4 General Education System & Education Reform in Sudan

Sudan witnessed a series of reforms in education, and the main goals of most of these reforms were to achieve the full integration of women into social and economic life (House, 1988). The reform of interest to this paper is the compulsory education reform presented at the 1995 UNICEF symposium. It was originally scheduled for 1995, but enacted in 1998 and went into effect for the 1999/2000 school year. The reform instructs the right to education for all children of eligible age without discrimination. The reform mandates the right to education for all children of eligible age without discrimination. Although the reform also made primary education free, it is still costly and families still have to contribute to school fees, which is a barrier to access to education. (UNESCO, 2018). The reform states that each Sudanese child at the age of 6 years shall have the right to basic education and specified the school education cycles (Arora, 2003).

To maintain equality in access to education, compulsory basic education, also known as primary education, was introduced. The current education system in

Sudan is represented in Figure 2.1. The official language in Sudan is Arabic, so the following figure is interpreted from left to right. Currently, in Sudan, preschool is two years for age groups 4-5; it is neither compulsory nor free; the compulsory primary education, that is represented as basic education in the figure, is from the age six to thirteen and it is for eight years. Primary education is followed by secondary education, which offers two programs; the first program is three years and is about preparing the students for higher education and the second program is a two-year vocational training course (World Data on Education, 2012).

Figure 2.1: The Education System of Sudan



Source: World Bank Data on Education (2012); Federal Ministry of General Education (2008).

The former system comprised two years of preschool, six years at the primary level and three years of secondary school and the entry age to primary education were seven (UNICEF, 2014b). By increasing primary education from six to eight years and making it compulsory and free, the government aims to increase the participation rates, the years of education and effectively address the drop-out rates. In 1999, after implementing the compulsory education reform, the enrol-

ment rate was recorded as 52.2%, which means almost half of the students were still out of school (World Data on Education, 2012). UNICEF cites the conflict between the Republic of Sudan and South Sudan, lack of awareness of the importance of education, and chronic underdevelopment as the factors contributing to the poor schooling of boys and girls in Sudan. Girls' school attendance is even more problematic because at the household and community level, poverty is the main factor undermining girls' right to education, and the lack of schooling requirements has exacerbated the gender gap in the country. Due to poverty, families have to decide which child goes to school, and families favour boys over girls (Ajak, 2019).

In Sudan, the semester runs from the middle or end of July to June and consists of 210 school days. Hence the compulsory education law bounds up the individuals born from July 1993 onwards. This reform aims to ensure access of all children to good quality education, eliminate gender disparities in primary education, and achieve literacy.

In terms of improving the education system and participation in education, Sudan has been making progress at a prolonged rate despite all the efforts. There are five main reasons identified by UNICEF (1999), which are the main impediments to school attendance. The reasons include the difficulty of access to the schools, lack of teacher training, obtaining textbooks learning and teaching materials, retaining teachers in the education system due to low income, the timing of schools, and the timely distribution of the teaching material. There is still a strong need to focus on teacher policies, literacy policies and out-of-school children, and sector-wise policy and planning (UNESCO, 2018). Although these problems are common for both girls and boys, girls are always the more disadvantaged group because

families instead invest in boys than girls, and the traditional views on the role of women result in fewer participation and completion rates for the girls (United Nations, 2017).

2.5 Data, Identification Strategy and Estimation Framework

The paper uses the women sample from the UNICEF Multiple Cluster Indicator Survey (MICS) Data from 2010 and 2014. The dataset includes both the ever-married and never-married women aged between 15 and 28. As represented in Panel A, 46% of the women are currently or formerly married, and 54% is never married. The average age of women in the dataset is 20.1, and the number of observations is 15,351. The dataset provides information about women's educational background, position within the society, family life, fertility, life satisfaction, wealth status, health problems, and access to resources. The data source proves an excellent opportunity to assess the extent to which developing countries can achieve the MDGs. The main results are from the women's dataset, which contains the data collected at the women's level, and the children and household datasets are used for the second stage estimates.

The reform was introduced in 1998 and came into effect in the 1999/2000 academic year, and bounded the individuals born after 1993 to mandatory primary schooling as these individuals turn to six years in that school year. The policy design allows the implementation of birth-date related discontinuity RDD, a quasi-experimental method to examine the effectiveness of compulsory and free education law as treatment. RDD, in simple terms, rely on analysing the effect of any policy which causes displacement of the regression line at a given point in

a forcing variable that causes differences in the treatment group which is exposed to this policy change and the control group which is not subjected to the policy implementation. Employing RDD helps to overcome the difficulties in estimating the impacts of education on empowerment and welfare due to unobserved factors such as the family background, features of the society and women's preferences. RDD provides robust evidence for causal inference due to its ability to provide a counterfactual for treatment and control groups (W. C. Smith, 2014). If used correctly, this methodology can yield internally valid estimates of causal effects of treatment which can be a policy or a program intervention, and it is a well-established tool for the estimation of the causal impact of education policies (Porter et al., 2017). As indicated by Agodini et al. (2009) the key advantage of RDD is that the assignment mechanism can be observed hence, is not as susceptible to omitted variable bias as other non-experimental designs.

The date of birth, which consists of both month and year, is in Century Month Code (CMC) format. It was necessary to conduct some calculations to figure out the CMC that the cut-off, which is (July 1993) refers to. As indicated by Rutstein and Rojas (2006), CMC can be calculated by the equation 2.1:

$$CMC = (YY * 12) + MM \tag{2.1}$$

By substituting 1993 into YY and 07 (July) into MM, the CMC date at the cut-off is obtained, and it is 1123. On the graphs, the normal date associated with the CMC is used for clarity. Also, the dataset is restricted to the women born after 1986 (CMC 1040). By the nature of the policy, the set up will be Fuzzy Regression Discontinuity. In fuzzy RD, there may be members of the treatment group that do not receive treatment and control groups that receive treatment

(Jacob et al., 2012). Hence, the running variable (date of birth) only determines the probability of receiving the treatment as represented in equation 2.2. In this case, some of the individuals born after July 1993 may not receive the treatment of completion of primary education, and some of the ones born before July 1993 may have completed primary education.

$$P[D_i = 1|x_i = \begin{cases} g_0(x_i)\ if\ x_i \geq x_0 \\ g_1(x_i)\ if\ x_i < x_0 \end{cases} \quad , \quad where\ g_1(x_0)\ \neq\ g_0(x_0). \tag{2.2}$$

In fuzzy RD design, it is not enough to compare the average outcomes of the people on one side of the cut-off to the other side of the cut-off. The non-compliance problem is solved by using the instrumental variables. In Fuzzy RD, the reason for discontinuity becomes an instrumental variable for treatment status (Angrist and Pischke, 2008, p. 192). The model assumes that the samples on each side of the cut-off are similar, and their treatment status differs because of the policy change.

RDD assumes that the determinants of outcome variables differ across the threshold determined by the reform (Odunowo, 2019). In this paper, the threshold is July 1993, which is 1123 in CMC format in this case. The reduced form of the equation is as follows:

$$\gamma_i = \alpha + \beta t_i + f\left(x_i\right) + \epsilon_i \tag{2.3}$$

Where γ_i is the outcomes chosen for the education output, women and children, β_{ti} is the parameter for the treatment status; women born on and after July 1993. and fx_i is the running variable which is the birth date, and ϵ_i is the error term.

This paper presents summary and descriptive statistics to provide an overall picture, followed by illustrating the discontinuous jumps on RDD graphs. The final phase of estimation includes Ordinary Least Squares (OLS) regressions for the first stage outcome and Instrumental variable (IV) estimations for the second stage outcomes. In this paper, the RDD framework assigns a cut-off point at July 1993 and compares the observations on either side of the cut-off to estimate the average treatment effect. The IV form can be estimated as follows:

$$D_i = \beta_0 + \beta_1 X_{ei} + \beta_2 W_i + u_s \tag{2.4}$$

$$Y_i = \alpha + \beta_3 X_{Di} + \beta_4 W_s + u'_s \tag{2.5}$$

Where D_i is the treatment status, and β_0 is the constant. $\beta_1 X_{ei}$ indicates that the sample born on and after July 1993, $\beta_2 W_i$ is the treatment effect of the education reform and u_s is the error term. Y_i is the outcome variable of interest, α is the constant, $\beta_3 X_{Di}$ is the LATE of the policy, $\beta_4 W_s$ is the effect of policy on second stage outcomes. The u_s and u'_s are the error terms.

As mentioned earlier, the policy changes the probability of receiving the treatment; hence, this is a fuzzy RD design, and it leads to instrumental variables set up. Therefore, the estimation framework is the two-stage least squares. The reason for discontinuity becomes an instrumental variable for treatment status (Angrist and Pischke, 2008, p. 189). The first stage includes regressing the outcome variable which is directly influenced by the policy change which is the reason for discontinuity and will then become the instrument for the second stage such as participation to education, completion of primary education and the literacy

rates.

RDD rely on some assumption and it is necessary to test whether the results are robust subjected to these assumptions. It is essential to make sure that the discontinuity at the cut-off point of July 1993 is the result of the policy change and otherwise, there would not be any difference between the treatment and the control group. This can be checked by using few other cut-off points and make sure that there is no jump across these points. The sensitivity of results is also checked by using different functional forms, by adding higher-order polynomials. These assumptions are further identified and investigated in section 2.7.

2.6 Results

This section presents the results in descriptive, graphical and regression analysis forms. The summary and descriptive statistics can be found in Table 2.1 followed by the first and second stage outcomes in Table 2.2. The first stage results show the impact of the reform on women's educational attainment, primary school completion, and literacy. In Table 2.2, (1), (2), and (3) refer to age ranges. The aim of this paper is to identify the causal effects of the compulsory education policy on women's empowerment and welfare outcomes as well as children's well-being. To assess this, the paper identifies all relevant variables with reference to the literature. (1) refers to those born between January 1993 and January 1994, (2) refers to the observations born between July 1992 and July 1994, and (3) refers to the birth date range between July 1991 and July 1995. The results indicate that the policy causes a significant increase in primary education completion, but participation in education and literacy are not affected. The second stage estimates explore the impact of primary education on the welfare outcomes

for women and children.

The results in Table 2.2, Panel E, show the first-stage estimates of the variables on which the policy might have an effect. Policy significantly improves the outcome for completion of primary education, which is used as the instrument for the second-stage IV estimates in Panel F. Table 2.2 analyses the causal effect of education policy on a wide range of variables. The selection of each variable is justified by reference to the relevant literature in this section. Free and compulsory education policies are assumed to improve women's empowerment outcomes, as well as their well-being and that of their children. In developing and least developed countries, education policies cannot promote participation in education, as this reform must include not only the elimination of school fees, but also all education-related fees such as books and uniforms, teacher attendance, and the provision of sanitary facilities for girls. (Pandey et al., 2000). It is important to understand which outcomes this policy has been able to improve and which have not, in order to explore the reasons for failure and to suggest solutions on how this policy could be improved by proposing additional measures that could be implemented alongside the policy of free and compulsory education. For this reason, the paper examines a wide range of variables and refers to the relevant literature to justify the choices and illustrate how higher levels of education can affect these variables.

Table 2.1: Summary & Descriptive Statistics

	Whole Sample		**Treatment**		**Control**	
Panel A: Age & Marriage	Mean (s.d)	Obs	Mean (s.d)	Obs	Mean (s.d)	Obs
Age of the Respondent	20.104 (3.466)	15,351	17.341 (1.863)	5,919	21.838 (3.094)	9,432
Ever Married	0.464 (0.499)	15,351	0.274 (0.446)	5,919	0.584 (0.493)	5,919
Never Married	0.536 (0.499)	15,351	0.726 (0.446)	5,919	0.416 (0.493)	5,919
Age at marriage	16.755 (2.900)	7,125	15.648 (2.122)	1,620	17.081 (3.016)	5,505
Panel B: Education						
Completed Primary	0.373 (0.484)	15,351	0.435 (0.146)	5,919	0.334 (0.472)	9,432
Ever Attended School	0.780 (0.414)	15,351	0.848 (0.359)	5,919	0.737 (0.440)	9,432
Literacy	0.305 (0.460)	15,351	0.359 (0.480)	5,919	0.271 (0.444)	9,432
Panel C: Welfare						
Married Before the Age 18	0.239 (0.426)	7,125	0.090 (0.286)	1,620	0.282 (0.450)	5,505
Number of Children Born	2.335 (1.388)	5,601	1.574 (0.786)	1,015	2.503 (1.436)	4,586
Given Birth at the Hospital	0.171 (0.376)	5,601	0.209 (0.407)	1,015	0.163 (0.369)	4,586
Panel D: Empowerment						
Respondent Earns Income	0.245 (1.191)	9,275	0.255 (1.169)	2,547	0.234 (1.216)	6,728
Having a Child Was Her Own Decision	0.710 (0.454)	5,601	0.778 (0.416)	1,015	0.695 (0.461)	4,586
Justifies Violence	0.436 (0.496)	15,351	0.418 (0.493)	5,919	0.447 (0.497)	9,432
Panel F: Child's Welfare						
FGM Should Continue	0.404 (0.491)	15,351	0.396 (0.489)	5,919	0.409 (0.492)	9,432
Physical punishement	0.225 (0.418)	9,275	0.220 (0.414)	2,547	0.231 (0.422)	6,728
Child's birthweigh is smaller than av.	0.141 (0.348)	2,702	0.129 (0.336)	674	0.146 (0.356)	2,028

Notes: The table shows the mean, standard deviation, and the number of observations from appended MICS Survey women sample, in treatment (individuals born after July 1993) and control group (individuals born after July 1993) aged between 15 and 28. Panel A shows the main characteristics of the women, and Panel B indicates the outcome variables of interest.
A Detailed variable description can be found in Table 2.5 Appendix.

Table 2.2: Parametric Estimation Results

Panel E: First Stage OLS Estimates

	Completed Primary			**Ever Attended School**			**Literacy**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Treatment	0.089*	0.081*	0.080**	0.013	0.034	-0.017	0.070	0.051	0.059*
	(0.039)	(0.030)	(0.024)	(0.036)	(0.047)	(0.031)	(0.041)	(0.033)	(0.027)
Mean	0.364	0.371	0.370	0.832	0.796	0.800	0.296	0.307	0.311
SD	0.481	0.483	0.483	0.374	0.403	0.400	0.457	0.461	0.463
N	1,409	2,835	5,358	1,409	2,835	5,358	1,409	2,835	5,358

Panel F: Second Stage IV Estimates

				Women's Welfare					
	Married before 18			**Number of Children Born**			**Given birth at the hospital**		
Treatment	-0.398	-0.237	-0.903	-1.413	1.216	0.876	1.760	0.765	0.073
	(0.501)	(0.785)	(1.570)	(2.647)	(1.903)	(1.645)	(2.138)	(1.245)	(0.769)
Mean	0.241	0.207	0.193	1.744	1.826	1.816	0.188	0.196	0.195
SD	0.428	0.405	0.395	0.872	0.929	0.952	0.392	0.397	0.396
N	446	1,045	2,020	324	772	1,455	324	772	1,455
				Women's Empowerment					
	Income Generating Activity			**Having a Child was Respondent's Decision**			**Justifies Domestic Violence**		
Treatment	2.287*	0.551	3.889	0.720	1.175	1.372	-0.187	0.146	0.095
	(1.166)	(1.561)	(3.311)	(1.122)	(1.704)	(1.416)	(0.418)	(0.378)	(0.283)
Mean	0.202	0.254	0.279	0.728	0.747	0.752	0.451	0.448	0.453
SD	1.212	1.296	1.343	0.445	0.435	0.432	0.498	0.497	0.498
N	1,158	1,613	2,786	324	772	1,455	1,409	2,835	5,358
				Children's Welfare					
	FGM Should Continue			**Physical Punishment**			**Child's birth weight is smaller than av.**		
Treatment	0.182	0.228	0.206	-2.343*	-3.149	-1.901	-0.992	-0.523	-0.699
	(0.569)	(0.505)	(0.344)	(1.072)	(2.446)	(1.720)	(1.637)	(1.318)	(4.304)
Mean	0.380	0.398	0.398	0.301	0.306	0.244	0.137	0.143	0.149
SD	0.486	0.490	0.490	0.459	0.461	0.430	0.345	0.350	0.356
N	1,409	2,835	5,358	771	1,500	2,786	226	533	940

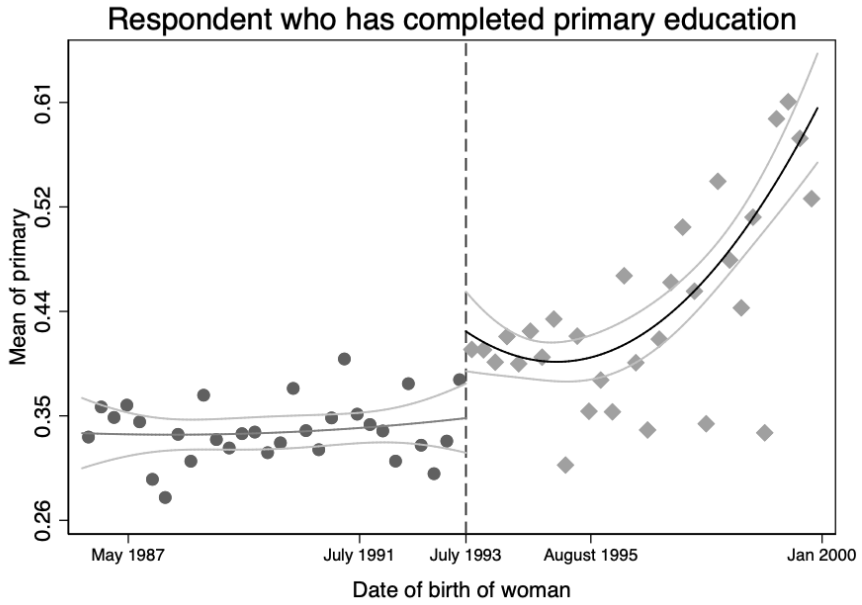
Notes: The table shows the parametric estimations within six, twelve, and twenty-four months of the cut-off. (1) indicates the individuals born between January 1993 and January 1994, (2) refers to the observations within July 1992 and July 1994, and (3) refers to the bandwidth between July 1991 and July 1995. Panel E shows the OLS results with the education outcome as the independent variable within the bandwidths indicated above. Panel F shows the second stage IV estimates of the outcomes concerning women's welfare, empowerment and children's welfare. * p<0.05, ** p<0.01, *** p<0.001. Standard errors are clustered according to the running variable.Standard errors are clustered by month-year-cohort.

2.7 The effects of Increased Years of Schooling on Women's Empowerment

The Summary Statistics in Table 2.1 Panel B shows that approximately 37% of women complete primary education. The descriptive statistics in Table 2.1 Panel C shows an approximate 10% difference between the treatment and the control group. The completion rate is only 33% among the women born before July 1993; this number is increased to 43% for the women bounded up by the policy.

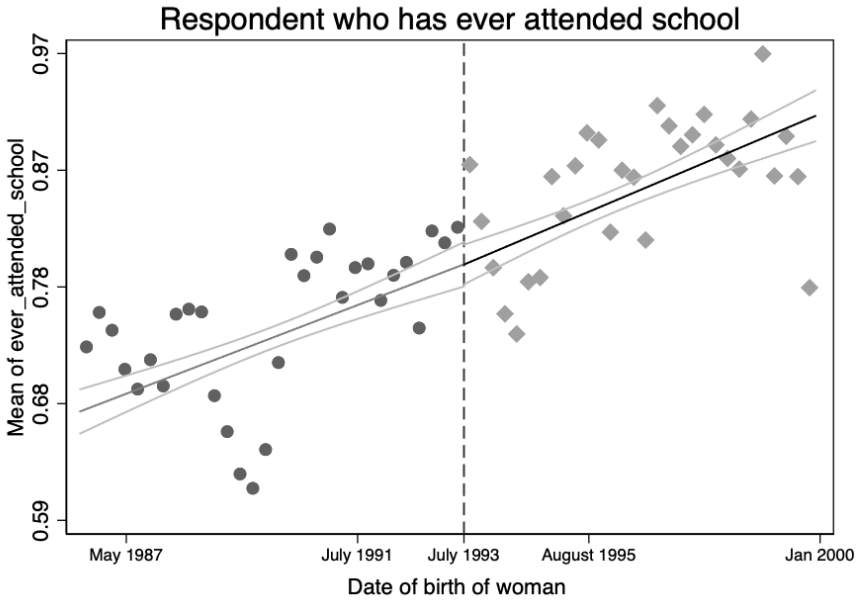
Figure 2.2 shows a discontinuous jump at the cut-off, confirming that the policy change increased the women's completion rates. So, the policy was successful at addressing the drop-out issue. The drop-out problem is worth dwelling on because it is classified as a "burning issue" by Obiakor (2010) as it has been one of the main concerns of educators, schools and government agencies. Mike, Nakajjo, and Isoke (2016) highlight that low completion rates are a complex problem to address because it is a composition of early marriage, the opportunity cost of education, considering education as a waste of money, and parental education. The regression results also support the positive jump in the RD pathway in Figure 2.2 and show a positive and significant 8.9 pp increase in primary education completion as can be seen in Table 2.2, Panel E.

Figure 2.2: Respondent Who Has Completed Primary education



Panel B in Table 2.1 shows that participation in education (ever attended school) is 78%, and the descriptive statistics in Table 2.2, Panel C indicate that the treatment group is almost 9% more likely to participate in school. However, Figure 2.3 does not illustrate any discontinuous jump, and the regression coefficient in Panel E in Table 2.2 is small and insignificant. Therefore, the policy has a negligible effect on participation in education which limits the impact of this policy on second stage outcomes. The reasons why the policy fails to increase the involvement in education is also explored further in the Discussion in section 2.13.

Figure 2.3: Respondent Who Attended School



Summary statistics on Panel B in Table 2.1 show that only 30% of the respondents are literate which means they can read the whole sentence or a part of it and understand. Descriptive statistics in Table 2.3 (Panel E) suggests a 9% increase in the literacy in the treatment group. Graph 2.4 also illustrates the positive jump at the cut-off that confirms the increase in literacy among women bounded up the policy. Regression results in Table 2.2 indicate a positive but insignificant coefficient of literacy which seems to be the result of increased years of education.

Figure 2.4: Respondent Who Can Read

In a nutshell, completion of primary education and literacy are the schooling outcomes which are has changed as a result of the compulsory schooling reform have improved. Although mandatory education is a useful tool that can address and improve all of the outcomes, completion of primary schooling is the only outcome that has improved as a result of the policy significantly. The paper uses it as an instrument to estimate the changes in second stage outcomes.

2.8 The effects of Increased Years of Schooling on Women's Welfare

2.8.1 Age of Marriage

The age of marriage is an essential indicator of women's welfare. Women who marry at an early age are at a higher risk of dropping out of education; they

experience poor health outcomes, and women who have children at a younger generation have more children over their lifetime. These factors, in the end, leads to a lack of engagement in economic activities, not earning sufficient income and living in poverty compared to other women who marry at later ages (The World Bank, 2017). Panel A in Table 2.1 reveals that the average age of marriage for women in Sudan is approximately 16.8, which means that the girls in Sudan get married before the age of 18. For the analysis of age at marriage, the data set is restricted to the ever-married sample, so the number of observations is 7,125.

Aforementioned, the Personal Status Law of Sudan permits the marriage of girls older than ten years old. However, the compulsory education reform that increases the completion of primary education encourages the girls to stay in education longer which possibly causes an increase in the age of marriage. Assessing the age at marriage as a continuous variable may not yield accurate results because the policy change is new, and the average age of the treatment group is much smaller than the average age of the control group. Therefore, this section assesses the marriage before the age of 18 and explores whether completing primary education causes a significant reduction in marriage rates before 18. Panel B in Table 2.1 indicates that 24% of women marry before 18; this case has fewer observations because the girls younger than 18 years old (15-17) are left out. Descriptive statistics (Table 2.2, Panel D) show a 19% decrease in marriage before 18 in the treatment group, which is also reflected in negative and significant regression result in Table 2.2. The coefficients of IV estimations are insignificant but negative that show that women born after July 1993 who benefit from the compulsory education policy are less likely to get married before the age of 18.

2.8.2 Number of Children

MGD 5 lays down maternal health improvement as a condition. This highlights the importance of sexual and reproductive health. It aims to reduce maternal mortality, which is the death of women during pregnancy, labour, or in the 42 days of delivery, by 75% (Hogan et al., 2010). Giving births with short intervals, high fertility rates and frequent births contribute to the 600,000 maternal deaths every year, and most of them occur in developing countries (Ali et al., 2011). There are many reasons for maternal mortality, including socioeconomic factors, that may cause a lack of care during pregnancy, unsafe abortions, high parity and frequent births. All these causes can be prevented by using family planning WHO (2018). Ali et al. (2011) use a community-based cross-sectional survey to study family planning in Eastern Sudan, where maternal mortality rates are very high. Their findings suggest that couples who acquire eight or more years of education are more likely to use family planning methods that reduce maternal mortality.

As a proxy for maternal health, the paper uses the number of children respondents ever given birth by using the variable children ever born is used to assess respondents' lifetime fertility until the point that the data was collected. Panel B in Table 2.1 indicates the average number of children a woman has is 2.3; the data-set is restricted to the women who have ever given birth; hence the number of observations is 5601. Descriptive statistics in Table 2.1 suggest that the average number of children for the control group is 2.5 and for the treatment, group is 1.06. Although, the negative coefficient indicate women bounded up by the policy have less children, the regression result in Table 2.2 is not significant.

2.8.3 Respondent Given Birth at the Hospital

The proportion of deliveries assisted by skilled attendants is an essential indicator of making progress towards MDG 5. In Africa, less than 50% of births take place without a skilled health attendant (Wanjira et al., 2011). Scientific evidence suggests that maternal deaths can be prevented to a large extent if adequate maternal care is provided on time (Berg et al., 2005). Especially in rural regions, Sudanese women have an attachment to the customary maternal practices in home-based delivery performed by Traditional Birth Attendants (TBAs). This practice is unhealthy and risky for the mother and the baby as it involves giving birth on the ground or a local mat and using and unsterilized tool to cut the umbilical cord (Adam, 2015).

This section intends to understand the impact of the education policy change on maternal health improvement, therefore assessing the women who have given birth at the hospital, government health services, and private clinics with professional assistance. The data set is restricted to the women who have given birth so that there are fewer observations. The variable of interest consists of the women who gave birth at the government hospital, health centres and private clinics. Panel B in Table 2.1 suggests that only 17% of the women give birth at the hospital, and the descriptive statistics in Table 2.1 shows that 16% of women born before July 1993 gave birth in hospital while this proportion is increased to 21% for the women born after July 1993. Despite the positive regression coefficient that can be seen in Table 2.2, it is not significant, which indicate that the policy was not effective in leading to an improvement in this outcome.

2.9 The Effects of Increased Years of Schooling on Women's Economic Empowerment

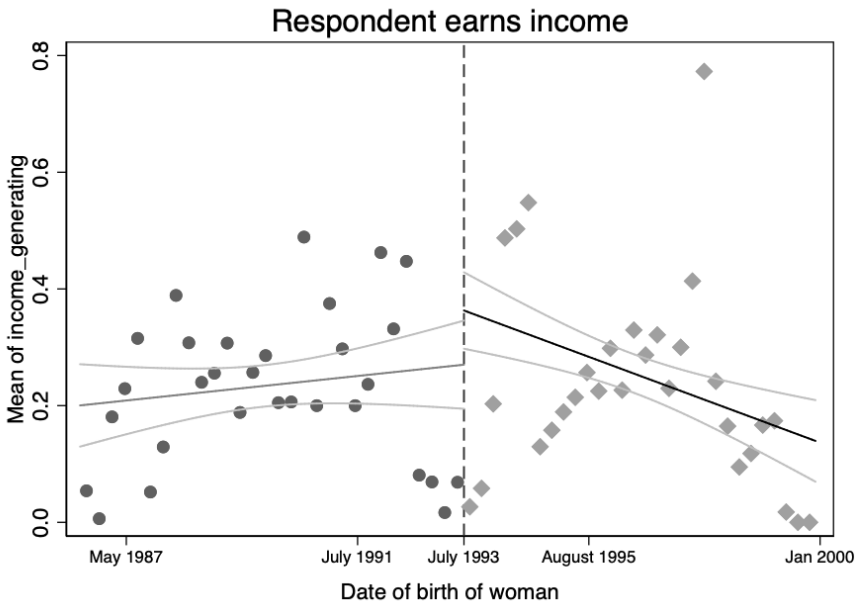
2.9.1 Participation in Labour Force

The definition of economic empowerment implies increased access to financial resources, so earning an income significantly increases economic empowerment. It is also important to highlight the difference between participation in paid and unpaid work because it is an issue that is at the centre of women's economic empowerment. Unpaid work is generally care-related work, including household chores and care-giving, and it impedes women's access to the labour force. To achieve women's economic empowerment, it is essential to understand unpaid work as it is a significant barrier to women's engagement in the labour market (UNICEF, 2020). In Sudan, the backbone of the economy is agriculture, and especially in rural regions, women involve in unpaid agricultural work as family workers and undertake tasks like threshing, fetching water and fuel. Within the cultural context of Sudan, the husbands believe that they would lose status if their wives are engaged in agricultural production or any other income-generating activities, so the women are largely engaged in unpaid family farm work (House, 1988).

This section analyses whether the policy has a significant impact on women's participation in the labour force. Only the 2014 dataset consists of the data about women's engagement in income-generating activities; hence the number of observations is 5,053. As summary statistics in Table 2.1 suggest (Panel B), only 25% of the women are economically active and working by buying or selling articles or engaged in any other income-generating activity. Being subjected

to increased years of schooling might have strengthened the position of women within the household and encourage participation in the labour force to deal with poverty. This can also be observed in Table 2.1; descriptive statistics suggest that the participation in the labour force for the control group is 26%, and this is 23% for the treatment group. Figure 2.5 shows a discontinuous jump which indicates that the participation of women to the labour force has increased by the policy implementation. Panel F confirm the positive influence of the policy on the like hood of women to engage in an income-generating activity by 2.3 pp. The coefficient is significant at the point closest to the cut-off; the bias may increase for observations farther from the cut-off as the age of the respondents decreases. It is possible that respondents are not working or still studying because of their age.

Figure 2.5: Respondent Who Earns Income



2.9.2 Fertility Decisions

Decision-making power is one of the most important indicators of empowerment. The relationship between women's empowerment and their fertility is one of the main focus of gender and development studies. An increase in educational attainment and economic opportunities are likely to lead to higher decision-making power; hence, greater autonomy over fertility decisions (Phan, 2013). Educated women are more likely to have control over having a child or not rather than their husbands/family or society. In North Sudan, the total fertility rate (TFR) per woman decreased from 6.02 to 4.59 children, so almost by 25% between the years 1975 to 1993 (Eltigani, 2000). In contrast to the majority of African countries, this progress is not attributed to the increased use of family planning methods but the expansion of educational opportunities both for female and male. Therefore, this section intends to understand whether the free and compulsory education policy of the 1999/2000 academic year had a discrete impact on women's decision-making power over their fertility.

Women's ability to make their fertility decisions can also be a proxy for women's decision-making power. The variable of interest assesses whether having a child was the women's or husbands'/partners' decision. To obtain the results, the dataset is restricted to the ever-given birth sample, and summary statistics in Table 2.1 (Panel B) indicates that 71% of the women report that having a child was their decision. The descriptive statistics in Table 2.1 show that the women bounded up by the policy are almost 8% more likely to make their own decision on having a child. The positive coefficient of the regression results on Panel F in Table 2.2 indicate a positive impact of the policy, but it is not significant. The effectiveness of policy may be limited because persistent and dominant norms which consider motherhood as the primary responsibility of the women and large

family size as an asset are not challenged by this education policy.

2.9.3 Attitudes Towards Domestic Violence

Domestic violence is a public problem and a violation of human rights. It is important to shape women's behaviour because if women tend to accept the violent behaviour of their intimate partner. Women's tolerance towards domestic violence limits the effectiveness of governmental and non-governmental organisations and their help-seeking behaviour leading to negative consequences for them (Guracho and Bifftu, 2018). Women with domestic violence experience often report low self-esteem, low self-efficacy and inability to deal with negative emotions (Shields and Hanneke, 1983). Education can play an important role to change women's attitudes towards accepting domestic violence by empowering them as they become more aware of their rights. Hence, another variable of interest to assess the women's empowerment is whether they justify being beaten for any of the reasons such as arguing with their husband, neglecting children, going out without permission, burning the food or refusing to have sex. Panel B in Table 2.1 shows that 43% of women justify domestic violence for at least one of the reasons stated above. The treatment group is 3% less likely to accept domestic violence (Table 2.1). Despite the negative coefficient, the IV estimations on Panel F in Table 2.2 do not present any significant results despite the negative coefficient indicating that tolerance towards domestic violence decreases with increased years of education.

2.10 The Effects of Increased Years of Schooling on Children's Well-being

2.10.1 Views on Female Genital Mutilation

FGM is a severe problem in Sudan which is solely rotted in customs, and almost all girls are circumcised, and UNICEF MICS 2014 suggests that 86.6% of girls aged between 15-49 are circumcised. FGM is a human rights violation, and as it significantly reduces girls' welfare. FGM harms the girls physically, psychologically and sexually; it causes long-lasting pain, recurrent urinary and vaginal infections, post-traumatic stress and severe pain during sexual intercourse, and complications during childbirth (UNFPA, 2020). FGM is generally associated with Islam as it is common in Muslim African countries. FGM has no place in Islam. Although the roots are unknown, it originated before Islam as FGM traces were present on ancient Egyptian mummies (Kouba and Muasher, 1985). FGM has no health benefits, but it may lead to severe bleeding, cysts, infections, complications in childbirth and increased new-born deaths (UNICEF, 2014b). The lack of education significantly affects opinions about FGM. In Northern Sudan, almost 90% of the girls undergo this practice, and only the young and well-educated people are against it (Almroth et al., 2001).

Education is identified as one of the most effective ways to eradicate FGM as laws and regulations seem to be ineffective due to the cross border FGM. For instance, although FGM is forbidden in Kenya, girls are taken to Uganda, Tanzania, Somalia and Ethiopia, where this practice is legal (Bhalla, 2018). Panel B in Table 2.1 suggests that 40% of the individuals think that this practise should continue. The descriptive statistics in Table 2.1 indicate no difference in the views of

the treatment and control group about the continuation of FGM. In both groups, almost 40% of the individuals are in favour of the continuation of this practice. The regression results on Panel F do not show a significant correlation between the treatment group and the continuation of FGM.

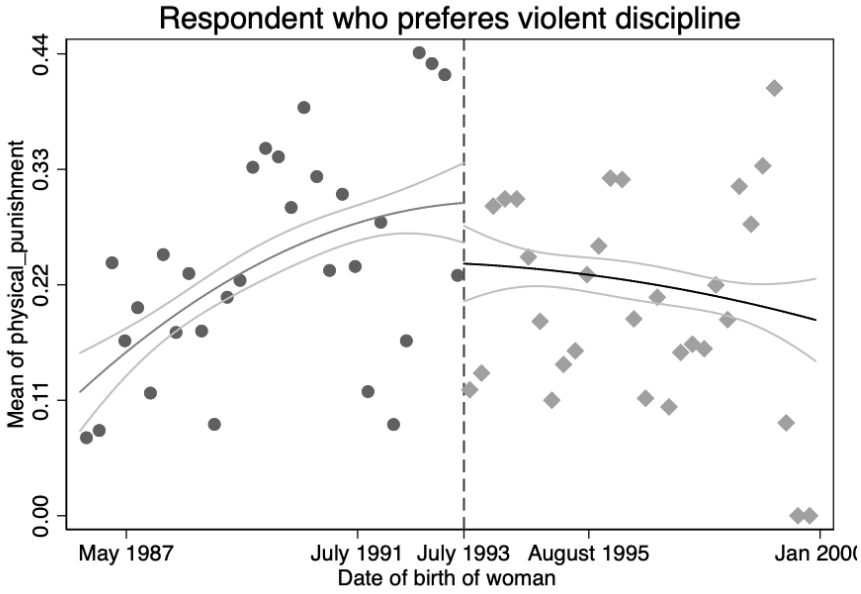
2.10.2 Physical and Psychological Violence Towards Children

Parents may tend to rely on violence, both psychologically and physically to shape their children's behaviour in the desired way. All forms of violence are unacceptable. UNICEF MICS data from 28 African countries put forth that 43% of the children aged between 2-14 are exposed to violence by their caregivers (Devries, 2016). In Sudan, physical violence towards children is integrated into the culture, and 64% of Sudanese children aged between 1 to 14 experience physical and psychological punishment (UNICEF, 2014a). Violent discipline by parents is worthy of investigation as it leads to reduced well-being and development of children. Corporal punishment is associated with adverse mental health outcomes in children (Mackenbach et al., 2014). Berger (2005) identifies that a violent past has adverse health and social consequences as it causes aggression towards children, depression and alcohol consumption. Khosravan et al. (2018) conduct a controlled trial study on 64 abusive mothers. They assigned 32 of them to the intervention group and the other half to the control group. The intervention group received educational interventions based on child growth and followed up for eight weeks through home visits. The educational programs improved parenting attitudes and reduced the prevalence of child abuse among the mothers in the intervention groups.

This section looks at maternal education and the tendency to resort to violence

while disciplining their children. 23% of the respondents think it is okay to use physical punishment on their children instead of positive parenting, such as dealing with a child's emotions by encouraging appropriate behaviour while preserving the children's self-esteem and physical and psychological integrity. The negative and significant jump on the RD pathway in Figure 2.6 along with the negative and significant regression coefficient suggest that compulsory education policy improves parents' behaviour towards children.

Figure 2.6: Respondent Who Uses Physical Punishment



2.10.3 Child's Size at Birth

Farah and Preston (1982) investigate the regional variations in child mortality in Sudan. Their results put forth that education has a persistent and robust impact in reducing child mortality, and their model implies that achieving ten years of schooling reduces mortality by 36 per cent. Low birth weight is an indicator

of public health problem caused by maternal malnutrition or poor healthcare during pregnancy, and it is one of the leading causes of child mortality. Just like most developing and underdeveloped countries, low birth weight is common in Sudan. The WHO defines low birth weight if the child's weight at birth is less than 2500 grams. The data for this outcome is also only available in the 2014 dataset; hence the number of observations is 2,702. This section explores whether the compulsory education policy in Sudan had a discrete effect on birth weight. To assess that the mother reported birth weight data is used and if the child's birth weight is less than the average; the child is classified as low birth weight. The Summary Statistics on Panel B in Table 2.1 shows that 14% of the children's birth weight is less than the average. The descriptive statistics in Table 2.1 shows that the prevalence of low birth weight in the control group is 15%, and in the treatment group, it is 13%. The negative regression coefficient in Table 2.2 (Panel F) is insignificant but still indicates an improvement in the child's birth-weight. The children of the women born after July 1993 are less like to have a birth weight less than the average.

2.11 Robustness Checks

The aim of the robustness checks to make sure that the results are robust to higher-order polynomials. This can be estimated by changing the bandwidth around the cut-off. The central assumption of the regression discontinuity is that the only difference between the treatment and the control group is solely caused by the policy change. Placebo checks are conducted to ensure that the relationship between the policy change and outcomes is genuinely causal by looking at the jumps at various cut-off points.

2.11.1 Non-Parametric Estimations

Table 2.3: Non-Parametric Estimations

Panel G: First Stage Sharp RD Estimates						
Indicator	**Treatment**	**s.e**	**N**	**N left**	**N right**	**h**
Completed Primary	0.078 ***	0.021	15,351	2,154	2,540	20.193
Ever Attended School	0.006	0.033	15,351	1,284	1,828	13.517
Can Read	0.055*	0.027	15,351	2,985	2,865	27.570
Panel H: Second Stage Fuzzy RD Estimates						
Indicator	**Treatment**	**s.e**	**N**	**N left**	**N right**	**h**
Women's Welfare						
Married before the age of 18	-0.041	0.035	7,125	836	450	19.158
Number of Children Born	-1.190	1.116	5,601	413	553	15.120
Given birth at the hospital	0.893	0.829	5,601	378	537	14.714
Women's Empowerment						
Respondent earns income	2.057**	0.716	5,053	229	459	10.105
Justifies Domestic Violence	-0.026	0.325	15,351	2,040	2,481	19.889
Fertility Decisions	1.050	1.050	5,601	649	648	21.226
Children's Welfare						
FGM Should Continue	0.387	0.418	15,351	1,747	2,225	17.879
Physical punishement	-2.601*	1.296	9,275	819	1,249	17.738
Size at birth	-0.545	1.011	2,702	377	497	22.840

* p<0.05, ** p<0.01, *** p<0.001. Standard errors are clustered according to the running variable.

For sound RDD estimations, it is essential to include graphical representation and both parametric and non-parametric regression analysis. As indicated by Lee and Lemieux (2010) non-parametric estimations are considered as a complement to the parametric estimation. With a finite sample, it is not possible to know which method would produce the most accurate results; therefore, the paper implements both. The main results are produced by parametric estimation (local linear approach), which uses the data close to the cut-off point. To reduce the bias, the robustness checks include the non-parametric estimations. The Table 2.3 shows the non-parametric estimations. The results of non-parametric estimations indicate that the main results are robust to different bandwidths as there is no significant difference in magnitude and level of significance between the non parametric estimations and the coefficients in Table 2.2.

2.11.2 Placebo Checks

Placebo tests are necessary to examine if the RD design's fundamental assumption that is to ensure that the jump at the cut-off is not influenced by other factors. The placebo tests involve assessing the evidence for discontinuities in pre-treatment covariates (De la Cuesta and Imai, 2016). This paper conducts placebo checks to ensure that the discontinuous jump at the cut-off is not random and results from the policy change. To do that, different birthdays are used as the cut-off for the variable of policy interest, which is the primary education completion rate. As illustrated in Figure 2.7 , there is no discontinuous jump at any of the cut-offs, and the first stage regressions in Table 2.4 shows small and insignificant coefficients that do not indicate any change across the cut-off.

Figure 2.7: Placebo Pathways

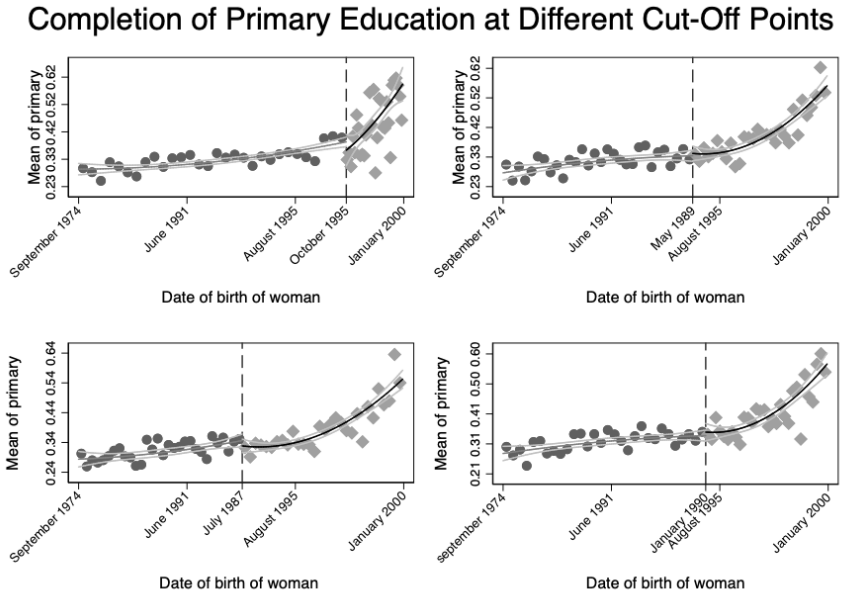


Table 2.4: Placebo Estimations

Completion of Primary Education						
Birth Date	**Coefficient**	**s.e**	**N**	**N left**	**N right**	**h**
July 1987	-0.03	0.030	15,351	1466	1585	10.243
May 1989	-0.002	0.020	15,351	385	540	5.667
January 1990	0.004	0.042	15,351	1682	1308	12.652
October 1995	0.031	0.064	15,351	1295	1027	13.397

The table shows the non-parametric estimation of completion of primary education at different cut-off points.
* p<0.05, ** p<0.01, *** p<0.001.

2.11.3 Power Calculations

The paper faces the weak identification problem. In FRD, weak identification corresponds to the situation where the discontinuity is of a small magnitude (Feir, Lemieux, and Marmer, 2016). Weak identification is a common and an important problem in FRD. Despite the large datasets, in FRD, the estimations are made based on the data around the cut-off, and this decreases the number of effective observations. Using the F-statistic to validate the instrument may be misleading. Feir, Lemieux, and Marmer (ibid.) suggest a simple modification to the t-test that eliminates the asymptotic size distortions caused by weak identification. To address this issue, power calculations are provided in this section.

This section analyses the ability of the dataset to produce valid results and the optimal sample size required to conduct the analysis. The sample size can directly affect the results and can lead to endogeneity. If the sample is not sufficiently 'powered', the paper fails to establish the relationship between the outcome and treatment. Therefore, it is essential to include sample size estimation to determine the number of observations required to provide valid research (Jones, Carley, and

Harrison, 2003). Although a statistical power analysis is frequently conducted for Randomised Control Trials (RCTs), as the paper does not present statistically a significant causal relationship, it is essential to make sure that the sample size is sufficient and powered enough to capture significant results.

RDD requires larger sample sizes than the Random Assignment Design (RAD) for a robust estimation with the same level of statistical power (Schochet, 2009). This section analyses the ability of the dataset to produce valid results. If the sample is not sufficiently 'powered', the research fails to establish the relationship between the outcome and treatment. Power calculations are conducted for all the variables included in the analysis and represented in Table 2.6, in the Appendix. H0 in Table 2.6 specifies the significance level for the power function and the default is 0.5 and the desired default power is 0.8. The power is usually tested against τau, the default for τau is half the standard deviation of the outcome for the untreated group, and the threshold is 0.8 (Cattaneo, Titiunik, and Vazquez-Bare, 2019). For the outcome variables of engagement in income generation, fertility decisions, justification of domestic violence, views on FGM, child discipline and child's birth weight, the sample is powered enough as the τau is higher than the threshold of 0.8. This indicates that if the analysis is performed 1000 times, a statistically significant difference can be observed 80% of the time. The results suggest that for some of the outcome variables, the sample is not powered enough to capture significant results in some of the variables. These outcomes are; married before 18, the number of children respondent given birth to, and given birth at a hospital as $\tau au < 0.8$.

2.12 Limitations

The study can be further extended to include boys' participation in education and to make a comparison between boys and girls. In addition, the analysis would be more accurate if years in education were used as a continuous variable as a first stage outcome. This data set lacks information on these variables. The wave of the survey to be released in 2021 could include data on boys' participation in education and the number of years in education so that a comparative and more accurate study can be produced that contributes to the existing analysis. The conflict in Sudan is a very well-known issue, and South Sudan gained independence in 2011 as a result of the 2005 agreement. The data only includes respondents from regions in North Sudan, which is also known as the Republic of Sudan. This provides further room for improvement by conducting a comparative analysis between these two countries, which recently separated.

One of the identification assumptions of RDD is that covariates should be smooth across the cut-off, meaning that they should not be affected by treatment status. Including covariates in the regression also mitigates small sample bias and increases the precision of treatment effect estimates (Frölich and Huber, 2019). The estimations could be improved was to control for the settlement region (urban/rural) of the respondents and level of education of their parents, but the dataset does not include information on these variables. If this issue is also addressed in datasets that are published, a more precise estimate can be obtained.

2.13 Discussion

The policy fails to encourage participation in education, so the second stage estimates do not produce significant outcomes. This requires further analysis to

understand the reasons why the policy has been ineffective in increasing primary school enrollment.Although the estimates presented in the paper are consistent with what the literature suggests in terms of empowerment outcomes, the paper does not show significant results in terms of improved health and well-being.

The poverty in Sudan is high and differs substantially between urban and rural regions. Urban regions are wealthier, but 26.5% of the population live below the poverty line. In the rural areas, 57.6% of the population lives below poverty. The regional disparities are the strongest predictor of participation in education due to poverty. Also, most of the community lives in rural regions, but the schools are located in urban areas (Demombynes, 2011). Long travel distance to schools in rural areas is one of the most prominent factors that hinder girls' access to education (World Bank, 2012). The inability of parents to afford the fees also impedes participation in education. Although education is free in Sudan, there are costs associated with school uniforms, textbooks and stationery. Besides, government spending on primary education is particularly low in Sudan, which means that households have to contribute to schools' maintenance, water and electricity and payments of teachers if they are sending their children to a school. These costs vary between 12 to 15 Sudanese pounds (SDG) per student. The government is investing in building schools; in 2008-2009 the number of schools is increased to 16,290, but in 2004-2005 that was shortly after the introduction of the compulsory schooling academic year the number of primary schools was only 13,125 (Demombynes, 2011). Just like many other sub-Saharan countries and the countries of conflict, Sudan also has a high number of child labour. This number varies dramatically across the states; 49.4% of children are engaged in child labour in East Darfur while 11.2% in River Nile. In total, UNICEF (2017a) reports that a quarter of children are missing out on education due to child labour. Figure 2.8 in

the Appendix compares the treatment and control groups and shows some of the main reasons that prevent girls from attending school. The figure indicates that after taking an essential step towards the goal of Universal Primary Education, the government failed to address the existing problems such as the unavailability of schools and fees which discourages the families from sending their daughters to school as well as the early marriage which requires changing the personal status law. Almost 21% of the women in the treatment group reported that fees are the main reason why they could not attend school, almost 28% of them could not attend due to early marriage and the primary issue is the unavailability of schools as 41% of girls reported this as the primary impediment.

Dabanga (2017) states that developing economies like Sudan should spend between 5% and 7% of their GDP on Education. Tunisia, where girls' participation in education is higher than men's, spends 7% of its GDP on education while the Sudanese Government's spending lies around 1 and 1.4% World Bank Data indicates that the Sudanese government spent 1.63% of GDP on education in 2000, which is right after the implementation of the compulsory schooling law. Increasing participation in education not only require reducing or eliminating the cost of school, which is already done in Sudan but also subsidise attendance by providing uniforms, textbooks and stationery needed for the students. This means a substantial increase in government spending (Kremer, 2003).

2.14 Conclusion

This paper employs RDD, which identifies the causal effect by comparing the observations that are on different sides of cut-off, otherwise similar. The aim of the paper is to evaluate the extent to which the compulsory education law has been

successful in Sudan, one of the least developed countries. The paper analyses many different variables related to women's empowerment and welfare, as well as children's well-being that the policy could impact in order to assess the causality. By examining several variables by referring to the relevant literature, the paper determines how education policy might affect these outcomes and how reform in Sudan might be accompanied by additional institutional changes to achieve these outcomes.

The reform successfully addressed the dropout issue, which is highly complex as it occurs after the children gain access to education, but its effect on the well-being of women and children is limited. The government still needs to handle the existing issues which hinder participation in education. In Sudan, most of the population lives in rural areas and the schools are located in urban areas so more investment in providing access to schools, free textbook and uniforms along with complementary policies such as the marriage law and prohibition of child labour can increase the participation in education. Also, as a Muslim country where one of the strictest forms of Sharia is practised, more investment in building single-sex classrooms would encourage the parents to send their daughters to school. An increase in completion rates led to better empowerment outcomes like more engagement in income-generating activities. This indicates that by accompanying the policy with adequate infrastructure to encourage the families to send their daughters to school, better development outcomes can be attained. In general, development policies may remain ineffective in countries like Sudan where the customary laws are dominant and gender roles are determined by the norms. There also is a role for non-governmental organizations to play in such cases. They can provide training opportunities that open new doors to women to participate in employment because the development policies require the norms

and traditions to be challenged.

The paper contributes to the existing literature by analysing compulsory education policies that lead to better development outcomes in developing and developed countries in the Sudanese context. This allows understanding how these policies should be implemented and accompanied by additional institutional and legal changes to achieve the desired results in more conservative and least developed countries. The paper not only conducts an analysis to understand the causality between compulsory education reform and development outcomes, but also identifies the reasons why the policy has failed in certain aspects and how these problems can be addressed.

2.15 Appendix

Table 2.5: Description of Variables

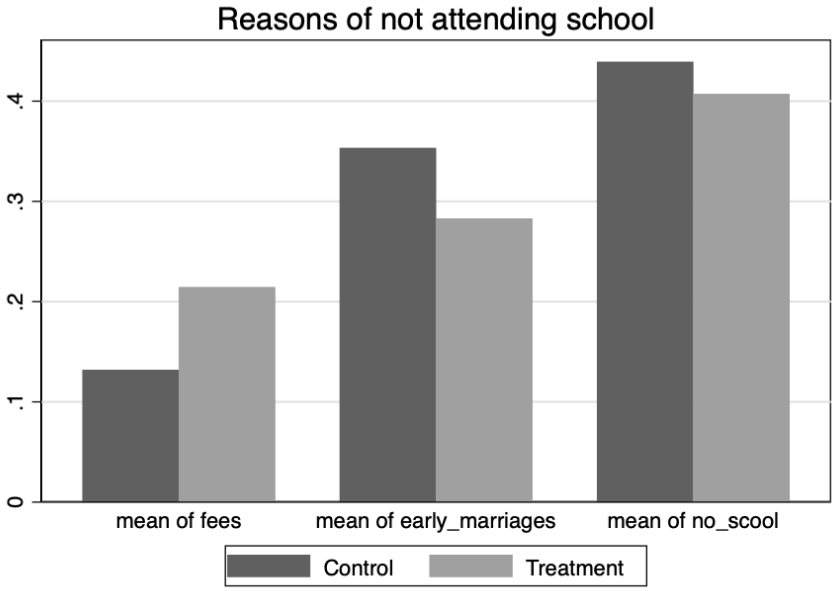
Variable	Description
Completed primary education	This variable assesses whether the respondent has completed primary education or not. This variable takes 1 if the respondent reports that she has completed the primary education and 0 if not.
Ever attended school	This is a yes or no question and assesses whether the respondent has ever gone to school or not. If the answer is yes, the variable takes the value 1 and 0 is the answer is no.
Literacy	This variable takes the value 1 if 'the respondent can read and understand a sentence either by being able to read it fully or partially.
Married before 18	This dummy variable assesses whether the respondent got married before the universally accepted age of marriage which is 18 or not.
Number of children	This is a continuous variable of the number of children the respondent has. It only includes the responses from the women who have given birth.
Given birth at the hospital	This variable also only consists of the women who have ever given birth and it is a dummy representing women who gave birth at a hospital.
Engaged in income generating activity	This is a dummy variable that includes the women who are engaged in buying and selling articles and in an income generating activity.
Justifies Domestic Violence	This is a variable that combines the women who answer "yes" to five specific domestic violence questions. These questions involve justification of violence in the case of arguing with husband, neglecting children, going out without permission, burning food and refusing to have sex.
Fertility Decisions	This variable identifies the women make their own decision on having a child and pregnancy.
FGM should continue	This variable identifies the respondent's opinions about the continuation of the FGM practice. It is a dummy variable and takes the value "!" if respondents things that FGM should continue.
Physical punishment	This variable evaluates the mother's behaviour towards their children. It is a dummy variable and include the women who has a preference towards physical punishment to discipline the child.
Child's Birth-weight	Child's size at birth is one of the main determinants of mortality. This is a dummy variable and become 1 if child's birth-weight is less than the 2500 grams.

Table 2.6: Power Calculations

Variables	H0: tau	0.2*tau	0.5*tau	0.8*tau	tau
Married before 18	0.05	0.079	0.237	0.511	0.700
Number of children	0.05	0.075	0.216	0.466	0.649
Given Birth at the hospital	0.05	0.083	0.267	0.570	0.762
Respondent earns income	0.05	0.091	0.315	0.656	0.840
Having a child was her own decisions	0.05	0.092	0.324	0.671	0.851
Justifies Violence	0.05	0.392	0.988	1.000	1.000
FGM Should Continue	0.05	0.187	0.761	0.990	1.000
Physical Punishment	0.05	0.197	0.787	0.993	1.000
Child's birthweigh is smaller than av.	0.05	0.109	0.422	0.806	0.942

Notes: The power calculations are conducted by using the *rdpower* command that provides power calculations for the RDD.

Figure 2.8: Reasons of Absence from Education



Notes: The data for this figure is from the 2014 Sudan MICS and, it is restricted to women respondents to show the primary factors that prevent girls' participation in education.

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Chapter 3

The Causal Effects of the Free Health Insurance Policy on the Well-Being and Health Utilisation of Jordanian Children

The provision of free health insurance can be considered as an essential step towards achieving Universal Health Coverage (UHC). The paper estimates the causal effect of the Jordanian government's free health insurance policy, which covers children under the age of six, on children's health care utilisation, well-being and development. This health insurance policy provides eligible children with free health care at any hospital or health centre embodied by the Ministry of Health. Using the Regression Discontinuity Design and 2017 Jordan Demographic Health Survey data, the paper estimates that children under age six are 17 percentage points more likely to be insured. The increase in insurance coverage leads to more frequent hospital visits, a preference for private hospitals and an improvement in children's well-being.

3.1 Introduction

Access to health care at an early age is essential for children's development, future health and well-being. There is an urgent need to examine the impact of health insurance policies on facilitating access to health care to achieve desired health outcomes. Millennium Development Goals (MDGs) 4, 5 and 6 address the importance of health care. MDG 4 aims to reduce child mortality by at least two-thirds, MDG 5 focuses on improving maternal health, and MDG 6 calls for action to eliminate HIV/AIDS and epidemics such as malaria. Sustainable Development Goal (SDG) 3 ensures the health and well-being of people of all ages. SDG target 3.8 highlights the need for UHC to ensure that people and communities have access to quality health services without risking financial hardship. In line with the MDGs and SDGs, many low- and middle-income countries have adopted UHC policies to enable low-income households to access health services (Ogbuabor and Onwujekwe, 2018). Continuous review and improvement of government health care systems are critical to the well-being of society in the face of changing demographics, the risk of epidemics and pandemics, and rising health care costs. Undoubtedly, children under the age of five are the most vulnerable group, as any health problem that occurs in the early stages of life can lead to lasting problems that have a negative impact on children's development later on (Grantham-McGregor et al., 2007).

Children's lack of access to health care is mainly attributed to poverty or not having health insurance. A growing line of the literature emphasises the importance of school children's access to health care. The goal of UHC policies is to mitigate financial barriers to accessing health services, protect vulnerable populations by ensuring coverage for the entire population, and provide the full

range of health services needed. UHC primarily aims to ensure adequate access to prenatal and postnatal care, assisted deliveries and cesarean sections, as well as health services for children and the elderly above a certain age. These services are chosen to primarily protect the poor and vulnerable segments of the population (Kutzin, 2013). UHC policies are particularly well suited to low- and Middle-Income Countries (LMICs) and are being adopted by many of these countries to make progress on the SDGs. The Jordanian government is committed to further improving health services to make them accessible to all citizens. One of the most important initiatives of the Jordanian government is related to the implementation of the Civil Health Insurance Plan (CHIP), which has been in force since 1965 and is continuously updated.

Children in LMICs have particularly limited access to health services (Bright et al., 2017). Expanding worldwide consideration is being drawn towards UHC, and health insurance policies play a strategic role in that drive. This paper focuses on the free health insurance coverage provided by the Jordanian government to children under the age of six. In accordance with the framework of CHIP, the government began offering health insurance to all government employees, their dependents, disadvantaged households and children under the age of six in 2002. The government also subsidises health services that benefit uninsured households (Library of Congress, 2006). Nevertheless, health care financing is a challenge for Jordan, similar to the case of every other country. The government reportedly spent 8.7% and 7.5% of GDP on health care in 2016 and 2017 respectively (Madae'en and Adeinat, 2018). Rawabdeh and Khassawneh (2018) notes that Jordan has the highest healthcare spending compared to most MENA countries, such as Egypt, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and Yemen. Jordan also has one of the lowest infant mortality rates in the MENA region with 13.64

deaths per thousand live births. However, this figure still needs improvement. . Therefore, free health care for children under the age of six in Jordan is worth exploring to understand the impact of government policies and how these policies can be implemented and monitored to improve their effectiveness. The paper uses DHS IPUMPS data and employs Regression Discontinuity Design (RDD) to assess the causal impact of free health insurance on health care utilization and developmental outcomes of eligible children. In RDD, children on either side of the cut-off are considered similar in the absence of treatment, and are assumed to be randomly assigned to insurance coverage. The differences in outcomes for children beyond the cut-off are caused by the change in eligibility status for free health insurance. The paper also uses data from the United Nation (UN) sources for analytical background information. The results are presented both as empirical estimates and as graphs. The RDD generates an unbiased estimate of treatment effects under certain assumptions. Therefore, in addition to the main results, the paper also includes robustness checks to validate the assumptions and main results. The Discussion and Conclusion sections assess the implementation of the policy and suggest ways to improve its effectiveness.

As defined in the WHO Constitution, accessing the best possible health care is a human right. Achieving UHC is important in Middle East countries because some of the Arab countries have inequitable health care systems that are the reason for the poor well-being of the citizens, which has also contributed to the uprisings in the Arab world (Saleh et al., 2014). Devarajan and Ianchovichina (2018) emphasize the broken social contract between the government and public as a reason of Arab Spring. Government is supposed to provide free services such as education, employment and healthcare, but due to the low quality of these services, people had to resort private services such as; private tutoring ad private

clinics. This in turn increased the dissatisfaction with the governments and public started raising their voice. DHS datasets have recently begun to include data on insurance coverage, and there are only a few studies that establish a causal relationship between insurance policies and changes in health and health utilisation in developing countries. This paper contributes to the understanding of the effectiveness and weaknesses of free health insurance for children by focusing on an Arab LMIC country, and provides insights on how these interventions can be accompanied to lead to better health outcomes by using fuzzy RDD, a robust methodology for analysing the effectiveness of health insurance interventions.

3.2 Literature Review

3.2.1 The Importance of Health Insurance Policies

Health is associated with socioeconomic status, educational attainment, and occupational prestige. For example, children from low-income households are more likely to have low birth weight, increased risk of preterm birth and chronic diseases later in life (Cesarini et al., 2016). It is important to adopt appropriate health policies to maintain a healthy population, regardless of an individual's socioeconomic status. The financial barriers faced by low-income individuals without insurance act as a barrier to accessing health care. The lack of insurance affects the quality of health care received by the population more than demographic and economic factors (The National Academies of Sciences and Medicine, 2018). Health care affects children's physical and emotional health, growth, and development, enabling them to reach their full potential. Therefore, children's access to health care is of great importance to children themselves, their families, and society. Carr, Zeitel, and Weiss (1992) examine the outcomes of children hospitalised for the same reasons, and mortality rates are nearly 1.5 times higher among unin-

sured children compared with insured children. Coye, Edmunds, et al. (1998, p. 46) indicate that in the USA, there is no difference in prevalence of chronic and acute diseases among insured and uninsured children. However, there is a significant difference in their contacts with physicians as 17% of uninsured children not likely to receive medical treatment even in the case of a serious infections that hinders participation in education. Currie, Decker, and Lin (2008) state that in the United States, expanding health insurance to low-income children and raising the eligibility age has increased health care utilisation and had a positive impact on health in later life (ibid.).

Investment in health care is fundamental to economic growth and development; without good health, children cannot participate in education and adults cannot participate in the workforce. Nearly one billion people do not have access to health care, and at least half of the world's population cannot attain basic health care needs. Health care spending also has a significant impact on household well-being, consuming a substantial portion of the budget. Universal Health Coverage (UHC) can be the solution to ensure that everyone receives health care when and where they need it without facing financial hardship (World Health Organization, 2017). Achieving UHC paves the way to achieving the World Bank Group (WBG) goals of eradicating extreme poverty and increasing equity (World Health Organization, 2018). Moreno-Serra and P. C. Smith (2012) also highlight that out-of-pocket health care expenditures can strain households, and their cross-country empirical evidence suggests that UHC facilitates access to health care, which improves population health, particularly the health of low-income households.

UHC is not necessarily about free care or health financing, but it is about im-

proving the health care system by making it accessible and affordable to all, and by improving quality (World Health Organization, 2019). Insurance is one of the most important tools that enable achieving the UHC. In an effort to meet UHC requirements, China has established a public health service system, a medical service system, a health insurance system, and a drug and supply security system. Accelerating the construction of the basic health insurance system was the most important reform undertaken by the Chinese government between 2009 and 2011 to achieve UHC by 2020 (Tao et al., 2020). There are many health insurance plans; in most countries such as Germany, Switzerland, France, Canada and Australia, the government funds privately provided health care. For example, the German government infuses funds into the system to ensure that low-income households are covered; in Canada, the government funds health insurance and the private sector provides it. In the USA, there is the Affordable Care Act (ACA), also known as Obamacare, which is designed to make health insurance accessible to all by lowering the cost for those who cannot afford it. The U.S. government mandates the purchase of health insurance for everyone, including healthy young people who pay high premiums. The government subsidises health insurance of individuals who are in financial hardship. These subsidies are funded by higher taxes on health care providers, but the high premiums young people pay offset the increase in taxation (Amadeo, 2018). Rwanda's government has implemented a "community-based health insurance" system that subsidises low-income households by generating revenues from premiums (Kutzin, 2012). United Kingdom and Austrilia have been relying on private provision of health care services that brings about more competition, promotion of consumer empowerment (Harley et al., 2011).

UHC should be provided at all levels to ensure optimal quality of healthcare

and attain the best health outcomes for children (Poda, Hsu, and Chao, 2017). UHC aims to ensure a certain level of equity across countries in terms of capacity and access, access to primary hospitals, access to necessary hospitals, density of health workers, health security and access to essential medicines. It is an integral part of achieving the highest standards of health, as access to essential medicines saves lives, reduces suffering and improves health (World Health Organization, 2020). The free health insurance policies are implemented to achieve the UHC aim to provide sustainable access to reliable, effective, quality and affordable essential medicines and vaccines for the eligible (Poda, Hsu, and Chao, 2017).

The Indian state of Karnataka, the Philippines, Taiwan, and Vietnam are the best-known countries that have implemented health insurance programs mainly targeting children. The programs in each of these countries were different, but served as important examples of the actions taken to achieve UHC. In Karnataka, a government-funded health insurance scheme was introduced to cover school children. Taiwan updated health insurance policies to provide coverage for the uninsured population, such as children under 14 and adults over 65, by providing those free annual check-ups and vaccinations for children under 14. The Philippines has introduced a program that covers school-age children. Vietnam has been expanding the free health insurance coverage since 1986 by adding up beneficiaries from different groups such as civil servants and formal sector employees, war heroes and veterans of the socialist revolution, low-income households, and children under six years of age (Palmer et al., 2015). Sri Lanka that has better health outcomes than its South Asian peers implemented public-private partnership to achieve UHC. The country is providing free public health services at primary level and since 2007, publicly financed health insurance scheme is in place that covers the students (Ramya Kumar, 2019).

Change in the insurance status of individuals is a common occurrence when they lose their jobs, when their income level changes, or because of age eligibility. Osei Asibey and Agyemang (2017) examine the impact of health insurance status on health care utilisation in Ghana, an LMIC that suffers from poorly implemented health policies. Their results suggest that individuals with active health insurance coverage tend to visit health services more frequently and low levels of health care utilisation leads to worryingly poor health outcomes.

3.2.2 Jordan's Health Profile and Health Insurance Policy

Jordan has one of the most sophisticated and progressive healthcare systems in Middle East, and remarkable progress has been made because of the health policies implemented and constantly updated since the 1980s. The country has achieved universal health immunisation and made progress in reducing potential health risks for children and maternal mortality. For example, the country has been polio-free since 1995 (World Health Organisation, 2006). The child mortality rate in Jordan is the lowest compared to other MENA countries, and JDHS 2012 report suggests that the child mortality rate has been decreasing steadily since the 1990s. All types of immunizations are available to 93% of children under the age of two, and 100% of children under the age of six can access all types of health services as they are covered by the national health insurance (The Hashemite Kingdom of Jordan, 2014; Ozawa et al., 2019).

Jordan's healthcare system comprises public/semi-public and private facilities that provide hospitals, primary care clinics, pharmacies, and ancillary services. Rawabdeh and Khassawneh (2018) indicate that by 2018 mainly Ministry of Health (MoH) and Royal Medical Services (RMS) is responsible for providing

health care services to 70% of the population. Jordan University Hospital and Jordan University of Science and Technology Hospital serve 5% of the population. 21% of the population utilises private hospitals, and the remaining 4% uses missionary health services. Table 3.1 compares public and private hospitals in Jordan. There has been a continuous investment to increase the number of hospitals in the country and it can be seen that private hospitals outnumber the public hospitals.

Table 3.1: Number of Hospitals in 2003 & 2017

Sector	*2003*	*2017*
Ministry of Health	29	31
Royal Medical Services	10	15
State Universities	2	2
Private Sector	56	69
Total	97	117

Source: (Private Hospitals Association, 2017; The Hashemite Kingdom of Jordan, 2014)

The MoH is responsible for regulating and auditing the entire health sector and acts as the leading provider of primary, secondary and tertiary level health services in the public sector (The World Bank, 2017). Nazer and Tuffaha (2017) show that almost 80% of the Jordanian population hold insurance with the public sector and the rest is covered by private insurance, United Nations Relief and Works Agency for Palestine Refugees (UNRWA), and other sources. Children under six years of age and citizens who are 60 years old or older are eligible for free insurance in the public health sector. Public sector provision includes the health services of MoH, university hospitals as well as those of the military Royal Medical Services (World Health Organisation, 2006). Free health insurance for children under the age of six is implemented as a part of the health sector reform by Royal decree. Prior to this reform using public health services was not

free for the children under the age of six. The free health insurance reform also comprise of the civil servants and their dependents as well as poor and disabled individuals (Kaldewei, 2010). Private insurance in Jordan only reimburse a part of the expenses so using outpatient services would cost around 16.1 Jordanian Dinars with private insurance and 46.2 Dinars for people without insurance. For inpatient care, people without insurance pays around 143.7 Dinars while insured individuals pay only around 32.1 Dinars (Bietsch et al., 2020).

One of the main reasons underlying this free insurance policy for children under the age of six is child mortality rates. MDGs 4 and 5 are about improving maternal and child health and reducing mortality. Considerable progress has been made with maternal mortality falling from 523,000 to 289,000 between 1990 and 2013 due to the improvements in Antenatal Care Coverage (ANC) (Kearns et al., 2016). Such policies play a crucial role in achieving good health outcomes, but it is also important to ensure that all citizens have access to these facilities. Women living in disadvantaged areas of Jordan may be unable to attend antenatal visits to hospitals. Those visits are critical to preventing complications during pregnancy (Hijazi et al., 2018). Between 1990 and 2007, with the help of the free health insurance policy for children under six, neonatal and under-five mortality dropped from 33 to 21 and from 40 to 24, respectively. (Kaldewei, 2010).

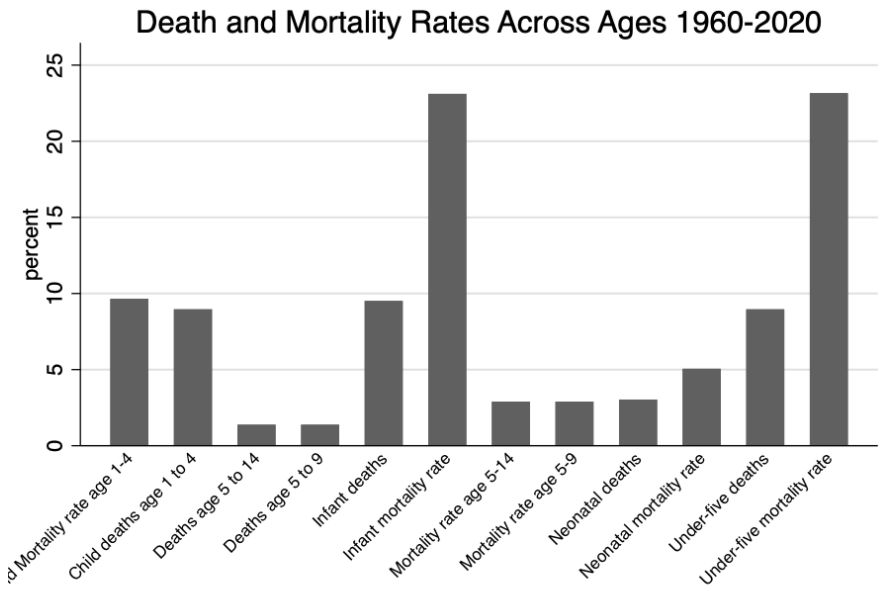
3.2.3 Policy Background

Jordanian Government is committed to achieving the UHC target, especially for the vulnerable individuals that make up 4.7% of the population. In recent years, the government has extended health insurance coverage to children under the age of six and people over sixty. In addition, citizens residing in low-income neighbourhoods are exempt from health fees provided by the MoH (Halasa-Rappel

et al., 2020). This policy has been in place since 2002, and the citizens have to apply for this insurance. Nearly 312,000 children currently benefit from this free health insurance coverage provided by Royal Decree (WHO, 2017; Malkawi, 2016).

This policy is an essential instrument to ensure that all children are vaccinated and protected against all types of diseases. Figure 3.1 illustrates the data from United Nations Inter-agency Group for Child Mortality Estimation (UN IGME) between 1961 and 2020. The data-set aggregates the data from African, European and Asian countries. The figure summarises the global prevalence of mortality in different age groups to provide an overall picture of the urgency of the issue. Infant mortality refers to deaths of children under one year of age and under-five mortality, also known as child mortality, refers to deaths of children under five years of age. Child and infant mortality are communicated as deaths per 1,000 children. The figure shows that the global infant and child mortality rates are almost 24%.

Figure 3.1: Mortality Across Age Groups



Given the vulnerability of young children to risk factors, free health coverage for children under six is essential for immunisation against communicable diseases, school health, and treatment of other illnesses. The introduction of free health insurance has dramatically improved immunisation among children. Measles vaccines coverage increased from 45% in 1982 to 100% in 2005, and the number of children who received the full dose of poliomyelitis increased from 74% in 1982 to 95% in 2005 (Al-Qudah, 2011).

Jordan free health insurance policy for children under the age of six is an important step to achieve the comprehensive health coverage goal. Only a few countries such as Vietnam, Philippines, Taiwan, and Karnataka state of India have employed similar policy targeting children (Palmer et al., 2015). Therefore, there are few empirical studies evaluating the impact of these policies on achieving UHC goal. This paper contributes to the existing literature by analysing free

health insurance policy covering children under the age of six within the context of Jordan and reach to conclusions on effectiveness of the policy and how it can be expanded to result in better outcomes.

3.2.4 Similar Studies

Bernal, Carpio, and Klein (2017) study the efforts of Peru to provide healthcare access to everyone by introducing Social Health Insurance (SHI) which is known as Seguro Integral de Salud (SIS) in the Peruvian context. This insurance coverage scheme targets the low-income population. The eligibility for the SHI scheme depends on the welfare of the household, and by employing the RDD and using the data from the National Household Survey of Peru, they estimate the local average treatment effects (LATE) of insurance coverage for those individuals whose welfare index has a value close the eligibility threshold. The paper puts forth that health insurance coverage increases health services utilisation, improvements in pregnancy care, and vaccination. However, increased utilisation of health services increases awareness of health problems, leading to increased out-of-pocket expenditures on medicines and surgeries.

Medicaid is the largest insurance provider for the children of low-income households, which provides insurance for almost 5% of poor children who live in a household below 200% of the federal poverty line. Mata et al. (2011) employs RDD to identify the causal effect of Medicaid by comparing the children aged between 5-18 who live in households just below the income threshold and to the children who live just above the low-income threshold. Medicaid enrolment is not compulsory, and only 53% of entitled children were enrolled, so that fuzzy RDD is employed to estimate the LATE. Their results suggest that the Medicaid program does not significantly affect utilisation rates for the children belonging to

the high-income group. The utilisation rate of children belonging to low-income households is significantly higher. Although the program improves the awareness of parents about their children's existing health problems, in the short run, it remains ineffective in improving the health of children when the outcomes of obesity and missing more than five school days because of illness are considered. In the medium run, it has a positive health impact on low-income households due to the increase in utilisation but adverse health outcomes for higher-income households as due to the Medicaid eligibility, higher-income households end up using lower-quality healthcare services than they could access.

Palmer et al. (2015) study the causal effect of a free health insurance policy in Vietnam on health utilisation and out-of-pocket expenditures. Public Health Insurance policies in Vietnam are being updated continuously. For instance, in 2003, individuals living in poor households were entitled to non-contributory health insurance, and in 2005, all children under the age of six had become con-contributory beneficiaries as well. The policy was successful in the sense that by the year 2006, 83% of the children under the age of six had insurance coverage, and the coverage was only 26% in 2004. By using the Vietnam Household Living Standards (VHLS) Surveys from 2006, 2008 and 2010, they employed RDD to identify the causal effects of the free health insurance for children on health care service utilisation and out of pocket expenditures. Their results suggest that overall the policy improved access to outpatient and inpatient care, but it did not impact healthcare expenditure.

3.3 Data, Identification Strategy and Estimation Framework

In Jordan, the MoH is the main provider of health services and is supported by USAID. Therefore, USAID keeps track of the improvements in the health system, so this paper uses USAID's Jordan DHS to conduct the primary analysis. The data is obtained from DHS IPUMPS, which provides information on demographic and health indicators. The main results are from the JDHS 2017. The dataset, which includes information on health insurance status, women's and children's health and well-being, development outcomes, health service utilisation, and out-of-pocket expenditures.

There are two groups treated differently in this study. Children up to 72 months of age are eligible for free health insurance by the MoH, and the children beyond the age of 72 months have to pay for their visits to hospitals or health centres. Using RDD with age as the running variable, the paper examines how free health insurance coverage leads to differences in health care utilisation between these groups. RDD is one of the most useful tools for evaluating policy changes. As explored in the literature review, RDD is widely used to evaluate health policies, especially health insurance policies. This paper exploits the discontinuity based on the age of the children, which is the determinant of free insurance eligibility. The paper uses age in months to ensure an accurate analysis and precision of the treatment effect. From the dataset, the age of the children in months on the date of interview is calculated by subtracting the date of birth of the children which is in Century Month Code (CMC) format, from the date of interview which is also in CMC format. The formula for the child's age in months comes from the DHS guidelines and can be generated as follows:

$$ageinmonths = V008 - B3 \tag{3.1}$$

The V008 is the date of interview and B3 is the child's date of birth in CMC format that is a combination of the reported month and year of birth and reported age for living children (DHS, 2017).

RDD was first proposed in educational psychology and has been widely used to evaluate education policies, political economy, and quantitative economic history. Its application in health economics is relatively new due to the popularity of Randomised Control Trials (RCT) popularity (Zuckerman et al., 2006). Basta and Halloran (2019) evaluates the advantages and disadvantages of RDD in evaluating one of the most effective public health interventions, immunisation policies. They conclude that this methodology is well-suited to for evaluations of immunisation programmes because it targets a specific group defined by the running variable and produces reasonable estimates compared to other pre-post designs. RDD also for assessment based on concurrent outcomes in both vaccinated and unvaccinated groups, allowing for comparison between these groups (Venkataramani, Bor, and Jena, 2016).

RDD allows causal inference using observational data by assigning individuals to a treatment or the status quo. RDD is a useful tool for evaluating health policies such as vaccination programmes and free health insurance introduced on the basis of age cutoffs. Free health insurance is the main interest of this paper. The treatment group consists of children older than 72 months, which is the threshold for free insurance eligibility, and the control group includes children younger than this threshold. First, insurance coverage data are used to examine

whether the insurance status of children older than 72 months has changed. Then, health service use behaviours are examined, as these are likely to change due to the change in insurance status. The number of visits to health services such as health centres and hospitals, outpatient visits, and use of private clinics are examined to assess the change in behaviour. To understand the impact of the policy on out-of-pocket spending, the cost of the most recent outpatient visit and other health-related expenditures are considered. To show the causality between the policy and child well-being, the prevalence of wasting among children is analysed.

The first set of results are presented in a parametric form. The change from the cut-off is estimated by setting bandwidths within the six, twelve and eighteen months of the cut-off. To count for the endogeneity of the treatment effect, that is purposefully caused by the changes in insurance status, the estimation framework is Fuzzy Regression Discontinuity. In Fuzzy RD, the continuous variable is not the determinant function of the outcomes; it only changes the probability of receiving the treatment. In Fuzzy RD, and the reason for discontinuity that insurance status becomes the instrument for the second stage estimations.

The simple reduced form of the model is:

$$y_{wi} = \alpha + f(x_i) + D_{wi} + X_{wi}\beta + v_i \tag{3.2}$$

Where y_{wi} is the dependent variable which is the outcome for the individual i at age w, α is the constant, $f(x_i)$ is the continuous variable which is a smooth representation of the age profile and defined by the equation (3.1), D_{wi} the treatment dummy which is the indicator of being older than 72 months. $X_{wi}\beta$ represents the vector of covariates that include the household size, sex of household head

and child as well as the household income and maternal education . v_{ai}^{y} is the unobserved error component.

The first stage variable is the insurance status, and it is estimated by using the ordinary least Squares (OLS). Using OLS for the second stage estimations would lead to biased estimates. Fuzzy RD is similar to the Instrumental Variables (IV) Approach as the reason of discontinuity becomes the instrument and leads to 2SLS estimates. The parametric IV form can be represented as:

$$D_i = \gamma + \beta_1 T_i + \beta_2 \left(A_1 - c\right).T_i + \beta_k \sum_k X_{ki} + \epsilon_i \tag{3.3}$$

$$Y_i = \alpha + \beta_3 D_i + \beta_4 \left(A_i - c\right).T_i + \beta_k^{'} \sum_k X_{ki} + \epsilon_i^{'} \tag{3.4}$$

Where:

- D_i indicates the insurance status of the individual i,
- $\beta_1 T_i$ is the indicator of the treatment group which consists the children aged above less than 72 months old,
- Y_i is the outcome variable,
- β_2 indicates the treatment effect of the insurance policy,
- β_3 indicates the LATE of the children who are covered by insurance,
- β_4 indicates the treatment effect of the insurance policy on second stage outcomes,

- $\beta_k \sum_k X_{ki}$ and $\beta_k^{'} \sum_k X_{ki}$ are the vector of covariates,
- ϵ_i and $\epsilon_i^{'}$ are the error terms.

Regression discontinuity assumes internal validity, which means that the causal inference is valid at the cut-off and that there would be no discontinuity in absence of the policy (Chaplin et al., 2018). Therefore, It thus refers to how confident we can be about the association between an intervention and an outcome (Campbell, 1957). External Validity is the generalisability of the results and to achieve this, it is necessary to contrast the observations close the cut-off to the ones far from the cutoff (Bertanha and Imbens, 2020). Trochim (1984) indicates that the RDD relies on the assumptions such as perfect adherence to the cut off rule, correct functional form, and no factors other than the program of interest are the reason for the discontinuity. The paper provides robustness and placebo tests to check these assumptions and validate the main results.

Robustness checks include the use of the non-parametric approach, which is useful when there is uncertainty concerning the functional form of the outcome's mean. Using the *"rdrobust"* package allows for covariate-adjusted point estimation, heteroscedasticity-robust and cluster–robust estimation methods (Calonico, Cattaneo, Farrell, et al., 2017). This method allows relaxing the assumption that the mean of the outcome is the linear combination of the covariates. Therefore, non-parametric estimation essentially runs a regression using only the data points that are close to the cut-off. However, when working with a finite sample, this does not obliterate the bias as it is not possible to identify which group has a smaller bias. Hence, to obtain reasonable estimates, it is essential to use all the data points and supplement the nonparametric estimate with a parametric estimate (Lee and Lemieux, 2010).

3.4 Results

This section describes the variables chosen to conduct the analysis and provides the summary and descriptive statistics, followed by the first-stage OLS estimates and the second-stage IV estimates. The results are shown in Tables 3.2, 3.3 and 3.4 respectively. For the OLS and IV estimates, covariates are included to increase the precision of the results. These covariates are household size, male household head, household income status, child's sex and mother's educational attainment in years. In RD, generally the observations closest to the cut-off present the most accurate results as there may be other factors further away from the cut-off that can affect the outcome. The availability of observations allowed the range to be set within six, twelve and eighteen months of the cut-off to provide valid results.

Table 3.2: Summary & Descriptive Statistics

	Whole Sample		**Treatment**		**Control**	
Variable	Mean (s.d)	Obs	Mean (s.d)	Obs	Mean (s.d)	Obs
Insurance	0.749 (0.434)	9,445	0.758 (0.489)	6,616	0.729 (0.440)	2,829
Number of Visits	1.444 (0.765)	9,445	1.507 (1.298)	6,616	1.298 (1.507)	2,829
Outpatient Visits	0.050 (0.212)	9,445	0.050 (0.212)	6,616	0.048 (0.207)	2,829
Using Private Hospitals for Outpatient Visits	0.079 (0.270)	9,445	0.080 (0.271)	6,616	0.077 (0.267)	2,829
Wasting Among Children	0.132 (0.339)	9,434	0.142 (0.350)	6,610	0.109 (0.311)	2,824
Cost of Health Related Expenses	3.513 (30.292)	9,379	3.563 (30.410)	6,590	3.396 (30.123)	2,789

Notes: The table shows the mean and standard deviation of the variables of interest for overall sample, treatment group that includes the children under the age of six and the control group that includes the children older than six years old.

Table 3.3: First Stage Outcomes

	66>=months<=78	60>=months<=84	54>=months<=90
		Insurace	
treatment	0.170***	0.101**	0.092**
	(0.029)	(0.029)	(0.030)
household size	0.004	0.002	0.001
	(0.003)	(0.002)	(0.002)
male	0.037	0.128*	0.107*
	(0.067)	(0.057)	(0.042)
poor	0.005	0.022	0.008
	(0.039)	(0.028)	(0.022)
boy	-0.024	-0.01	0.003
	(0.034)	(0.024)	(0.020)
years_in_education	0.009	.010**	.007**
	(0.003)	(0.003)	(0.002)
Observations	766	1,434	2,157

Notes: The table shows the first stage estimates that is of insurance coverage of children aged 66 to 78 months, 60 to 84 months, and 54 to 90 months. The chosen bandwidths are within 6, 12 and 18 months of the cut-off. Covariates include *household size* indicating the number of persons in the household, *male* indicating that the head of household is male, *poor* designates that the household belongs to the low-income segment, *boy* states that the child is a boy, and *years_in_education* is the mother's education level in years Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.4: Second Stage IV Regressions

Panel A: Health Utilisation Outcomes									
Variables	number of visits			recent outpatient visit			use of private health services		
	66 & 78	60 & 84	54 & 90	66 & 78	60 & 84	54 & 90	66 & 78	60 & 84	54 & 90
insurance	1.479**	2.069*	2.479**	0.254	0.242	0.254	0.612**	0.190	0.308
	(0.534)	(0.835)	(0.803)	(0.152)	(0.194)	(0.202)	(0.183)	(0.265)	(0.234)
household_size	0.000	0.0037	0.002	-0.001	-0.000	0 .000	-0.001	0.000	-0.001
	(0.007)	(0.007)	(0.005)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
male	-0.159	-0.331*	-0.284*	-0.004	-0.050	-0.033	-0.048	-0.068	-0.055
	(0.149)	(0.161)	(0.147)	(0.033)	(0.039)	(0.033)	(0.074)	(0.068)	(0.048)
poor	-0.071	-0.134*	-0.048	0.016	0 .010	0.009	0.004	-0.007	-0.005
	(0.057)	(0.058)	(0.057)	(0.022)	(0.013)	(0.010)	(0.028)	(0.014)	(0.012)
boy	0.057	0.034	0.021	0.033	0.015	0.012	0.036	0.016	0.018
	(0.061)	(0.051)	(0.055)	(0.017)	(0.013)	(0.010)	(0.026)	(0.018)	(0.014)
years_in_education	-0.032**	-0034***	-0.027***	-0.004	-0.003	-0.001	-0.008**	-0.005*	-0.002
	(0.014)	(0.012)	(0.010)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
Observations	766	1,434	2,157	766	1,434	2,157	766	1,434	2,157

Panel B: Well-Being and Out of Pocket Expenditures						
Variables	Wasting			cost_health		
	66 & 78	60 & 84	54 & 90	66 & 78	60 & 84	54 & 90
insurance	-0.404*	-0.158	.041	57.238	42.150	50.837
	(0.182)	(0.266)	(0.276)	(37.914)	(47.546)	(46.915)
household_size	-.002	-.004*	-.004**	0.052	0.018	-0.034
	(0.001)	(.001)	(0.001)	(0.355)	(0.218)	(0.174)
male	0.076	0.069	0.038	-4.355	-6.334	-6.678
	(.053)	(.045)	(0.035)	(5.282)	(7.611)	(6.022)
poor	.005	0.003	0.000	-1.526	0.039	-0.439
	(.024)	(.015)	(0.014)	(5.282)	(3.990)	(2.600)
boy	-0.030**	-0.011	-.023	5.504	0.735	0.894
	(0.009)	(0.009)	(0.012)	(3.794)	(2.345)	(1.794)
years_in_education	0.009**	0.009*	.004	-0.596	-0.545	-0.392
	(0.003)	(0.003)	(0.003)	(.660)	(.641)	(.442)
Observations	766	1,434	2,157	756	1,420	2,141

Notes: The table shows the parametric estimations within six, twelve, and eighteen months of the cut-off. Panel A shows the IV results of the health utilisation outcomes as the independent variable within the bandwidths indicated above. Panel B shows the second stage IV estimates of the outcomes concerning children's welfare and out-of-pocket expenditures.* p<0.05, ** p<0.01, *** p<0.001. Standard errors are clustered according to the running variable.

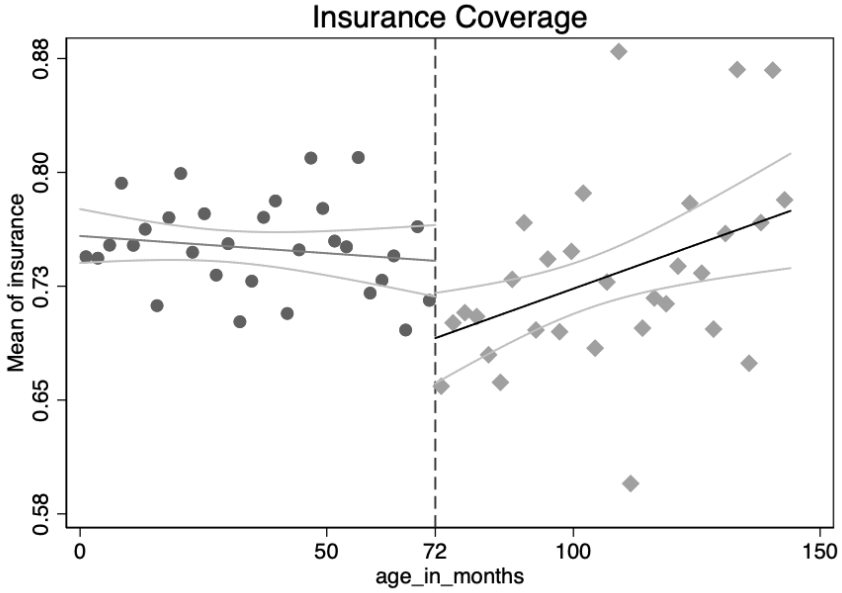
3.4.1 Insurance Coverage

Insurance coverage indicates the children who have health insurance and is the variable to which the policy primarily refers. As the summary statistics in Table 3.2 shows, 75% of children ages 0 to 12 have health insurance. The descriptive statistics in Table 3.2 show that coverage for children under 72 months of age is 76%, while 73% of children older than 72 months are insured. Under normal circumstances, this figure should have been close to 100%, given that insurance is free and the government wants to ensure that all eligible children are insured. However, there is some friction; enrollment is voluntary and people in rural areas of Jordan do not have access to information about the availability of government services. Free health insurance is provided on the basis of registration, and in rural areas, birth registration which is a prerequisite for accessing government services can be problematic due to cost, lack of information or geographical reasons (OECD, 2019).

The first stage estimates in Table 3.3 show the insurance status of children and how their health care utilisation changes accordingly. Figure 3.2 shows the negative discontinuous jump at the cutoff that children older than 72 months are less likely to be insured. Despite the negative jump, the regression coefficient of 17 percentage points (pp) is positive. This is because treatment status is assigned to children younger than 72 months and the regression coefficient indicates their insurance status. Therefore, the probability of being insured is 17 percentage points higher in the treatment group and statistically significant within the bandwidth of six months. The observations that are twelve and eighteen months further from the cut-off have lower coefficients indicating a decrease in the likelihood of being insured. The household head being male, and the mother's years of education are two factors that have a positive and significant effect on the treatment

status. Having free insurance may affect several outcomes, such as the number of hospital visits, the choice of health care services (public/private), outpatient visits, child wasting, and out-of-pocket spending, which are examined in the next sections. The results are in line with the Palmer et al. (2015)'s results. The free health insurance policy in Vietnam also increased the like hood of being insured for children under 72 months by 0.202 pp.

Figure 3.2: Insurance Status of Children



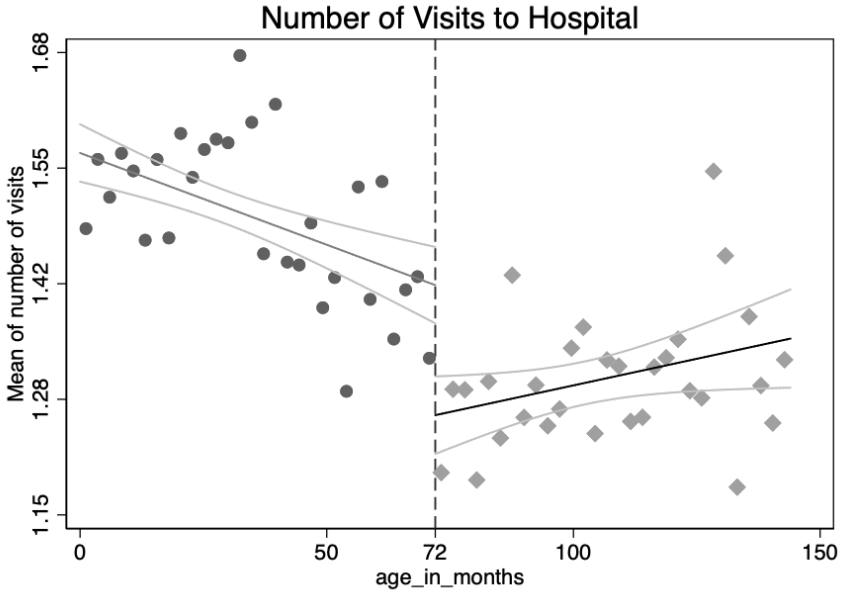
3.4.2 Health Utilisation Outcomes

Number of Visits to Hospital

Anderson, Dobkin, and Gross (2012) exploit the change in insurance status due to ageing. Their results suggest that ageing out causes around 5 to 8 pp reduction in insurance coverage that leads to a 40 per cent decrease in the utilisation of health services. Changes in eligibility status for insurance coverage can cause

big differences in healthcare utilisation. This section seeks to answer the question, "To what extent does the number of hospital visits changes depending on insurance eligibility?" The variable of interest is continuous and indicates the frequency of children visiting the hospital and it is a mother reported outcome. The summary statistics in Table 3.2 in the Appendix show that children aged between 0 to 144 months visit the hospital 1.5 times. The descriptive statistics in Table 3.2 show that children under 72 months visit the hospital 1.5 times, and children older than 72 months visit 1.3 times. Figure 3.3 shows the negative discontinuous jump indicating that the control group make less frequent visits to hospitals on average. The second stage estimates in Table 3.4 show that insurance is positively associated with the number of visits and, showing an increase in the number of visits.

Figure 3.3: Outpatient Visits at a Private Hospital



Outpatient Visits

This section examines the causal effect of insurance status on children's use of outpatient services. Outpatient visits do not require a prolonged stay at the facility and patients usually leave the hospital the same day. Zhou et al. (2017) analyse the effect of health insurance on the utilisation of outpatient services, and their study suggests that the utilisation of outpatient services is significantly lower among uninsured individuals. Thuong (2020) indicates that a revised health insurance policy in Vietnam that expanded the coverage also caused a significant increase in outpatient visits. However, the literature on the correlation between outpatient visits and health insurance is scarce. The summary statistics in Table 3.2 show that 5% of children had a recent outpatient visit. On average, there is no difference between children who are eligible for free health insurance policy and those who are not, as shown by descriptive statistics in Table 3.2. The regression results in Table 3.4 also show that the impact of insurance on outpatient visits is positive, indicating more visits by the insured children. However, the effect is not statistically significant.

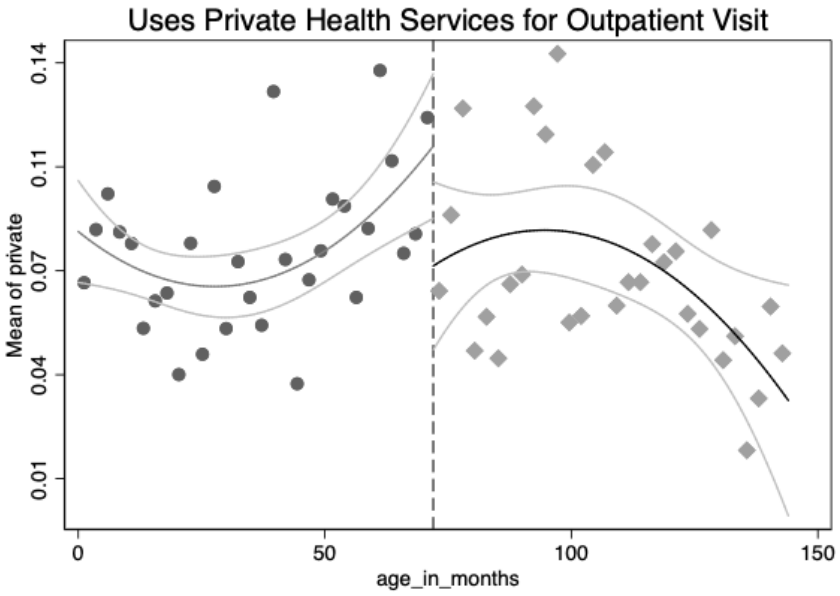
Had Outpatient Visit at a Private Hospital

The Jordanian MoH provides subsidised health services at a low cost. In Jordan, the cost of outpatient visits depends on which service is claimed but on average the cost per visit is 37.4 Jordanian Dinars (WHO, 2005; Hammad, Fardous, and Abbadi, 2017). However, the public health sector suffers from increasing population, health care costs, unorganised growth of the health care system, poor institutional planning, and lack of qualified health care personnel (Al-Oun and Smadi, 2011). This may affect the choice of hospital when it comes to the treatment of their children. In general, insurance is associated with higher utilisation and lower out-of-pocket spending, yet this also depends on the insurance scheme

in which individuals enrol (Ekman, 2007).

As shown in Table 3.2, 8% of the sample use private hospitals for outpatient visits, and the descriptive statistics in Table 3.2 show that there is not much difference between the treatment and control groups. AlRyalat et al. (2019) point out that long waiting time is one of the major quality problems in state hospitals. Figure 3.4 and the regressions in Table 3.4 show that the predicted level of utilisation of private health is significantly higher than that of the public health services, especially at the closest point to the cut-off. Children who are not eligible for free health insurance are more 61 pp likely to use public services when they do not need urgent treatment. This may be caused by the low quality of public health services, lack of access to health services, or the fact that parents of children over the age of six are unable to allocate additional funds from their household budgets for heath expenditures, so they are more likely to use government health services. The results are similar to Mata et al. (2011)'s findings that compares the insurance status and related outcome of children just above and just below income that determines the free health insurance eligibility criteria. According to their results children who can benefit from free health insurance are 0.13 to 0.202 pp more likely to use preventive health care services depending on the age group.

Figure 3.4: Use of Private Hospitals for Outpatient Visits



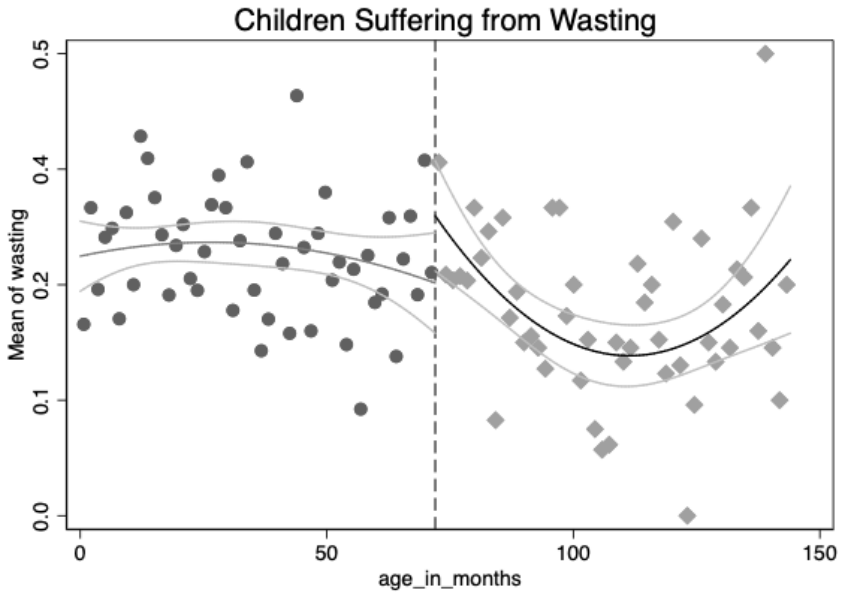
3.4.3 Well-Being and Out of Pocket Expenditures

Wasting

Wasting is known as low weight-for-height and is caused by malnutrition or frequent illness, and if not properly treated it can increase the risk of death (World Health Organization, 2014). As stated in the guidelines of WHO, a child is considered as wasted if the weight to height ratio is less than -2 standard deviations below the mean of WHO's Child Growth Standards. Although wasting is a common problem for children under five, Obembe, Adenuga, and Asuzu (2018) indicate that wasting causes one-third of mortality among school children. The SDGs call for the elimination of all types of malnutrition, which is the cause of wasting and the reduction of the number of children suffering from wasting to less than 3% by 2030. UHC can facilitate the progress towards the elimination of wasting as it can improve the access of children to treatment (Organization et al.,

2020). The summary statistics in Table 3.2 show that the prevalence of wasting among children aged between 0-12 years is 13% and the descriptive statistics in Table 3.2 suggest that it is more common among children aged between 0-72 months. However, looking at the closest points to the cut-off in Table 3.4, it can be seen that wasting is 40 pp lower among children in the treatment group. This is also confirmed by Figure 3.5, which shows a positive discontinuous jump for the control group, which includes children older than 72 months. This suggests that wasting increases among children who start going to the school. This coefficient is insignificant and gets smaller as moving away from the cut-off. WHO indicates that the main reason of wasting is insufficient nutritional intake and it happens at early ages. The underlying reason of the significant negative coefficient at the closest point to the cut-off can be that the children start school at age six, when they lose eligibility for free insurance. When children start school, parents cannot check their nutritional intake regularly. The lack of regular health checks and advice in this transition period may cause an increase in wasting. As moving away from cut-off, parents can notice the problem and take an action and also this problem is less prevalent among older children.

Figure 3.5: Use of Private Hospitals for Outpatient Visits



Healthcare Costs

DHS data provide information on out-of-pocket expenditures, and these expenditures include cash payments for health care services such as medications, consultation fees, and laboratory diagnostic tests (Wang, Temsah, and Carter, 2016). In this section, healthcare costs associated with the most recent outpatient visit, which is a continuous variable is considered. As Table 3.2 shows, the out-of-pocket expenditures of families with children aged 0 to 144 months is 3.5 on average, and the health care costs of the treatment are slightly lower than those of the control group as shown by the descriptive statistics in Table 3.2. The large but insignificant coefficient in Table 3.4 confirms the higher out-of-pocket expenditures of the treatment group. The reason for the higher costs is the preference for using private health care services and more prescribed drugs due to more frequent hospital visits.

3.5 Robustness Checks

3.5.1 Non-Parametric Estimations

Table 3.5: Non-Parametric Estimations

Indicator	Treatment	s.e	N	N left	N right	h
Insurance	-0.111***	0.029	9445	897	907	15.727
Number of Visits	2.173**	0.77598	9445	968	965	16.307
Outpatient Visits	0.336	0.236	9445	1378	1249	22.783
Using Private Hospitals for Outpatient Visits	0.550*	0.26399	9445	1710	1434	27.409
Wasting Among Children	-0.482*	0.240	9434	575	624	10.962
Cost of Health Related Expenses	56.624	44.595	9379	1444	1281	23.566

Unlike the IV estimations in Table 3.4, the coefficient of the first stage variable, insurance status is negative because the *"rdrobust"* estimation takes into account the change across the cutoff as the treatment status is not defined. * p<0.05, ** p<0.01, *** p<0.001. Standard errors are clustered according to the running variable.

The first part of the robustness tests involves running the non-parametric regressions by using the 'rdrobust' command. As stated by Calonico, Cattaneo, and Titiunik (2015) this command implements the local-polynomial RD treatment effect point estimators and confidence intervals, as well as robust bias-corrected confidence intervals, for average treatment effects at the cut-off. Therefore, this method presents results with optimal bandwidth selection. In parametric IV estimates, bandwidth selection was made considering the closest points to the cut-off. The bandwidths in non-parametric estimates are different from the bandwidths chosen for parametric estimates. The results in Table 3.5 show that the main results are robust to different bandwidths as the magnitudes and significance levels of the coefficients are consistent with the results in Tables 3.4 and 3.5. One of the important highlights is the negative coefficient of Insurance status. This is because it is the first stage estimate and treated observations that are the children between 0 and 72 months are not defined in this regression so this results shows

the negative jump across the cut-off so shows that children older than 72 months are 11 pp less likely to be insured.

3.5.2 Placebo Checks

RDD gives rise to a concern that other factors may contaminate the jump at the cut-off. Therefore, it is important to ensure that the policy change is the sole determinant of the discontinuous jump. The discontinuity at various cut-off points is reviewed to make sure that the discontinuity at the 72 months cut-off is due to the insurance eligibility. The placebo checks include both graphical and regression results. The Figure 3.6 illustrates that there is no discontinuous jump when the cut-off points of 36, 82 and 90 months are chosen, respectively. The non-parametric estimations in Table 3.5 suggest that the jump at the cut-off is very small in magnitude and insignificant. These results confirm that the discontinuous jump is solely because of the change in eligibility criteria and there is no other policy change regarding the insurance eligibility of children further from the cut-off.

Figure 3.6: Pathways of Placebo Tests

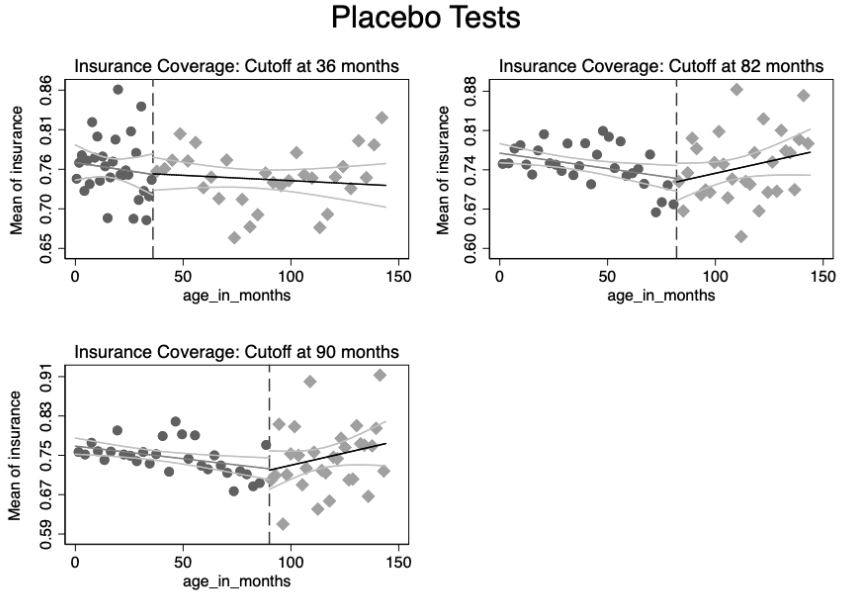


Table 3.6: Placebo Estimations

Insured						
Age in months	**Coefficient**	**s.e**	**N**	**N left**	**N right**	**h**
36 months	-0.005	0.040	9379	1160	866	12.101
82 months	-0.057	0.039	9379	789	789	14.154
90 months	0.007	0.050	9379	1011	756	18.006

The table shows the non-parametric estimation of completion of insurance status education at different cut-off points.
* p<0.05, ** p<0.01, *** p<0.001.

3.6 Power Calculations

IV and Fuzzy RD have similar identification framework, and produce same results under certain conditions. However, the weak identification problem is not a matter of attention in Fuzzy RD. In fuzzy RD, instead of using F-statistics to

address the weak identification problem, a modified t-test is proposed by Feir, Lemieux, and Marmer (2016) to show that the sample is powered enough to provide significant results. They show that in presence of weak identification which is the case when the discontinuity is of small magnitude, the usual t-test based on the FRD estimator and its standard error suffers from asymptotic size biases, as in the standard instrumental variables setting. This problem can be particularly severe in the FRD setting, as only observations close to the discontinuity are useful for estimating the treatment effect. In this paper, the modified t-test is used by implementing the *"rdpow"* command developed by Cattaneo, Titiunik, and Vazquez-Bare (2019) to show that the dataset is sufficiently powered.

Table 3.8 shows the tau statistics where default is 0.5 and desired default power is 0.8. The results indicates that the the outcome variables are statistically powered enough as tau is greater than 0.8 in all cases.

3.7 Discussion

This section discusses the findings from the main results and further explores how the policy could lead to better health outcomes. The results suggest that both utilisation and out-of-pocket spending are higher among insured children. It is important to emphasise that health insurance coverage varies widely across regions, as shown in Table 3.9 in the Appendix. In some regions, nearly 100% of children are registered for health insurance. However, in more populous cities such as Amman, the enrolment rate is less than 50%. It is important to ensure that this policy covers every child to achieve sustainable health outcomes.

According to the policy, school-age children and teens in puberty are not eli-

gible for free health insurance. For many children, these are crucial times as they start engaging in activities that will have a long-lasting impact on their adult lives. Currently, Jordan may not have sufficient resources to provide health insurance coverage to school-age children. However, the Student Health Survey identifies risk factors in this group. Alarming risks include obesity, mental disorders, and poor dental hygiene. Extending health insurance coverage to school children would pave the way for improving the health of these young individuals. Therefore, as stated by UNICEF (2017b) a particular programme for school-age children that allows them to access a specific set of preventive health services free of charge can bring long-term benefits.

As indicated by Kaldewei (2010) the health reform has been successful and improved in the equity of access, setting a goal of full formal insurance coverage for all; and improvements of efficiency and clinical effectiveness of service delivery, and standards of service delivery. Despite the success, the challenges such as inefficiencies provision and financing of health services remain. Currently, Jordan has an advanced and affordable health care system, yet; it is a low-income country. The quality of care in many public hospitals and clinics is low, and accessibility can also be problematic. This paper analyses how free health insurance coverage for children under six changes the healthcare utilisation behaviour and whether it affects household welfare. The results suggest that children who are eligible for free health insurance are more likely to regularly visit hospitals or other health care services, use outpatient care and private health services. Health care-related expenditures are higher for this group, which is a consequence of using private health services. The prevalence of wasting is lower among insured children. This proves that this policy plays a significant role in improving the well-being of children, as wasting can lead to mortality and adverse physical and mental de-

velopment outcomes.

In Table 3.4, although not significant, the results show an increase in spending on health-related costs for those children who are eligible for free health insurance, which is associated with increased use of private services. However, Sepehri, Sarma, and Simpson (2006) suggest that free health insurance could reduce the burden on household budgets, as the results indicate that such insurance in Vietnam reduced out-of-pocket expenditures by 16 to 18% among low-income households.This issue may be context dependent and might be investigated when more detailed data is released on Jordan.

3.8 Conclusion

This paper examines the free health insurance policy for children in Jordan by analysing its causal impact on health service utilisation in terms of frequency and type of health service utilisation, out-of-pocket expenditures, and children's well-being. The paper contributes to the existing literature by analysing the effectiveness of current health insurance policy and suggesting ways to make it more effective.

The policy of free health insurance plays a crucial role in improving access to health services and is an important tool that paves the way to achieve the goal of UHC. The policy also leads to improved health outcomes for children as wasting is lower among the insured. The most vulnerable group is undoubtedly children younger than six years. Nevertheless, the literature suggests that school children are also at risk and, this is well-supported by the analysis presented in this paper. Wasting is common among school children who cannot benefit from free insurance.

Increasing spending on health care is a challenge for any country. A government needs to manage health care spending efficiently to establish a sustainable and equitable system. The impact of this policy can expand if the government can ensure that all eligible children can benefit from this program, along with increasing the insurance eligibility age to cover children entering primary school.

3.9 Appendix

Table 3.7: Description of Variables

Variable	Description
Insurance	This variable indicates the insurance status of the children. It is a dummy variable and takes the value 1 if the child has a health insurance and 0 if the child has not.
Number of Visits	This is a continuous variable and indicates how often the children visited a hospital in the last four weeks.
Outpatient Visits	This is a dummy variable and takes the value 1 if the child has had a recent outpatient visit.
Outpatient Visits: Private	This a mother reported outcome that indicates the type of hospital from which the child received the last outpatient treatment. If the child had gone to a private hospital for the treatment, the variable takes the value 1.
Wasting	Wasting is defined as low weight relative to height, and it is an important indicator of child well-being. This is a dummy variable, and if the weight to height ratio is less than -2, the child is considered as wasted, and the variable takes the value 1.
Cost of Outpatient Visits	This is a continuous variable that states the cost of the last outpatient visit of the children.

Table 3.8: Power Calculations

Variables	**H0: tau**	**0.2*tau**	**0.5*tau**	**0.8*tau**	**tau**
Number of Visits	0.050	0.617	1.000	1.000	1.000
Outpatient Visits	0.050	0.249	0.893	0.999	1.000
Using Private Hospitals for Outpatient Visits	0.050	0.328	0.966	1.000	1.000
Wasting Among Children	0.050	0.212	0.825	0.996	1.000
Cost of Health Related Expenses	0.050	0.145	0.609	0.947	0.994

Table 3.9: Regional Differences in Insurance Status of Children

Regions	**Insurance**
Amman	0.496
Balqa	0.621
Zarqua	0.499
Madaba	0.727
Irbid	0.783
Mafraq	0.827
Jerash	0.874
Aljoun	0.924
Karak	0.877
Tafilh	0.911
Maan	0.803
Aquaba	0.714

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