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Gendered Impacts of Colonial Education: the Role of Access and Norms Transmission in French Morocco*

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Abstract

We examine colonial-era primary education as a determinant of modern-day attainment and gender disparities in education. We construct a novel dataset from the French Protectorate in Morocco, combining archival data on colonial school locations in 1931 and 1954 with the most recent Demographic and Health Survey (DHS) data in arbitrary grids. We analyse the influence of colonial schools on the probability of attaining primary and secondary education in 2004. Overall, schools dedicated to Moroccans in 1931 exhibit a persistent positive impact on education outcomes, but only in the absence of nearby schools reserved for Europeans. Stark gender gaps in access during the Protectorate were narrowed in places with schools for Jewish Moroccans. These had a positive impact on girls' contemporary levels of education, but a negative impact on the enrolment for boys following the dismantling of Jewish communities after 1948. DHS measures of preferences for female education point to a social norms transmission mechanism between Jewish and Muslim Moroccan communities.

Keywords: education, colonial legacy, female education, Morocco, French Protectorate

JEL classifications: N37, O15, I21

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1. Introduction

Education plays a pivotal role in shaping societies, fostering economic growth, and promoting social mobility. However, many countries continue to grapple with large disparities in educational opportunities and poor educational outcomes. Corrective policies require a good understanding of the reasons behind these challenges, which often have deeper roots. We investigate the historical factors underlying contemporary educational outcomes in Morocco, Africa's fifth-largest economy. Upon independence in 1956, the Moroccan government inherited a segregated education system from the French colonial administration. Over sixty years since mandatory schooling for all children was introduced, there is still a substantial gender gap in Moroccan school enrolment rates. The 2014 census shows that boys have a higher primary (secondary) enrolment rate of 65.1% (34.5%) compared to 51.7% (26.4%) for girls (au Plan, 2014). Could the stark gender disparities within the modern Moroccan education system be rooted in the country's colonial history?

In this paper, we explore the influence of colonial-era schools established under the French Protectorate (1912-1956)[1] on the levels of education of Moroccans in the 21st century. We focus specifically on gender effects and distinguish between the contributions of different types of colonial-era schools. During the Protectorate, the French public education system in Morocco was deliberately segregated between Europeans, Muslim and Jewish Moroccans, in stark contrast to the French-Arab school model in Tunisia and Algeria (Salah et al., 2017). Schools for European settlers and Muslim Moroccans were funded directly by the French government, with schools for Europeans enjoying funding priority. The schools for Morocco's large Jewish community were instead funded by the Paris-based *Alliance Israélite Universelle* (AIU), though they broadly followed the French curriculum. There were wide gender disparities in education access: by 1951, only 19% of French government schools for Moroccans were open to girls, compared with 78% of the Jewish schools. The French government transferred

[1]This period of formal colonial rule followed the military occupation that began in 1907.

its schools to the new Moroccan government upon independence, and in 1961 the AIU transferred one-third of its schools, due to the exodus of the Jewish population from Morocco.

To investigate whether this segregated colonial-era education left long-lasting effects, we compile a novel dataset containing colonial school locations and school type in 1931 and 1954, hand-collected and constructed from archival material on the French Protectorate.[2] This information is matched with the most recent Moroccan Demographic and Health Survey (DHS 2004) with nearly 54,000 respondents from 420 clusters across the country. Using an Ordinary Least Squares (OLS) model with arbitrarily defined 28 x 28 kilometer grid-cells, we estimate the effect of colonial schools in 1931 and 1954 on an individual's probability of having attained some primary or secondary education in 2004. This grid-based approach mitigates concerns about household selection near schools, as neighbouring grids share similar characteristics because the location of the boundaries is random.[3] We add a rich set of individual and grid-level controls to isolate the effect of colonial schools on educational outcomes in 2004.

We first look at overall average impacts on the population's education enrolment and then focus on gender effects in the whole sample and within different generations. We also explore the DHS survey of females only to understand the impact on literacy and on gendered norms around education and labour force participation. We find persistent effects of schools established by the French during the Protectorate. The early schools reserved for Europeans (recorded in 1931) have no or a negative impact on later Moroccan generations' school enrolment. However, having at least one school reserved for (any) Moroccans in 1931 in a grid increases the probability of attaining some primary education by 2004 by nearly 7.8 percentage points (a 14% increase on the sample mean), provided there were no schools for Europeans nearby. The avail-

[2]The data include schools from pre- and post-World War II, sourced from the 1931 "Annuaire de statistique générale du Maroc" and the 1954 "Répertoire des services et des établissements publics d'enseignement au Maroc."

[3]In our sensitivity analysis, we also vary the grid size and grid placement, with consistent results.

ability of schools for local Moroccans also increases the chance that later generations acquire some secondary education, extending the time in school by nearly a year in places with no schools for Europeans. This is potentially due to French settler schools displacing funds that could have gone to Moroccan schools because of the established funding priorities. By 1954, the schools for Europeans had become more accessible to Moroccans, and we find that they have a positive impact on later access to education.

Girls are positively impacted by the schools for Moroccans, but the benefits come entirely from schools for Jewish Moroccans. If a grid had a Jewish school in 1931, female primary school enrolment measured in 2004 is 4.9 percentage points higher. While both genders benefit equally from European schools established by 1954, boys are 10.9 percentage points less likely to have attended any primary schooling if they live in grids that historically had Jewish schools, likely due to the disinvestment in these schools following the pogroms and mass emigrations of the Jewish population after 1948. Girls' education remains unaffected by the 1954 Jewish schools.

The rich archival data enable us to explore the mechanisms underpinning the persistent effects of Jewish schools on girls' education. We find that early access for girls (especially in girls-only schools, granted almost exclusively by Jewish schools) seems to have been instrumental in boosting their attainment, with effects felt for the generations born between 1950 and 1990 and even after 1990. The evidence suggests the 1931-recorded Jewish schools increased literacy in later generations of girls. Given the near total disappearance of the Jewish population after 1948, a process of intercommunal and intergenerational transfer of social norms favouring female education to the Muslim community is the most plausible explanation for these persistent effects. We find supportive evidence that modern-day generations of Muslim Moroccan women living in places that had historical Jewish schools have stronger preferences for educating girls and gender parity, as measured in the DHS survey.

Our main findings for primary education are confirmed by sensitivity analyses that vary grid sizes and locations, by placebo tests, and by using a non-linear probability model. These reinforce the finding that colonial education left an enduring legacy of

educational disparities.

The gendered effect of colonial-era schools is to our knowledge a novel finding in the literature. Calvi et al. (2022) show a lasting positive link between Protestant missions and contemporary human capital for women, especially in missions with higher female presence. Meier zu Selhausen and Weisdorf (2016) note rapid literacy gains and high-status employment for men in colonial Uganda, initially exacerbating gender inequality, which then decreases post-independence.[4] In a different context, Miho et al. (2024) exploit the mass deportations of Germans and Chechens across Russia to highlight the transmission of gender-related social norms, showing more pronounced gender equality norms among native populations culturally closer to deportees (particularly where deportees were a significant share of the population). Our unique data on different types of colonial schools in Morocco allow us to dissect the origins of today's gender disparities in education enrollment, and to show how early school expansion and norms transmission narrowed the access gap for generations up to the present.

More broadly, our article contributes to the large literature on the lasting effects of colonialism,[5] and particularly the smaller subset of studies examining the persistent effects of colonial education. Some of these look at the long-term consequences of Christian missions on modern educational outcomes (Lankina and Getachew, 2012, Woodberry, 2012, Becker and Woessmann, 2009, Nunn, 2009, Waldinger, 2017, Calvi et al., 2022). A few papers are closer to our exploration. Huillery (2009) found persistent disparities in French West Africa, with higher modern public investments in areas with a stronger colonial history, driven by the strategic (military-political) allocation

[4]Haas (2022)' study of inequality in Uganda emphasizes Africans' pivotal role and characterizes European influences as both diffusive and divisive.

[5]Most focus on the institutional legacy, see for example Rueschemeyer et al. (1992), Sokoloff and Engerman (2000), Acemoglu et al. (2001), Bernhard et al. (2004), Lange (2004), Woodberry (2004), Acemoglu and Johnson (2005), Banerjee and Iyer (2005), Kapur and Kim (2006), Panikkar (2007), Feyrer and Sacerdote (2009), Dell (2010), Iyer (2010), Bruhn and Gallego (2012), Maseland (2018), Zwart et al. (2022). Wantchekon et al. (2015) emphasize the human capital formation channel, though Wietzke (2015) support a colonial institutions channel over the human capital channel in the case of Madagascar.

of new teachers by the French. Salah et al. (2017) and Chaudhary and Garg (2015) examine the long-term impact of colonial schools in Tunisia and India, respectively. Both studies highlight how post-colonial governments overcame spatial disparities inherited from the colonial era through universal primary education.[6] We add depth to the literature by looking at the impact of a segregated education system for Europeans and Moroccans on present-day educational outcomes.[7] This aligns with findings from the Partitions of Poland, where the Austrian system, by supporting Polish identity, fostered positive social norms around education, unlike the Prussian system, which used schooling for assimilation Bukowski (2019).

Finally, we expand an emerging body of research on the educational legacy of the historical policies in the Maghreb. Only two papers explore this topic in the region (Koehler-Derrick, 2023, Salah et al., 2017). The findings of Salah et al. (2017) are particularly relevant to our context as a comparison with a former French North African colony where assimilation was a main goal of colonial education and a strong post-independence universal education policy. Koehler-Derrick (2023) is to our knowledge the only other study on the colonial legacy on education in Morocco. However, this paper studies how the Civil Registration Reform of 1950 influenced post-independence universal education success, rather than the impact of colonial schools.

The rest of this article is organised as follows: Section 2 describes the historical context of the French Protectorate, Section 3 presents the data and methodology, Section 4 discusses the main results, Section 5 the additional findings and Section 6

[6]The difference between colonizers has been studied for example by Dupraz (2019), who uses Cameroon's partition disparities and finds that individuals in the British-administered region had more schooling and high-skilled occupations, attributed to variations in French and British pedagogical culture.

[7]During the French colonial period in Africa, income inequality was generally high (Alfani and Tadei, 2017), with French government expenditures predominantly benefiting French settlers in administration and military endeavours (Huillery, 2014). The education sector in many different colonies further reflected inequality, with separate systems for settlers and local populations, disadvantaging the latter with extremely poor-quality education, see e.g., Abad (2016), Pasquier-Doumer and Brandon (2015) for Peru, and Das et al. (2013), España-Eljaiek et al. (2023) for a broader view of indigenous education.

the Sensitivity analyses, and Section 7 concludes.

2. Background

2.1. Historical overview

Morocco has long been inhabited by various groups including Amazighs, Phoenicians, Carthaginians, Romans, Arabs, and Jews, among others.[8] The kingdom of Mauretania, founded in the 3rd century BCE, was one of the earliest kingdoms in present-day Morocco, Algeria, and Mauritania. The arrival of the Arabs in the 7th century CE led to the establishment of Islamic rule, followed by alternating periods of political unity and fragmentation. Most Amazigh tribes converted to Islam early on.

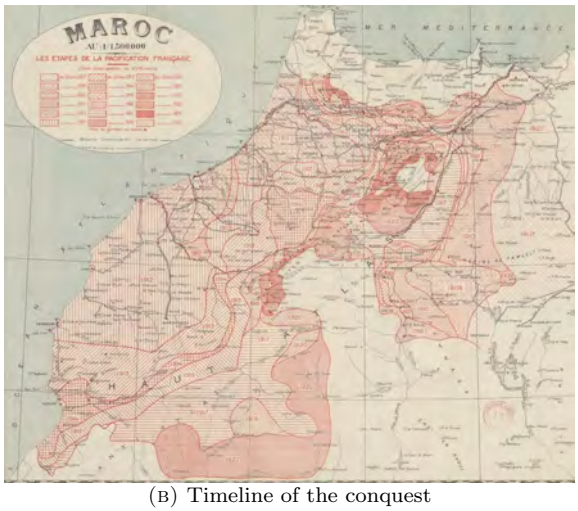
Beginning with the conquest of Algiers in 1830, France expanded its control over North Africa. From 1907, France occupied two zones in Morocco: one around Casablanca and another around Oujda in the east. In 1912, the French Protectorate was established in the central region of Morocco, as depicted in the left panel of Figure 1a.[9] The French government gradually occupied more territory until 1935, as presented in the right panel of Figure 1b, developing infrastructure, telecommunications, urban planning, agriculture, healthcare, education, transport, and ports, that served European development. They focused mainly on the Fez, Casablanca, and Marrakesh triangle, which was an agricultural and mining zone of particular economic interest. The construction of a railway network facilitated the transport of troops and goods across the country, serving French economic interests, such as resource extraction and exports.

[8] Amazighs are the indigenous inhabitants of the Maghreb region, with 28% of Morocco's population speaking the Amazigh language in 2016. Phoenicians were ancient Middle Eastern maritime traders who established city-states along the Mediterranean coast (e.g., Carthage), first arriving in Morocco in the 12th century BCE (later establishing permanent settlements such as Mogador in present-day Essaouira on the Atlantic coast). Their influence waned with the arrival of the Carthaginians, who in turn lost power to the Romans in the 2nd century BCE. Jewish people first arrived in the area around the 5th century BCE, and large numbers of Jewish refugees came from Spain between the 14th and 15th centuries CE.

[9] The Protectorate aimed to differ from a colony by respecting Moroccan institutions and religious practices and implementing reforms for economic development. The Spanish controlled the northern and southern regions of present-day Morocco (except for Tangier, which was jointly controlled by France, Great Britain, Spain, and Italy).

FIGURE 1: Morocco in 1912

(A) Division of Morocco in 1912



(B) Timeline of the conquest

Notes : The timeline of the French conquest of Morocco is from "*Les étapes de la pacification française*" in the *Bibliotheque National de France*

(Adidi, 2011). The development of the coastal cities led to large internal migration, with localities in the interior retaining only 40% of the urban population in 1952, compared to 54% in 1921. The small European population increased from 1.5% of the 5.4 million inhabitants in 1920 to 5.7% of the 7.9 million in 1955. They were concentrated in urban areas, comprising 16% of the urban population in 1936 (Noin, 1962), primarily in coastal cities like Casablanca and Rabat (Rivet, 2012).

Nationalist movements in Morocco began before World War II but were temporarily halted during the war. However, anti-French demonstrations erupted in 1952-1953 due to the rise of democratic ideas that undermined resistance by the colonisers. Repressive actions by French and Spanish authorities further fuelled Moroccan support for independence. Morocco gained independence in 1956, with the European population dropping from 350,000 in 1955 to 150,500 in 1963 (Pellegrini, 2016) and a huge decline in the Jewish community, which shrank from approximately 250,000 in 1948

to less than 70,000 in 1967-75.[10] Figure Appendix B.1 shows a timeline of the major events in Moroccan Jewish history from 1912 until the 1970s. Areas with formerly large Jewish communities became dominated by the Muslim majority population, especially with the increasing urbanisation of post-independence Morocco.

Since gaining independence in 1956, Morocco has progressed significantly in political and economic development, with democratic elections beginning in 1963 and continuing through the most recent parliamentary elections in 2021. Morocco's GDP per capita rose from approximately USD 346 in 1960 to around USD 3,500 in 2020, reflecting decades of growth driven by economic diversification and reforms (The World Bank, 2021).

2.2. Education

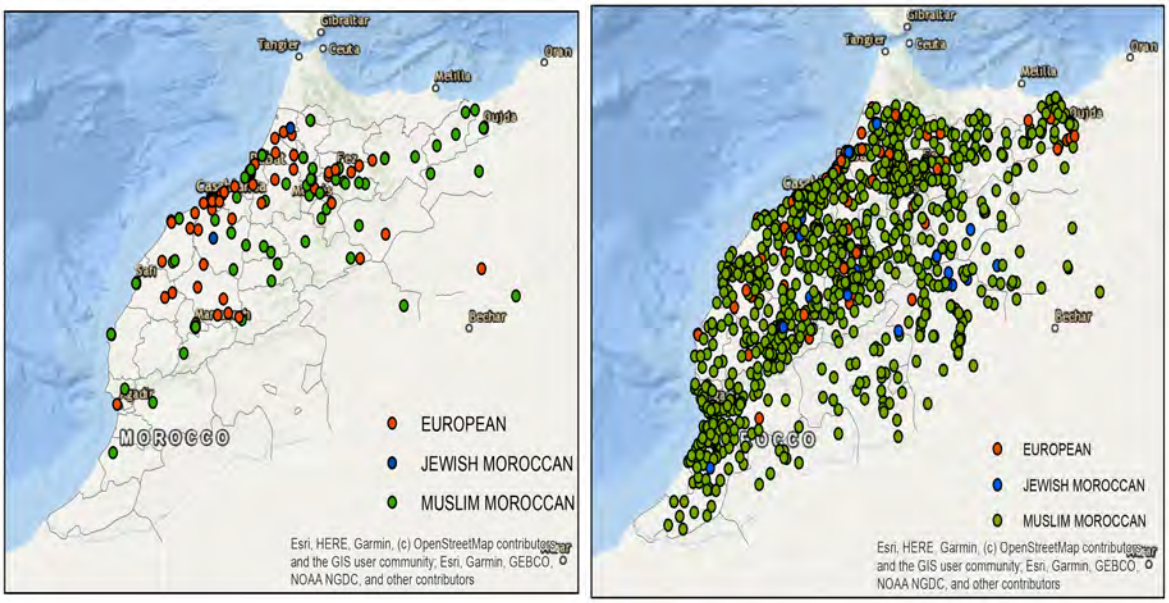
The city of Fez in Morocco was a flourishing center of Islamic learning in medieval times, starting with Al Quaraouiyine University, founded in 859 CE. From the late 13th century, the Marinid dynasty built madrasas (religious schools) associated with this university. This centre was set in the wider traditional Islamic education system based on Quranic schools, funded through religious endowments known as *Habous* that continued through the centuries. Quranic schooling was typically reserved for boys, as teaching girls to read and write was considered improper (Wagner and Lotfi, 1980).[11]

Before colonization, European school systems had a limited presence in Morocco: some Spanish and English schools, as well as private institutions like the *Alliance Israélite Universelle* (AIU), a French-based Jewish organisation that managed the education of Jewish Moroccans also during the Protectorate, were already established.

[10]The Jewish community in Morocco mass-emigrated to Israel, France and Canada, driven by the creation of Israel in 1948, anti-Jewish pogroms in 1948, 1953, and 1955, and organized initiatives like Operation Yakhin in 1961 in which the Israeli authorities and the American Hebrew Immigrant Aid Society paid Morocco for each Jew who left for Israel. Political changes, such as King Mohammed V's discourse in 1955 aiming to enhance democracy and reduce racism, did not stem the tide. Three emigration waves between 1948 and 1967 led to a huge decline in the Jewish population. By 2018, only around 2,200 Jews remained in Morocco (Laskier (2012), Wigoder (1996)).

[11]Exceptions included the 15 Quranic schools for girls in Fez (André, 1911) and one in Rabat (Mercier and à Rabat, 1906) established already by 1912.

FIGURE 2: Number of French schools implemented during the French Protectorate



(A) Schools implemented in 1931

(B) Schools implemented in 1954

Notes: information from hand collected data on the location and type of primary schools from the colonial reports - "Annuaire de statistique générale du Maroc" (1931) and "Répertoire des services et des établissements publics d'enseignment au Maroc" (1954)

The latter opened their first boys' school dedicated to Jewish Moroccans in Tétouan, Morocco, in 1862.[12] Also in Tétouan, AIU founded the first school open to Jewish girls in 1968, with 300 girls enrolled. By 1912, there were 1800 girls in AIU schools, an expansion which continued through the Protectorate years (Rodrigue, 2003). The schools of the AIU, funded by the French government and Jewish communities, grew from 160 students to 27,000 by the time of Moroccan independence (Chevalier-Caron, 2022). They were promoting European values, following a French curriculum taught by teachers trained in France, leading community initiatives (focused on social protection), and teaching European languages and biblical studies in addition to Judaism.

During the Protectorate, the French public education system was introduced along-

[12]Before the introduction of these schools, education among Jews and Muslims in Morocco was similar, often taking place in synagogues or mosques, respectively, or in the teacher's home (Kenbib, 2016).

side the existing religious schools. However, unlike the mixed French-Arab school model of Tunisia and Algeria, the French segregated schools in Morocco by Europeans, Muslim and Jewish Moroccans. Funding and investment prioritised the former over those for Muslim Moroccans (Katan, 1993) (see Figure 2). The education for the Jewish community continued to be managed and funded by the AIU. The Moroccan population demanded access to schools reserved for Europeans (modeled on French education) (Katan, 1993), but only a few of Morocco's Arab elite were accepted there before WWII.[13] In 1931, only 183 (0.7%) out of 24,998 pupils in schools for Europeans were Muslim (see section 3). By 1951, Muslim students made up 12% of enrollments.

For the Muslim Moroccan population, the French government created two main types of schools. The first were the "*Fils de notables*" ("Children of Notables", henceforth *elite*) schools aimed to create an elite that would collaborate with the French Protectorate.[14] In 1931, these schools attracted only 1,468 students, but by 1955, they enrolled 314,800. The second werre the schools for Muslim Moroccans that delivered technical education (needed for agricultural and manual work) across urban, rural and Amazigh areas. This basic agricultural education, beginning at the primary level, fell short of catering for the needs of large population groups, such as the merchant class (Direction générale de l'instruction publique, 1956).

The funding priorities of the French government had implications for historical school access and educational attainment. Europeans' schools came before schools for Muslim elites, which ranked above those for the Amazigh and rural schools. As a result, the Schools for Muslim Moroccans had lower teacher-to-pupil ratios than Europeans' schools, while rural schools had the poorest supplies and infrastructure (see Appendix Table A.1). Despite constituting 96% of the Protectorate's population in 1931, Moroccans were allocated only 34% of school admissions. The number of

[13]Some schools made exceptions for Arab students, while others rejected all Arab students, such as the Bugeaud school in Casablanca and the Guéliz school in Marrakesh (Knibiehler et al., 1992).

[14]In fact, the Moroccan elite in these schools coalesced against the Protectorate (Segalla, 2009a). For example, the school in Amazigh Azrou had more than 80% of the students between 1927 and 1959 from the lower-middle class, who played a role in securing independence (Mohamed, 2005).

schools for Muslim Moroccans expanded from 268 to 1,201 schools by 1954 (out of 1,463 schools, see 2); nevertheless, large disparities in access persisted, with Muslims' enrollment rate being 6.2% in 1955, compared to 100% for young Europeans and 76% for Moroccan Jews.[15]

The education system also induced significant gender disparities, with severely limited access for girls. In 1951, the French government opened a few schools for Muslim girls: 10% girl-only schools and 9% mixed-gender (out of all the schools for Muslim Moroccans). By contrast, Jewish schools in 1951 counted over 68, of which 78% were accessible to girls (49% mixed-gender and 29% girl-only). The large share of single-sex Jewish schools aligned with Moroccan norms, unlike the coeducational settings preferred by the French, which faced local opposition. The Moroccan nationalist movement created free schools (including girls-only) independently of the French government to counter French colonial hegemony (Segalla (2009b), Ahmed (2016)).[16] To curb this competition, the Protectorate issued a 1935 law that made it impossible for free schools to operate as intended, causing many to close.

After Independence, the Moroccan government struggled to reform a segregated education system. The Protectorate's French schools and a third of AIU schools were nationalised (Laskier, 1990). Remaining AIU schools were transformed into private *Ittihad-Maroc* schools. Following the exodus of the Moroccan Jews, many of these remining Jewish schools closed, and AIU institutions retained only 9,000 pupils by 1965 (down from 28,700 in 1956) (Kaspi et al., 2010). Post-independence education reforms such as rapid reconstruction, mandatory universal schooling in 1963, and Arabisation in 1970, helped primary school enrollment rise from 245,000 in 1955-1956 to over 1.3 million by 1987-1988 (Gallagher, 1958). Nevertheless, low enrollment rates in

[15]This emerges from archival evidence, e.g., the annual reports submitted by school directors to the Moroccan Department of Public Education and sent to regional education inspectors (Katan, 1993).

[16]The first Moroccan free schools were opened in Rabat, Fez, and Tetouan in 1919, expanding to other cities by 1930, to over 30 schools and 1,500-2,000 pupils. This was significant compared to the 6,000 Muslim children in protectorate schools Damis (1975). The 1934 "Plan of Moroccan Reforms" advocating for segregated education for girls, was disregarded by the French authorities.

rural areas, inadequate infrastructure and staff shortages have persisted, with primary enrollment rates in 2014 reaching only 65.1% for boys and 51.7% for girls.

3. Data and methodology

Given the institutional setup of French education in the Protectorate and the cultural backdrop against which education was expanded, we propose the following hypotheses:

Hypothesis I: Places with colonial schools have higher present-day education enrolment and attainment.

Hypothesis II: Colonial schools for Europeans and for Moroccans have differential effects on present-day education outcomes.

Hypothesis III: Amongst the colonial schools for Moroccans, the schools for Jewish Moroccans have a differential effect on present-day girls' education outcomes, compared to non-Jewish schools.

The empirical analysis is based on a novel hand-collected dataset on the location of colonial primary schools in Morocco in 1931 and 1954 during the Protectorate, linked with modern-day educational outcomes data from the contemporary Demographic and Health Surveys (DHS) Program. The colonial schools dataset provides a comprehensive overview of the education system managed by the French government and the independent *Alliance Israélite Universelle* in Morocco, as well as the other (free schools) that emerged early in the Protectorate. To our knowledge, it is the first time that these data have been systematically gathered and analysed. The sources and methodology used to create these databases are described below.

3.1. Data

3.1.1. Educational outcomes data

We have education outcomes data from the Demographic and Health Surveys (DHS) from 2004, the most recent year in which the survey was run in Morocco (see Table Appendix C.1 for summary statistics). The DHS surveys are conducted nationally, using

TABLE 1: Summary Statistics

Individual variables (DHS)	Mean	SD	*Historical variables*	Mean	SD
Any primary education	0.585	0.493	Number of colonial schools per grid in 1931	5.861	9.40
Any secondary education	0.253	0.435	- for Europeans in 1931	3.951	6.980
Any primary education only for girls	0.491	0.500	- for Moroccans in 1931	2.185	3.134
Any secondary education only for girls	0.491	0.500	- for Muslim Moroccans in 1931	1.460	2.089
Any primary education only for boys	0.689	0.463	- for Jewish Moroccans in 1931	0.725	1.289
Any secondary education only for boys	0.689	0.463			
Female	0.524	0.499			
Born before 1950	0.136	0.343	Number of colonial schools per grid in 1954	30.875	41.266
Born between 1950 and 1990	0.684	0.465	- for Europeans in 1954	5.417	10.083
Born after 1990	0.180	0.384	- for Moroccans in 1954	15.438	20.633
Casablanca, Rabat	0.183	0.387	- for Muslim Moroccans in 1954	13.403	16.621
Small City	0.264	0.441	- for Jewish Moroccans in 1954	2.035	4.341
Town	0.061	0.239			
Countryside	0.492	0.500	Log Moroccan population	7.013	1.465
Casablanca (grid level)	0.129	0.335	Log Jewish population	1.627	2.645
Rabat (grid level)	0.054	0.226	Log Financial Value Habous	11.742	7.801
Marrakech (grid level)	0.028	0.166	Distance Railways Station	1.728	0.991
Fez (grid level)	0.052	0.222	Uncontrolled zone	0.138	0.345
Total observations			46,358		

standardized questionnaires focusing on health-related indicators and socio-economic characteristics. Data is collected through a household questionnaire and an individual questionnaire for each member of every household. In total, 46,358 aged six years or older enter our analysis for primary education.[17] The sample used in the survey was randomly selected to be representative at a highly disaggregated geographical level, as illustrated in Figure Appendix B.2. The data provides the geo-localisation of 420 clusters, each containing a number of households.[18] The individual-level characteristics include gender, age group, and type of location. We split respondents by the decade of birth into three periods: born before 1950, between 1950 and 1990, and after 1990.

We code two main outcome variables: whether the individual has attended any primary education (equal to 1 if the individual declared completed or incomplete primary education) and whether the individual attended any secondary education (equal to 1 if the individual declared completed or incomplete secondary education). We also have the number of years of education completed, basic literacy skills, preferences for

[17] Among 53,973 individuals, 86% were aged over 6 years old, and 77% were aged over 10 years old.

[18] To protect respondents, household coordinates were randomly shifted by 0–2 and 0-5 kilometres in urban and rural locations, respectively, with each 100th household shifted by 0–10 kilometres.

education and gender norms.

In our study sample, 59% of individuals over 6 years old had attended primary school, and 29% of those over 10 years old had attended a secondary school. There are gender gaps in attainment: 49% of female respondents had any primary education, compared to 69% of males. Primary school enrolment is 92% for those born after 1990, 58% for those born between 1950 and 1990, and 13% for those born before 1950. The rates of primary school attendance are lower in rural municipalities (39%).

3.1.2. Colonial-era educational investment

For the main independent variables on colonial educational investment, we compiled a dataset from hand collected information on the number, location and type of primary schools from the French Protectorate reports for Morocco. We collected information on the schools opened before WWII, published in the 1931 "Annuaire de statistique générale du Maroc", and after WWII, published in the 1954 "Répertoire des services et des établissements publics d'enseignment au Maroc". These reports were compiled by the "Direction générale de l'agriculture, du commerce et de la Colonisation" for 1931, and by the "Bureau de la documentation de l'information et de la statistique", both held in printed form in historical archives in the Diplomatic archives in Nantes in France. The reports documented a total of 268 primary schools in 1931 and 1,463 primary schools in 1954, accommodating a combined student population of 49,833 and 238,214, respectively.

Our analysis focuses on primary schools due to their significance as the main form of education during the French colonial occupation. For example, in 1931 there were only nine secondary schools educating 6,910 students, concentrated in major cities and predominantly attended by Europeans (with 12.1% Moroccans). The colonial primary schools were under French management and catered to different audiences: schools reserved for Europeans (132 in 1931, 192 in 1954), schools specifically designated for Muslim (and other) Moroccans (managed by the French government; 91 in 1931, 1201 in 1954), schools for Jewish Moroccans (managed by the *Alliance Israélite Universelle*, a

separate Paris-based organization; 40 in 1931, 64 in 1954), and private schools (Catholic or Italian schools established in the early 20th century; 20 in 1931).

The gender composition also varied depending on the school type. Girls made up only 24.9% of the 11,149 students in 1931 schools for Moroccan Muslims.[19] By contrast, 45.1% of 11,733 Jewish students were girls. Of the 1954 schools, only 19% were accessible to Muslim Moroccan girls (combining girls-only and mixed-gender). By contrast, Jewish schools had 78% of their schools open to girls.

We geo-localised schools based on the towns and villages mentioned in the archival records, which was available for most schools, or manually retrieved for places that changed names. In major cities, we manually searched and cross-checked the schools' locations with archival sources for 23 cities exceeding 5,000 inhabitants in 1931.

We also compiled a comprehensive dataset on the free schools funded and run by Moroccans for Morrocans, from various sources (see Table Appendix A.16). Approximately 30 free schools were in operation around 1930 and 102 from 1947 to 1952 Damis (1975). A 1935 law significantly hindered the operation and growth of these schools.

Early 20th century Morocco also included traditional Quranic schools, for which we lack data, and which we proxy with the (log) financial value of *Habous*. These were lands managed by religious institutions that funded public services, including education.[20].

To match the historical school data with the contemporary household data, we created an arbitrary grid with rectangular cells of 0.25 degrees (around 28 by 28 km) in ArcGIS; we then recorded to measures of exposure to colonial education: 1) the colonial school presence (a binary indicator whether there was at least one colonial of school, for each different type) and 2) the number of colonial era schools in each grid-cell. In our main estimations below, we focus on the presence of at least one colonial school in a grid (i.e., the intensive margin). However, in additional estimations we use

[19]Only 25 of these 86 schools in 1931 accepted girls.

[20]The source is comprehensive data on *Habous* from the "Annuaire de statistique générale du Maroc" in 1931 and illustrated in Figure Appendix B.3

the number of schools per grid (i.e. the extensive margin).

3.1.3. Historical and geographic controls

To control for pre-colonial investments, we included a set of historical variables informed by the historical background (see Section 2). We proxy the pre-Protectorate educational investment with the distance in a straight line from the grid centroid to Fez, the home of Al Quaraouiyine University established in 859 (and the associated institutions of Islamic learning).

We proxy the long-term persistence of early economic prosperity by the distance in a straight line from Beirut, the home of Phoenician explorers that established colonial outposts on Morrocan shores in the 2nd century BCE. We also include an indicator for grids located in 'insecurity zones' - those municipalities not yet under the Protectorate's control by 1931 due to local resistance and low colonial investment.[21] Furthermore, we control for the distance from the grid centroid to the railway stations constructed in 1920 as a proxy of colonial-era infrastructure investment that could affect general socio-economic development (sourced from the 1920 "Grand annuaire général de l'Algérie, de la Tunisie et du Maroc") (Figure Appendix B.4).[22]

To account for the demand for education, we control for the (natural logarithm of) the municipality non-Jewish and Jewish Moroccan population in 1931, from the "Recensement de la population de la zone française de l'empire chérifien 1931". In Appendix C we describe how we matched ethnic groups or tribes to grids.

In addition, we control for a standard set of geographic variables, including distance in a straight line to the coast in km, latitude, average slope, soil suitability, mean

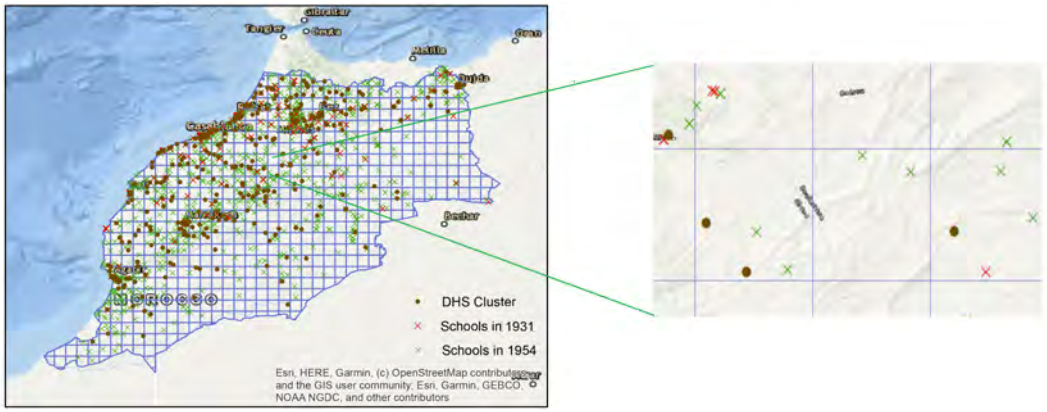
[21] 'Insecurity zones' had no schooling policies by the French government yet in 1931 (see Figure Appendix B.5. The information on the insecurity zones is from "Recensement de la population de la zone française de l'empire chérifien 1931"

[22] Pre-colonial conditions, such as pre-colonial power centralisation, are important controls in studies of colonial impact (Gennaioli and Rainer, 2007) or Islamic rule (Izama, 2016, Bauer et al., 2022, Jedwab et al., 2022, Chaney, 2016), and their interaction (Bolt and Gardner, 2020, Archibong, 2018, 2019). Some studies suggest pre-colonial institutions are more fundamental determinants of institutional and economic development than colonialism itself (Nunn, 2008, Michalopoulos and Papaioannou, 2013, Bandyopadhyay and Green, 2016).

elevation and arable land (from the Food and Agriculture Organisation of the United Nations - Global Agro-ecological Zones Assessment for Agriculture), temperature (from NASA Earth Observations), and precipitation (from the Global Historical Climatology Network dataset). More detailed information about these variables can be found in Appendix C.[23]

3.2. Empirical Specification

FIGURE 3: Arbitrary grids



Our main aim is to estimate the long-term impact of colonial schools on modern-day education levels, overall and by gender. Our sample consists of 188 arbitrary cells of 0.25 degrees (around 28kmx28km), which are considered treated if there was at least one colonial-era school within the grid cell.[24] This approach reduces the bias from household's self-selection into more educated areas (as in Figure 3). The econometric analysis estimates the effect of colonial schools in 1931 or in 1954 on current education

[23]Similar controls are included in related studies, such as Salah et al. (2017) and Gallego and Woodberry (2010), who include: 1) terrain slope, latitude, distance from the coast, soil suitability for growing wheat and olives, the average rainfall per year between 1901 and 1911, the number of mines in 1905, the number of railway stations in 1926, and a dummy equal to one for pre-colonial major urban centres and region fixed effects in Tunisia; 2) population density, distance to the sea, dummies for the presence of rivers, lakes and access to the sea, a dummy for whether the capital city of the country is located in the region, and broad region dummies in Africa.

[24]The sample excludes Spanish or international areas, and disputed territories in Western Sahara. See Appendix Figure Appendix B.5.

levels according to the following equation (testing Hypotheses I and II):

$$Education\_Enrolment_{igm,2004} = \alpha + \beta_1 D\_School_{g,1931(1954)} + \beta_2 X_{igm} + \zeta_r + \epsilon_{igm}, \quad (1)$$

where the dependent variable $Education\_Enrolment_{igm,2004}$ is a dummy variable equal to one if the individual i in grid g in municipality m has at least some primary (secondary) education in 2004.

Our main variable of interest is $D\_School_{g,1931(1954)}$, a dummy variable equal to one if there is at least one colonial school in grid g in 1931 (or in 1954). In further estimations we also use information on the number of colonial schools in the grid.

Our main focus is on primary schooling, and we split the primary school treatment in further categories of primary schools as described above: first, schools reserved for European settlers and those reserved for Moroccans; and then in a second step, schools for Moroccans are disaggregated into those managed by the French government for Muslim (and other) Moroccans and those overseen by the *Alliance Israélite Universelle*, an organization based in Paris, for Jewish Moroccans. In additional estimations, we also control for the presence of non-colonial (free) schools in a grid.

While we expect selection at the region level, we can plausibly argue there is no systematic selection based on education or income across fairly small arbitrary grid-cells within regions. We assume that in expectation, contiguous grid-cells are equally likely to be chosen by any relocating household, as the grid delimitation is randomly determined and neighbouring grids share similar characteristics. Thus, the primary source of variation between grids lies only in the treatment variable, which is the presence (number) of schools.

However, this does not fully address potential long-distance migration between different regions in the time since independence. By including region (i.e., province) fixed effects (ζ_r), we go a step further in controlling for region characteristics that could

attract migrants to get a step closer to plausibly causal effects of colonial education.[25]

We also control for an extensive set X_{igm} of observable characteristics of individuals (i), grids (g) and municipalities(m). Individual characteristics include gender, decade of birth and place of residence (rural, Casablanca, Fez, Marrakech, Rabat, and other cities); the (log of) Moroccan population living in the municipality m in 1931; an insecurity zone dummy; the distance of the center of grid g from Fez and Beirut; and the (log of) the financial value of *Habous* within the municipality m, which funded local religious education. We also add a set of grid-specific geographic and economic controls, which includes a measure of terrain slope, latitude, distance from the coast, soil suitability, the average rainfall, and the distance from the nearest train station in 1926 to the middle of the grid g assigned to each household. ϵ_{igm} are the robust standard errors clustered at the level of the province.

We are particularly interested in gender effects, so we also estimate the effect of colonial schools in 1931 or 1954 using interaction terms with the gender dummy $Female$ according to the following equation (testing Hypothesis III):

$$\begin{aligned} Education\_Enrolment_{igm,2004} = \gamma + \delta_1 D\_School_{g,1931(1954)} + \delta_2 Female + \\ \delta_3 D\_School_{g,1931(1954)} * Female + \delta_4 X_{igm} + \zeta_r + \eta_{igm}. \end{aligned} \tag{2}$$

Our main estimates of interest are $\hat{\delta_1}$, which shows the effect of the presence (number) of a colonial school in a grid for boys, and $\hat{\delta_3}$, which shows the additional effect for girls. X_{igm} the vector of control variables from equation (1), ζ_r are region dummies, and the errors η_{igm} are clustered at province level.

While this empirical strategy aims to estimate the causal relationship between the colonial schools treatment and current education levels, we recognise the potential threats to causal identification. A major concern is the presence of unobserved grid-specific heterogeneity that may simultaneously affect both the treatment and dependent

[25]There are 45 provinces, administratively organised during colonial times, and current and past education policies, like curriculum (e.g., teaching the Amazigh language), may vary by province.

variables (e.g., if grids are too large, they may capture area self-selection). In addition to including a rich set of controls, we conducted a comprehensive set of sensitivity analyses, including varying the grid sizes, using randomised grid generation to capture slightly different territorial divisions, and conducting placebo tests to assess the robustness of the observed treatment effects. We also discuss how internal migration could affect our results in section 6. These methodological safeguards go further in addressing potential threats to internal validity.

4. Main results

4.1. Colonial schools and modern primary school enrolment

In Table 2 we test our Hypotheses I and II and report the estimates from model 1 and variations or interactions with different types of colonial schools as treatment variables, for the binary outcome of whether the survey respondents in 2004 had attended any primary education. The first four columns report estimates conditional on individual controls and city FE, and the last four include our complete set of controls. In Panel A the results are from specifications with the presence of schools in 1931, and in Panel B from those with the presence of schools in 1954.

Column 1 in Panel A shows a significant effect of a 3.3 percentage points increase in the likelihood that a respondent attended some primary education in grids with at least one colonial school in 1931 compared to grids without colonial schools. Column 2 shows the effect is coming from schools dedicated to Moroccans (4.6 percentage points higher probability to attend primary school). Moreover, in column 3, the negative and significant coefficient of the interaction term between the presence of schools for European settlers and Moroccans suggests a substitutability of investment in schools of Europeans and those for locals, as outlined by Katan (1993). These specifications reveal that the average effect of having a school for Moroccans in a grid with no schools for Europeans is positive, significant and large: 8.6 percentage points higher probability that individuals residing in these grids attended some primary education. The

TABLE 2: The presence of colonial schools and primary education

	Any primary education							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
Presence of schools in 1931	0.033**				0.019			
	(0.016)				(0.022)			
Presence of schools for Europeans in 1931		−0.010	0.012	−0.001		−0.021	0.001	−0.014
		(0.016)	(0.023)	(0.017)		(0.023)	(0.026)	(0.025)
Presence of schools for Moroccans in 1931		0.046***	0.086***			0.036	0.078***	
		(0.017)	(0.020)			(0.023)	(0.023)	
Schools for European × Moroccans			−0.067**				−0.069**	
			(0.031)				(0.030)	
Presence of schools for Muslim Moroccans in 1931				0.025				0.020
				(0.021)				(0.022)
Presence of schools for Jewish Moroccans in 1931				0.016				0.008
				(0.022)				(0.023)
Proxies of local investments								
Distance from Fez					0.031**	0.028**	0.030**	0.031**
					(0.012)	(0.012)	(0.012)	(0.012)
Insecurity zone					0.055**	0.054**	0.056**	0.053**
					(0.023)	(0.023)	(0.023)	(0.023)
Log Financial Value Habous					0.002**	0.002**	0.002**	0.003**
					(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.395	0.395	0.396	0.395	0.402	0.402	0.403	0.402
	Panel B							
Presence of schools in 1954	0.002				−0.013			
	(0.025)				(0.018)			
Presence of schools for Europeans in 1954		0.039**	−−	0.052***		0.025	−−	0.046**
		(0.016)	−−	(0.019)		(0.020)	−−	(0.019)
Presence of schools for Moroccans in 1954		−0.013	−−			−0.021	−−	
		(0.025)	−−			(0.019)	−−	
Schools for European × Moroccans			−−				−−	
			−−				−−	
Presence of schools for Muslim Moroccans in 1954				−0.012				−0.021
				(0.025)				(0.019)
Presence of schools for Jewish Moroccans in 1954				−0.042*				−0.071***
				(0.023)				(0.022)
Proxies of local investments								
Distance from Fez					0.032***	0.032***	−−	0.033***
					(0.012)	(0.011)	−−	(0.011)
Insecurity zone					0.054**	0.054**	−−	0.058**
					(0.023)	(0.022)	−−	(0.021)
Log Financial Value Habous					0.003**	0.003**	−−	0.003***
					(0.001)	(0.001)	−−	(0.001)
R^2	0.394	0.395	0.395	0.396	0.402	0.402	−−	0.404
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004. The presence of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. Interaction terms between presence of schools reserved for European settlers and for Moroccans are included in columns 3 and 7. Panel A looks at schools established by 1931, Panel B by 1954. Control variables include distance of grid centroid to Fez, a binary variable ("Insecurity zone") for areas outside full French control, log of the Muslim and Jewish population at the municipality level, the *Habous*' monetary value in the grid, the grid centroid distance from the nearest railway station, city fixed effects for Casablanca, Rabat, Meknes, and Fez, individual controls (decade of birth, gender, and type of residence - big cities, small cities, town, and countryside) and geographic controls (distance to the coast, latitude, average slope and soil suitability, mean elevation, arable land, temperature, precipitation). Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

results suggest the funding hierarchy of the French government, described in Section 2, favoured education for settlers at the expense of Moroccans, despite a small ratio of French settlers to Moroccans (and urban over rural schools; see Table Appendix A.1 and Appendix A.4).

Adding more controls does not change the substitution effect of the presence of a school for Europeans in a grid on the net positive effects of having a school for Moroccans (column 7). Overall, schools for Europeans have no significant impact (columns 6-8). The value of *Habous* is positively correlated with educational outcomes, suggesting the importance of pre-colonial indigenous investments (still operating during the Protectorate). Results in Table Appendix A.5 from specifications that also include *free schools* – established by the Moroccan population – remain consistent.[26] The distance from Fez and 'insecurity zones' have a significant positive effect on modern-day primary school attendance – possibly due to compensatory post-independence reforms in previously less developed areas (see Section 2) – showing a potentially larger marginal return of education in areas previously under-supplied with schools.[27]

Contrary to expectations, the results in Panel B suggest that the grid-level presence of colonial schools in 1954 does not impact on average the probability of having attended any primary schooling in 2004. We cannot report an interaction for schools dedicated to Europeans or Moroccans (as all grids contain both types by 1954), but there is a significant positive impact (up to 4.6 percentage points) of schools for European settlers on primary education attendance of the 2004 population. Unlike in 1931, Muslim Moroccans had access to these settlers' schools by 1954. The presence of schools for Jewish Moroccans has instead a negative impact on school attendance in column 8. This is potentially due to the disinvestment and destruction of some of these schools during the post-1948 pogroms and the start of mass emigration of

[26]Free schools are likely a bad control because they were founded in response to dissatisfaction with French colonial schools. For this reason, we choose not to include them in the main specifications.

[27]Note that we also run a placebo test with other measures of distance in Table Appendix A.6, and the distance from Fez seems to capture a North-South difference in line with the history of Morocco.

the Jewish population, without sufficient compensatory educational investment by the independent Moroccan government.

Table Appendix A.2 shows the results using the number of schools per grid instead of the presence. Each additional school for Europeans in 1931 has marginally negative impact on the probability of acquiring some primary education, while an additional 1931 school for Moroccans increases the probability of acquiring primary education later on by 2.6 percentage points. When we disaggregate the schools for Moroccans, we find significant positive impacts of both schools for Muslim and for Jewish Moroccans: one additional school increases the probability of primary education in 2004 by 2.5 and 3.6 percentage points, respectively.

By contrast, an additional 1954 European school open to Moroccans has an insignificant marginal impact. The impact of an additional Jewish school in 1954 is negative (up to 2.1 percentage point reduction in the outcome). This points to insufficient educational investment by the Moroccan government in areas that previously had a large Jewish community.

In sum, we find support for both Hypothesis I and II. The results document a persistent positive effect on modern primary school attendance of 1931 colonial schools that is driven by schools for Moroccans, and of 1954 schools for Europeans (albeit weaker). The latter is likely explained by the greater integration of Muslim Moroccans in schools for European settlers after WWII, as European settler schools began admitting Muslim Moroccans in 1944. There are also indications of lasting effects of the school funding hierarchy by the French government, as well as the large-scale disappearance of the Moroccan Jewish population and their schools after WWII.

4.2. Colonial schools and modern primary school enrolment by gender

Morocco still displays large gender disparities in education. Table 3 accordingly tests our third hypothesis and reports our analysis by gender of the 2004 DHS respondents following equation (2), i.e., where the main school presence treatments are interacted with gender, using the full set of controls.

TABLE 3: The presence of colonial schools and primary education by gender

	Any primary education		
	(1)	(2)	(3)
	Panel A		
Presence of schools in 1931 (boy)	−0.001		
	(0.025)		
Presence of schools in 1931 × girl	0.040**		
	(0.018)		
Presence of schools for *Europeans* in 1931 (boy)		−0.031	−0.020
		(0.025)	(0.028)
Presence of schools for *Europeans* in 1931 × girl		0.019	0.011
		(0.014)	(0.014)
Presence of schools for *Moroccans* in 1931 (boy)		0.019	
		(0.024)	
Presence of schools for *Moroccans* in 1931 × girl		0.033**	
		(0.013)	
Presence of schools for *Muslim Moroccans* in 1931 (boy)			0.018
			(0.023)
Presence of schools for *Muslim Moroccans* in 1931 × girl			0.004
			(0.011)
Presence of schools for *Jewish Moroccans* in 1931 (boy)			−0.018
			(0.022)
Presence of schools for *Jewish Moroccans* in 1931 × girl			0.049***
			(0.017)
R^2	0.402	0.403	0.403
	Panel B		
Presence of schools in 1954 (boy)	−0.024		
	(0.020)		
Presence of schools in 1954 × girl	0.022		
	(0.018)		
Presence of schools for *Europeans* in 1954 (boy)		0.006	0.050**
		(0.023)	(0.022)
Presence of schools for *Europeans* in 1954 × girl		0.037**	−0.007
		(0.017)	(0.015)
Presence of schools for *Moroccans* in 1954 (boy)		−0.020	
		(0.021)	
Presence of schools for *Moroccans* in 1954 × girl		−0.000	
		(0.017)	
Presence of schools for *Muslim Moroccans* in 1954 (boy)			−0.019
			(0.020)
Presence of schools for *Muslim Moroccans* in 1954 × girl			−0.004
			(0.017)
Presence of schools for *Jewish Moroccans* in 1954 (boy)			−0.109***
			(0.021)
Presence of schools for *Jewish Moroccans* in 1954 × girl			0.071***
			(0.015)
R^2	0.402	0.403	0.405
Observations	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for the probability of individuals receiving primary education in 2004, focusing on women included in the DHS dataset and the presence or number of French schools. The analysis captures migration dynamics using the variable moved, which indicates whether the type of place of residence for a woman differs from her type of place of residence during childhood. Panel A examines schools established by 1931, and Panel B examines schools established by 1954. All specifications include the complete set of controls as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

Column 1 in Panel A shows that the existence of at least one colonial school in 1931 in the grid has a significant positive impact only for girls: their probability of having

attended at least some primary schooling is 4 percentage points higher in grids with colonial school availability.[28] Disaggregating schools shows the impact is coming from schools for the locals, and specifically schools for Jewish Moroccans. Girls residing in grids where pre-WWII there was at least one school for Jewish Moroccans are 4.8 percentage points more likely to have attended some primary education in 2004 (panel A, column 3). The coefficient of the interacted term is still positive and significant when the outcomes are regressed against the presence of 1954 schools for Jewish Moroccans in Panel B. This indicates that for girls, Jewish schools mitigate the negative impact of the post-1954 dismantling of Jewish communities found for boys (column 3). Schools for European settlers in 1954 had a positive impact on boys' and girls' educational outcomes, as European schools became more accessible to local populations, although non-Jewish Moroccan girls seldom attended these schools.

Table Appendix A.3 shows similar effects for the number of schools. Each additional school for Europeans in 1931 significantly reduces the likelihood of primary schooling in 2004 in the same extent for males and females. An additional school for Moroccans in 1931 improves both males' and females' primary educational outcomes (marginally more for females, up to a 3 percentage point increase), which is due to both schools for Muslim and Jewish Moroccans in the case of girls, but only the Muslim Moroccan schools for boys. For 1954, we still see a positive, albeit small effect on girls' outcomes of having an additional school for Muslim Moroccans, while the effect disappears for boys. The effect of an additional Jewish school on female primary education is positive but insignificant, while it is now negative and significant for males.

Table Appendix A.7 delves into the mechanisms behind the impact of colonial schools for girls. We add interactions between a dummy for schools open to Moroccan girls (such as mixed-gender schools) and gender, and between another dummy for girls-

[28] A triple interaction of schools for European settlers, Moroccans, and gender in Table Appendix A.8, shows a significant positive effect for Moroccan boys attending schools dedicated to Moroccans in 1931 when European schools were not present nearby. This indicates a substitution effect between investments in schools dedicated to Europeans and locals.

only schools and gender. It is clear that 1931 school presence impacted girls' access to education in the long-term through the availability of girls-only schools (provided by the Jewish-funded education), again pointing to the importance of observing gendered social norms in ensuring early access to education. This is not as evident with 1954 schools, although the positive impact for girls is still generated only by the schools for Jewish communities (which include mixed-gender schools).

Overall, we see that early access for girls (especially in girls-only schools) was critical for modern primary school enrolment. The findings indicate that the colonial education system contributed to a persistent unequal gender access dating back to at least 1931.

The contrasting effects of Jewish schools on boys' and girls' education is striking. The departure of European and Jewish populations post-independence was a social and economic shock. The dismantling of Jewish communities and the closure of many Jewish schools coincided with a trend towards urbanisation in Morocco. There was therefore a likely under-investment in education by the Moroccan government in areas where the Jewish were replaced by Muslim Moroccans, which should have affected both genders similarly after independence. We believe that the persistent positive impact on girls' education of Jewish schools is consistent with the explanation that the presence of Jewish schools influenced social norms regarding the educational investment in girls. The earliest Jewish schools offered easy access to girls, while this was virtually non-existent for Muslim Moroccan girls pre-WWII and still very imbalanced by 1951 (78% of the Jewish schools open to girls as opposed to 19% of the French schools for Muslim Moroccans). Prior to the 1948 pogroms, the Moroccan Muslim and Jewish communities cohabited closely and mostly peacefully, so we can expect a norm transfer from Jewish to Muslim families (Gottreich, 2020, Geertz et al., 1979, Zafrani, 1983), similar to the mechanisms discussed in

5. Additional results

Our main findings are concentrated on primary education. We next explore the effects of colonial-era schools on secondary education and on the years of schooling,

before looking at female learning outcomes measured by literacy rates. The effect on female primary education of Jewish schools found above may be explained by persistent social norms, which we investigate in more depth. Finally, we look at effects across generations.

5.1. Effects of colonial schools on modern secondary education enrolment and on years of education

Tables Appendix A.9 and Appendix A.10 report estimates based on model 2 with the enrolment in secondary education and the total number of years of education completed as outcomes. Note that the share of DHS respondents who reported any secondary education is half that for primary education at just under 22% (see Table Appendix C.1). Moreover, among those in education, the average duration is 6.8 years, (primary education). This indicates potential challenges related to 'rare-event' occurrences (female attendance rate is 18%). There is also potential recall bias in recording the number of school years completed by older cohorts.

As with primary education, schools for Moroccans in 1931 have a positive impact on education secondary education attendance and total education completed, in places with no European schools (leading to a 8 percentage points increase in the probability of attending secondary school and almost an entire additional year of education completed on average). The positive effect of schools for Moroccans on total years of education is larger for boys. Jewish schools do not display an effect on girls' total years completed. The presence of schools for Europeans before WWII also has gendered effects: boys' secondary schooling (see Table Appendix A.11) and years of schooling (see Table Appendix A.12) are decreased more than girls' outcomes.

5.2. Colonial schools and female learning outcomes

School enrolment is an important indicator, but enrolment alone does not inform us about learning. Within the DHS dataset, a separate questionnaire specifically targets other outcomes, such as basic literacy among women and girls aged 15-49. We select

TABLE 4: Colonial schools and learning outcomes of girls

	Literacy scale (1)	Able to read (2)	Reads newspaper (3)
	Panel A - 1931 and Presence of school		
Presence of schools in 1931 for Europeans	−0.035	−0.015	−0.023
	(0.069)	(0.035)	(0.032)
Presence of schools in 1931 for Muslim Moroccans	0.019	0.009	−0.002
	(0.069)	(0.035)	(0.026)
Presence of schools in 1931 for Jewish Moroccans	0.032	0.019	0.003
	(0.065)	(0.033)	(0.029)
R^2	0.314	0.295	0.222
	Panel B - 1931 and Number of school		
Number of schools in 1931 for Europeans	−0.040***	−0.023***	−0.017**
	(0.012)	(0.006)	(0.006)
Number of schools in 1931 for Muslim Moroccans	0.038	0.021	0.006
	(0.030)	(0.015)	(0.011)
Number of schools in 1931 for Jewish Moroccans	0.118**	0.067***	0.050**
	(0.048)	(0.023)	(0.024)
R^2	0.315	0.297	0.223
	Panel C - 1954 and Presence of school		
Presence of schools in 1954 for Europeans	0.070	0.036*	0.027
	(0.044)	(0.021)	(0.020)
Presence of schools in 1954 for Muslim Moroccans	−0.070*	−0.034	−0.007
	(0.039)	(0.020)	(0.021)
Presence of schools in 1954 for Jewish Moroccans	−0.131**	−0.064**	−0.072***
	(0.058)	(0.029)	(0.026)
R^2	0.316	0.297	0.224
	Panel D - 1954 and Number of school		
Number of schools in 1954 for Europeans	0.0.006	0.003	−0.001
	(0.012)	(0.006)	(0.005)
Number of schools in 1954 for Muslim Moroccans	−0.001	−0.001	0.001
	(0.006)	(0.003)	(0.003)
Number of schools in 1954 for Jewish Moroccans	−0.020	−0.010	−0.006
	(0.024)	(0.012)	(0.010)
R^2	0.314	0.296	0.222
Observations	13,654	13,654	13,654
Controls variables and Region FE	Yes	Yes	Yes

Notes: OLS estimates from Equation (1) for learning outcomes in 2004 and the presence or number of French schools during the protectorate period, focusing on women included in the DHS dataset. Three indicators measure learning outcomes: the "Literacy scale" which is null if the woman cannot read at all, one if she can read a part of a sentence and two if she can read all the sentences shown in the survey (column 1); a binary indicator equal to one if the woman can read (column 2); and a binary indicator equal to one if the woman reports that she reads newspapers (column 3). We assess the impact on 2004 learning outcomes of the presence of schools in 1931 (Panel A), the number of schools in 1931 (Panel B), the presence of schools in 1954 (Panel C), and the number of schools in 1954 (Panel D). For each panel, we estimate the impact of different types of schools on modern-day learning. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

three indicators of learning: 1) the "Literacy scale" which is null if the woman cannot read at all, one if she can read a part of a sentence, and two if she can read all the sentences shown in the survey; 2) a binary indicator denoting literacy; and 3) a binary indicator equal to one if the woman reports that she reads newspapers. We examine both the presence and the number of schools.

Table 4 reports the estimates based on equation 1 with these three outcomes. The presence of colonial schools in 1931 (Panel A) does not display any significant impact on

the literacy measures, although the coefficients are large and positive for the presence of Jewish schools. The number of colonial schools for Europeans in 1931 has a significant negative impact on women's literacy measured in 2004, while the number of Jewish schools in 1931 has a positive and significant impact on girls' learning (Panel B), in line with the effects on access to primary education. The results using the 1954 European schools show little effect on girls' learning, and there is a significant negative effect of 1954 schools for Moroccans (both Muslim and Jewish) across the board. The number of schools of each type has no impact (Panel D). This suggests that the impact of 1954 schools worked through the quality of education rather than through access, which had in fact been expanded relative to 1931 (see the positive effect of 1954 Jewish schools on girls' primary school enrolment in Table 3). A change in the quality of education post-WWII might be expected due to the persecution of the Jewish communities and boycotts of synagogues and schools; moreover, shortly after independence, one third of the schools for the Jewish communities were nationalised by the Moroccan government.

In sum, undermining the parts of the education system that worked for girls (especially Jewish schools) led to limiting gender norms in acquiring skills and potentially lower education quality, which still reverberate into the 21st century.

5.3. Gender norms persistence

We have seen that Jewish schools positively impacted the enrolment of Moroccan girls in 2004. Our hypothesis is that this effect is underpinned by an inter-community and intergenerational transmission of social norms concerning girls' education. This hypothesis is supported for several reasons.

First, we may be concerned that our results conflate education with wealth effects. If the positive impact of Jewish were driven by the higher average wealth of Jewish communities, we would expect to see positive effects of Jewish schools on boys' education, as well, not only on girls' education.

Second, we can exclude persistent effects being driven by human capital accumulation in the Jewish population. Mass emigration out of Morocco during the mid-20th

century, leading to a plunge in the Jewish population in Morocco from 265,000 in 1948 to 18,000 in 1977 (Avneri (1982), Shapiro (1978); see Figure Appendix B.1). The Jewish schools' impact lies only in their historical influence (through their community and school infrastructure) on the remaining population in Morocco.

Third, Jewish schools were accessible to Moroccan Jews and often single-sex, aligning with Muslim Moroccan norms, unlike the coeducational French schools for Muslims, which were contested by the local population.[29] The Moroccan nationalist movement's 1934 Plan of Moroccan Reforms advocated for segregated education for girls, which the French authorities disregarded. The nationalist initiatives that followed, including free schools for girls, were quashed in the mid-1930s. In 1951, 78% of Jewish schools were open to girls compared to only 19% of French schools for Muslim Moroccans.

Finally, pre-1940, strong community ties documented between the Muslims and the Jewish, meant that the Jewish's gender norms regarding education was likely to be observed and mirrored by their Muslim neighbours. The accessibility of education for Jewish girls potentially reshaped societal attitudes towards female education within the Muslim population. Anthropologists reveal intricate interactions between Moroccan Jewry, Muslims and Amazighs, as summarized by Zafrani (1983): "between Jews and Muslims there was an active solidarity in the intimacy of language and the analogy of mental organization, as well as a significant degree of symbiosis or religious syncretism, expressed in daily life and significant events." Cultural exchanges are evident in shared poetry, music, linguistic transfers, shared religious traditions such as venerating common saints (Gottreich (2020), Chtatou, 2020, 2022, Geertz et al. (1979)).[30] An example

[29]Jewish girls-only education partially challenged traditional gender roles, but espoused European ideals of 'masculinity' and 'femininity' that reinforced some gender norms. Drucker (2015) describes the notion of "femininity" as encouraging women's education and participation in the workforce, albeit within the framework of maintaining traditional domestic roles. "*Teaching should not make women less feminine*": girls were taught to cook, keep house, clean and make clothes, with an emphasis on "*moral education and manual tasks*" (Chouraqui, 1965). For example, girls had fewer hours of French lessons: "*since they were considered to be mothers, they did not need to know the workings of the languages in depth*", according to the teaching guide (Miller, 1996).

[30]Similar dynamics are seen in Libya and Tunisia, where shared cultural and religious contexts influenced Muslim and Jewish communities Goldberg (1990), Gottreich and Schroeter (2011).

is the "*Union des femmes du Maroc*", a society of Moroccan women of all faiths that worked on local issues and anti-colonialism (Ouaknine-Yekutieli (2019)).

In addition to this qualitative evidence, we try to test this hypothesis empirically. We use the DHS dataset on women aged 15-49 to construct four proxies of females' education preferences: 1) a binary indicator equal to one if the proportion of daughters enrolled in primary school is higher than or equal to that of sons, and 2) a similar binary indicator for children's secondary school; both these point towards the relative importance of female education within the household; 3) a binary variable equal to one if the woman was married before the age of 18; and 4) a binary variable equal to one if the woman is currently employed or has been employed at any time in the past year, which is a measure of gender parity in the labour market, linked to educational qualifications. A significant impact of colonial-era Jewish schools on these outcomes would support our hypothesis of social norms transmission regarding female education.

To assess the impact of Jewish schools through intergenerational social norms transmission, we distinguish between the two-thirds of Jewish schools that were not nationalized after independence and the one-third that were nationalized, as their approach to girls' education likely remained different. **Schools that were not nationalized tailored their provision to girls.** Additionally, we control for the number of pogroms occurred in the city and the presence or number of free schools, which could also directly impact the transmission of social norms regarding girls' education. Our analysis examines both the presence (extensive margin) and the number of schools (intensive margin).

Table 5 reports the estimates from regressions based on equation 1 (for a female-only sample), using the four outcomes related to gendered norms. The presence or number of Jewish schools in 1931 (Panels A and B, respectively) does not display any significant impact on social norms, except for a significant reduction in the likelihood to marry before 18 (Panel B). However, the presence and the number of Jewish schools in 1954 had a positive impact on the proportion of daughters enrolled in primary and secondary school compared to sons (Panels C and D). This effect is observed with the

schools that were not nationalized after independence, indicating that in places with a longer exposure to education in the Jewish tradition (more accessible to girls), mothers became more likely to enrol their daughters in primary and secondary schools, as reported in 2004. This effect manifests despite the departure of the Jewish population.

5.4. Gendered effects of colonial schools across generations

Table 6 reports a heterogeneity analysis by generation and gender of the 2004 survey respondents, using our main outcomes. All results are based on equation 2 with the full set of controls, interacting school presence with gender, and are run separately for three different respondent samples, by decades of birth: individuals born before 1950 (i.e. pre-independence), between 1950 and 1990, and after 1990.

For individuals born before 1950, i.e. aged 53 or over at the time of the DHS survey (column 1), the presence schools under the French government in 1931 has a significant positive impact for boys, and a significant negative impact for girls (column 1). The impact of 1931 colonial schools for the younger generations of boys disappears, while the presence of colonial schools significantly increases primary school enrolment for girls born in 1950–1990 (column 3). This is entirely driven by the 1931 schools for the Jewish community (column 4), which continue to significantly impact girls born after 1990 (column 6). This persistence is noteworthy, as the 1962 education reform introduced compulsory primary education for both genders: the effects of colonial-era schools would fade by 1990 if post-independence policy had successfully closed the educational gender gap. This provides further support for the argument that the mechanism at play is the intergenerational transmission of gender education norms.

The impact of 1954 Jewish schools follows the same pattern, with positive effects realised for post 1950-born girls (mitigating the negative impact for boys). The notable difference is in the impact of European schools, which have a significant negative impact for girls born before 1950, and positive afterwards. The positive impacts only for girls born after 1950 can be explained by the expansion in access to Muslim Moroccans after WWII (for European schools) and after independence (for Jewish schools).

TABLE 5: Colonial schools and social norms outcomes for girls

	(1) Daughter's primary enrollment proportion higher or equal than Sons'	(2) Daughter's secondary enrollment proportion higher or equal than Sons'	(3) Age of first marriage less than 18 (yes/no)	(4) Currently or previously (in the past year) working (yes/no)
	Panel A - 1931 and Presence of school			
Presence of schools for *Europeans* in 1931	0.035*	0.024	0.021	−0.029
Presence of schools for *Muslim Moroccans* in 1931	−0.028	−0.031	−0.037	0.024
Presence of schools for *Jewish Moroccans* in 1931 not nationalized after 1956	0.008	−0.001	−0.025	−0.023
Presence of schools for *Jewish Moroccans* in 1931 nationalized after 1956	0.022	−0.011	0.027	0.007
R^2	0.149	0.214	0.062	0.060
	Panel B - 1931 and Number of school			
Nb schools for *Europeans* in 1931	0.011	0.015*	0.016	−0.008
Nb schools for *Muslim Moroccans* in 1931	0.001	−0.023**	−0.018*	−0.002
Nb schools for *Jewish Moroccans* in 1931 not nationalized after 1956	−0.018	−0.032	−0.056**	−0.024
Nb schools for *Jewish Moroccans* in 1931 nationalized after 1956	−0.027	−0.009	0.002	0.069*
R^2	0.149	0.213	0.062	0.060
	Panel C - 1954 and Presence of school			
Presence of schools for *Europeans* in 1954	0.0286	−0.00767	0.00461	0.0680*
Presence of schools for *Muslim Moroccans* in 1954	0.012	0.031*	−0.006	−0.016
Presence of schools for *Jewish Moroccans* in 1954 not nationalized after 1956	0.054***	0.054***	0.033	−0.022
Presence of schools for *Jewish Moroccans* in 1954 nationalized after 1956	−0.006	−0.050*	−0.021	0.001
R^2	0.149	0.215	0.063	0.060
	Panel D - 1954 and Number of school			
Nb schools for *Europeans* in 1954	−0.002	−0.003	−0.002	0.002
Nb schools for *Muslim Moroccans* in 1954	0.004**	0.000	0.001	−0.003
Nb schools for *Jewish Moroccans* in 1954 not nationalized after 1956	0.000	0.021**	0.005	0.007
Nb schools for *Jewish Moroccans* in 1954 nationalized after 1956	−0.030	−0.036	−0.013	0.013
R^2	0.149	0.214	0.062	0.060
Observations	6,931	6,931	8,017	13,654
Observations	8,017	13,654	6,931	6,931
Controls variables and Region FE	*Yes*	*Yes*	*Yes*	*Yes*
Pogroms controls	*Yes*	*Yes*	*Yes*	*Yes*
Free schools controls	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for social norms related to education in 2004 and the presence or number of French schools during the protectorate period, focusing on women included in the DHS dataset. The presence or number of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. Social norm outcomes are measured using four indicators: a binary indicator equal to one if the proportion of daughters enrolled in primary school is higher than the proportion of sons (column 1); a binary indicator equal to one if the proportion of daughters enrolled in secondary school is higher than the proportion of sons (column 2); a binary variable equal to one if the woman was married before the age of 18 (column 3); and a binary variable equal to one if the woman is currently employed or has been employed at any time in the past year (column 4). We assess the impact on 2004 social norms outcomes of the presence of schools in 1931 (Panel A), the number of schools in 1931 (Panel B), the presence of schools in 1954 (Panel C), and the number of schools in 1954 (Panel D). All specifications include the complete set of control as in columns (5-8) of Table 2 plus, at the grid level, the number of pogroms that occurred in the city and the presence or number of free schools. Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE 6: Presence of colonial schools, gender and primary education by generation

	Any primary education					
	Born before 1950		Born between 1950 and 1990		Born after 1990	
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A					
Presence of schools in 1931 *(boy)*	0.053**		−0.016		0.000	
	(0.024)		(0.030)		(0.020)	
Presence of schools in 1931 × *girl*	−0.082***		0.075***		0.021	
	(0.020)		(0.027)		(0.015)	
Presence of schools for *Europeans* in 1931 *(boy)*		0.009		−0.033		0.001
		(0.026)		(0.037)		(0.021)
Presence of schools for *Europeans* in 1931 × *girl*		−0.005		0.020		−0.009
		(0.025)		(0.020)		(0.015)
Presence of schools for *Muslim Moroccans* in 1931 *(boy)*		0.016		0.023		0.002
		(0.028)		(0.027)		(0.017)
Presence of schools for *Muslim Moroccans* in 1931 × *girl*		−0.053		0.017		0.014
		(0.032)		(0.016)		(0.027)
Presence of schools for *Jewish Moroccans* in 1931 *(boy)*		0.008		−0.030		−0.004
		(0.040)		(0.026)		(0.011)
Presence of schools for *Jewish Moroccans* in 1931 × *girl*		−0.037		0.074***		0.040*
		(0.037)		(0.025)		(0.021)
R^2	0.193	0.194	0.304	0.305	0.074	0.075
	Panel B					
Presence of schools in 1954 *(boy)*	0.010		−0.031		−0.032	
	(0.024)		(0.030)		(0.021)	
Presence of schools in 1954 × *girl*	−0.031		0.028		0.066***	
	(0.027)		(0.028)		(0.024)	
Presence of schools for *Europeans* in 1954 *(boy)*		0.078***		0.045		0.033*
		(0.023)		(0.030)		(0.017)
Presence of schools for *Europeans* in 1954 × *girl*		−0.061***		0.007		0.013
		(0.022)		(0.024)		(0.021)
Presence of schools for *Muslim Moroccans* in 1954 *(boy)*		−0.022		−0.014		−0.029
		(0.021)		(0.030)		(0.020)
Presence of schools for *Muslim Moroccans* in 1954 × *girl*		0.021		−0.020		0.045*
		(0.024)		(0.024)		(0.024)
Presence of schools for *Jewish Moroccans* in 1954 *(boy)*		−0.057*		−0.132***		−0.063***
		(0.030)		(0.027)		(0.018)
Presence of schools for *Jewish Moroccans* in 1954 × *girl*		−0.042		0.101***		0.035
		(0.025)		(0.023)		(0.022)
R^2	0.189	0.198	0.302	0.307	0.075	0.080
Observations	6,308	6,308	31,661	31,661	8,324	8,324
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving primary education in 2004, disaggregated by gender, generation, and the presence of colonial schools. Results are presented for individuals born before 1950 (columns 1-2), those born between 1950 and 1990 (columns 3-4), and those born after 1990 (columns 4-5). The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Panel A looks at schools established by 1931, and Panel B looks at schools established by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

Boys born before 1950 benefited from schools for Europeans, owing perhaps to some degree of access for elite Moroccans in these schools. The only persistent impact is the negative impact of the 1954 Jewish schools on males' primary enrolment for generations born after 1950, likely capturing the adverse social and economic shock of dismantling Jewish communities without enough compensatory educational investment.

6. Alternative channels and sensitivity analysis

In constructing the treatment variable, schools were organized into 188 arbitrary cells of 0.25 degrees, approximately 28kmx28km. With fairly small grids, the treatment at grid-cell level (the presence and the number of schools within each cell) reduces the potential bias arising from household self-selection in choosing to live in regions with better economic outlook and education access. We assume that relocating households are equally likely to choose any grid-cell in expectation, given that the grid delimitation is randomly determined and neighbouring grids exhibit similar characteristics.

Nevertheless, to mitigate the risks that unobserved heterogeneity specific to the grid could concurrently influence both the treatment and dependent variables, we undertake a set of sensitivity analyses, including variations in grid sizes, deployment of randomized grid generation to capture slightly altered territorial divisions with the same 28km-wide grid size, and a placebo test where false treatments are assigned to untreated grids. We also re-estimate the main results with a non-linear estimator and consider the possibility of spatial autocorrelation between grids.

Grid variations. The randomized grid generation approach maintaining the same 28km-wide grid size, and grid size variations of 0.2 degrees (approximately 22km wide) and 0.3 degrees (approximately 33km wide) yielded outcomes consistent with our primary education analysis in Table 2 for both the presence of schools in a grid (see Table Appendix A.13) and the number of schools in a grid (see Table Appendix A.14).

Placebo test. We implement placebo tests by employing a random assignment of treatment grids, meaning that households that were actually exposed to colonial schools are no longer necessarily those treated in the placebo. Thus, the assignment of grids

to households is independent of the actual colonial schools treatment. To eliminate any systematic patterns, this process is iterated 1000 times. The resulting coefficients consistently converge around zero and are statistically insignificant, as shown in Figure Appendix B.6. This bolsters the credibility of our findings: when the treatment does not reflect the real location of the colonial schools, we find no effect. We read this evidence as strong support for interpreting the impact of colonial schools as causal.

Internal migration. Internal migration is a significant factor influencing education outcomes and regional demographics. The primary reasons for migration to urban areas include work and employment (56.38%), marriage (29.26%), and education (8.14%) (Bouoiyour et al., 2017). Gender-specific patterns reveal stark differences: for men, work and employment dominate migration motives (83.29%), followed by education (9%) and marriage (3.82%). For women, however, marriage emerges as the primary driver (67.38%), with work and employment (16.05%) and education (6.85%) playing much smaller roles (Bouoiyour et al., 2017). This underscores that wedding migrations are the leading reason for female migration. On average, migrants are less likely to have attended primary school (Bouoiyour et al., 2017). This trend introduces a downward bias in our results, as migrants generally exhibit lower baseline education levels compared to non-migrants. Despite this, our analysis identifies robust positive effects on education outcomes for specific historical grid conditions. As illustrated in Figure Appendix A.19, we examine a sub-sample of women to investigate gender-specific migration dynamics further. The results indicate that female migrants are, on average, less likely to have attended primary school. This negative effect is particularly pronounced among individuals who migrated to areas with Jewish schools. These findings suggest that internal migration could partially influence the observed outcomes. However, given that migrants generally have lower baseline education levels, this trend could only downward bias our results, reinforcing the robustness of the positive impact of Jewish schools on female education.

Non-linear estimation approach. While the main econometric approach employs a Linear Probability Model, we also employ a non-linear probit model and find

in Table Appendix A.15 that the choice of model does not alter the estimation results.

Spatial Autocorrelation. While our primary specification already incorporates geographic controls (latitude, longitude, and distance to the coast) and region fixed effects, and clusters standard errors at the province level, we further address spatial dependencies by employing a Spatial Autoregressive Model (SAR). To quantify spatial dependence, we compute Moran's I statistic on the residuals of our main specification (column 5, Table 2), which confirms significant spatial autocorrelation (Moran's I = 0.489).[31]

Our SAR model incorporates spatial interactions through a spatial weights matrix. Given that all individuals within a grid share the same treatment status, this estimation is conducted at the grid level, with control variables aggregated accordingly. We re-estimate the primary specification using an OLS model with population-weighted regressions. This method ensures that each grid's contribution to the estimation reflects its actual population distribution, rather than treating all grids equally. The results (Appendix Table Appendix A.20) indicate that the estimates from the SAR model align closely with those obtained from our main regressions. Specifically, the positive impact of Moroccan schools in 1931 remains robust, while the interaction with European schools continues to yield a negative coefficient, with magnitudes consistent with the baseline results. Similar patterns hold for the 1954 specification, confirming that our findings are not driven by spatial dependencies or unobserved spatial heterogeneity. Minor discrepancies between the OLS and SAR estimates likely stem from differences in aggregation levels.

7. Conclusions

Our study sheds light on the enduring impacts on modern-day educational outcomes in Morocco of colonial-era primary education. We construct a novel dataset based on

[31] The presence of spatial autocorrelation introduces two key risks: spurious correlations arising from spatial trends and downward-biased standard errors that may inflate statistical significance (Kelly, 2019).

archival information on colonial-era schools in 1931 (pre-WWII) and 1954 (post-WWII and shortly before Moroccan independence) and on Demographic and Health Survey (DHS) data from 2004. Our identification strategy relies on the use of an arbitrary grid with DHS clusters matched to colonial-era school locations at grid level, and a rich set of individual and location controls. Our focus on the different types of colonial schools established during the French Protectorate provides a nuanced understanding of their influence on individuals' likelihood of attaining education in 2004, accounting for generational and gender variations.

The findings reveal persistent effects that hinge on the nature of schools established by the French government during the Protectorate. Colonial-era schools segregated the education for European settlers and Muslim and other Moroccans, funded by the French government, and for Jewish Moroccans, funded by the Paris-based *Alliance Israélite Universelle* (AIU). This segregation was linked with disparities in funding, infrastructure and gender accessibility. Having at least one school reserved for (any) Moroccans in a grid cell in 1931 increases the probability of obtaining any primary education in 2004 by nearly 7.8 percentage points, but only where there were no schools for Europeans nearby. This substitution effect is likely a result of the funding competition between schools for Europeans and those for Moroccans. We see positive effects of the presence of a school for Europeans in 1954, when these schools had become more open to Moroccans.

Disparities in access persist in the modern Moroccan education system, particularly across gender lines. We find surprising differences between the types of colonial-era schools: schools for Jewish Moroccans negatively affected later primary schooling for boys and positively influenced that of girls. Pre-WWII Jewish schools increase female primary schooling by 4.9 percentage points. For boys, we find a 10.9 percentage points lower chance of primary schooling for 1954 schools. Findings are particularly strong for the respondents born between 1950 and 1990.

The positive impact of Jewish schools on modern-day education for girls is a novel result that we suggest stems from social norms transmission. AIU-run Jewish schools

provided accessible education through girls-only schools, which were more culturally acceptable among the Jewish and Muslim communities than boys-only (and at best mixed-gender) schools reserved for Muslim Moroccans under French governance. This dynamic, possibly nurtured by strong community ties between Jewish and Muslim Moroccans, offset the negative shock in enrollment that occurred after the quasi-disappearance of the Jewish Moroccan community and the closure of many of their schools, and has had a lasting impact on current-day education. We support the hypothesis of social norms transmission with historical research on the inter-communal links, and with quantitative evidence using measures of the preference for female education and gender parity from the DHS.

Early access for girls (especially in girls-only schools) seems to have been a critical element. The persistence of these effects, albeit weaker beyond 1990, suggests that the Moroccan government in 2004 had not fully mitigated the impact of colonial investments in primary education. Thus, the efforts of post-colonial governments to achieve universal primary education nationwide require more than 60 years to overcome the disparities inherited from the colonial schooling system. This finding is consistent with studies conducted in India (Chaudhary and Garg, 2015) and Tunisia (Salah et al., 2017), which demonstrate the very gradual reversal of colonial educational investments.

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APPENDIX FOR ONLINE PUBLICATION

Appendix A. Additional tables

TABLE APPENDIX A.1: Descriptive statistics on the teacher-student ratio in colonial schools

	Students over teachers (avg)	(sd)	Teachers over students (avg)	(sd)	N
Schools implemented in 1931					
Schools for Europeans	35.8	30.3	0.038	0.026	132
including *Private Schools*	25.5	8.6	0.045	0.022	20
Schools for Jewish Moroccans	42.5	8.4	0.024	0.005	28
Schools for Muslims Moroccans	34,6	13.8	0.034	0.021	86
- *Elite schools*	29.4	11.1	0.037	0.011	6
- *Urban schools*	32.3	13.1	0.038	0.026	39
- *Berbers schools*	37.3	12.8	0.030	0.011	16
- *Rural schools*	37.5	13.6	0.031	0.013	25
Schools implemented in 1954					
Schools for Europeans	34.8	9.8	0.033	0.019	181
Schools for Jewish Moroccans	46.2	10.8	0.023	0.006	64
Schools for Muslims Moroccans	40.9	9.9	0.026	0.008	1,183

TABLE APPENDIX A.2: Number of schools and primary education

	Any primary education							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
Number of schools in 1931	0.001				0.001			
	(0.002)				(0.003)			
Number of schools for Europeans in 1931		−0.011***	−0.001	−0.012***		−0.012**	−0.012	−0.014**
		(0.004)	(0.007)	(0.004)		(0.005)	(0.011)	(0.005)
Number of schools for Moroccans in 1931		0.026***	0.025***			0.026***	0.026***	
		(0.009)	(0.009)			(0.009)	(0.009)	
(Nb) Schools for European× Moroccans			−0.001*				−0.001	
			(0.001)				(0.001)	
Number of schools for Muslim Moroccans in 1931				0.024**				0.023**
				(0.010)				(0.010)
Number of schools for Jewish Moroccans in 1931				0.034**				0.035
				(0.015)				(0.022)
Distance from Fez					0.031**	0.035***	0.035***	0.033***
					(0.012)	(0.012)	(0.011)	(0.012)
Insecurity zone					0.053**	0.054**	0.054**	0.053**
					(0.023)	(0.022)	(0.022)	(0.021)
Log Financial Value Habous					0.003**	0.002**	0.002**	0.002**
					(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.394	0.395	0.395	0.395	0.402	0.403	0.403	0.403
	Panel B							
Number of schools in 1954	0.000				−0.000			
	(0.000)				(0.000)			
Number of schools for Europeans in 1954		0.001	0.007	0.005		0.001	0.003	0.005
		(0.003)	(0.004)	(0.004)		(0.004)	(0.005)	(0.004)
Number of schools for Moroccans in 1954		−0.001	0.000			−0.001	0.000	
		(0.002)	(0.002)			(0.002)	(0.002)	
(Nb) Schools for European × Moroccans			−−				−−	
			−−				−−	
Number of schools for Muslim Moroccans in 1954				0.001				0.001
				(0.002)				(0.002)
Number of schools for Jewish Moroccans in 1954				−0.017**				−0.021**
				(0.007)				(0.009)
Distance from Fez					0.031**	0.031**	0.032**	0.035***
					(0.012)	(0.013)	(0.012)	(0.012)
Insecurity zone					0.052**	0.052**	0.053**	0.058**
					(0.023)	(0.023)	(0.023)	(0.022)
Log Financial Value Habous					0.003**	0.003**	0.003**	0.002**
					(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.394	0.394	0.395	0.395	0.402	0.402	0.402	0.402
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004. The number of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. Interaction terms between presence of schools reserved for European settlers and for Moroccans are included in columns 3 and 7. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.3: Interaction of the number of schools and gender over primary education

	Any primary education		
	(1)	(2)	(3)
	Panel A		
Number of schools (boy)	−0.002		
	(0.002)		
Number of schools × girl	0.003***		
	(0.008)		
Number of schools for *Europeans* (boy)		−0.013**	−0.013**
		(0.005)	(0.006)
Number of schools for *Europeans* × girl		0.001	−0.001
		(0.001)	(0.002)
Number of schools for *Moroccans* (boy)		0.022**	
		(0.008)	
Number of schools for *Moroccans* × girl		0.006*	
		(0.003)	
Number of schools for *Muslim Moroccans* (boy)			0.022*
			(0.009)
Number of schools for *Muslim Moroccans* × girl			0.006*
			(0.004)
Number of schools for *Jewish Moroccans* (boy)			0.024
			(0.022)
Number of schools for *Jewish Moroccans* × girl			0.022**
			(0.009)
R^2	0.402	0.403	0.403
	Panel B		
Number of schools (boy)	−0.000		
	(0.000)		
Number of schools × girl	0.001***		
	(0.000)		
Number of schools for *Europeans* (boy)		0.002	0.007
		(0.004)	(0.005)
Number of schools for *Europeans* × girl		−0.000	−0.001
		(0.002)	(0.002)
Number of schools for *Moroccans* (boy)		−0.002	
		(0.002)	
Number of schools for *Moroccans* × girl		0.002*	
		(0.001)	
Number of schools for *Muslim Moroccans* (boy)			0.000
			(0.002)
Number of schools for *Muslim Moroccans* × girl			0.001*
			(0.001)
Number of schools for *Jewish Moroccans* (boy)			−0.020**
			(0.010)
Number of schools for *Jewish Moroccans* × girl			0.004
			(0.004)
R^2	0.402	0.402	0.403
Observations	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving primary education in 2004, disaggregated by gender and the number of colonial schools. The number of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.4: Presence of schools by types and primary education by generation

	Any primary education		
	Before 1950	Between 1950 and 1990	After 1990
	(1)	(2)	(3)
Presence of schools for Europeans in 1931	−0.002	−0.028	−0.010
	(0.019)	(0.032)	(0.020)
Presence of Amazigh Schools for Moroccans in 1931	0.010	0.061	0.059*
	(0.019)	(0.037)	(0.032)
Presence of rural schools for Moroccans in 1931	0.008	0.030	0.000
	(0.020)	(0.027)	(0.020)
Presence of urban schools for Moroccans in 1931	0.023	0.045	0.033*
	(0.048)	(0.039)	(0.017)
Presence of elite Schools for Moroccans in 1931	−0.062	−0.049	−0.025
	(0.048)	(0.042)	(0.028)
Presence of schools for Jewish Moroccans in 1931	−0.001	0.025	0.022
	(0.026)	(0.030)	(0.022)
Observations	6,292	31,598	8,308
R^2	0.190	0.304	0.076
City FE and Individual controls	Yes	Yes	Yes
Geographic controls	Yes	Yes	Yes
Region Fixed effects	Yes	Yes	Yes

Notes: OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004. The presence of colonial schools is captured by all types of schools: for Europeans, Moroccan Jews and different types of schools for Moroccan Muslims (Urban schools, rural schools, schools for Amazighs and the elite schools) for each grid. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.5: Presence of schools in 1931 and the *Free schools*

	Any primary education							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
Presence of schools in 1931	0.019				0.019			
	(0.022)				(0.022)			
Presence of schools for *Europeans* in 1931		−0.021	−0.001	−0.014		−0.021	−0.001	−0.014
		(0.026)	(0.025)	(0.025)		(0.022)	(0.026)	(0.025)
Presence of schools for *Moroccans* in 1931		0.036	0.078***			0.036	0.077***	
		(0.023)	(0.023)			(0.023)	(0.025)	
Schools for *Europeans* × *Moroccans*			−0.069*				−0.069*	
			(0.030)				(0.030)	
Presence of schools for Muslim Moroccans in 1931				0.020				0.019
				(0.022)				(0.023)
Presence of schools for Jewish Moroccans in 1931				0.008				0.008
				(0.023)				(0.023)
Presence of Free schools between 1919 and 1952					−0.011	−0.012	−0.007	−0.007
					(0.034)	(0.034)	(0.033)	(0.032)
					(0.032)	(0.032)	(0.032)	(0.031)
R^2	0.401	0.402	0.402	0.401	0.401	0.402	0.402	0.401
	Panel B							
Presence of schools in 1954	−0.013				−0.013			
	(0.018)				(0.018)			
Presence of schools for *Europeans* in 1954		0.025	0.025	0.046**		0.025	0.025	0.046**
		(0.020)	(0.020)	(0.019)		(0.020)	(0.020)	(0.019)
Presence of schools for *Moroccans* in 1954		−0.021	−0.021			−0.021	−0.021	
		(0.019)	(0.019)			(0.020)	(0.020)	
Schools for *Europeans* × *Moroccans*			−−				−−	
			−−				−−	
Presence of schools for Muslim Moroccans in 1954				−0.021				−0.021
				(0.019)				(0.019)
Presence of schools for Jewish Moroccans in 1954				−0.071***				−0.072***
				(0.022)				(0.022)
Presence of Free schools between 1919 and 1952					−0.012	−0.012	−0.012	0.001
					(0.032)	(0.033)	(0.033)	(0.027)
R^2	0.401	0.402	0.402	0.403	0.401	0.402	0.402	0.403
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Notes:OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004 and controlling the presence of the *Free schools* implemented between 1931 and 1952 at the grid level. The presence of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. Interaction terms between presence of schools reserved for European settlers and for Moroccans are included in columns 3 and 7. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.6: Placebo test: Different distances

	Any primary education						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A						
Presence of schools for Europeans in 1931	0.001	−0.000	−0.002	−0.002	−0.001	−0.000	0.001
	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)
Presence of schools for Moroccans in 1931	0.078***	0.078***	0.079***	0.079***	0.077***	0.076***	0.080***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Schools for European × Moroccans	−0.069**	−0.067**	−0.065**	−0.065**	−0.068**	−0.067**	−0.072**
	(0.030)	(0.029)	(0.029)	(0.029)	(0.028)	(0.029)	(0.029)
Distance from Fez	0.030**						0.040
	(0.012)						(0.058)
Distance from Gilbratar		0.037**					0.022
		(0.018)					(0.153)
Distance from Mecca			0.040				−0.786
			(0.318)				(1.806)
Distance from Paris				0.058			−0.273
				(0.106)			(0.692)
Distance from Marrakech					0.022		0.020
					(0.018)		(0.046)
Distance from Ouarzazate						0.019	−0.016
						(0.015)	(0.042)
R^2	0.403	0.403	0.402	0.402	0.402	0.402	0.403
	Panel B						
Presence of schools for Europeans in 1954	0.025	0.025	0.025	0.026	0.024	0.024	0.026
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Presence of schools for Moroccans in 1954	−0.021	−0.021	−0.015	−0.015	−0.016	−0.018	−0.020
	(0.019)	(0.020)	(0.018)	(0.019)	(0.019)	(0.019)	(0.021)
Schools for European × Moroccans	−−	−−	−−	−−	−−	−−	−−
	−−	−−	−−	−−	−−	−−	−−
Distance from Fez	0.032***						0.042
	(0.011)						(0.059)
Distance from Gilbratar		0.041**					0.000
		(0.017)					(0.156)
Distance from Mecca			0.062				−0.427
			(0.318)				(1.805)
Distance from Paris				0.061			−0.136
				(0.104)			(0.684)
Distance from Marrakech					0.022		−0.009
					(0.018)		(0.053)
Distance from Ouarzazate						0.022	0.009
						(0.014)	(0.047)
R^2	0.402	0.401	0.401	0.401	0.401	0.401	0.402
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004 and controlling different distances instead of the "Distance from Fez" at the grid level (distance from Gibraltar, Mecca, Paris, Marrakech and Ouarzazate). The presence of colonial schools is captured by two types of schools: for Europeans and Moroccans within each grid. Interaction terms between presence of schools reserved for European settlers and for Moroccans are also included. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.7: Accessibility of colonial schools to girls and primary education

	Primary education		
	(1)	(2)	(3)
	Panel A		
Presence of schools for *Europeans* in 1931 (boy)	−0.020	−0.020	−0.020
	(0.028)	(0.028)	(0.028)
Presence of schools for *Europeans* in 1931 × girl	0.011	0.010	0.008
	(0.014)	(0.014)	(0.013)
Presence of schools for *Muslim Moroccans* in 1931 (boy)	0.018	0.018	0.021
	(0.023)	(0.024)	(0.024)
Presence of schools for *Muslim Moroccans* in 1931 × girl	0.004	−0.002	−0.010
	(0.011)	(0.011)	(0.014)
Presence of schools for *Jewish Moroccans* in 1931 (boy)	−0.018	−0.020	−0.016
	(0.022)	(0.052)	(0.052)
Presence of schools for *Jewish Moroccans* in 1931 × girl	0.049***	0.022	0.008
	(0.017)	(0.023)	(0.016)
Mixed gender and girls-only schools for *Moroccans* in 1931 *(boy)*		0.004	0.005
		(0.063)	(0.066)
Mixed gender and girls-only schools for *Moroccans* in 1931 × *girl*		0.035	0.014
		(0.024)	(0.021)
Girls-only schools for *Moroccans* in 1931 *(boy)*			0.012
			(0.038)
Girls-only schools for *Moroccans* in 1931 × *girl*			0.052***
			(0.018)
R^2	0.402	0.402	0.403
	Panel B		
schools for *Europeans* in 1954 *(boy)*	0.051**	0.048**	0.048**
	(0.022)	(0.023)	(0.023)
schools for *Europeans* in 1954 × *girl*	−0.007	−0.009	−0.009
	(0.015)	(0.015)	(0.015)
schools for *Muslim Moroccans* in 1954 *(boy)*	−0.024	−0.022	−0.022
	(0.023)	(0.022)	(0.022)
schools for *Muslim Moroccans* in 1931 × *girl*	−0.004	−0.005	−0.004
	(0.017)	(0.017)	(0.017)
schools for *Jewish Moroccans* in 1954 *(boy)*	−0.095***	−0.131***	−0.131***
	(0.023)	(0.040)	(0.040)
schools for *Jewish Moroccans* in 1954 × *girl*	0.071***	0.064***	0.064***
	(0.015)	(0.018)	(0.018)
Mixed gender and girls-only schools for *Moroccans* in 1954 *(boy)*		0.060	0.049
		(0.043)	(0.050)
Mixed gender and girls-only schools for *Moroccans* in 1954 × *girl*		0.010	0.023
		(0.018)	(0.033)
Girls-only schools for *Moroccans* in 1954 *(boy)*			0.011
			(0.035)
Girls-only schools for *Moroccans* in 1954 × *girl*			−0.013
			(0.032)
R^2	0.404	0.404	0.404
Observations	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving primary education in 2004, disaggregated by gender and the presence of colonial schools accessible to girls. The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Column (1) repeats specification (3) from Table 3 for easier comparison; column (2) adds a dummy variable if the school was open to girls (mixed-gender schools or girls-only schools) and the interaction with being female; and column (3) adds a dummy variable if the school was open only to girls and the interaction with being female. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.8: Interaction of the presence of schools, gender and type of schools on primary education

	Any primary education
	(1)
	Panel A
Presence of schools for *Europeans* in 1931 *(boy)*	−0.003
	(0.028)
Presence of schools for *Europeans* in 1931 × girl	0.005
	(0.005)
Presence of schools for *Moroccans* in 1931 *(boy)*	0.079***
	(0.023)
Presence of schools for *Moroccans* in 1931 × *girl*	−0.003
	(0.023)
Girl	−0.222***
	(0.012)
Presence of schools for *Moroccans* in 1931 × Presence of schools for *Europeans* in 1931 *(boy)*	−0.097***
	(0.029)
Presence of schools for *Moroccans* in 1931 × Presence of schools for *Europeans* in 1931 × *girl*	0.055*
	(0.029)
R^2	0.403
	Panel B
Presence of schools for *Europeans* in 1954 *(boy)*	0.005
	(0.023)
Presence of schools for *Europeans* in 1954 × *girl*	−0.000
	(0.017)
Presence of schools for *Moroccans* in 1954 *(boy)*	−0.020
	(0.021)
Presence of schools for *Moroccans* in 1954 × *girl*	0.037**
	(0.017)
Girl	−0.221***
	(0.016)
Presence of schools for *Moroccans* in 1954 × Presence of schools for *Europeans* in 1931 *(boy)*	−−
	−−
Presence of schools for *Moroccans* in 1954 × Presence of schools for *Europeans* in 1931 × *girl*	−−
	−−
R^2	0.402
Observations	46,358
City FE and Individual controls	*Yes*
Geographic controls	*Yes*
Region Fixed effects	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving primary education in 2004, disaggregated by gender, the presence of schools for Europeans, the presence of schools for Moroccans and the triple interaction among the schools for European settlers, Moroccans, and gender. The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.9: Presence of schools and secondary education

	Any secondary education							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
Presence of schools in 1931	0.015				0.002			
	(0.015)				(0.020)			
Presence of schools for Europeans in 1931		−0.028*	−0.003	−0.018		−0.043**	−0.019	−0.034
		(0.016)	(0.018)	(0.017)		(0.021)	(0.025)	(0.022)
Presence of schools for Moroccans in 1931		0.042**	0.087***			0.034	0.080**	
		(0.019)	(0.032)			(0.033)	(0.031)	
Schools for European × Moroccans			−0.075**				−0.075**	
			(0.037)				(0.039)	
Presence of schools for Muslim Moroccans in 1931				0.025				0.021
				(0.026)				(0.026)
Presence of schools for Jewish Moroccans in 1931				0.004				−0.007
				(0.026)				(0.024)
R^2	0.256	0.257	0.258	0.256	0.260	0.261	0.261	0.260
	Panel B							
Presence of schools in 1954	−0.000				−0.012			
	(0.017)				(0.017)			
Presence of schools for Europeans in 1954		0.011	0.011	0.019		−0.001	−0.001	0.013
		(0.011)	(0.011)	(0.014)		(0.012)	(0.012)	(0.014)
Presence of schools for Moroccans in 1954		−0.005	−0.005			−0.012	−0.012	
		(0.017)	(0.017)			(0.017)	(0.017)	
Schools for European × Moroccans			−−				−−	
			−−				−−	
Presence of schools for Muslim Moroccans in 1954				−0.004				−0.012
				(0.017)				(0.016)
Presence of schools for Jewish Moroccans in 1954				−0.027				−0.045*
				(0.023)				(0.024)
R^2	0.256	0.256	0.256	0.256	0.260	0.260	0.260	0.261
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for the probability of individuals having some secondary education in 2004. The presence of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. Interaction terms between presence of schools reserved for European settlers and for Moroccans are included in columns 3 and 7. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.10: Presence of schools and number of years of education

	Number of years of education							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
Presence of schools in 1931	0.188				0.069			
	(0.175)				(0.249)			
Presence of schools for Europeans in 1931		−0.385**	−0.162	−0.260		−0.501**	−0.262	−0.403
		(0.169)	(0.213)	(0.187)		(0.227)	(0.289)	(0.260)
Presence of schools for Moroccans in 1931		0.623***	1.022***			0.511*	0.958**	
		(0.234)	(0.369)			(0.285)	(0.356)	
Schools for European × Moroccans			−0.676				−0.737	
			(0.432)				(0.443)	
Presence of schools for Muslim Moroccans in 1931				0.387				0.335
				(0.318)				(0.307)
Presence of schools for Jewish Moroccans in 1931				0.113				0.035
				(0.321)				(0.323)
R^2	0.159	0.160	0.160	0.159	0.162	0.162	0.162	0.162
	Panel B							
Presence of schools in 1954	−0.157				−0.290			
	(0.207)				(0.224)			
Presence of schools for Europeans in 1954		0.166	0.166	0.262		0.052	0.052	0.206
		(0.154)	(0.154)	(0.175)		(0.164)	(0.164)	(0.179)
Presence of schools for Moroccans in 1954		−0.223	−0.223			−0.306	−0.306	
		(0.212)	(0.212)			(0.230)	(0.230)	
Schools for European × Moroccans			−−				−−	
			−−				−−	
Presence of schools for Muslim Moroccans in 1954				−0.215				−0.308
				(0.210)				(0.219)
Presence of schools for Jewish Moroccans in 1954				−0.317				−0.522*
				(0.290)				(0.301)
R^2	0.159	0.159	0.159	0.159	0.162	0.162	0.162	0.162
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (1) for the probability of individuals receiving number of years education in 2004. The presence of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. Interaction terms between presence of schools reserved for European settlers and for Moroccans are included in columns 3 and 7. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.11: Interaction of the presence of schools and gender over secondary education

	Any secondary education		
	(1)	(2)	(3)
	Panel A		
Presence of schools in 1931 (boy)	−0.005		
	(0.021)		
Presence of schools in 1931 × girl	0.013		
	(0.011)		
Presence of schools for *Europeans* in 1931 (boy)		−0.060**	−0.047*
		(0.023)	(0.024)
Presence of schools for *Europeans* in 1931 × girl		0.033**	0.024*
		(0.013)	(0.013)
Presence of schools for *Moroccans* in 1931 (boy)		0.043*	
		(0.026)	
Presence of schools for *Moroccans* in 1931 × girl		−0.018	
		(0.011)	
Presence of schools for *Muslim Moroccans* in 1931 (boy)			0.027
			(0.028)
Presence of schools for *Muslim Moroccans* in 1931 × girl			−0.011
			(0.012)
Presence of schools for *Jewish Moroccans* in 1931 (boy)			−0.009
			(0.024)
Presence of schools for *Jewish Moroccans* in 1931 × girl			0.005
			(0.014)
R^2	0.260	0.261	0.261
	Panel B		
Presence of schools in 1954 (boy)	−0.003		
	(0.022)		
Presence of schools in 1954 × girl	−0.017		
	(0.019)		
Presence of schools for *Europeans* in 1954 (boy)		−0.007	0.010
		(0.015)	(0.017)
Presence of schools for *Europeans* in 1954 × girl		0.012	0.005
		(0.011)	(0.013)
Presence of schools for *Moroccans* in 1954 (boy)		0.001	
		(0.023)	
Presence of schools for *Moroccans* in 1954 × girl		−0.024	
		(0.020)	
Presence of schools for *Muslim Moroccans* in 1954 (boy)			0.001
			(0.022)
Presence of schools for *Muslim Moroccans* in 1954 × girl			−0.024
			(0.019)
Presence of schools for *Jewish Moroccans* in 1954 (boy)			−0.050*
			(0.026)
Presence of schools for *Jewish Moroccans* in 1954 × girl			0.011
			(0.012)
R^2	0.260	0.260	0.261
Observations	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving secondary education in 2004, disaggregated by gender and the presence of colonial schools. The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.12: Interaction of the presence of schools and gender over the number of years of education

	Number of years of education		
	(1)	(2)	(3)
	Panel A		
Presence of schools in 1931 (boy)	0.063		
	(0.271)		
Presence of schools in 1931 × girl	0.011		
	(0.134)		
Presence of schools for *Europeans* in 1931 (boy)		−0.711***	−0.602**
		(0.246)	(0.276)
Presence of schools for *Europeans* in 1931 × girl		0.408***	0.383***
		(0.145)	(0.138)
Presence of schools for *Moroccans* in 1931 (boy)		0.746**	
		(0.329)	
Presence of schools for *Moroccans* in 1931 × girl		−0.457**	
		(0.176)	
Presence of schools for *Muslim Moroccans* in 1931 (boy)			0.529
			(0.345)
Presence of schools for *Muslim Moroccans* in 1931 × girl			−0.371**
			(0.175)
Presence of schools for *Jewish Moroccans* in 1931 (boy)			0.077
			(0.356)
Presence of schools for *Jewish Moroccans* in 1931 × girl			−0.086
			(0.189)
	Panel B		
Presence of schools in 1954 (boy)	−0.253		
	(0.275)		
Presence of schools in 1954 × girl	−0.070		
	(0.169)		
Presence of schools for *Europeans* in 1954 (boy)		0.087	0.215
		(0.192)	(0.211)
Presence of schools for *Europeans* in 1954 × girl		−0.066	−0.018
		(0.127)	(0.134)
Presence of schools for *Moroccans* in 1954 (boy)		−0.291	
		(0.289)	
Presence of schools for *Moroccans* in 1954 × girl		−0.030	
		(0.175)	
Presence of schools for *Muslim Moroccans* in 1954 (boy)			−0.296
			(0.276)
Presence of schools for *Muslim Moroccans* in 1954 × girl			−0.023
			(0.174)
Presence of schools for *Jewish Moroccans* in 1954 (boy)			−0.483
			(0.345)
Presence of schools for *Jewish Moroccans* in 1954 × girl			−0.075
			(0.157)
R^2	0.162	0.162	0.162
Observations	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving number of years education in 2004, disaggregated by gender and the presence of colonial schools. The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Panel A looks at schools established by 1931, Panel B by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.13: Sensitivity checks with the presence of schools

	Any primary education											
	Iteration 1				Iteration 2				Iteration 3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A - 0.25 degrees (27.7 km)												
Presence of schools in 1931	0.019				0.032				0.037**			
Presence of schools for Europeans in 1931		-0.021	0.001	-0.014		-0.006	0.027	0.002		-0.001	0.009	0.001
Presence of schools for Moroccans in 1931		0.036	0.078***			0.031	0.094***			0.055**	0.078*	
Schools for European × Moroccans			-0.068**				-0.101***				-0.037	
Presence of schools for Muslim Moroccans in 1931				0.020				0.013				0.039
Presence of schools for Jewish Moroccans in 1931				0.008				0.012				0.017
R^2	0.401	0.402	0.402	0.401	0.402	0.401	0.402	0.401	0.402	0.403	0.403	0.402
Panel B - 0.25 degrees (27.7 km)												
Presence of schools in 1931	-0.013				-0.003				-0.026			
Presence of schools for Europeans in 1931		0.025	0.025	0.046**		0.036**	0.036**	0.055***		0.014	-0.005	0.020
Presence of schools for Moroccans in 1931		-0.021	-0.021			-0.012	-0.012			-0.029	-0.030	
Schools for European × Moroccans			0.000				0.000				0.019	
Presence of schools for Muslim Moroccans in 1931				-0.021				-0.010				-0.029
Presence of schools for Jewish Moroccans in 1931				-0.071***				-0.054***				-0.018
R^2	0.401	0.402	0.402	0.403	0.401	0.402	0.402	0.403	0.401	0.402	0.402	0.402
Panel C - 0.2 degrees (22.1 km)												
Presence of schools in 1931	0.075***				0.014				0.019			
Presence of schools for Europeans in 1931		0.019	0.044*	0.028		-0.015	-0.007	-0.015		-0.014	0.014	-0.006
Presence of schools for Moroccans in 1931		0.075**	0.146***			0.038*	0.074			0.029	0.069**	
Schools for European × Moroccans			-0.105*				-0.049				-0.069*	
Presence of schools for Muslim Moroccans in 1931				0.044				0.034				0.002
Presence of schools for Jewish Moroccans in 1931				0.030				0.007				0.023
R^2	0.404	0.405	0.405	0.404	0.402	0.403	0.403	0.403	0.402	0.402	0.402	0.402
Panel D - 0.2 degrees (22.1 km)												
Presence of schools in 1954	0.010				0.001				-0.015			
Presence of schools for Europeans in 1954		0.036*	-0.119	0.043*		0.020	0.019	0.034		0.015	-0.056	0.042**
Presence of schools for Moroccans in 1954		0.010	0.002			-0.003	-0.003			-0.016	-0.019	
Schools for European × Moroccans			0.164				0.001				0.073	
Presence of schools for Muslim Moroccans in 1954				0.010				-0.004				-0.013
Presence of schools for Jewish Moroccans in 1954				-0.020				-0.038				-0.060***
R^2	0.402	0.403	0.403	0.403	0.402	0.402	0.402	0.403	0.401	0.402	0.402	0.402
Panel E - 0.3 degrees (33 km)												
Presence of schools in 1931	0.056**				-0.013				0.026			
Presence of schools for Europeans in 1931		0.030	0.040	0.037		-0.014		-0.010	-0.015	0.022	0.030	0.023
Presence of schools for Moroccans in 1931		0.033	0.057*			-0.000	-0.006			0.005	0.021	
Schools for European × Moroccans			-0.035				0.007				-0.025	
Presence of schools for Muslim Moroccans in 1931				0.022				-0.027				0.011
Presence of schools for Jewish Moroccans in 1931				0.003				0.043				-0.013
R^2	0.403	0.403	0.403	0.403	0.402	0.402	0.402	0.402	0.402	0.402	0.402	0.402
Panel F - 0.3 degrees (33 km)												
Presence of schools in 1954	-0.003				0.004				-0.028			
Presence of schools for Europeans in 1954		0.043**	0.043**	0.057***		-0.018	-0.133***	-0.007		0.033	0.033	0.044**
Presence of schools for Moroccans in 1954		-0.016	-0.016			0.016	0.010			-0.033	-0.033	
Schools for European × Moroccans			0.000				0.117***				0.000	
Presence of schools for Muslim Moroccans in 1954				-0.018				0.017				-0.032
Presence of schools for Jewish Moroccans in 1954				-0.035**				-0.042*				-0.035**
R^2	0.401	0.403	0.403	0.403	0.402	0.402	0.402	0.402	0.402	0.402	0.402	0.402
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
Controls variables and Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes Yes	Yes	Yes	Yes	Yes

Notes: OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004. The presence of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. The analysis involves two historical periods, and sensitivity checks assess robustness, considering grid size and boundary variations. Six panels were created, each with interactions involving random boundary changes: Panel A (0,25 degree and schools implemented in 1931), Panel B (0,25 degree and schools implemented in 1954), Panel C (0,2 degree and schools implemented in 1931), Panel D (0,2 degree and schools implemented in 1954), Panel E (0,3 degree and schools implemented in 1931), Panel F (0,3 degree and schools implemented in 1954). All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.14: Sensitivity checks with the number of schools

	Any primary education								
	Iteration 1			Iteration 2				Iteration 3	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A - 0.25 degrees (27.7 km)								
Nb schools in 1931	-0.000			0.003			0.004		
Nb schools for Europeans in 1931		0.001	0.005		0.005	0.003		-0.000	-0.003
Nb schools for Moroccans in 1931		-0.001			-0.001			0.010	
Nb schools for Muslim Moroccans in 1931			0.001			-0.004			0.007
Nb schools for Jewish Moroccans in 1931			-0.018*			0.018			0.032
R^2	0.401	0.402	0.402	0.402	0.402	0.402	0.402	0.402	0.402
	Panel B - 0.25 degrees (27.7 km)								
Nb schools in 1954	-0.000			0.001			0.001		
Nb schools for Europeans in 1954		0.001	0.005		0.007*	0.009**		0.004	0.004
Nb schools for Moroccans in 1954		-0.001			-0.001			0.000	
Nb schools for Muslim Moroccans in 1954			0.001			-0.000			0.002
Nb schools for Jewish Moroccans in 1954			-0.018*			-0.030***			-0.014
R^2	0.401	0.402	0.403	0.401	0.402	0.402	0.402	0.402	0.402
	Panel C - 0.2 degrees (22.1 km)								
Nb schools in 1931	0.002			0.002*			0.002		
Nb schools for Europeans in 1931		-0.009	-0.005		-0.003	-0.000		0.002	0.002
Nb schools for Moroccans in 1931		0.027**			0.014*			0.002	
Nb schools for Muslim Moroccans in 1931			0.031**			0.020**			0.001
Nb schools for Jewish Moroccans in 1931			0.009			-0.005			0.005
R^2	0.402	0.403	0.404	0.402	0.403	0.403	0.402	0.402	0.402
	Panel D - 0.2 degrees (22.1 km)								
Nb schools in 1954	0.000			0.000			-0.000		
Nb schools for Europeans in 1954		-0.003	0.010***		0.000	0.006		0.004**	0.008***
Nb schools for Moroccans in 1954		0.004*			0.001			-0.002**	
Nb schools for Muslim Moroccans in 1954			0.005**			0.001			-0.000
Nb schools for Jewish Moroccans in 1954			-0.030***			-0.014			-0.030***
R^2	0.402	0.403	0.403	0.402	0.402	0.403	0.402	0.402	0.402
	Panel E - 0.3 degrees (33 km)								
Nb schools in 1931	0.001			0.004			0.001		
Nb schools for Europeans in 1931		0.000	0.004		0.000	-0.003		0.006	0.004
Nb schools for Moroccans in 1931		0.003			0.011*			-0.009	
Nb schools for Muslim Moroccans in 1931			0.005			0.007			-0.012
Nb schools for Jewish Moroccans in 1931			-0.014			0.037			0.004
R^2	0.401	0.402	0.402	0.402	0.402	0.402	0.402	0.402	0.402
	Panel F - 0.3 degrees (33 km)								
Nb schools in 1954	0.000			0.006*			0.000		
Nb schools for Europeans in 1954		-0.000	0.006**		0.009***	0.009***		0.003	0.007***
Nb schools for Moroccans in 1954		0.001			-0.029**			-0.001	
Nb schools for Muslim Moroccans in 1954			0.001			-0.001			-0.001
Nb schools for Jewish Moroccans in 1954			-0.018**			-0.029**			-0.020**
R^2	0.401	0.401	0.402	0.402	0.403	0.403	0.402	0.402	0.402
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
Controls variables and Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes Yes	Yes

Notes: OLS estimates from Equation (1) for the probability of individuals having some primary education in 2004. The number of colonial schools is captured by all types of schools: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans within each grid. The analysis involves two historical periods, and sensitivity checks assess robustness, considering grid size and boundary variations. Six panels were created, each with interactions involving random boundary changes: Panel A (0,25 degree and schools implemented in 1931), Panel B (0,25 degree and schools implemented in 1954), Panel C (0,2 degree and schools implemented in 1931), Panel D (0,2 degree and schools implemented in 1954), Panel E (0,3 degree and schools implemented in 1931), Panel F (0,3 degree and schools implemented in 1954). All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.15: Presence of schools and primary education with a non-linear model (probit and marginal effects)

	Any primary education							
	Coef.	*Marginal effects*	*Coef.*	*Marginal effects*	*Coef.*	*Marginal effects*	*Coef.*	*Marginal effects*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A							
Presence of schools in 1931	0.128**	0.031**						
	(0.063)	(0.015)						
Presence of schools for Europeans in 1931			−0.045	−0.011	0.041	−0.017	−0.012	−0.030
			(0.064)	(0.016)	(0.087)	(0.014)	(0.102)	(0.019)
Presence of schools for Moroccans in 1931			0.192***	0.047***	0.353***	0.054***	0.318***	0.045**
			(0.068)	(0.017)	(0.083)	(0.015)	(0.096)	(0.021)
Schools for European × Moroccans					−0.268**	0.058**	−0.274**	0.053**
					(0.121)	(0.028)	(0.121)	(0.079)
Proxy of local investments								
Distance from Fez							0.134***	0.032***
							(0.046)	(0.011)
Insecurity zone							0.214**	0.051**
							(0.086)	(0.021)
Log Financial Value Habous							0.011**	0.003**
							(0.004)	(0.001)
R^2	0.362		0.362		0.363		0.371	
	Panel B							
Presence of schools in 1954	0.016	0.004						
	(0.091)	(0.022)						
Presence of schools for Europeans in 1954			0.155**	0.038**	0.155**	0.043***	0.091	0.026
			(0.066)	(0.016)	(0.066)	(0.017)	(0.078)	(0.018)
Presence of schools for Moroccans in 1954			−0.047	−0.011	−0.047	−0.084	−0.100	−0.024
			(0.091)	(0.022)	(0.092)	(0.022)	(0.073)	(0.019)
Schools for European × Moroccans					−−	−−	−−	−−
					−−	−−	−−	−−
Proxy of local investments								
Distance from Fez							0.148***	0.036***
							(0.045)	(0.011)
Insecurity zone							0.209**	0.050**
							(0.084)	(0.020)
Log Financial Value Habous							0.011***	0.003***
							(0.004)	(0.001)
R^2	0.362		0.362		0.362		0.371	
Observations	46,358	46,358	46,358	46,358	46,358	46,358	46,358	46,358
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: The probit estimates examine the probability of individuals receiving primary education in 2004 based on the existence of schools managed by the French government for Europeans or Moroccans at the grid level and the substitution effect between the schools reserved for Europeans and the ones for Moroccans. These sets of variables are available for two distinct panels: Panel A, which pertains to schools established in 1931, and Panel B, which concerns schools implemented in 1954. The analysis covers 188 grids, each with a size of 0.25 degrees, corresponding to the household's location. The marginal effects are reported in the columns 2, 4, 6 and 8. The control variables used in the analysis are the same as those reported in the notes of Table 2. The standard errors in the table are clustered at the province level (45 clusters). *, **, *** denote significance at the 10%, 5%, 1% level respectively.

TABLE APPENDIX A.16: Sources of the *Free schools* dataset

Region	**Year**	**Source Description**
Casablanca	1952-53	Report from the "Délégation aux affaires urbaines" de Casablanca providing addresses of the schools.
Marrakesh	1948	Letter from the civil controller to the head of the region.
Meknes	1947	Confidential report from the "Direction de Meknes, secretariat general, section politique" including addresses of the schools. Schools labeled as unauthorized but acknowledged by the French government.
Fez	1948-49	Results of a confidential census of free schools conducted by the civil controller, providing school addresses.
Rabat	1934	Confidential letter from the regional commander to the director of indigenous affairs.

TABLE APPENDIX A.17: Colonial schools and learning outcomes of girls

	Literacy scale			Able to read			Reads newspaper		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A - 1931 and Presence of school								
Presence of schools in 1931	0.038			0.023			0.002		
Presence of schools in 1931 for Europeans		−0.048	−0.035		−0.023	−0.015		−0.026	−0.023
Presence of schools in 1931 for Moroccans		0.058			0.031			0.006	
Presence of schools in 1931 for Muslim Moroccans			0.019			0.009			−0.002
Presence of schools in 1931 for Jewish Moroccans			0.032			0.019			0.003
R^2	0.310	0.310	0.310	0.298	0.298	0.298	0.221	0.222	0.222
	Panel B - 1931 and Number of school								
Number of schools in 1931	−0.004			−0.002			−0.003		
Number of schools in 1931 for Europeans		−0.030**	−0.040***		−0.017***	−0.023***		−0.011*	−0.017**
Number of schools in 1931 for Moroccans		0.056**			0.031**			0.016	
Number of schools in 1931 for Muslim Moroccans			0.038			0.021			0.006
Number of schools in 1931 for Jewish Moroccans			0.118**			0.067***			0.050**
R^2	0.310	0.311	0.311	0.298	0.299	0.299	0.222	0.222	0.223
	Panel C - 1954 and Presence of school								
Presence of schools in 1954	−0.058			−0.027			−0.004		
Presence of schools in 1954 for Europeans		0.034	0.070		0.019	0.036*		0.007	0.027
Presence of schools in 1954 for Moroccans		−0.069*			−0.033			−0.006	
Presence of schools in 1954 for Muslim Moroccans			−0.070*			−0.034			−0.007
Presence of schools in 1954 for Jewish Moroccans			−0.131**			−0.064**			−0.072***
R^2	0.310	0.310	0.311	0.298	0.298	0.299	0.222	0.222	0.223
	Panel D - 1954 and Number of school								
Number of schools in 1954	−0.001			−0.001			−0.001		
Number of schools in 1954 for Europeans		0.003	0.006		0.001	0.003		−0.003	−0.001
Number of schools in 1954 for Moroccans		−0.003			−0.002			0.000	
Number of schools in 1954 for Muslim Moroccans			−0.001			−0.001			0.001
Number of schools in 1954 for Jewish Moroccans			−0.020			−0.010			−0.006
R^2	0.310	0.310	0.310	0.298	0.298	0.298	0.222	0.222	0.222
Observations	13,654	13,654	13,654	13,654	13,654	13,654	13,654	13,654	13,654
Controls variables and Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: OLS estimates from Equation (1) for learning outcomes in 2004 and the presence or number of French schools during the protectorate period, focusing on women included in the DHS dataset. Three indicators measure learning outcomes:the "Literacy scale" which is null if the woman cannot read at all, one if she can read a part of a sentence and two if she can read all the sentences shown in the survey (columns 1-3); a binary indicator equal to one if the woman can read (columns 4-6); and a binary indicator equal to one if the woman reports that she reads newspapers (columns 7-9). We assess the impact on 2004 learning outcomes of the presence of schools in 1931 (Panel A), the number of schools in 1931 (Panel B), the presence of schools in 1954 (Panel C), and the number of schools in 1954 (Panel D). For each panel, we estimate the impact of different types of schools on modern-day learning. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.18: Presence of colonial schools, gender and primary education by generation

	Any primary education								
	Born before 1950			Born between 1950 and 1990			Born after 1990		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A								
Presence of schools in 1931 *(boy)*	0.053**			−0.016			0.000		
	(0.024)			(0.030)			(0.020)		
Presence of schools in 1931 × *girl*	−0.082***			0.075***			0.021		
	(0.020)			(0.027)			(0.015)		
Presence of schools for *Europeans* in 1931 *(boy)*		0.004	0.009		−0.033	−0.049		−0.003	0.001
		(0.026)	(0.026)		(0.037)	(0.034)		(0.021)	(0.021)
Presence of schools for *Europeans* in 1931 × *girl*		−0.003	−0.005		0.020	0.032		−0.007	−0.009
		(0.028)	(0.025)		(0.020)	(0.022)		(0.016)	(0.015)
Presence of schools for *Moroccans* in 1931 *(boy)*		0.036				0.020		−0.000	
		(0.030)				(0.028)		(0.018)	
Presence of schools for *Moroccans* in 1931 × *girl*		−0.084***				0.061***		0.041*	
		(0.028)				(0.018)		(0.022)	
Presence of schools for *Muslim Moroccans* in 1931 *(boy)*			0.016		0.023				0.002
			(0.028)		(0.027)				(0.017)
Presence of schools for *Muslim Moroccans* in 1931 × *girl*			−0.053		0.017				0.014
			(0.032)		(0.016)				(0.027)
Presence of schools for *Jewish Moroccans* in 1931 *(boy)*			0.008		−0.030				−0.004
			(0.040)		(0.026)				(0.011)
Presence of schools for *Jewish Moroccans* in 1931 × *girl*			−0.037		0.074***				0.040*
			(0.037)		(0.025)				(0.021)
R^2	0.193	0.193	0.194	0.304	0.305	0.305	0.074	0.075	0.075
	Panel B								
Presence of schools in 1954 *(boy)*	0.010			−0.031			−0.032		
	(0.024)			(0.030)			(0.021)		
Presence of schools in 1954 × *girl*	−0.031			0.028			0.066***		
	(0.027)			(0.028)			(0.024)		
Presence of schools for *Europeans* in 1954 *(boy)*		0.068***	0.078***		−0.012	0.045		0.009	0.033*
		(0.018)	(0.023)		(0.031)	(0.030)		(0.017)	(0.017)
Presence of schools for *Europeans* in 1954 × *girl*		−0.089***	−0.061***		0.071***	0.007		0.034**	0.013
		(0.020)	(0.022)		(0.026)	(0.024)		(0.015)	(0.021)
Presence of schools for *Moroccans* in 1954 *(boy)*		−0.021			−0.015			−0.030	
		(0.024)			(0.031)			(0.019)	
Presence of schools for *Moroccans* in 1954 × *girl*		0.020			−0.015			0.046*	
		(0.024)			(0.024)			(0.024)	
Presence of schools for *Muslim Moroccans* in 1954 *(boy)*			−0.022			−0.014			−0.029
			(0.021)			(0.030)			(0.020)
Presence of schools for *Muslim Moroccans* in 1954 × *girl*			0.021			−0.020			0.045*
			(0.024)			(0.024)			(0.024)
Presence of schools for *Jewish Moroccans* in 1954 *(boy)*			−0.057*			−0.132***			−0.063***
			(0.030)			(0.027)			(0.018)
Presence of schools for *Jewish Moroccans* in 1954 × *girl*			−0.042			0.101***			0.035
			(0.025)			(0.023)			(0.022)
R^2	0.189	0.194	0.198	0.302	0.304	0.307	0.075	0.077	0.080
Observations	6,308	6,308	6,308	31,661	31,661	31,661	8,324	8,324	8,324
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Notes: OLS estimates from Equation (2) for the probability of individuals receiving primary education in 2004, disaggregated by gender, generation, and the presence of colonial schools. Results are presented for individuals born before 1950 (columns 1-3), between 1950 and 1990 (columns 4-6), and after 1990 (columns 7-9). The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. Panel A looks at schools established by 1931, and Panel B looks at schools established by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

TABLE APPENDIX A.19: Presence of colonial schools interact with migration

	Any primary education
	Panel A
Move	-0.124***
	(0.033)
Presence of schools in 1931 for *Europeans* in 1931	-0.009
	(0.031)
Presence of schools in 1931 for *Europeans* in 1931 × Move	-0.054
	(0.053)
Presence of schools in 1931 for *Muslim Moroccans* in 1931	0.005
	(0.031)
Presence of schools in 1931 for *Muslim Moroccans* in 1931 × Move	0.089
	(0.062)
Presence of schools in 1931 for *Jewish Moroccans* in 1931	0.066
	(0.045)
Presence of schools in 1931 for *Jewish Moroccans* in 1931 × Move	-0.198***
	(0.055)
R^2	0.324
	Panel B
Move	-0.062
	(0.054)
Presence of schools in 1954 for *Europeans* in 1954	0.060***
	(0.018)
Presence of schools in 1954 for *Europeans* in 1954 × Move	-0.048
	(0.038)
Presence of schools in 1954 for *Muslim Moroccans* in 1954	-0.032
	(0.026)
Presence of schools in 1954 for *Muslim Moroccans* in 1954 × Move	-0.033
	(0.050)
Presence of schools in 1954 for *Jewish Moroccans* in 1954	-0.013
	(0.036)
Presence of schools in 1954 for *Jewish Moroccans* in 1954 × Move	-0.126**
	(0.053)
R^2	0.325
Observations	13,654
City FE and Individual controls	Yes
Geographic controls	Yes
Region Fixed effects	Yes

Notes: OLS estimates from Equation (1) for the probability of individuals receiving primary education in 2004 and the presence or number of French schools interact with having moved from the type of place between the place of residence and the childhood during the protectorate period, focusing on women included in the DHS dataset. Panel A looks at schools established by 1931, and Panel B looks at schools established by 1954. All specifications include the complete set of control as in columns (5-8) of Table 2. Standard errors are clustered at province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

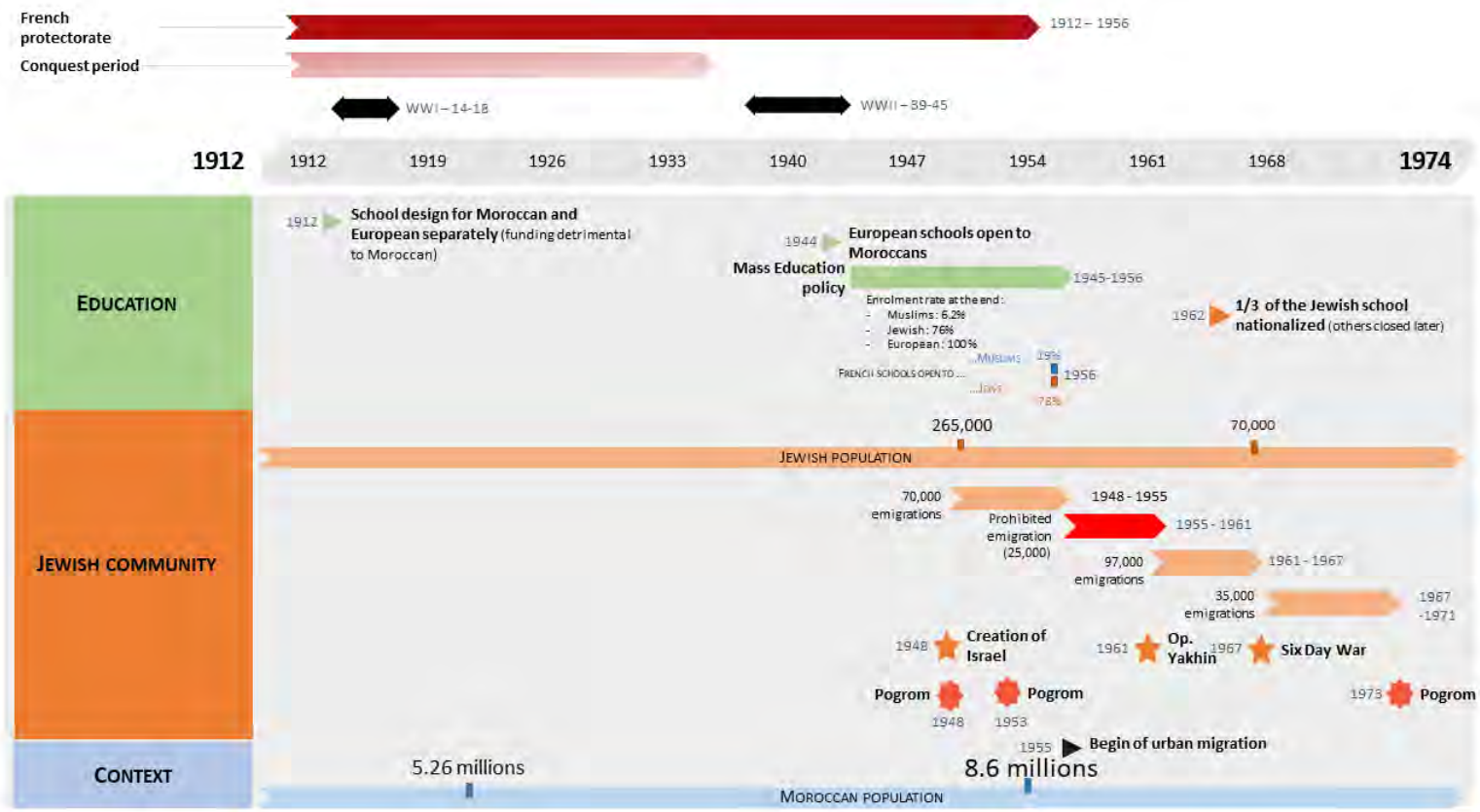
TABLE APPENDIX A.20: Presence of schools and primary education at the grid level with a Spatial autoregressive model

	Primary education within the grid			
	(1) OLS	(2) SAR	(3) OLS	(4) SAR
	Panel A			
Presence of schools for Europeans in 1931 (at the grid level)	0.015	0.022*	0.003	0.003
	(0.015)	(0.012)	(0.017)	(0.010)
Presence of schools for Moroccans in 1931 (at the grid level)	0.008	0.041**		
	(0.018)	(0.017)		
Presence of schools for European × Moroccans in 1931 (at the grid level)	−0.026	−0.061***		
	(0.018)	(0.022)		
Presence of schools for Muslim Moroccans in 1931 (at the grid level)			0.000	0.008
			(0.013)	(0.011)
Presence of schools for Jewish Moroccans in 1931 (at the grid level)			−0.005	−0.004
			(0.021)	(0.014)
R^2	0.950		0.949	
	Panel B			
Presence of schools for Europeans in 1954 (at the grid level)	0.019	0.026***	0.031**	0.038***
	(0.012)	(0.009)	(0.013)	(0.009)
Presence of schools for Moroccans in 1954 (at the grid level)	−0.000	−0.012		
	(0.018)	(0.012)		
Presence of schools for Muslim Moroccans in 1954 (at the grid level)			−0.003	−0.014
			(0.018)	(0.011)
Presence of schools for Jewish Moroccans in 1954 (at the grid level)			−0.034*	−0.037***
			(0.018)	(0.011)
R^2	0.950		0.952	
Observations	404	404	404	404
Controls aggregated at the grid level (average)				
City FE and Individual controls	*Yes*	*Yes*	*Yes*	*Yes*
Geographic controls	*Yes*	*Yes*	*Yes*	*Yes*
Region Fixed effects	*Yes*	*Yes*	*Yes*	*Yes*

Notes: The estimates examine the probability of a grid to have a higher proportion of primary education in 2004 based on the presence of schools managed by the French government. The presence of historical schools is captured by all types of schools within each grid: for Europeans, Moroccans, Muslim Moroccans, and Jewish Moroccans. The estimates are given by an OLS (1;3) or a Spatial Autoregressive Model (2;4). Spatial dependencies are accounted for using a spatial weights matrix. Panel A examines schools established by 1931, while Panel B considers schools established by 1954. All specifications include the full set of controls as in columns (5-8) of Table 2 aggregated at the grid level. Standard errors are clustered at the province level (45 clusters), and significance levels are denoted by * (10%), ** (5%), and *** (1%).

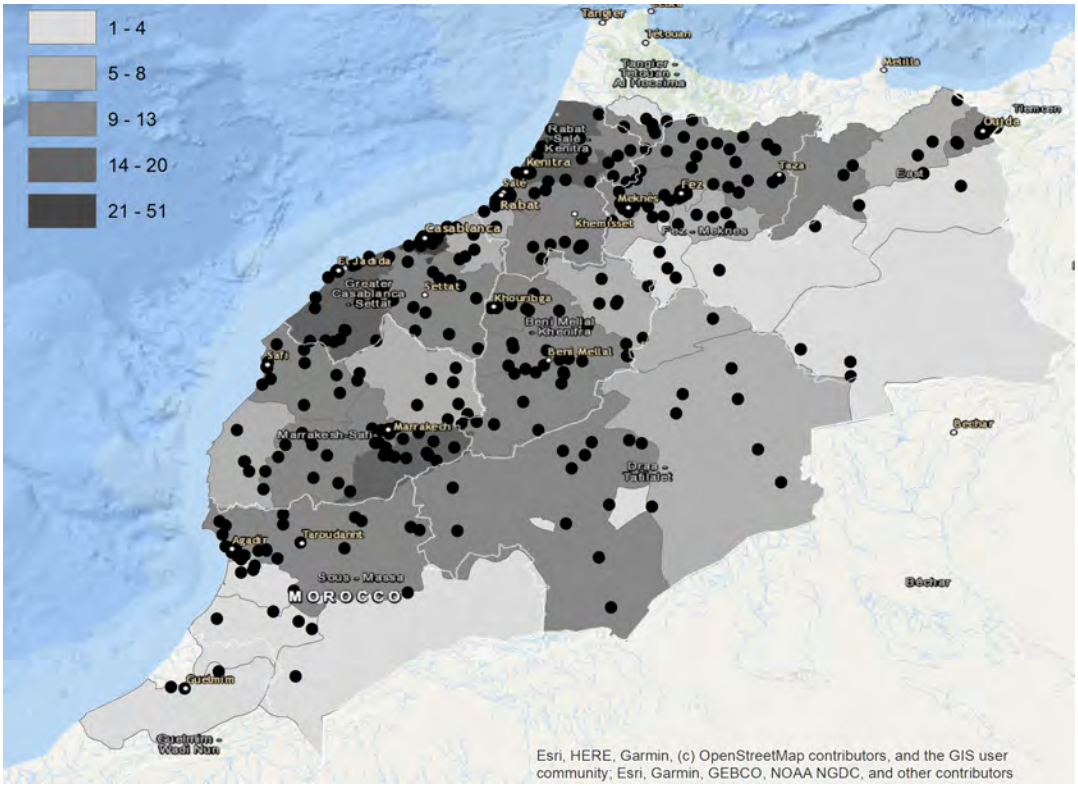
Appendix B. Additional figures

FIGURE APPENDIX B.1: Timeline



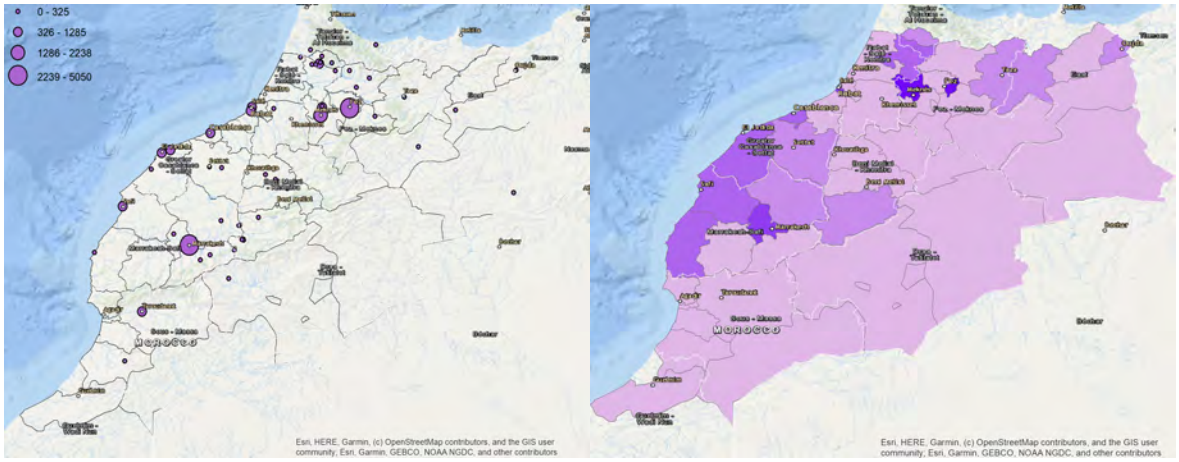
Notes: This figure shows a timeline of the French protectorate and its aftermath, focusing on education investment and the Jewish community in Morocco. We highlight the Jewish community to examine the impact of Jewish Moroccan schools on modern education. During the mid-20th century, the Jewish community in Morocco faced significant immigration challenges, leading to a sharp population decline. In 1948, Morocco had 265,000 Jews. The creation of Israel that year began a series of events prompting emigration. Operation Yakhin in 1961, an agreement between Moroccan and Israeli authorities, facilitated the departure of over 97,000 Moroccan Jews to Israel.

FIGURE APPENDIX B.2: Cluster DHS



Notes: This represents the localisation and repartition of the cluster for the Household. To protect the confidentiality of respondents the geo-located data is displaced. The displacement process moves the latitude and longitude to a new location under set parameters. Urban locations are displaced 0-2 kilometres while rural locations are displaced 0-5 kilometres with 1% (or every 100th point) displaced 0-10 kilometres. The displacement is a random direction/random distance process.

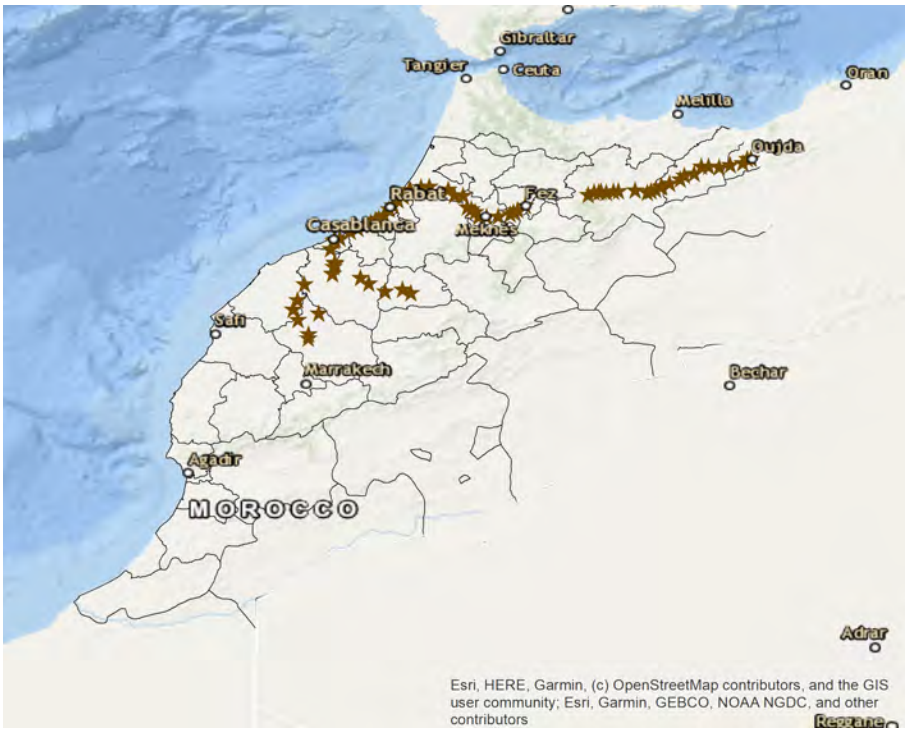
FIGURE APPENDIX B.3: *Habous* in 1931



(A) Number of buildings constructed by *Habous* (B) Monetary values of the *Habous*

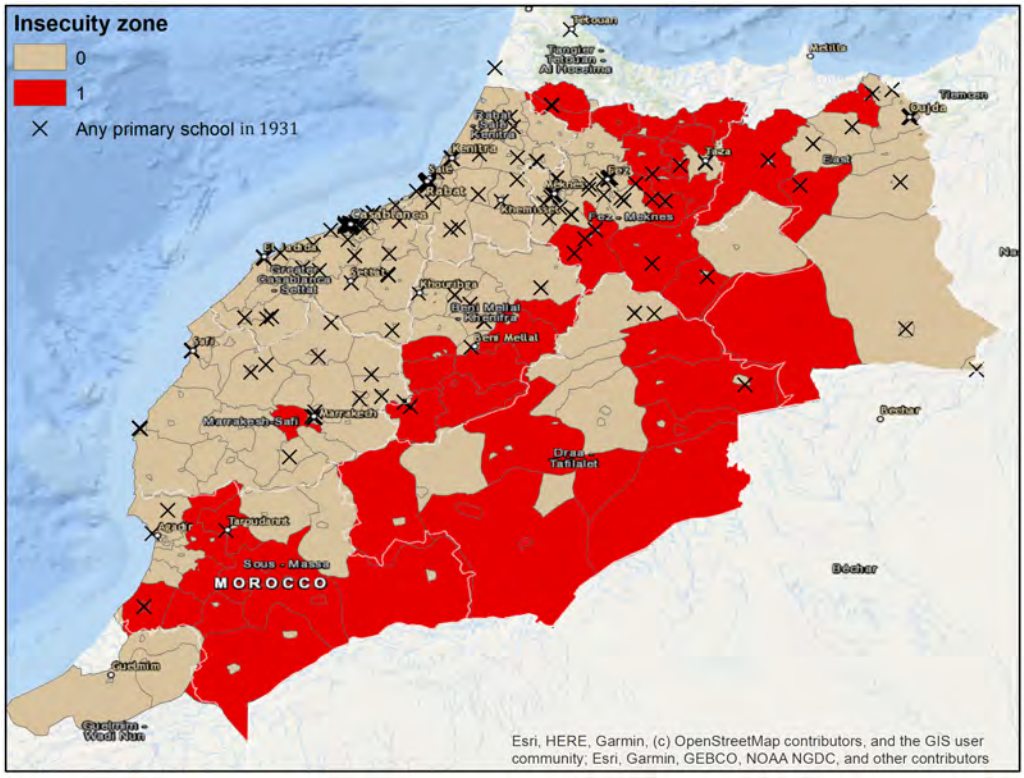
Notes: *Habous* are religious endowments that were established by individuals or institutions with the intention of benefiting the community through charitable and religious activities, such as education. These endowments typically consist of land, properties, or funds that generate income to sustain their objectives. The establishment of *Habous* dates back to the early Islamic era, but their significance in Morocco grew during the medieval period and is still present during the protectorate.

FIGURE APPENDIX B.4: The railways in 1920



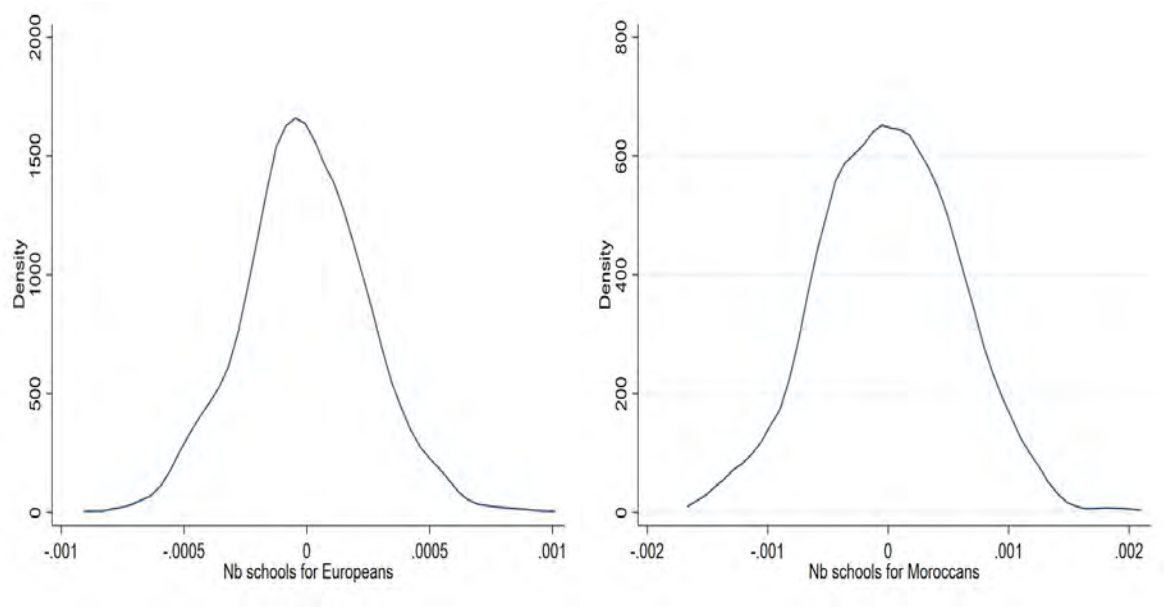
Notes: At the beginning of the French Protectorate in Morocco in 1912, the colonial authorities undertook the construction of a railway network to facilitate the transport of troops and goods across the country. The first section to be built linked the city of Casablanca to the city of Fez, an important imperial city in Morocco. The construction of the line was difficult and took several years due to the rugged terrain and logistical challenges. The work was completed in 1923, marking the beginning of an era of modernisation and development of transport infrastructure in Morocco. The Casablanca-Fez railway line was followed by the construction of other lines across the country, such as the Marrakech-Oujda line and the Tangiers-Oujda line. These lines played an important role in Morocco's connectivity and economic development during the 20th century.

FIGURE APPENDIX B.5: "Insecure" zone in 1931 for the French Government



Notes: The insecure zones, which are areas not fully controlled by the French government, have been identified in the "Recensement de la population de la zone française de l'empire chérifien" in 1931. These zones are delineated based on tribal or civil controls (territorial administrative organization in 1931), and we have attempted to match these tribes or civil controls with the municipalities or provinces/prefectures present in 2004. It should be noted that the matching process is an estimation, as the boundaries of the tribes or civil controls may have evolved or could slightly differ from the boundaries of current administrative units. The map also displays all types of schools present in 1931, excluding Quranic schools. From the map, we can observe that the distribution of schools lies outside the insecure zones.

FIGURE APPENDIX B.6: Placebo test



Notes: This figure displays the results of a placebo test conducted through random matching, which has been repeated 1000 times. The coefficient of the estimator in the main analysis (refer to Table 2, column 6), for the number of schools specifically designated for Europeans and Moroccans are -0.011 and 0.027, respectively.

Appendix C. Geographical variables and matching procedures

Latitude. This is the absolute value of DHS cluster latitude of the Household. The variable was calculated from ArcMap.

Distance to coast and river. This variable represents the mean distance to the nearest coastline, measured in km. The variable was calculated from ArcMap.

Slope. This is the slope terrain calculated from ArcMap.

Mean elevation. The mean elevation above sea level is measured in meters. The variable was retrieved from the dataset maded by the collaboration between the FAO with IIASA, ISRIC-World Soil Information, Institute of Soil Science, Chinese Academy of Sciences (ISSCAS), and the Joint Research Centre of the European Commission (JRC). Results are provided at 30 arc-second (0.9 x 0.9 km) resolution.

Land suitability. This is a measure of land suitability for agriculture given by FAO and GAEZ. It is construct namely: (1) soil nutrient availability; (2) soil nutrient retention capacity; (3) soil rooting conditions; (4) soil oxygen availability for roots; (5) presence of soil salinity and sodicity; (6) presence of lime and gypsum, and (7) soil workability. These are estimated from soil characteristics available in HWSD v1.2. These qualities are assessed for each crop and input/management level and for four water supply systems (rainfed, gravity irrigated, sprinkler irrigation and drip irrigation) and result in a crop and input specific suitability rating. Available soil water is assessed considering soil depth, soil volume and salinity. Results are provided at 30 arc-second (0.9 x 0.9 km) resolution.

Percentage arable land. This measures the percentage of cropland in a 5 arc-minute (about 9 x 9 km at the equator) grid cells given by FAO and GAEZ.

Temperature. This a the average daytime weekly or monthly land surface temperature for 2001-2010 based on thermal infrared measurements made by the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard NASA's Terra satellite in 0.5-degree resolution grids. The measurements shown here represent the temperature of the "skin" (or top 1 millimeter) of the land surface at night — includ-

ing bare land, snow or ice cover, urban areas, and cropland or forest canopy — and should not be confused with surface air temperature measurements that are given in a typical weather reports.

Precipitation. This a mean across the average monthly precipitation over time (1900-2010) in 0.5-degree resolution grids. This variable were compiled from several updated sources including a recent version of the Global Historical Climatology Network dataset GHCN2); a version of the Daily Global Historical Climatology Network (GHCN-Daily) (Menne et al., 2012); GC-Net data (Steffen et al., 1996); Greenland station records from the Automatic Weather Station Project (courtesy of Charles R. Stearns at the University of Wisconsin-Madison); and daily records from the Global Surface Summary of Day (GSOD). Station climatologies from Legates and Willmotts (1990) unadjusted (for raingage undercatch) archive also were used as a part of the background climatology (see Spatial Interpolation below).

Table Appendix C.1: Summary Statistics of the Geographical variables

	Mean	SD		Mean	SD
Slope (Degrees)	2.244	2.413	Distance from Beirut (degree)	42.418	1.815
Latitude (degrees)	32.927	1.324	Distance from Fez (degree)	2.562	1.526
Longitude (degrees)	-6.674	1.775	Distance from the coast (degree)	0.919	0.757
Elevation (m)	524.335	518.114			
Arable land (%)	43.223	24.294			
Land suitability (Unitless index)	1.938	1.373			
Temperature (Fahrenheit)	161.870	29.445			
Precipitation (Millimeters)	128.245	15.937			
Total observations			46,358		

Matching procedures about Moroccan population in 1931. Data on Moroccan population in 1931 was obtained from the "Recensement de la population de la zone française de l'empire chérifien 1931" at the municipality level. To match the historical documents with the administrative delineation in 2004, the municipalities were matched with the tribes mentioned in the historical documents. In cases where the provinces and tribes did not align with the administrative boundaries, we imputed values based on the closest identified villages, and divided the population of the tribe by the number of villages in the vicinity. For instance, when investigating the mu-

nicipality of *Ait Ichou*, we did not come across any tribes specifically named as such. However, we did discover a tribe called *Oulmes*, which happens to be the municipality where *Ait Ichou* is situated. To estimate the population of *Ait Ichou*, we divided the total population of the *Oulmes* tribe (6681) by ten, representing the number of municipalities within the town of *Oulmes*, including *Ait Ichou*. Consequently, our estimate suggests that the population of *Ait Ichou* was approximately 668 in 1931. For large cities, where population data was available only for the city and not the municipality, the total city population was divided by the number of municipalities that make up the city in 2004.