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The Role of Language of Instruction: The Case of Morocco

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Abstract: This paper explores the differential and intergenerational effects of Morocco's 1983 language policy that changed the language of instruction for most subjects in grades 6 to 12 from French to Classical Arabic. Although the policy has faced ongoing criticism over four decades, the plausible heterogeneous effects of the policy on marginalized groups and its intergenerational impact have yet to be investigated in the literature. Exploiting the sudden and progressive implementation of the policy, we study the impact of the language policy using two random samples of Morocco's 1982 and 2004 population censuses. First, using a triple difference approach, we find that girls were relatively positively affected by the policy, with inconclusive heterogeneous effects by mother tongue. Second, exploiting an initial drop in educational attainments due to the language policy, we find that human capital is transmitted from mothers intergenerationally. Our preferred estimate shows that a 1-year increase in a mother's years of schooling leads to a 0.18-year increase in the child's years of schooling mainly through middle and secondary education. Therefore, the negative short-term shock to mothers' educational attainment created by the language policy had a negative effect on the educational attainment of their children.

Keywords: Language of Instruction, Mother Tongue, Educational Attainment, Gender Gap, Intergenerational Transmission, Morocco

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1 Introduction

In recent years, concerns have grown over the quality and inclusiveness of education in low- and middle-income countries. Education systems are failing to deliver quality learning at a supposedly unprecedented scale. UNESCO (2013) has called it a 'global learning crisis'. Although access has tremendously improved, school enrollment is not a guarantee of adequate learning. Children are leaving primary school without basic skills in reading, writing, and math (Hungi et al., 2010; Bold et al., 2017). Some governments in developing countries have looked toward changing the language of instruction. The decision often involves trade-offs between mother tongue and foreign language instruction.

Mother tongue instruction refers to when students are taught in a language they already know from home before starting school. In Ethiopia (Seid, 2022), South Africa (Eriksson, 2014; Taylor and von Fintel, 2016), and Peru (Hynsjö and Damon, 2016), mother tongue instruction has been adopted across primary education. Evidence in favor of mother tongue instruction is growing. Children who go to primary school and study in their mother tongue learn more and at a faster pace than those who do not (Smits et al., 2008; Piper et al., 2016; Ramachandran, 2017; Brunette et al., 2019; Laitin et al., 2019). Reading and writing in a second language also appears to improve if children start their formative education years learning in their mother tongues (Taylor and von Fintel, 2016; Laitin et al., 2019; Seid, 2019). In addition to cognitive skill improvements, evidence indicates mother tongue instruction encourages students to participate in class and become more self-confident (Benson, 2000).

Despite these promising results, choosing mother tongue instruction is not always as simple in practice. The language(s) of instruction a country chooses is also driven by social, cultural, economic, and political agendas (Alalou, 2018). For countries plagued by the aftermath of colonization, the colonial language may have a long-lasting influence, particularly on education. For many of these countries, the language of instruction has historically been that of an imposed colonial language, such as English or French. In fact, the debate surrounding the language of instruction has been ongoing in North Africa, especially in Morocco. The Maghreb country gained independence from the French Protectorate in 1956 and its school system has faced substantial criticism since. A large part of this attention has evolved around the so-called "Arabization" policy of middle and secondary public schools. In 1983, Classical Arabic was declared the main medium of instruction and French language instruction of math and sciences in grades 6 to 12 was to be switched to Classical Arabic.[1] The change in medium of instruction was implemented progressively. Students entering grade 6 in September 1983 and later would continue their public school education entirely in Classical Arabic, while those who started grade 6 in 1982 would continue in both French and Classical Arabic (Angrist and Lavy, 1997). In other words, the policy was not fully implemented across middle and secondary school until 1990 when the first cohort affected started grade 12.

The Arabization policy exposed and created a linguistic dilemma. Firstly, although a foreign language, French had set deep roots in Morocco's social and economic fabric during the French Protectorate (1912-1956). According to Angrist and Lavy (1997), removing French as a language of instruction from middle and secondary public schools led to a substantial reduction in the returns to schooling for students affected by the program, largely attributable to the loss of French writing skills. Shortly after its implementation, Moroccan public schools were critiqued for producing "bilingual illiterates" (Angrist and Lavy, 1997, p. 50). Even since the language reform, French has almost exclusively been used in private businesses, public administration, and ministries, as well as parts of academia, especially in science and technical majors. French is taught in both private and public schools, but

[1]Until 1990, Morocco's education system was structured as follows: primary school grades 1 to 5, middle school grades 6 to 9, and secondary school grade 9 to 12. School enrollment is mandatory from ages 7 to 16, which theoretically translates to attending grades 1 to 9.

not equally in degrees of exposure. Until recently, French was only taught as a separate language subject in public schools (Loutfi and Noamane, 2020). Since the reformed language policy did not extend past grade 12, this has also been attributed to creating difficulties for students with public school backgrounds pursuing science majors in university, which are predominantly taught in French (Mansouri and Moumine, 2017). According to Loutfi and Noamane (2020), some of these students struggle to graduate on time or even drop out, while their private-school peers do not, but rather thrive linguistically in French. As a result, this inconsistent language planning across education levels has been highly debated. It has been blamed for creating language difficulties for public students looking to pursue technical university programs or job roles where mastering French is beneficial, if not required, particularly in the aforementioned sectors and with globalization.

Secondly, Classical Arabic is not considered a mother tongue for households in Morocco. Like most African countries, Morocco has a multilingual population and is home to languages such as Classical (interchangeable with Modern Standard) Arabic, Moroccan Arabic, Hassaniyya Arabic, Judeo-Moroccan Arabic, French, Spanish, as well as Amazigh, composed of the dialects Tamazight, Tachelhit and Tarifit. The 1983 reform replaced all language of instruction with Classical Arabic – the language of the Quran. However, the majority of Moroccans speak Moroccan Arabic as their native language. A quarter of the population, if not more, also speak Amazigh. Despite this dynamic, for reasons we will discuss, Classical Arabic became the official language of Moroccan public education.

The language debate is still ongoing. In 2019, Morocco reversed the nearly four-decade-long language policy. The language of instruction in science, math, and technical classes has now, yet again, switched from Classical Arabic to French. One Moroccan newspaper explains it as a step to deal with dropout rates in public universities and to increase scientific research within Morocco (Berets, 2022). As expressed by (Alalou, 2018), "if [a] new policy is to be more successful than the one pursued in the last [decades], a meaningful debate needs to be initiated." It remains unclear whether the change in language of instruction affected the population differently based on characteristics such as mother tongue or gender. Given Morocco's complex language dynamics and documented gender gaps in education, this is critical to understand moving forward in the language debate. The initial negative shock of the policy to years of schooling and other outcomes also presents an opportunity to better understand the human capital transmission of education in Morocco and the intergenerational effect of the much-debated policy.

In our research, we examine the impact of the language policy on educational attainments in Morocco using two empirical methodologies. Census data from 1982 and 2004 coupled with the nature of the progressive implementation of the policy allow us to both explore heterogeneous and intergenerational effects. The census data enables us to bucket individuals into cohorts based on year of birth and assign these individuals to treatment versus control according to their school age in 1983. Those born before 1970 enter grade 6 in 1982 or earlier and hence are assigned to the control group. Those born in 1970 or after enter grade 6 in 1983 and the years following. These birth cohorts are assigned to our treatment group. First, to identify the heterogeneous effects of the language policy, we exploit geographical variation coming from pre-reform primary completion rates to proxy for the likelihood of policy exposure, as well as temporal variation by year of birth and individual-level difference by mother tongue and gender. Using this approach in our triple difference specification, we show that the language policy had larger positive impacts on girls' educational attainments, with the heterogeneous effect emerging gradually. In contrast, we do not find any convincing heterogeneity by mother tongue. Second, we identify the intergenerational transmission of human capital in Morocco using the negative shock to educational attainment following the policy's sudden announcement and implementation. Directly following the policy enactment, we see a sharp drop in students entering middle school, as well as other educational attainments. We use this initial drop in our regression discontinuity design and find that human capital is transmitted intergenerationally to the children of those affected in the 1980s, primarily from mothers. After controlling for the fixed effect of children's cohorts, we show that a 1-year increase in mothers' educational attainments leads to a 0.183-years increase in children's total years of schooling. In contrast, fathers' educational attainments had no significant effects on the educational outcomes of their children.

This paper is related to three distinct strands of literature: the effects of language instruction, the intergenerational transmission of human capital, and, more broadly, post-primary education in developing countries. First, our research contributes to the literature on the effect of language instruction. We discuss how our results on the differential effects of the policy add to the key findings by Angrist and Lavy (1997) and align with evidence of salient gender gaps in Morocco suggested by Alesina et al. (2021). Morocco is one of many countries grappling with the consequential choice of language of instruction, particularly foreign languages. We explore why our results may differ from other papers on the effect of mother tongue instruction such as Seid (2019) because of the nature of the policy and language dynamics at hand in Morocco. This study contributes to a small yet growing body of research on language of instruction within the context of Africa, more specifically the Maghreb region. Both Algeria and Tunisia enacted Arabization education policies, which makes this paper particularly policy relevant from a regional perspective. Second, we also add to the literature on the intergenerational transmission of human capital. Research has shown that human capital is transmitted intergenerationally from parents (especially mothers) to children in developed nations (Currie and Moretti, 2003; Black et al., 2005), but evidence from developing countries remains limited. Using the language policy in Morocco, we investigate how the impact of this language policy on educational outcomes is transmitted from parents to their children to highlight the intergenerational transmission of human capital in Morocco. We also find mothers to be consequential in determining children's educational attainment. Thirdly, our research complements the literature on the effect of post-primary educational reforms in developing countries. The majority of previous research is focused on primary education (Banerjee et al., 2013). By evaluating the 1983 language policy targeting middle and secondary education in Morocco, we hope this paper brings more evidence to the much-needed research on post-primary education reforms, particularly in the Maghreb region.

The paper is organized as follows: In Section 2, we discuss the existing literature. In Section 3, we explore the 1983 language policy and the language dynamics in Morocco. We also present our hypotheses as to how the policy could heterogeneously and intergenerationally affect the Moroccan population. Section 4 explains the data used in the main analysis. In Section 5, using the triple difference approach, we show how the policy heterogeneously affected the educational attainments of the first generation. Section 6 mainly focuses on the intergenerational transmission of human capital and Section 7 concludes the paper.

2 Literature Review

This paper addresses three strands of literature. The first, and most central, is research on the role of language of instruction on educational outcomes. The language(s) chosen as the medium of instruction is one of many decisions governments face in the development of national curricula. Should students be taught in their mother tongue or in a foreign language? For countries affected by colonization, the language of instruction has historically been that of an imposed colonial language, such as English or French. This has been the reality for many despite most children starting school with little to no abilities in these languages (Evans and Mendez Acosta, 2021). In fact, more than 50% of children entering first grade in Africa are taught in a language that is not their mother tongue (Ouane and Glanz, 2010).

Research on the topic has gained momentum in recent years and suggests countries essentially face a dichotomy when it comes to language and education. On the one hand, mother tongue instruction shows overwhelmingly positive effects on school performance. Earlier reports find positive effects on academic achievement (Alidou et al., 2006; Brock-Utne et al., 2006), as well as attendance, classroom participation, and early literacy and reading skills (Benson, 2005; Bender et al., 2005; Trudell, 2013). The evidence of improved primary school performance with mother tongue instruction is only growing. Teaching children to read in their language spoken at home increased the speed at which these children learned to read in Cameroon (Laitin et al., 2019), Kenya (Piper et al., 2016) and Uganda (Brunette et al., 2019; Kerwin and Thornton, 2020). Ramachandran (2017) also finds, in the case of Ethiopia, giving access to mother tongue instruction in primary school for the largest ethnic group in 1994 increased the ability to read by 40%. The duration of mother tongue exposure in early grades before learning a second language also seems pivotal. A review by Evans and Mendez Acosta (2021) identifies studies with similarly promising results, including findings of a positive impact on the ability to learn a second language in Cameroon (Laitin et al., 2019), Ethiopia (Seid, 2019) and South Africa (Taylor and von Fintel, 2016).

A limited but growing number of papers also delve into the long-term effects of mother tongue instruction in Africa. Here, later labor market outcomes are center-stage. For immigrants in developed countries, there is a documented premium for proficiency in the dominant language of the host country, and as a result, better labor market performance (Dustmann and Soest, 2001; Dustmann and Fabbri, 2003; Bleakley and Chin, 2004). This would indicate that mother tongue instruction may negatively affect labor market performance if it lowers the proficiency in national or international languages in the presence of a premium for proficiency in these very languages (Seid, 2022). Whether this is the case for developing countries in Africa is unclear. However, a key paper by Angrist and Lavy (1997) has become a central point of reference for this concern. Exploiting the sharp change in the language of instruction from French to Classical Arabic in Morocco's Arabization policy of 1983, Angrist and Lavy create instrumental variables identifying the relationship between language skills and earnings and find the policy led to a substantial reduction in returns to schooling. Again, it is important to note that Classical Arabic, although the national language of Morocco, is not considered to be a mother tongue. Hence, comparing these contradictory findings to the general consensus of improved learning from mother tongue instruction must be done with caution.

In fact, the positive effect of mother tongue instruction on human capital accumulation through better school performance may also positively affect labor market outcomes. Findings by Eriksson (2014) suggest this to be true in South Africa using the Bantu Education Act in 1953, which mandated eight years of mother tongue instruction. Utilizing a difference-in-difference approach, Eriksson finds positive effects on wages after the increase in the duration of local language instruction. In the absence of labor market discrimination from apartheid, these effects would more than likely have been even larger. Another paper by Seid (2022) finds mother tongue instruction in primary schools introduced after a 1994 Ethiopian reform also improved later labor market outcomes.

Regardless of these promising findings, some countries also face the legacy of colonialism. As Tollefson and Tsui (2003, p.vii) explain, "in post-colonial countries, the educational agenda of using the most effective medium for education is often driven or clouded by the political agendas of nation-building, national identity, and unity." Under the umbrella of language literature, some research delves into the motivations behind the decision of language(s) of instruction in post-colonial countries (Tollefson and Tsui, 2003). These studies emphasize the importance of understanding the role of language planning in improving educational outcomes and the part linguistic elites play, but few studies are able to draw conclusions about the causality of language on learning (Ramachandran, 2017).

For North African countries, it took several decades to change the language of instruction away from

French post-independence. One of the main reasons for parental and teacher resistance toward mother tongue instruction is the concern for negative outcomes, such as worse performance on exams, poorer access to higher education, and less favorable employment opportunities, as previously mentioned (Muthwii, 2004; Jones, 2012; Nyarigoti and Ambiyo, 2014). For example, despite a national policy of mother tongue instruction in Kenya, some schools prohibit the use of the mother tongue by both students and teachers (Spernes, 2012) and students may even be punished if they do (Wangia et al., 2014). According to Trudell (2007) and Jones (2012), stakeholder beliefs and involvement are critical to the success of mother tongue initiatives.

As to be reviewed in Section 3.1, this paper explores Morocco's 1983 language policy that gradually changed the language of instruction completely to Classical Arabic in grades 6 to 12. It is one of many examples of efforts to promote native languages. The language reform is an interesting case for several reasons, including its similarities with linguistic politics in neighboring countries. The Arabization policy was also recently reversed in 2019 after four decades. In other words, Morocco's language debate is ongoing. What still remains unclear is who actually benefits from being taught in French versus Classical Arabic given the complex language dynamics in the country and the documented gender gap in education. Angrist and Lavy (1997) find a negative effect of the aforementioned policy on French language skills and earnings of young Moroccan men, but it is essential for a comprehensive understanding of the policy to consider whether there is a differential effect in education outcomes by mother tongue or gender. Like Eriksson (2014) on South Africa, we explore the policy's heterogeneous effects on educational attainment.

The second strand of literature this paper addresses is that of intergenerational effects. The census data reveals a negative shock to several metrics of educational attainment for those starting grade 6 in 1983 and thus affected by the policy. We use this as an opportunity to expand the analysis even further to understand the intergenerational transmission of human capital. Globally, the educational attainments of children are positively correlated with the educational attainments of their parents (Agüero and Ramachandran, 2020). This seems to be the case for both low- and middle-income countries (Ferreira et al., 2012; Beegle et al., 2016), as well as high-income countries (Björklund and Salvanes, 2011). However, as Agüero and Ramachandran (2020) discuss, only a few studies have been able to extrapolate causal effects in the literature of intergenerational schooling transmissions, especially in the context of developing countries. This is partly due to the lack of appropriate data (Azomahou and Yitbarek, 2021).

Using census data, Alesina et al. (2021) thoroughly map intergenerational mobility (IM) in educational attainment in 27 African countries since independence.[2] They construct measures of absolute upward IM (i.e., the likelihood that children born to parents who have not completed primary education manage to do so) and absolute downward IM (i.e., the likelihood that the offspring of parents with completed primary education fail to do so). The results show wide cross-country and within-country heterogeneity, as well as higher upward IM in urban versus rural areas. The findings also indicate a salient gender gap in North Africa, including Morocco and Egypt, as well as in the Sahel, including Senegal, Togo, Mali, and Ethiopia. More specifically, for Morocco, they estimate about a 40% likelihood that children between the ages of 14 to 25, with parents who have not completed primary education, manage to do so and a 12% likelihood for offspring not to complete primary education despite their parents having done so (Alesina et al., 2021). Other papers have conducted similar studies on educational mobility, but across regions in India (Asher et al., 2018) and China (Geng, 2018).

Research on intergenerational effects of specific education-related policies is especially limited in the context of Africa. Agüero and Ramachandran (2020) are one of few, exploring causal estimates of intergenerational transmission of schooling in Zimbabwe. Using a fuzzy regression discontinuity design,

[2] Alesina et al. (2021) pool census data from 1982, 1994 and 2004.

they exploit the exogenous variation in schooling attainment for black students before and after a reform in 1983 that ensured automatic advancement of students to secondary school, essentially removing school-rationing inherited from apartheid. Their estimates show that a 1-year increase in the schooling of the mother and father raises the child's school attainment by 0.072 and 0.092 years respectively. However, to the best of our knowledge, no study has explored intergenerational transmission of human capital following a change in language of instruction in Africa. Now that decades have passed since many of these language changes were first implemented, there is certainly an opportunity to further understand the role of language in multilingual developing countries.

Our third, and final, pillar of contribution is more broadly related to the needed expansion in research on middle and secondary education. Developing countries across the world are facing challenges in improving learning outcomes. With limitations in financial and human resources, there is little consensus as to how they best achieve these desired outcomes (Piper et al., 2018). The majority of research is focused on primary schooling (Banerjee et al., 2013). In a recent review by Evans and Mendez Acosta (2021) examining 145 empirical education studies between 2014-2020, 61% of the identified studies focused on primary education and only 24% on secondary. Earlier reviews by Kremer and Holla (2009) and Glewwe et al. (2011) also reflect this skewed distribution toward early years of schooling, with 71% and 65% of studies focused on primary education respectively.

Nevertheless, the literature is growing in the quest to improve both access to education and the quality of learning. In the context of Africa, Evans and Mendez Acosta (2021) find consistent results across a multitude of policies. For example, although there are relatively few studies on school construction in Africa, Duflo (2001) shows the nationwide construction of primary schools in Indonesia between 1973-1978 led to an increase in education and earnings. School fee elimination also seems to offer stable gains in access, while school feeding offers both consistent benefits in access and learning (Evans and Mendez Acosta, 2021). Moreover, the movement toward free primary education (FPE) in Africa exploded in the 1990s. Lucas and Mbiti (2012) find Kenya's FPE program in 2003 boosted primary completion, although disproportionately for boys, suggesting complementary programs are needed to target girls. No policy is all-encompassing. More studies are evaluating multi-faceted programs to boost quality and equality. For example, in Tanzania, the combination of school grants and teacher incentives augmented learning gains, more so than achieved separately (Mbiti et al., 2019).

Despite this progress, there is a growing international worry of a 'global learning crisis' (UNESCO, 2013). The quality of learning advancements does not seem to be proportional in size. Even after years of schooling, a large number of students are showing limited literacy and numeracy skills (Adeniran et al., 2020; Evans and Mendez Acosta, 2021). The lack of inclusivity in education is also a concern. As the evidence suggests, language of instruction could be a key catalyst for change in both improving the access and quality of education. In this sphere, we hope to bring more much-needed evidence to this type of policy intervention, particularly for post-primary education in the Maghreb region.

3 Schooling and Language in Morocco

3.1 The Arabization Policy of 1983

It took several decades for many North African countries to change the language of instruction away from French post-independence. Cost concerns and the risk of social upheavals have been cited as reasons behind the delay; from finding new teachers to switching textbooks, and perhaps most significantly, to the fear of losing French fluency and all its economic, social, and cultural value (Angrist and Lavy, 1997). In the case of Morocco, the country became independent from the French Protectorate in 1956, but did not remove French as one of the main languages in public education until 1983.

Morocco's education system was structured as follows: primary school grades 1 to 5, middle school grades 6 to 9, and secondary school grade 9 to 12. In 1983, French instruction of math and science subjects was to be gradually replaced with Classical Arabic instruction in middle and secondary Moroccan public schools. This change to Classical Arabic as the main medium of instruction in public school education was called the "Arabization" policy. Other Maghreb countries such as Algeria and Tunisia followed suit with their own Arabization language policies (Weinstein and Thayer, 1990).[3] In 1991, Algeria declared Classical Arabic to be the new exclusive medium of instruction across all education levels, from primary school to university (Angrist and Lavy, 1997).

The change driven by the Arabization policy in Morocco was first experienced by all students who entered 6th grade in the 1983-1984 school year. Thereafter, the change was progressively implemented in one additional grade each school year until all grades from 6 to 12 had made the change by 1990. In other words, all students who started grade 6 during (and after) the fall of 1983 were affected and, as a result, taught mostly in Classical Arabic until the end of secondary school. If a student entered 7th grade in the school year 1983-1984, they were to continue learning math and sciences in French. For those affected, French was instead taught as a separate foreign language subject for six hours per week. Some additional steps were made in order to ease the transition following the implementation of the policy. This included offering some training in Classical Arabic for teachers who had previously taught French.[4] Efforts were also made to produce textbooks in Classical Arabic, but it is unclear whether this was successful at the time of the transition (Angrist and Lavy, 1997). However, testimonials and reviews of the policy suggest both teachers and students felt unprepared for the transition (Mansouri and Moumine, 2017; Berets, 2022).

3.2 Language Dynamics in Morocco

To fully grasp the implications of the policy, it is important to understand the language dynamics in Morocco and the reasons behind the nationwide critique of the Arabization policy. Firstly, the linguistic context in Morocco is complex. As a multilingual country, Morocco is home to many languages, including Classical Arabic, Moroccan Arabic, Hassaniyya Arabic, Judeo-Moroccan Arabic, French, Spanish, as well as Amazigh, composed of the dialects Tamazight, Tachelhit, and Tarifit. Moroccan Arabic, also known as Darija, is the official and majority language of Morocco. Before the period of colonization, language was dominated by written Arabic and spoken maternal languages across the Maghreb region (Weinstein and Thayer, 1990).

One of these oral maternal languages is Moroccan Arabic (Weinstein and Thayer, 1990). Like other spoken Arabic dialects, Moroccan Arabic is a mother tongue language native speakers learn before starting school (Holes, 2004). In the 2014 census, 80% of individuals speak Moroccan Arabic as their primary language.[5] Historically, Moroccan Arabic has been perceived as a low-status language, even by its own speakers (Loutfi and Noamane, 2020). It has been systematically excluded from media and TV, despite being the most commonly spoken language in everyday family life (Salmi, 1987). In addition, Moroccan Arabic is not used in academia primarily because it lacks a written system. Compared to Classical Arabic, the Moroccan Arabic lexicon is not as rich (Loutfi and Noamane, 2020).[6] However, as explained by Salmi (1987, p. 2), it "has been the only vehicle of transmission of

[3] Algeria and Tunisia were French colonies from 1830-1962 and 1881-1956 respectively (Weinstein and Thayer, 1990).

[4] The degree of effectiveness of this training is uncertain. According to an interview by Al-Fanar Media with a public school teacher teaching physics and chemistry in French at the time of the policy, they were only offered two weeks of training by Morocco's Ministry of Education (Berets, 2022).

[5] This pertains to the entire IPUMS sample for the 2014 census (Minnesota Population Center, 2020). More descriptive statistics post-data cleaning are displayed in Table 1 in Section 4.

[6] A combination of Modern Standard Arabic and Moroccan Arabic called Middle Moroccan Arabic has been suggested as an emerging alternative. Middle Moroccan Arabic expands its lexicon from Modern Standard Arabic while maintaining

a major part of Moroccan history, art, folklore, traditions, and customs."

Then there is the Amazigh language, which was spoken before the Arabs conquered Morocco in the 7th century A.D. (Loutfi and Noamane, 2020). The Amazigh language is that of the indigenous people of Morocco (Zouhir, 2014) and one of the oral maternal languages in precolonial Maghreb in addition to Moroccan Arabic (Weinstein and Thayer, 1990). There are several Amazigh dialects, including Tamazight, Tachelhit, and Tarifit.[7] The three dialects supposedly compete with each other to maintain their distinct characteristics in the standardized Amazigh bucket (Loutfi and Noamane, 2020). Of the entire 2014 IPUMS census sample, 17% of individuals speak Amazigh as their primary language (Minnesota Population Center, 2020).

Most progress in recognizing Amazigh as an official language in Morocco has been made in the last few decades. The language was only recently acknowledged as an official language in 2011, despite being the mother tongue of almost a quarter of the population, if not more. In a 1994 speech, Morocco's King Hassan II made the state's first official reference to Amazigh and Moroccan Arabic as being important languages for Morocco's national identity. In a royal decree in 2001, Morocco established the Royal Institute of Amazigh Culture (IRCAM - Institut Royal de la Culture Amazighe), tasked with preserving and promoting the language and Amazigh culture across educational, media, and social contexts on both a national and local scale. In 2003, the Amazigh language was introduced as a subject in 317 public primary schools across the country (Aissati et al., 2011).

Classical, or interchangeably Modern Standard, Arabic is not considered to be a mother tongue. Western linguists consider Classical Arabic and Modern Standard Arabic to be two distinct forms of Arabic with the purpose of discerning the written language from before the mid-nineteenth century (Classical Arabic) and after (Modern Standard Arabic). Modern Standard Arabic is a described by Holes (1996, p. 5) as a "modern descendent of Classical Arabic, unchanged in the essentials of its syntax but very much changed, and still changing, in its vocabulary and phraseology." There is no agreed moment in time when Modern Standard Arabic markedly evolved from Classical Arabic and also no set of agreed criteria that distinguish the two. Yet, Arabic speakers do not systematically differentiate between the two terminologies. Instead they are both commonly referred to as 'eloquent' Arabic (Holes, 2004).

Moreover, Classical Arabic is considered the language of the Quran. More linked to one's Islamic identity than native language, "[it] has a very strong historical and religious legitimacy" (Loutfi and Noumane, 2020, p.2). Classical Arabic is also a difficult language to master. It is described as the traditional form of Arabic from which spoken dialects, such as Moroccan Arabic, are derived (Weinstein and Thayer, 1990). While Moroccan Arabic has evolved and changed with spoken language in terms of vocabulary, phonetics, and structure, Classical Arabic is described as a "frozen code", analogous to comparing Latin and 20th century French (Salmi, 1987, p. 23). However, the comparison between the two forms of Arabic, one written and one primarily spoken, highlight a critical language dynamic common across Arabic-speaking countries. While Classical Arabic is a highly regarded written language, the spoken dialect of Moroccan Arabic is one of lower prestige (Weinstein and Thayer, 1990).

The final language covered in this study is French. During the French Protectorate, the foreign language was progressively introduced and became a so-called 'literary language' in Moroccan society (Salmi, 1987).[8] The introduction of the French language is described to have affected the existing

the core characteristics of Moroccan Arabic. However, it still requires further understanding as a separate linguistic system (Loutfi and Noamane, 2020).

[7] As Zouhir (2014) explains, the dialects can be split into three geographical linguistic blocks. Tamazight is the dialect of the Middle Atlas, while Tachelhit is that spoken from the High Atlas through the Anti-Atlas mountain range, and Tarifit is spoken in the North across the Rif mountains.

[8] Although Morocco was also colonized by Spain in the Northern region of the country, Spanish never became as widely used as French. In part, this is because of the differing cultural policies of France and Spain, where the French

languages of Maghreb countries differently. The oral maternal languages, such as Moroccan Arabic and Amazigh, were able to gradually assimilate French terms. In contrast, Classical Arabic maintained its traditional form and remained the symbol of Islamic identity in face of French linguistic and cultural imposition (Weinstein and Thayer, 1990).

Until recently, French has been taught in both public and private Moroccan schools, but not to the same degree. While French has been taught as a separate subject in public schools post-1983, it is the main language of instruction in most private schools. The 1983 language reform changed the language of instruction to Classical Arabic in grades 6 to 12, but it did not extend to university education, leaving many university programs to be taught completely in French. For students with a public school background, this has been attributed to creating difficulties in pursuing university-level math and science majors, which are predominantly taught in French, while private-school students, in contrast, thrive linguistically. Although French is not an indigenous language of Morocco, it is widely spoken by the Moroccan population. Even after the language reform, French has almost exclusively been used in private businesses, public administration, ministries, and academia, especially in science and technical majors (Loutfi and Noamane, 2020). French has also been important for educated labor force participants, who have often been employed in French-trained civil roles or positions in sectors trading with French-speaking countries (Angrist and Lavy, 1997; Elbiad, 1991).

Languages in Morocco are essentially confined to their roles in society. Moroccan Arabic and the Amazigh language are limited to everyday speech. Classical Arabic fills the courts, media, and parts of academia. French dominates public and private administration, top positions in the job market, and elite academia (Loutfi and Noamane, 2020). As described by Aissati et al. (2011), Morocco's language situation can be characterized as triglossic, where local vernaculars, Moroccan and Amazigh, are informally used and Classical Arabic is reserved for written communication and formal speech. It is not a unique linguistic situation. For example, outside of Maghreb in the Democratic Republic of Congo, languages spoken can also be structured based on perceived hierarchical importance in society. French, a former colonial language, is at the very top of the hierarchical pyramid in Congolese society (Hulstaert, 2018). Similar parallels around hierarchical distinctions between native languages and French can also be drawn to Morocco's Maghreb neighbors Algeria (Daoudi, 2018) and Tunisia, where French is a language of high status and power in all three countries (Weinstein and Thayer, 1990).

Language planning in post-independent Maghreb became an important process for legitimizing the new governments. The goal of the Arabization policies across Morocco, Algeria and Tunisia was to restore their national identities and oppose the cultural alienation of Arabic from important domains where French had been imposed. According to Weinstein and Thayer (1990), Classical Arabic became the official language over regional dialect alternatives for three reasons. First, despite their popularity, the distinct varieties of dialects would make national linguistic standardization difficult. Second, choosing one Arabic dialect, such as Moroccan Arabic, risked causing unique issues for Amazigh minorities, which was a particular concern for Morocco and Algeria. Third, Classical Arabic was perceived as the best choice and most reliable language for formal academic writing.

As a result, the language policy in 1983 exposed and created a linguistic dilemma. Morocco's leadership felt it could either continue to depend on French or attempt to restore its pre-colonial identity (Weinstein and Thayer, 1990). The choice of Arabic instruction in education was perceived by some as the only way to achieve complete independence (Angrist and Lavy, 1997). Yet, ever since implementation, the 1983 language policy has been criticized by Moroccan politicians, educators, and intellectuals alike for deteriorating the quality of education in public schools (Alalou, 2018). According to Mansouri and Moumine (2017, p. 14), "the language of teaching in primary and secondary education

prioritized imposing cultural and linguistic assimilation. In contrast, the Spanish educational system did not replace Arabic with Spanish in schools (Salmi, 1987).

has been hostage to political ideologies" and continue, explaining "Morocco [still] has not succeeded in having a clear-cut linguistic policy so far." As a result, the education system has faced challenges with a lack of qualified teachers, adapted curricula, and program unity (Marley, 2004; Mansouri and Moumine, 2017).

In sum, this paper is not just relevant for better understanding the effect of the language policy in Morocco, but also for better understanding language policies in the Maghreb region and other countries confronted by the same language dynamics.

3.3 Possible Mechanisms of the Language Policy

Given this linguistic background, in what ways do we expect the language policy of 1983 to impact the educational outcomes of the first generation of students affected, as well as the generations that followed?

Firstly, the change from French to Classical Arabic may have caused practical difficulties that in the short term challenged both teachers and students. With only a few weeks of training for math and science teachers to prepare for the language change and issues with delivering new textbooks, the transition may have caused a chaotic start to the new era of language of instruction. References also indicate the change in the language of instruction was not exactly welcome with open arms (Zouhir, 2014). These two forces combined may explain the negative shock to years of schooling post the implementation of the reform. As previously discussed, the beliefs and engagement of stakeholders involved, from teachers to parents, are essential in the adoption of language initiatives.

Secondly, since neither French nor Classical Arabic are native languages, there may be relative advantages and disadvantages for the mother tongue groups associated with the change in the linguistic learning experience. Prior to the language policy, approximately 63% of the literate Moroccan Arabic population were literate in French and Arabic, as opposed to 49% of the literate Amazigh population.[9] As a result, we expect Moroccan Arabic speakers may have some relative advantage in the transition and switch from French to Classical Arabic. However, the shift to only Classical Arabic may have also positively affected school completion for Amazigh speakers. Learning likely became easier as students were able to complete school in one rather than two non-native languages. Angrist and Lavy (1997) do not delve into the heterogeneous effects by mother tongue, but given the language context of Morocco, it is important to consider how language policies affect different ethnic groups.

Thirdly, as Alesina et al. (2021) point out, the gender gap in education is salient in Morocco. In 1960, the reported illiteracy rates were 96% percent for women and 78% for men. Three decades later, in 1990, illiteracy rates were 78% and 56% respectively (Spratt, 1992). Within the scope of the Arabization policy, the differential effect by gender is hence probable, but theoretically more ambiguous. We can assume the results may have materialized in relatively positive effects for girls versus boys primarily if the policy led to a reduction in barriers to entry and completion of school. For example, prior to the language change, 5th-grade students were required to pass an end-of-primary school exam, of which almost half required French fluency. If literacy is higher among boys than girls, then language could be an underlying factor and the removal of French from post-primary school and critical examinations both from 5th to 6th grade and in higher grades may have benefited girls who were previously hindered by the trilingual language requirement.[10]

[9] These percentages are estimated by pooling the 1994 and 2004 censuses from IPUMS to obtain the relative shares of literacy in both French and Arabic from the literate population amongst the two mother tongues (Minnesota Population Center, 2020). To avoid bias from those affected by the program, these approximations are based on those who were born before 1965 and hence were no longer in school in 1983.

[10] Students must also pass high school baccalaureate exams at the end of 12th grade (Angrist and Lavy, 1997).

4 Data

Our main data source is the Integrated Public Use Microdata Series (IPUMS) International (Minnesota Population Center, 2020). IPUMS provides easy access to harmonized census data from all over the world, currently covering more than 100 countries. It typically reports 10% random representative samples of census data. The data are coded consistently across countries over time. In this study, we use random samples of two Moroccan population censuses from 1982 and 2004, all of which are obtained from IPUMS. This data allows us to conduct both a triple difference approach and a regression discontinuity design.

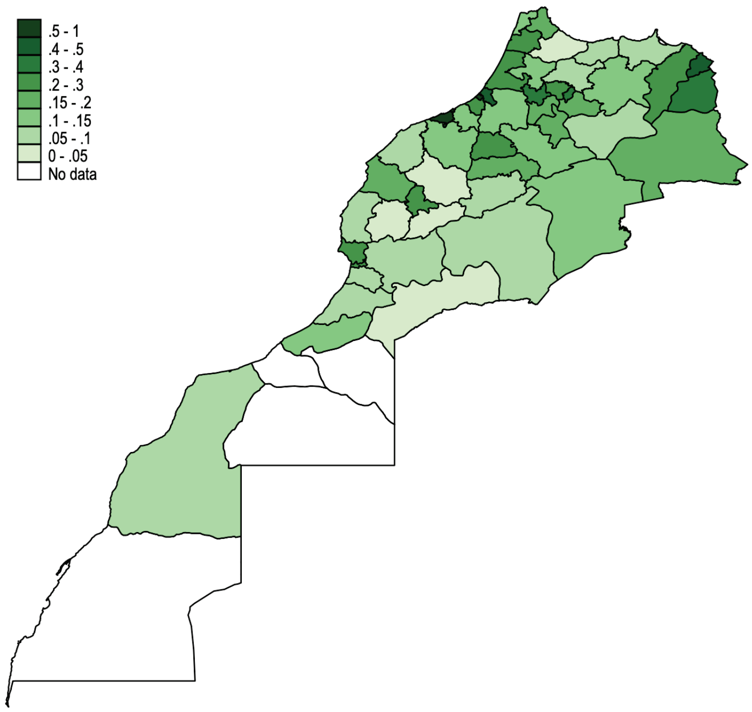


Figure 1: Map of Morocco Showing the Distribution of Share in Primary School Completion Across Provinces
Note: Using the 1982 census, we obtain the province-level distribution of the share of people who had completed primary education or above by the time of the census.

The 1982 census, which was conducted before the language policy, is used to understand the pre-treatment conditions in primary school completion as a proxy for the likelihood of exposure to the policy in 1983. This is done to consider potential systematic differences in provincial access to post-primary education at the time of the policy, which would be ignored if we simply use a binary variable for primary completion. Therefore, we assign individuals share of primary completion in 1982 by province to proxy for treatment intensity in our triple difference approach. Figure 1 shows the province-level map of Morocco and the distribution of shares in primary school completion. Four provinces are dropped due to small sample size.[11] In the 1982 census, these provinces had 125, 209, 76, and 194 observations respectively. Linking primary school completion shares for these provinces to those in 2004 risks not representing the true population in these provinces and biasing our results. We take the share of primary school completion for each province in 1982 and match all individuals in the 2004 sample with a treatment intensity value based on the approximate province of birth.[12] The

[11] These provinces are Oued-Ed-Dahab and Aousserd, Assa-Zag, Es-Semara, and Tan-Tan.

[12] For consistency, we refer to the first administrative unit as region and the second administrative unit as province.

2004 census is used to estimate both the differential impact of the language policy by mother tongue and gender in the triple difference section (Section 5) and the intergenerational effect of the policy in the regression discontinuity section (Section 6).

To avoid potential bias in Section 5, we drop some observations from our sample according to the following criteria. First, our analysis focuses on those who were aged 19 or above at the time of the census to avoid issues with incomplete schooling or those who may go back to school to finish their education. Otherwise, their educational attainments might be underestimated. Second, the individuals included in the sample were born between 1960 and 1978 because those who were born before and after this period might have been affected by independence in 1956 or another reform in September 1990 restructuring primary education by moving grade 6 from middle school to primary school. Third, we do not include those born in another country since their outcomes might have been affected by different factors. Fourth, due to the lack of data on provinces of birth in the Moroccan data sets, our sample only consists of those who had never migrated or who migrated when they were 6 years old or younger to their residence at the time of the census. Though restrictive, this allows us to approximately identify the provinces of birth for each individual and where they received their education.[13] We do not use their current residence since it may be potentially endogenous to treatment intensity if people move in search of better economic opportunities. Fifth, since the language policy specifically targeted middle schools, we exclude those who never attended school or only preschool.[14] If their educational attainments are unknown, they are also omitted. This selection makes our sample slightly more educated than the entire population. We do not believe this challenges the internal validity of our results because the language policy addresses post-primary education only and we believe it is reasonable to assume that the policy did not deter students from starting school at all.[15] Finally, as we seek to compare the effects of the policy on two different mother tongue groups, individuals whose primary languages are unknown or not locally spoken are not included in our sample. The resulting sample consists of 130,019 individuals in our triple difference analysis.

In Section 6, we use the regression discontinuity design to identify the intergenerational transmission of human capital. Thus, this sample is slightly different from the sample used in Section 5, consisting of those who were born between 1965-1969 (control) and 1970-1974 (treatment). Furthermore, since we are interested in the intergenerational transmission of human capital, we drop those who do not have either fathers or mothers in the data set. Using the data structure from IPUMS, we can link parents to their children. However, not all parent-children pairs are included in the data set. Some children do not have their parents in the data set or vice versa, and they are removed from the sample in Section 6. In total, we have 20,952 children for father sample and 34,594 children for the mother sample.

Table 1 reports descriptive statistics for the two samples of the triple difference and regression discontinuity sections. In Panel A, we see no signs of drastic differences in the share of Moroccan Arabic speakers among the control and treatment groups, as well as mean age by gender within each respective group. In Panel B, we present descriptive statistics for the regression discontinuity sample. Except for age (as the running variable is the year of birth), there is no sign of significant differences in the variables. Using these specific samples from the 2004 census, we create several outcome variables. The outcome variables include years of schooling, literacy, the probabilities of completing Grades 6, 10,

[13] This assumption is also made in papers such as Seid (2016), Seid (2019), Seid (2022), and Eriksson (2014).

[14] As a result, we also exclude those who attended "Quranic" preschools, which historically are schools separate from public education for children ages 5 to 7, dedicated to teaching the Quran, basic numeracy skills, and the Arabic language (Mansouri and Moumine, 2017). This subsample of observations is very small in relation to our entire sample.

[15] Support for this assumption can be seen in the covariate smoothness tests in Section 6, where grade completion across primary school remain unaffected at the point of discontinuity.

Table 1: Descriptive Statistics for the Triple Difference and Regression Discontinuity Sections

	Control Cohort				Treated Cohort			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Panel A: Triple Difference								
Male Sample: *N*	27,887				50,634			
Age	39.662	2.600	36	44	29.688	2.559	26	34
Moroccan Arabic	0.884	0.321	0	1	0.858	0.349	0	1
Literate	0.987	0.111	0	1	0.985	0.122	0	1
Years of Schooling	8.268	4.183	1	18	7.906	3.913	1	18
Primary (1-5)	0.444	0.497	0	1	0.407	0.491	0	1
Middle (6-9)	0.181	0.385	0	1	0.295	0.456	0	1
Secondary (10-12)	0.224	0.417	0	1	0.174	0.379	0	1
University (12+)	0.151	0.358	0	1	0.123	0.329	0	1
Female Sample: *N*	17,535				33,963			
Age	39.555	2.569	36	44	29.653	2.556	26	34
Moroccan Arabic	0.950	0.217	0	1	0.905	0.293	0	1
Literate	0.987	0.114	0	1	0.986	0.118	0	1
Years of Schooling	8.633	4.152	1	18	8.436	4.105	1	18
Primary (1-5)	0.378	0.485	0	1	0.358	0.479	0	1
Middle (6-9)	0.211	0.408	0	1	0.295	0.456	0	1
Secondary (10-12)	0.257	0.437	0	1	0.186	0.389	0	1
University (12+)	0.154	0.361	0	1	0.160	0.367	0	1
Panel B: Regression Discontinuity Design								
Father Sample: *N*	8,881				4,265			
Father's Age	37.139	1.413	35	39	32.432	1.376	30	34
Moroccan Arabic	0.854	0.353	0	1	0.826	0.379	0	1
Father's Years of Schooling	7.855	3.971	0	1	6.538	3.194	0	1
Fathers' Children Sample: *N*	14,927				6,025			
Child's Age	10.153	3.260	5	29	9.239	2.728	5	33
Daughters	0.474	0.499	0	1	0.479	0.500	0	1
Children Literate	0.521	0.500	0	1	0.388	0.487	0	1
Child's Years of Schooling	3.611	2.280	1	18	2.872	1.959	1	15
Mother Sample: *N*	9,545				8,952			
Mother's Age	36.960	1.415	35	39	32.096	1.425	30	34
Moroccan Arabic	0.935	0.247	0	1	0.906	0.292	0	1
Mother's Years of Schooling	8.487	4.038	1	18	7.200	3.380	1	18
Mothers' Children Sample: *N*	19,599				14,995			
Child's Age	11.784	3.910	5	29	10.158	2.908	5	24
Daughters	0.488	0.500	0	1	0.488	0.500	0	1
Children Literate	0.691	0.462	0	1	0.555	0.497	0	1
Child's Years of Schooling	5.229	2.997	1	18	3.908	2.317	1	16

Note: In the triple difference sample group, those born in 1960-1968 are in the control cohort and those born in 1970-1978 are in the treated cohort. In the regression discontinuity sample group, the two groups are restricted to 1965-1969 for the control group and 1970-1974 for the treatment group. The 0 to 1 values for minimum and maximum indicates the variable is binary.

and 13, and as a result, the probabilities of entering middle school, secondary school and university.[16] We are also interested in the likelihood of completing middle school, secondary school and university. Except for years of schooling, all outcome variables are binary.

Although school enrollment is mandatory from ages 7 to 16, theoretically grades 1 to 9, practically we must consider possible repetition and early or delayed school enrollment. Grade repetition in primary school was quite common because of supposedly limited spots in middle school and deteriorating teacher conditions (Angrist and Lavy, 1997). School repetition rates in 1980 and 1983 were 31.3% and 32.3% respectively (Mansouri and Moumine, 2017). Based on LSMS data, Angrist and Lavy (1997) find children repeat at least one grade in primary school. In addition, 16% of children starting first grade in 1983-1984 were 6 years old, not 7. This increased to 25% in 1986-1987 (Khandker et al., 1994; Angrist and Lavy, 1997). Like Angrist and Lavy (1997), we do not have information regarding at what age individuals started school in our data set, hence, we distinguish treated versus untreated cohorts based on a fixed-age cutoff. A child born in 1971, who entered grade 1 at age 7 and did not repeat a grade in primary school would start grade 6 in 1983 at 12 years old. A child born in 1970 who entered grade 1 at age 7 but repeated one grade in primary school would start grade 6 in 1983 at 13 years old. Considering the reality of prevalent grade repetition, as done by Angrist and Lavy (1997), we also assume students repeat one grade in primary school. Hence, those born in 1970 and later are considered to be affected by the language policy.

We do not estimate the impact on occupational outcomes since we only have access to data on the individuals' occupations or employment status at the time of the census. Since occupations may change over time due to economic fluctuation, age, and other factors, we believe the 2004 census does not necessarily show or allow us to explore the impact of the policy on labor outcomes as more than 20 years had passed before the census was conducted.

5 Effects on Educational Attainment

5.1 Identification Strategy

To uncover the heterogeneous impacts of the language policy on educational attainment, we employ a triple difference approach. Our identification strategy exploits two exogenous forms of variation in exposure to the Arabization policy in 1983, in addition to having Moroccan Arabic as a mother tongue or being female.

The first is the temporal variation in exposure to the language change by birth cohort. Those born in 1970-1978 are categorized as the *treated cohort*, while those born in 1960-1968 are the *control cohort*. The cohort groups are restricted to these two nine-year intervals to avoid confounding effects of education reforms in the initial years of independence and another structural reform in September 1990. The latter reform moved grade 6 from middle school to primary school. In addition, schools from the religious school system (Quranic schools) were also absorbed into special tracks of public school (Angrist and Lavy, 1997). As a result, we get these two equally sized buckets of treatment versus control.

Our second source of variation is the pre-reform variation in primary school completion by province obtained using the 1982 census data. Since the reform was deployed nationwide, we use this as a proxy for the likelihood of being exposed to the program given province-level determinants in access to schooling. Angrist and Lavy (1997) use a dummy for having 6 or more years of schooling, but this in itself could be affected by the education reform, as seen in the initial negative shock in educational attainment for those affected in 1983. As previously mentioned, there may also be systematic differences

[16] Grades 6, 10, and 13 correspond to the first year of middle school, secondary school, and university.

in access to education. Therefore, individuals are assigned the share of primary school completion in their province one year before the reform as an exogenous source of variation in the likelihood of exposure to the policy targeting 6th grade and above.

With the intent of identifying the causal relationship in the differential impact of the policy by mother tongue and gender, we construct the following triple difference model for individual i born in province j and in year t:

$$\begin{aligned} y_{ijt} = \beta_0 + &\beta_1(T_t \times PC_{j,1982} \times MT_i) + \beta_2(T_t \times PC_{j,1982}) + \beta_3(T_t \times MT_i) \\ &+ \beta_4(PC_{j,1982} \times MT_i) + \beta_5 MT_i + \delta_j + \gamma_t + \epsilon_{ijt} \end{aligned} \tag{1}$$

$$\begin{aligned} y_{ijt} = \beta_0 + &\beta_1(T_t \times PC_{j,1982} \times G_i) + \beta_2(T_t \times PC_{j,1982}) + \beta_3(T_t \times G_i) \\ &+ \beta_4(PC_{j,1982} \times G_i) + \beta_5 G_i + \delta_j + \gamma_t + \epsilon_{ijt} \end{aligned} \tag{2}$$

where y_{ijt} denotes the educational outcomes of interest.[17] On the right-hand side, T_t is a dummy indicating whether the individual belongs to the treated cohort, $PC_{j,1982}$ denotes the intensity of the policy in their province of birth, MT_i is binary indicator in Equation 1, taking the value 1 if the individual's mother tongue is Moroccan Arabic and 0 if Amazigh. In Equation 2, G_i for gender takes the value 1 if the individual is female and 0 if male. Finally, δ_j and γ_t represent the fixed effects of province and cohort, respectively, and ϵ_{ijt} is the idiosyncratic error term that is clustered at the province level.[18]

The third-level interaction term β_1 captures all variations in treated cohorts (relative to control cohorts) who live in a province with the highest pre-reform primary completion (relative to those who live in provinces with lowest shares) and who have Moroccan Arabic as their mother tongue (relative to Amazigh) or who are female (relative to male). The coefficient β_1 indicates the differential causal effect of the language policy on the outcomes of the affected cohorts by mother tongue and gender. Moving on to the second-level interactions, β_2 accounts for characteristics in treated cohorts and being in a province with relatively high primary completion, β_3 for characteristics of being treated and Arabic or female, and β_4 for characteristics of being in a province with relatively high primary completion and being Arabic or female. As for the separate controls, β_5 controls for characteristics of being Arabic or female.

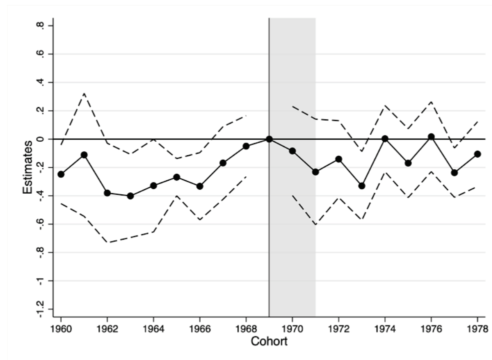
The causal interpretation of the coefficient β_1 in Equations 1 and 2 relies firstly on the parallel trends assumption. In the absence of treatment (the language policy), the difference in trends between those with Moroccan Arabic and Amazigh as mother tongues, or between girls and boys, would have been the same between treatment and control groups. We are not worried about composition effects from the underlying population changing given the mother tongue and gender composition in the treated and control cohorts displayed in Table 1. To rule out parallel trend violations in the two specifications, we conduct event studies for both Equations 1 and 2. Figures 2 and 3 show the triple difference estimates in educational attainment outcomes by mother tongue across the entire cohort span. We do see some concerning parallel trend assumption violations in panels (a), (b), (c) and (f) in Figure 2. This will be considered in the discussion of results. However, panel (d) and (e) in Figure 2 do not indicate parallel trends violations among pre-treatment cohorts. The remaining event studies for the mother tongue specification of some completion of university (i.e. grade 12+) and literacy is available in Appendix A1. As shown in Figure 3, we do not have any major concerns over the parallel trends assumption for the gender specification. More event students for heterogeneous effects

[17] Outcomes in this regression are years of schooling, literacy skills, the probabilities of completing Grades 6, 9, and 13, and the likelihood of graduating from middle school, secondary school, and university. Grades 6, 9, and 13 correspond to the first year of middle school, secondary school, and university.

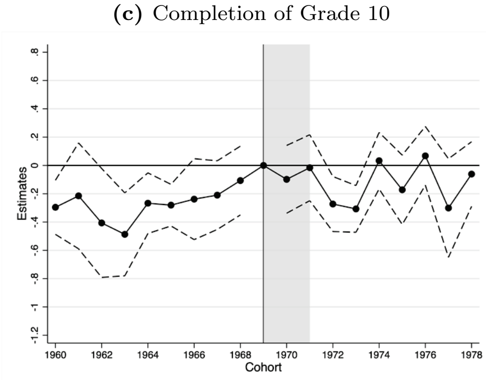
[18] We cluster at the province level to account for possible serial correlation from assigned policy exposure by province.

(a) Completion of Grade 6

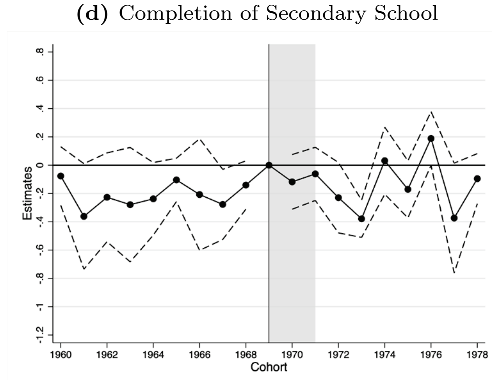
(b) Completion of Middle School



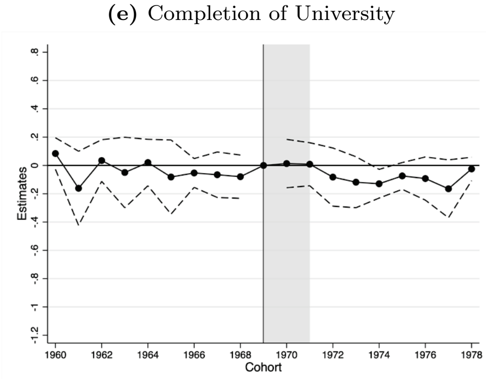
(c) Completion of Grade 10



(d) Completion of Secondary School



(e) Completion of University



(f) Years of Schooling

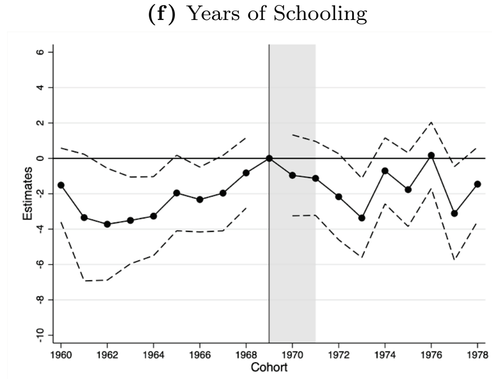
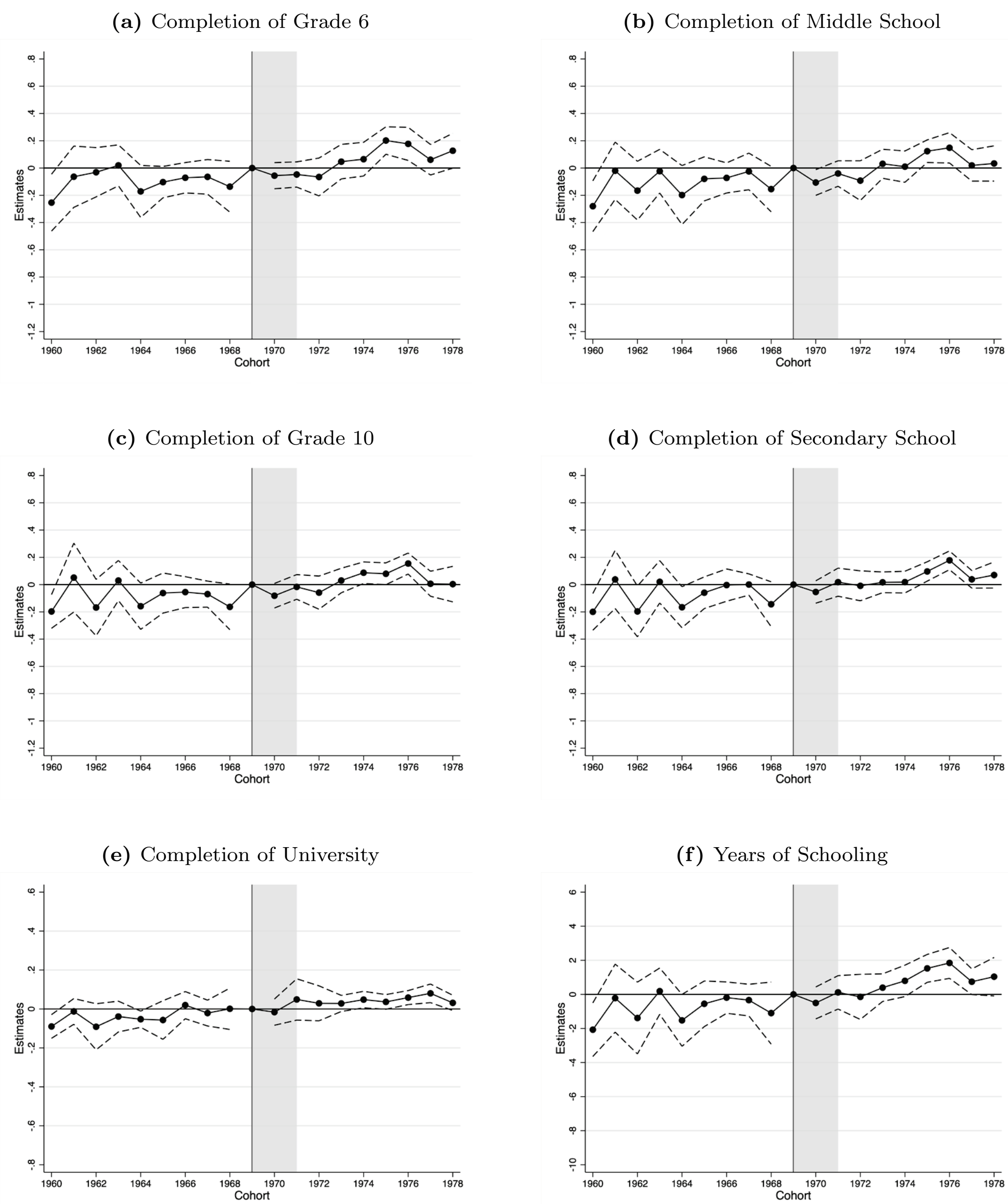


Figure 2: Triple Difference in Educational Attainment by Mother Tongue

Note: Each figure plots the triple difference estimates of Equation 1 for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey shaded area shows the first two cohorts affected by the policy in 1983.



(a) Completion of Grade 6

(b) Completion of Middle School

(c) Completion of Grade 10

(d) Completion of Secondary School

(e) Completion of University

(f) Years of Schooling

Figure 3: Triple Difference in Educational Attainment by Gender

Note: Each figure plots the triple difference estimates of Equation 2 for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey shaded area shows the first two cohorts affected by the policy in 1983.

by gender are available in Appendix A2. Comparing Figures 2 and 3, we see more visual indications of significant heterogeneous effects by gender.

The confounding effects we avoid by restricting our sample to birth cohorts between 1960-1978 also limit our options with robustness checks. We are unable to construct appropriate placebo tests by assigning treatment to a control cohort group born before the policy while simultaneously maintaining equal size cohorts *and* avoiding confounding effects, such as independence from the French protectorate. As an alternative robustness check, we employ province-specific time trends as a control for provincial convergence. The event studies including this robustness check are available in Appendix B1 and B2. These controls do not drastically change the event studies, however, we do see slight reductions in pre-treatment significant results (i.e. parallel trend violations) in Figures 8 and 9 for the mother tongue specification. As for the gender specification, the event studies do not change with the inclusion of province-specific time trends shown in Figures 10 and 11. To address the concern regarding our mother tongue specification mentioned above, we check the triple difference estimates including province-specific time trends and do so for both equations. The estimates are presented in Appendix B3 and B4 and are discussed in the results.

The remaining threat to our identification strategy would be any education policies or macroeconomic events that could lead the triple difference estimates to confound the effect of the language change in post-primary education with the effect of some differential trend of another source that would have been captured even in the absence of language reform. To address this concern, we review education policies during the time period and conclude no major red flags in terms of confounding effects. Angrist and Lavy (1997) reach the same conclusion. We aim to account for the more than likely significant developments in the education system during the first years post-independence, as well as the structural reform in 1990 moving grade 6 to primary school, in the construction of our specifications by adjusting the treated and control cohorts accordingly.

The most prominent source for concern is rather a financial crisis that occurred in 1983 where Morocco defaulted on its international debt and was forced to borrow from the IMF. This led to a "strategy for economic restructuring and containment of public-expenditures," (World Bank, 1986, p. 2). This strategy essentially arose from ambitious growth policies pursued by the government across sectors in the 1970s. Financed initially by phosphate revenues obtained from the tripling of phosphate prices in 1973, the expansionary policies were later financed by foreign borrowing. This disequilibrium in fiscal and balance-of-payments led to a three-year stabilization program starting in 1978, reducing public sector expenditure and restricting imports. However, the situation worsened and in 1983 the government acknowledged the issue of its depleted foreign exchange reserves. As a result, Morocco signed the 1983 Standby Agreement with the IMF and began discussions on economic restructuring and the restriction of public sector spending. This also included industrial restructuring to strengthen export production, agricultural reform to improve farming techniques and overcome constraints, and public enterprise reform to improve public enterprise efficiency (World Bank, 1986).

However, we conclude that this should not be a major problem for three reasons rooted in deductions from macroeconomic indicators presented in Figure 12 of Appendix C. Firstly, Morocco's annual GDP growth between 1970 and 2000 can only be described as quite volatile, and 1983 is no exception. Secondly, the government expenditure on education as a percentage of GDP does not drastically drop, but rather fluctuates between 4%-5% over the span of three decades. Thirdly, the percentage share of government expenditure on the different levels of education remains very stable and we see no concerning shift in this distribution of expenditure on education. Hence, we make the assumption that this financial event likely did not cause differential effects by mother tongue or gender for those at the age of entering middle school in provinces with a high share of primary completion in 1983.

5.2 Results

Tables 2 and 3 report the estimates for the triple difference by mother tongue (Equation 1) and gender (Equation 2), with standard errors clustered at the province level. The main coefficient of interest is the third-level interaction term. For Table 2, the coefficients capture the effect of the change in the language of instruction on Moroccan Arabic speakers living in provinces with the highest share of primary completion, and hence, policy exposure. A positive (negative) and significant coefficient implies that the language policy benefited (worsened) the educational outcomes of the Moroccan-speaking students most likely exposed to the language change relative to Amazigh-speaking students.

Column 1 in Table 2 shows a net positive effect on years of schooling for Arabic speakers compared to Amazigh speakers. Moreover, Columns 4 and 5 indicate significant positive effects at the 10% and 1% level for middle school completion and grade 10 completion respectively for treated Arabic speakers with the highest likelihood of exposure to the program. This suggests that students with Moroccan Arabic as their mother tongue were relatively positively affected by the program in advancing their middle and secondary education compared to their Amazigh-speaking peers. The remaining coefficients are positive, except for those in columns 7-8 pertaining to university-level education, and minuscule in magnitude.

Despite the statistical significance of some estimates in Table 2, we again highlight the parallel trend assumption issues for these outcomes, as previously discussed. Our results change when including province-specific time trends (see Table 9 of Appendix B3). The estimates including this additional control change signs for all except literacy, entering university, and completing university. In addition, we lose statistical significance for middle school completion and starting secondary school. We do, however, get statistically significant negative effects at the 10% level for university completed, but the size is very small at 0.053 percentage points. As a result, Table 9 suggests that we cannot make any conclusions about heterogeneous effects found in Table 2 for middle and secondary school because these are likely driven by differential time trends across provinces. In other words, our mother tongue specification does not conclusively show heterogeneous effects by mother tongue for these outcomes of interest.

As seen in Table 3, the differential effects of the policy by gender are much clearer than by mother tongue across all education outcomes. Here, we are also not worried about violations of our identification assumptions. The results are very similar when including province-specific time trends (see Table 10 of Appendix B4). The overall net effect of the program on female students is positive with a statistical significance level of 1%. Program exposure increased female students' years of schooling by 1.587 years compared to male students, as seen in Column 1. Again, as in Table 2, we do not see any differential effects on literacy. Moreover, female students' educational attainments are positively affected at the 1% level of significance across the board compared to their male peers. The magnitudes are larger for entering middle school up to entering university, while smaller for completing university.

The estimates indicate that treated female students living in provinces with high likelihood of primary school completion are more likely to complete middle school (Column 4), secondary school (Column 6), and university (Column 8) by 0.142, 0.131, and 0.076 percentage points compared to their male peers. These female students are also relatively more likely to successfully enter middle school (Column 3), secondary school (Column 5) and university (Column 7) by 0.175, 0.125, and 0.121 percentages points.

Table 2: Triple Difference Estimates of the Reform's Effects on the Educational Attainment by Mother Tongue

	(1) Years of Schooling	(2) Literate	(3) Grade 5-6	(4) Middle School Completed	(5) Grade 9-10	(6) Secondary School Completed	(7) Grade 12+	(8) University Completed
Treated x Program Intensity x Arabic	0.703	0.011	0.084	0.104*	0.140***	0.072	-0.017	-0.030
	(0.520)	(0.021)	(0.060)	(0.058)	(0.047)	(0.046)	(0.062)	(0.022)
Treated x Program Intensity	0.073	-0.007	-0.078	-0.027	-0.077*	0.037	0.106*	0.084***
	(0.567)	(0.020)	(0.069)	(0.060)	(0.039)	(0.041)	(0.061)	(0.028)
Treated x Arabic	-0.449***	-0.005	-0.032**	-0.045***	-0.058***	-0.054***	-0.023**	-0.012**
	(0.118)	(0.005)	(0.015)	(0.014)	(0.015)	(0.013)	(0.011)	(0.006)
Program Intensity x Arabic	-2.310***	-0.048***	-0.269***	-0.243***	-0.264***	-0.205***	-0.097*	-0.045**
	(0.446)	(0.013)	(0.065)	(0.062)	(0.058)	(0.054)	(0.049)	(0.018)
Arabic	1.297***	0.021***	0.139***	0.145***	0.129***	0.109***	0.056***	0.030***
	(0.135)	(0.004)	(0.022)	(0.019)	(0.014)	(0.012)	(0.009)	(0.006)
Constant	7.276***	0.972***	0.487***	0.416***	0.313***	0.191***	0.068***	0.024***
	(0.130)	(0.004)	(0.019)	(0.016)	(0.013)	(0.012)	(0.009)	(0.007)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130019	130019	130019	130019	130019	130019	130019	130019

Note: Each column shows coefficients for different outcomes. All regressions include province and birth cohort fixed effects. Standard errors in parentheses are clustered at the province level. Arabic refers to Moroccan Arabic speakers. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Table 3: Triple Difference Estimates of the Reform's Effect on Educational Attainment by Gender

	(1) Years of Schooling	(2) Literate	(3) Grade 5-6	(4) Middle School Completed	(5) Grade 9-10	(6) Secondary School Completed	(7) Grade 12+	(8) University Completed
Treated x Program Intensity x Female	1.587***	0.002	0.175***	0.142***	0.125***	0.131***	0.121***	0.076***
	(0.371)	(0.008)	(0.049)	(0.049)	(0.039)	(0.033)	(0.024)	(0.011)
Treated x Program Intensity	-0.048	0.000	-0.063*	0.008	-0.008	0.034	0.020	0.013
	(0.231)	(0.004)	(0.031)	(0.029)	(0.030)	(0.026)	(0.012)	(0.011)
Treated x Female	-0.335**	0.002	-0.070***	-0.033*	-0.027**	-0.028**	-0.007	-0.007
	(0.128)	(0.004)	(0.017)	(0.017)	(0.013)	(0.011)	(0.008)	(0.005)
Program Intensity x Female	-0.862	0.005	-0.105*	-0.120*	-0.098*	-0.085*	-0.054	-0.036
	(0.558)	(0.008)	(0.061)	(0.062)	(0.054)	(0.048)	(0.039)	(0.023)
Female	0.398**	-0.005	0.073***	0.075***	0.044***	0.043***	0.011	0.010
	(0.161)	(0.003)	(0.019)	(0.019)	(0.016)	(0.014)	(0.010)	(0.006)
Constant	8.176***	0.990***	0.576***	0.509***	0.397***	0.261***	0.108***	0.045***
	(0.081)	(0.002)	(0.010)	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130019	130019	130019	130019	130019	130019	130019	130019

Note: Each column shows coefficients for different outcomes. All regressions include province and birth cohort fixed effects. Standard errors in parentheses are clustered at the province level. Arabic refers to Moroccan Arabic speakers. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

5.3 Discussion

5.3.1 Primary Versus Post-Primary Education in Determining Literacy

The language policy in 1983 essentially left primary school language planning unchanged. The first two years of primary school were taught completely in Classical Arabic and from grade 3 to 5, 54% of courses were in Classical Arabic and 46% in French (Salmi, 1987). Although the policy likely negatively affected French language skills (as suggested by Angrist and Lavy (1997)), our results indicate no effects on whether students were more or less likely to leave school literate. Both Tables 2 and 3, as well as our robustness checks, show the minuscule magnitude and statistical insignificance of the policy's effect on literacy. This would corroborate the literature on the importance of primary school as formative years for literacy (Banerjee et al., 2013; WorldBank, 2021). This is also reflected in the triple difference sample, where 97% of individuals who completed 5 years or less schooling (i.e. only primary school) were literate. As a result, this dispels part of the critique the policy received in terms of creating "bilingual illiterates" (Angrist and Lavy, 1997, p. 50). Instead, the policy more likely affected the level of fluency and language skills, as suggest by Angrist and Lavy (1997). However, it is also possible that the high level of literacy in the group with only primary school completion also reflects the acquisition of literacy outside of school. Alternatively, the triple difference does not capture the policy's impact on literacy, regardless of mother tongue or gender.

5.3.2 Differential Advantage in Language Fluency and Status

Prior to the language policy, approximately 63% of the literate Moroccan Arabic population were literate in French and Arabic, as opposed to 49% of the literate Amazigh population in the 1982 census data. Despite the different levels of French and Arabic fluency between the mother tongue groups, we do not see striking differences in educational outcomes following the policy in Table 2. Instead, we only find statistically significant results on middle school completion and likelihood of entering secondary school for the differential effects of the policy on those with Moroccan Arabic versus Amazigh as their mother tongues. However, Table 9 of Appendix B3, which includes province-specific time trends, provides contrasting results, only revealing statistically significant results for university completion. As seen in Figure 2 and Figure 8, the parallel trends assumption holds for this outcome. Even though our estimates in Table 2 likely capture provincial time trends, both specifications, whether excluding or including province-specific time trends, yield small estimates in magnitude.

One plausible explanation for this underwhelming difference is the only slight relative advantage in literacy Moroccan Arabic students could have utilized in performance outcomes such as math or reading scores rather than level differences in educational attainment. In addition, the policy did not change, or at least not directly, the primary school language experience. According to Salmi (1987), it was strictly banned to speak anything in the classroom apart from the two official languages of the educational system (Classical Arabic and French). At 7 years old, all children would enter primary school having only learned the language spoken by their families and their immediate community, whether Moroccan Arabic or Amazigh. Classical Arabic is also a difficult language to master. Neither mother tongue group would have likely spoken Classical Arabic at home, although it is possible their parents' fluency in the language could have been influential. As suggested by Niklas et al. (2016), parents are very important in forming their children's early learning.

Our results on this specific level of heterogeneity may be unclear, but it is important to consider that the Moroccan Arabic and Amazigh experiences within Moroccan society are inherently different under this policy. The former language is viewed as more prestigious than the latter. According to Zouhir (2014), the Arabization policy is centered around the theoretical understanding that Morocco's multilingualism is an obstacle to the country's political and economic development. As a result, the

Amazigh language was viewed as an obstacle to unity, and hence, the language groups must instead assimilate into the Arabic Moroccan identity. Zouhir (2014, p. 44) continues, explaining many Amazigh speakers view the policy as suppressive, as well as a form of "cultural and linguistic genocide", as opposed to unifying.

Given the aforementioned linguistic context, it would not be surprising if there were a differential effect. Since Moroccan Arabic is an Arabic dialect, Moroccan Arabic students likely had an advantage in handling the practical difficulties in fully changing the language of instruction to Classical Arabic. Meanwhile, the negative estimates in Tables 2 and 9 for the likelihood of starting university, completing some university, and fully completing university, could indicate the relative struggle for Moroccan Arabic-speaking students to complete university if they disproportionately pursued technical and science majors compared to Amazigh-speaking students, and as a result, were relatively negatively affected by the policy because of their loss in French language skills. If this were the case, our results for higher-level education align with papers such as Loutfi and Noamane (2020) claiming the policy created difficulties for students with public-school backgrounds being forced to study science majors in French instead of Arabic in university. In contrast, the extra exposure to Classical Arabic for the Amazigh-speaking students could have benefited their mastery of Classical Arabic and, as a result, cause relatively positive effects on educational attainment.[19] In Tables 2 and 9, we see significant positive results for Amazigh students in entering university at the 10% level and completing university at the 1% level. Finally, given parallel trend concerns for the majority of the earlier outcomes in middle and secondary school, we stress the importance of being cautious in the interpretation of these differential effects.

For example, we cannot entirely rule out any potential spillover effects to older cohorts during the roll-out of the policy that would have also affected one ethnicity disproportionately compared to the other. In addition, it is possible that the specification captures the enduring effects of changes in the education system following independence. As Mansouri and Moumine (2017) explain, the education system created under French colonial power did not treat the Moroccan population equally. Instead, the different types of schools that emerged under the French Protectorate were largely segregated based on religion and ethnicity. For example, separate schools were created for the indigenous Amazigh population such as the well-known Collège d'Azrou (Ilahiane, 2017). Policies such as these were enacted with the purpose of facilitating French rule over Amazigh tribes (Miller, 2013).[20] Hence, it is possible that the disparity in educational treatment between ethnicities and the challenge to provide education for all post-1956 had enduring effects captured by our mother tongue specification.

5.3.3 Gender Inequality in Education

The significant differential effects by gender is very much indicative of the referenced North African gender gap in education (Alesina et al., 2021). Overall, heterogeneous effects of education policies by gender are very country-specific, yet the differential effects of language policies are unclear. For example, Seid (2019) finds no heterogeneity in treatment effect by gender in Ethiopia when the country adopted mother tongue instruction in primary schools. Laitin et al. (2019) also explore the impact of local language instruction by gender, but find no evidence of heterogeneous treatment effects.

As we know from Angrist and Lavy (1997), the policy led to substantial reductions in the returns to schooling for young Moroccan men affected by the policy. Our evidence suggests female students were

[19]As previously mentioned, until 2003 Amazigh was prohibited from being taught in schools (Aissati et al., 2011). University programs were most likely in Classical Arabic or French, depending on the major.

[20]The French colonial concept of *Berber Dahir* (or Amazigh separatism) was deeply rooted in the French colonial experience in North Africa and founded in the belief of separating the Amazigh and Arabs beyond linguistic differences (Miller, 2013).

relatively positively affected by the policy compared to their male peers. Again, the explanation for this is theoretically ambiguous. It is plausible that the positive estimates are driven by the relatively larger negative impact on educational attainment for boys. If the returns to education are perceived to be smaller after the policy, perhaps boys left school disproportionately to work or try vocational training.

Another potential explanation is the role of cultural forces. Based on data from a 1990 World Development Report, from a regional MENA (Middle East and North Africa) perspective, Morocco's educational participation rates were lower than its MENA peers, while its adult illiteracy rates were among the highest (Spratt, 1992).[21] The greater difference between female and male illiteracy rates in MENA countries compared to low- and middle-income countries showed a relatively larger gender gap, which according to Spratt (1992) indicates cultural factors are perhaps at play. In this case, policy could have reduced cultural barriers for girls to enter primary school or pursue more years of schooling without requiring investments in, for example, French tutoring. According to Ben Haman (2021), gender disparities in education are still constraining full access to education, particularly for girls living in rural areas. To address the gender gap, Ben Haman (2021) explains more needs to be done.

The higher likelihood of women being monolingual in some mother tongue groups is another explanation. For example, the Amazigh-speaking population of women have historically been more likely to only speak one language, while men had more opportunities through labor market activities to acquire Moroccan Arabic as a second language (Spratt, 1992). As a result, the removal of French (as a foreign language) and the increased exposure to Arabic may have benefited these girls disproportionately. However, this monolingual issue might be more important in describing differences in adult illiteracy, while Amazigh-speaking children may catch up in terms of Classical Arabic skills in the "total-immersion setting of the primary school classroom" (Spratt, 1992, p. 127). This rationale is therefore challenging to decipher from our findings, especially with our inconclusive findings for differential effects by mother tongue.

5.3.4 Inconsistent Language Planning

Most studies evaluating the development of language planning in Morocco generally conclude that language issues are caused by inadequate planning, research, and resources (Zouhir, 2014). As Evans and Mendez Acosta (2021) discuss, teacher professional development and instructional materials are effective tools for boosting learning. In addition, Loutfi and Noamane (2020) argue for the integration of language compatibility between education levels as a key element in building clear language policy. As a result, inadequate preparation of teachers and material coupled with an inconsistent language policy across education levels is relevant to consider. The relatively negative effects for Moroccan Arabic speakers in the tertiary education estimates in Table 2 or the waning relative benefit for women in completing university compared to estimates for middle and secondary school in Table 3 could be indications of these issues associated with incompatible language planning across education levels.[22] However, as previously noted, the mother tongue estimates overall are unclear.

[21] Spratt (1992) refers to low- and middle-income MENA countries at the time to include Morocco, Tunisia, Algeria, Libya, Egypt, Yemen, Jordan, Syria, Turkey.

[22] The estimate for university completion in Table 9 of Appendix B3 (statistically significant at a 10% level) implies Moroccan Arabic speakers were 0.053 percentage points less likely to complete university compared to their Amazigh-speaking peers.

5.3.5 Limitations

Although our triple difference approach allows us to explore the heterogeneous effects of the language policy, there are of course limitations to the findings presented in this section. The first is the quality of the census data. According to Spratt (1992), statistics for literacy in Morocco have historically been based on self-reports or third-person reports to provide census information on literacy and educational level. There may be unknown distortions in the data due to assumptions about literacy, for example, if a respondent attended school and marked illiterate otherwise.[23]

In addition to data quality concerns, there are more heterogeneous effects that would have advanced the discussion on heterogeneous effects even further but were limited by our use of census data. For example, only the 2014 census data indicates whether individuals live in rural or urban areas. According to Alesina et al. (2021), the urban-rural gap is very salient in North Africa and as Ben Haman (2021) points out, the illiteracy rates are particularly high in rural areas, especially among women. Unlike Angrist and Lavy (1997), we also do not delve into heterogeneity in labor market outcomes because of limitations in the census data mentioned in Section 4. Given references to the differential use of language based on sector or job role, as suggested by Seid (2022), there may be important heterogeneity in outcomes based on the labor market, which might be essential to understanding the returns to education in relation to language requirements later in life.

Second, we must interpret the triple difference estimates for heterogeneous effect by mother tongue with more caution because of parallel trend concerns. Given the visual difference in the events studies and estimates when we include province-specific time trends, it is likely that estimates for some of the educational outcomes capture provincial time trends. As a result, we are not able to fully ensure the level differences between our treatment and control group by mother tongue would have been the same in absence of the policy treatment.

Third, Morocco has had substantial grade repetition and enrollment of overaged children, which does not provide much insight into educational participation. Actual participation rates should also be considered, as the literature suggests this can differ across population subgroups (Spratt, 1992). Educational enrollment risks being misleading. However, we do our best to deal with these possible issues by, for example, removing observations with missing values and assuming at least one year of repetition in primary school, shifting the treated cohort to those born in 1970 rather than 1971, as done by Angrist and Lavy (1997). We also must consider that the sample used is relatively more educated than the general population since we drop observations with no education or preschool education in order to estimate the effect of the policy on those within the education system. This limits our ability to comment on the policy's effect on the overall population and any possible effects on access.

Finally, we also restrict our sample in this section to individuals who had never migrated at the time of the 2004 census or migrated to their current province of residence at age 6 or younger. This is done to ensure the assignment of the pre-treatment proxy for the likelihood of exposure matches where these individuals actually went to school, which is critical for our specification for the likelihood of treatment. Although this is a common assumption in the literature, where census data is used and district of birth is not always available (see Seid (2016), Seid (2019), Seid (2022), and Eriksson (2014)), we are aware of the possible limitations to this approach. For example, if the policy increased the educational attainment of some individuals, and as a result, spurred internal migration to places with demand for higher-income, educated workers, removing migrants could bias our results if this systematically differed by mother tongue or gender, but it is difficult to say the direction of this potential bias. This would be particularly concerning if the bias moves in the same direction as our estimates and our estimates are larger in magnitude than the true effect of the policy.

[23] The latest 2014 census received a B rating, which implies "use with caution", and an 87.3 Data Quality Index score (World Economics, 2022).

6 Effects on Intergenerational Transmission

6.1 Identification Strategy

The language policy was suddenly announced, causing immediate disruption to education in middle school due to a decline in the quality of teaching and expected economic returns to education (Marley, 2004). This led to a sharp drop in educational attainments for those born in 1970 who were hit first by the policy. As shown in Figures 4 and 5, there is an immediate drop in completion rates of grade 6 (i.e., the first year in middle school) and graduation rates of middle school for treated cohorts, although the impact seems smaller among women.

Using this trend break, we identify the intergenerational transmission of human capital. Following Agüero and Ramachandran (2020), we will employ a fuzzy regression discontinuity design since the probability of treatment did not increase sharply from 0 to 1 at the cutoff due to grade repetition and dropout. Those born in 1970 and the years following were disproportionately more likely to attain fewer years of schooling than those who were slightly older. For child i who was born in year j and whose father was born in year t, we estimate the following regression:

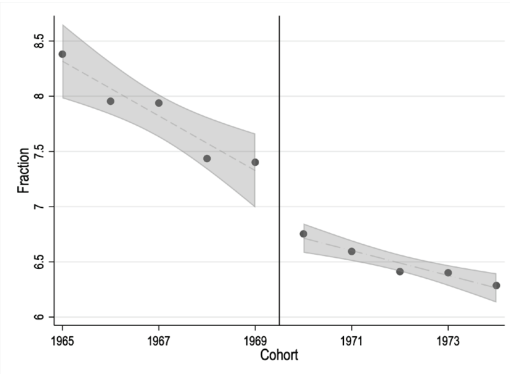
$$y_{ijt} = \beta_0 + \beta_1 \widehat{y_{it}^F} + \beta_2(YB_t - 1970) + \beta_3(YB_t - 1970) \times T_t + \gamma X_{ij} + \epsilon_{ijt} \quad (3)$$

$$y_{it}^F = \alpha_0 + \alpha_1 T_t + \alpha_2(YB_t - 1970) + \alpha_3(YB_t - 1970) \times T_t + \delta X_{ij} + \eta_{ijt} \quad (4)$$

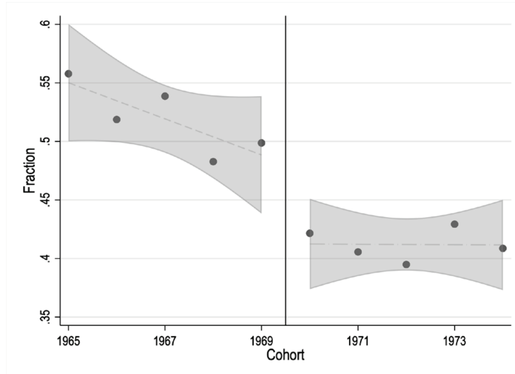
where y_{ijt} shows the educational attainments of children and y_{it}^F shows fathers' years of schooling. T_t is equal to 1 for the individual whose father was born after 1970, and hence, treated. The running variable, YB_t, which is centered around the cutoff, is the year of birth for the father. We allow the coefficient on parents' years of birth to vary on either side of the discontinuity. X_{ij} is a vector of child characteristics, such as age, province, and gender. Since the treated parents are, by definition, older than the untreated parents, their children may be younger, and thus, exposed to better learning conditions, resulting in a spurious intergenerational impact. We use the heteroskedasticity-robust standard errors, following Cunningham (2021), Huntington-Klein (2021), and Kolesár and Rothe (2018). The coefficient of interest is β_1, which shows the drop at the cutoff. Since some parents have more than one child, we re-weigh the data by the inverse of the number of children in the data set per household. If we do not use this plausibly exogenous shock as an instrument for fathers' educational attainments and simply estimate Equation (3), β_1 will be biased due to omitted variables. We also run the same regression using mothers' years of education as an endogenous variable.

There are several identification assumptions we must consider. To begin with, in terms of the regression discontinuity design, the continuity assumption must hold. It means, in the absence of the language policy, there would be no jump or discontinuity in parental education at the cutoff. In addition to the continuity assumption, there are several assumptions associated with the IV regression. First, the instrument should be strongly correlated with the endogenous variable. As shown in Tables 6 and 7, the endogenous variable is strongly correlated with the instrument. To complement this finding, we present the F-statistics in Table 8. The F-statistics exceed 10, and thus, we believe this first assumption is satisfied. Second, the instrument must meet the exclusion restriction. In other words, the instrument should affect children's educational attainments only through parents' educational attainments. This is not directly testable, but we conduct some robustness tests to check. First, as we discussed, we check the covariate smoothness. Second, we explore whether Morocco undertook any other policies that might have affected the schooling of the children. As we mentioned, the financial crisis of 1983 may pose a potential threat to the identification. However, if the financial crisis had negatively affected educational outcomes in 1983, we would have seen a sharp drop in the completion of middle school and secondary school at different cutoffs. Thus, we are not concerned about the threat of this financial crisis. Assuming these assumptions hold, we can interpret β_1 as causal.

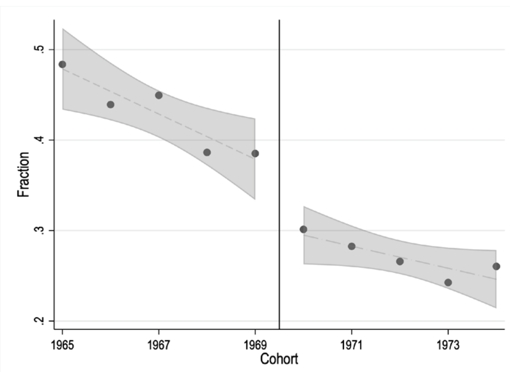
(a) Years of Schooling



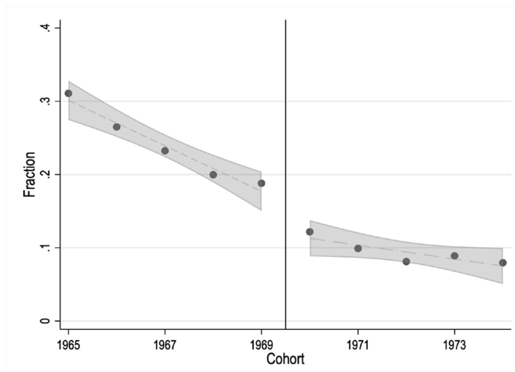
(b) Completion of Grade 6



(c) Completion of Middle School



(d) Completion of Secondary School



(e) Completion of University

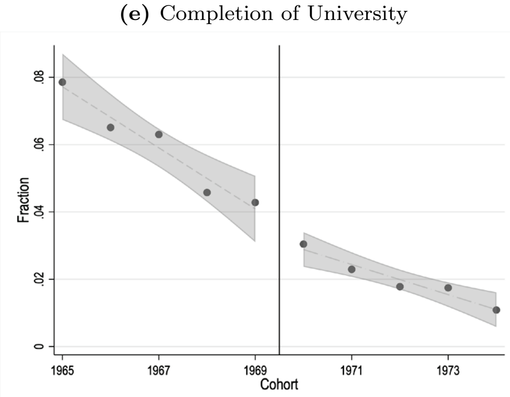


Figure 4: Discontinuity in Education for Fathers

Note: Each dot shows the cohort means of the corresponding variables. Linear lines are fit separately before and after the language policy. The shaded areas around the lines show the confidence intervals of 95%.

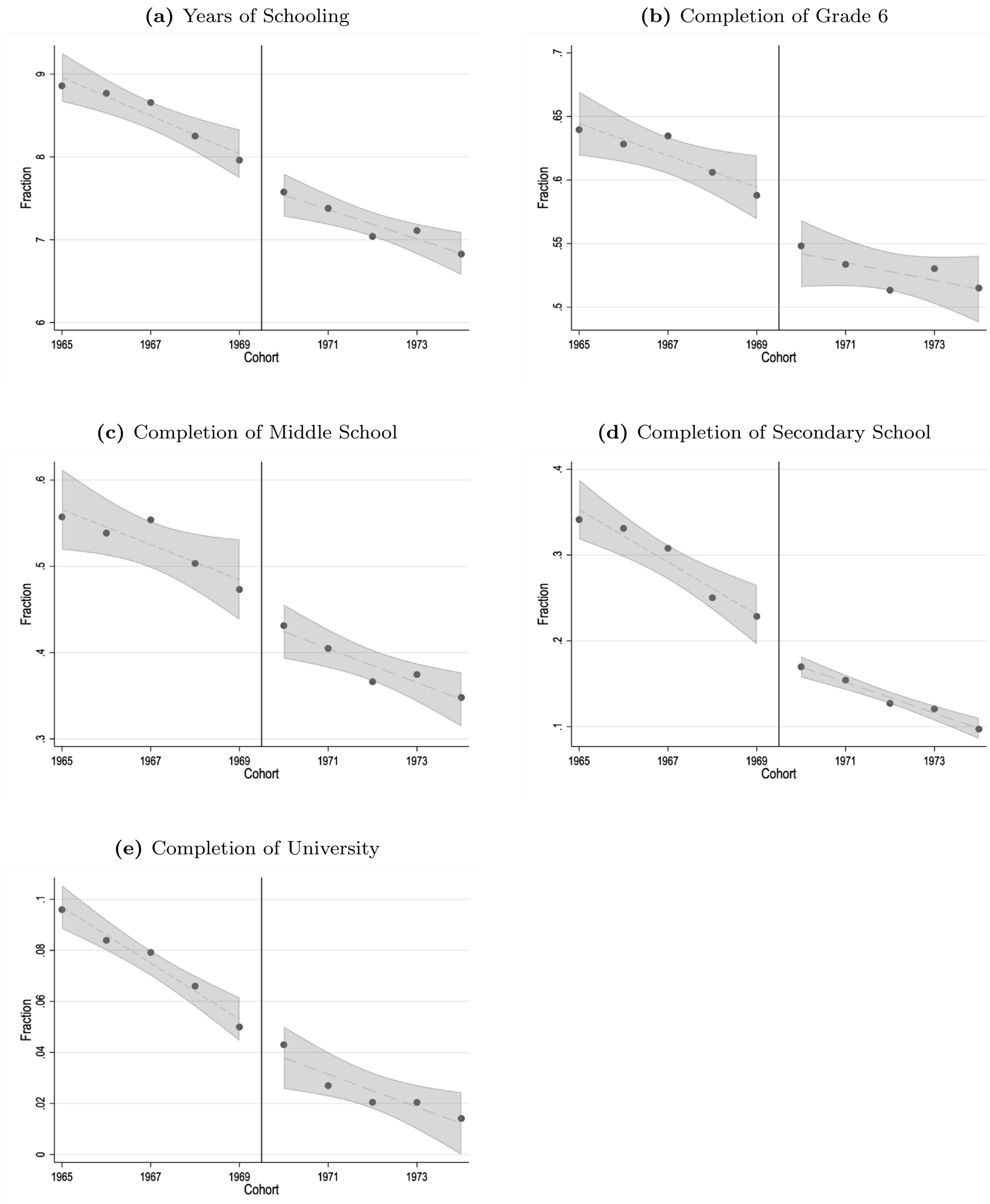


Figure 5: Discontinuity in Education for Mothers

Note: Each dot shows the cohort means of the corresponding variables. Linear lines are fit separately before and after the language policy. The shaded areas around the lines show the confidence intervals of 95%.

There are a few threats to the identification of causal effects. First, if the policy had been known in advance, some children might have decided to repeat grades in primary education to study in Arabic in middle school or study harder to study in French due to its economic returns. However, in this case, because the policy was announced suddenly (Marley, 2004), we can assume that no families could have expected the policy to be implemented. Thus, we believe it is very unlikely that people had time to adjust their behavior (in terms of grade completion in primary school) to benefit from the policy at the cutoff.

Table 4: Covariate Smoothness for Fathers

	Grade 2	Grade 3	Grade 4	Grade 5	Disability	Arabic	Boy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated	-0.008**	-0.004	0.001	-0.001	0.000	-0.010	-0.006
	(0.004)	(0.007)	(0.010)	(0.013)	(0.003)	(0.012)	(0.017)
Cohort	0.000	-0.002	-0.002	-0.006***	-0.001**	-0.009***	-0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)
Cohort x Treated	0.002	0.002	-0.006	-0.009**	0.002	0.010**	0.006
	(0.001)	(0.002)	(0.004)	(0.005)	(0.001)	(0.004)	(0.006)
N	20952	20952	20952	20952	20952	20952	20952

Note: Each column shows coefficients for different outcomes. Robust standard errors are in parentheses.
*, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Table 5: Covariate Smoothness for Mothers

	Grade 2	Grade 3	Grade 4	Grade 5	Disability	Arabic	Boy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated	0.002	0.007*	0.013*	0.022**	0.001	-0.011*	0.005
	(0.002)	(0.004)	(0.007)	(0.009)	(0.002)	(0.007)	(0.012)
Cohort	0.000	0.000	-0.001	-0.007***	-0.000	-0.004***	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.003)
Cohort x Treated	-0.001	-0.005***	-0.009***	-0.010***	-0.000	0.001	-0.004
	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.004)
N	34594	34594	34594	34594	34594	34594	34594

Note: Each column shows coefficients for different outcomes. Robust standard errors are in parentheses.
*, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Second, if people born before 1969 are different from those born after 1970 in other aspects, the discontinuity at the cutoff may not be due to the language policy. In other words, for identification, there should not be any observable discontinuous change in other variables around the cutoff. We directly test for covariate smoothness by estimating Equations (3) and (4) with several outcome variables that are arguably pre-determined with respect to the reform. Since the policy affected post-primary education, there should be no significant difference in primary education completion. Also, there should be no difference in their ethnicity or disability status (these are the only pre-determined variables in the data set). The results are presented in Table 4 for men and Table 5 for women. In Columns 1 – 4, as outcome variables, we use binary variables for the completion of the corresponding grade or above. For instance, for Column 1, the outcome variable is equal to 1 if the person completes Grade 2 or above. In Column 5, we also check the share of people with disabilities. The outcome variable is equal to 1 if the person has any disability. In Column 6, we use a binary variable for those who speak Arabic as their primary language. Since Arabic-speaking people may be relatively better off than Amazigh-speaking people, if the share of Arabic-speaking people changes around the cutoff due to sampling variation, it will confound the effect. In Column 7, we test whether the share of male children differs between the affected cohorts and unaffected cohorts. According to the tables, there is no significant difference between men born before 1969 and those born after 1970. However, for women, there are a few statistically significant differences. Although these are concerning, we believe the continuity assumption still holds for this sample. As shown in appendices D and E, Figures 13 and 14 indicate our main covariates to be smooth at the point of discontinuity.

6.2 Results

Tables 6 and 7 present our main results for the first-stage analysis. For both men and women, the first cohort affected by the language policy (those who were born in 1970) was less likely to complete Grade 6 and above. The language policy lowered the probability of completing grade 6 among the first affected cohort by 7.5 percentage points for men and 4.4 percentage points for women. The negative shock persisted until the completion of secondary school among men and until the completion of the university among women. This results in a huge drop in the years of schooling completed by both men and women (Column 10 in the tables). Thus, our estimates show that the language policy affected the first cohort negatively.

Table 6: Discontinuity in Education for Fathers (First-stage)

	Grade 6	Grade 7	Grade 8	Middle School	Grade 10	Grade 11	Secondary School	Grade 13	University	Years of Schooling
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treated	-0.072***	-0.067***	-0.065***	-0.068***	-0.053***	-0.062***	-0.050***	-0.010	-0.007	-0.476***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.014)	(0.013)	(0.012)	(0.009)	(0.006)	(0.118)
Cohort	-0.016***	-0.019***	-0.022***	-0.025***	-0.036***	-0.033***	-0.032***	-0.018***	-0.009***	-0.250***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.026)
Cohort x Treated	0.014**	0.015**	0.011*	0.012**	0.022***	0.022***	0.021***	0.008**	0.004**	0.130***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.003)	(0.002)	(0.042)
N	20952	20952	20952	20952	20952	20952	20952	20952	20952	20952

Note: Each column shows coefficients for different outcomes. Robust standard errors are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Table 7: Discontinuity in Education for Mothers (First-stage)

	Grade 6	Grade 7	Grade 8	Middle School	Grade 10	Grade 11	Secondary School	Grade 13	University	Years of Schooling
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treated	-0.045***	-0.049***	-0.040***	-0.040***	-0.045***	-0.049***	-0.042***	-0.020**	-0.008	-0.311***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.010)	(0.008)	(0.006)	(0.092)
Cohort	-0.013***	-0.016***	-0.019***	-0.020***	-0.035***	-0.033***	-0.031***	-0.016***	-0.011***	-0.233***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.023)
Cohort x Treated	0.005	0.006	0.003	0.001	0.016***	0.015***	0.013***	0.004	0.004**	0.054*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.032)
N	34594	34594	34594	34594	34594	34594	34594	34594	34594	34594

Note: Each column shows coefficients for different outcomes. Robust standard errors are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

We now present our estimates for the intergenerational transmission of human capital. The results are presented in Table 8. All estimates of intergenerational transmission from fathers to their children are insignificant. However, the corresponding estimates for mothers are statistically significant and concentrated in middle school. A 1-year increase in mothers' years of schooling leads to a 0.18-year increase in children's educational attainments (Panel B: Column 14). This means that the sudden implementation of the language policy lowered the educational attainments of mothers and their children among those who were affected by the policy. Furthermore, our estimates suggest that this intergenerational effect is mainly through enrollment in middle and secondary schools and the completion of middle school (Panel B: Columns 6, 8, and 9).[24] As a robustness check, we also control for province fixed effects and children's gender in Table 11, and our results are robust to the inclusion of those control variables. Overall, we find that, after controlling for fixed effects of children's age, the effect

[24]Note that following a structural education reform in 1990, Grade 6 was incorporated into primary education and Grade 7 became the first grade in middle school.

of the unexpected change in the language policy and its negative impact on mothers' education had a negative intergenerational impact on children's education.

6.3 Discussion

Recently, economists have paid more attention to the intergenerational transmission of human capital in development, leading to the growing literature from developing countries. Alesina et al. (2021) show that intergenerational mobility is quite low in Africa and that the gender gap is severe. Recent descriptive evidence from Latin America and India (Asher et al., 2018; Munoz Saavedra, 2022) also demonstrates low intergenerational mobility in these countries. Thus, the question is what can improve or worsen intergenerational mobility in the process of development.

The literature on causal evidence of intergenerational mobility has been growing. One question addressed in the literature is whether education policies have the potential to affect education intergenerationally. Akresh et al. (2018) study the intergenerational impact of large-scale school construction programs in Indonesia and show that its positive impact on education persists intergenerationally. Furthermore, Agüero and Ramachandran (2020) demonstrate the intergenerational impact of the education reforms in Zimbabwe. Using the positive shock to education, they find that human capital is transmitted from parents to children. Thus, existing evidence seems to suggest that education policies can have positive intergenerational impacts on the direct beneficiaries and their children.

In our research, using a negative shock to education due to the 1983 language policy in Morocco, we identify the intergenerational transmission of human capital. The language policy negatively affected educational outcomes because of teachers being poorly prepared and negative stakeholder reactions (Marley, 2004). Furthermore, this language policy did not extend to universities, which again implied students learning science and math in Classical Arabic would face difficulties entering and completing university where French is crucial (Marley, 2004). As a result, more students might have decided not to pursue higher education. For these reasons, the language policy led to a temporary decline in educational attainments. Using this policy, we investigate how the disruption to education was transmitted across generations.

Moreover, our findings complement the growing literature on the intergenerational impact of education policies in the context of Africa. For example, both Agüero and Ramachandran (2020) and our study use fuzzy regression discontinuity designs. Of course, our findings are only relevant to those who were born around the cutoff of 1970 in Morocco. Yet, despite the differences in contexts and the direction of policy impacts, our findings are aligned in terms of showing the intergenerational transmission of human capital through education. Although we only find the effect through mothers' education, Agüero and Ramachandran (2020) find fathers' and mothers' educational attainments affect children's educational outcomes positively. They are not able to reject the null hypothesis that the effect of fathers' education on children's education is different from the effect of mothers' education.

Our evidence is also consistent with other studies on intergenerational effects. For instance, Caruso (2017) shows the negative intergenerational impact of natural disasters in Latin America. Examining the long-term impact of childhood exposure to natural disasters, the author claims that affected individuals accumulate less human capital, experience worse health, and have fewer assets when they are adults. In addition, Caruso shows that their children have lower educational attainments. Thus, disruption to education due to natural disasters has negative long-term intergenerational impacts. As for the intergenerational transmission of human capital from mothers, our results are consistent with Currie and Moretti (2003) who show that higher maternal education improves infant health in the United States and claim that the returns to education may underestimate the total return if

Table 8: Intergenerational Transmission of Human Capital (with FE of Children's Age)

	Grade2	Grade3	Grade4	Grade5	Grade6	Grade7	Grade8	Middle	Grade10	Grade11	Secondary	Grade 13	University	Total Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Panel A: Fathers' Years of Schooling as an Endogenous Variable														
y^{Father}	-0.036	0.024	0.016	0.029*	-0.005	-0.006	0.002	0.004	0.004	0.003	0.003	0.001	-0.000	0.038
	(0.025)	(0.023)	(0.020)	(0.017)	(0.013)	(0.011)	(0.009)	(0.008)	(0.006)	(0.006)	(0.005)	(0.003)	(0.000)	(0.069)
Cohort	-0.017**	-0.003	-0.006	-0.000	-0.007	-0.005	-0.001	0.003	0.002	0.002	0.002	0.001	-0.000	-0.032
	(0.008)	(0.008)	(0.007)	(0.006)	(0.005)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.000)	(0.024)
Cohort x Treated	-0.001	0.000	0.003	0.005*	0.006**	0.004**	0.002	-0.002	-0.000	-0.001	-0.002**	-0.000	0.000	0.016
	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.012)
F-statistics	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187	16.187
Observations	20952	20952	20952	20952	20952	20952	20952	20952	20952	20952	20952	20952	20952	20952
Panel B: Mothers' Years of Schooling as an Endogenous Variable														
y^{Mother}	-0.006	-0.035	0.017	0.031	0.035*	0.048**	0.026	0.043***	0.022**	0.007	-0.007	-0.002	0.000	0.183**
	(0.019)	(0.024)	(0.021)	(0.021)	(0.021)	(0.021)	(0.016)	(0.017)	(0.010)	(0.008)	(0.006)	(0.004)	(0.002)	(0.091)
Cohort	-0.003	-0.014*	0.000	0.002	0.003	0.008	0.002	0.010*	0.005	0.002	-0.003	-0.001	0.000	0.013
	(0.006)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.032)
Cohort x Treated	-0.004**	-0.004	-0.004*	0.001	0.001	0.003	0.004**	0.001	0.001	0.000	0.001	0.000	-0.000	-0.001
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.011)
F-statistics	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564	12.564
Observations	34594	34594	34594	34594	34594	34594	34594	34594	34594	34594	34594	34594	34594	34594

Robust standard errors are used. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

we only focus on increases in wages. Black et al. (2005) also find evidence on the intergenerational transmission of human capital from mothers to their sons, but not to daughters, in Norway. They did not find evidence of a causal relationship between fathers' education and children's education, which is consistent with our findings. Adding to the huge literature on the importance of maternal education, we show that mothers' educational attainments are intergenerationally transmitted to their children. From a policy perspective, this insight emphasizes the importance of closing the gender gap in education and maximizing the potential for girls to pursue higher education. This could prove to have long-lasting effects on generations to come. Given indications of the policy's relatively positive effects on girls in Section 5, language could be an important equalizer in closing the gender gap in education.

Zooming out, there are several potential mechanisms through which the language policy in Morocco had negative intergenerational impacts. First, the language policy might have affected job opportunities. In Morocco, French is highly valued in the labor market, and thus, the language policy may have resulted in a lower possibility for students to obtain well-paid jobs after graduation. In turn, this could have led to a decline in wages (as suggested by Angrist and Lavy (1997)), and thus, affected parents could not afford to send their children to school, resulting in lower educational attainments among their children. Thus, the first channel might be related to economic opportunities such as wages and occupational choices. Second, the policy may have affected parents' perceived expected returns to education. Parents may have concluded that they could not obtain quality education when they attended the first class in Grade 6 soon after the language policy (potentially due to the use of Classical Arabic or the lack of updated learning materials in the language), leading them to drop out. Their first-hand experience in a classroom might have reinforced their subjective beliefs that education was not as important as labor market experience, and thus, they may have directly or indirectly discouraged their children from pursuing higher levels of school. Finally, parents' educational attainments may have affected their children's cognitive skills and language skills since parents are critical in shaping their children's early learning (Niklas et al., 2016). Parents tend to read to their children from a very young age (Niklas et al., 2016), which may have huge implications for the intergenerational transmission of human capital through this language policy. However, due to data limitations, we are not able to empirically test these different mechanisms.

Our regression discontinuity design has some additional limitations. First, since our data was collected in 2004, the data may not capture intergenerational impacts to the fullest extent. Although the 2014 census is available as a solution to this issue, we cannot use this data in our regression discontinuity design because the census categorizes people's ages into 5-year buckets. Thus, the most recent census is not appropriate to use in our empirical design. Since Grade 6 approximately corresponds to ages 12 or 13, it means that affected cohorts were around 33 or 34 years old at the time of the census. As a result, their children may not yet be of university-age. Although we try to deal with this issue by including the fixed effects of children's age in the regression, the intergenerational impact of the policy on higher education (e.g., university education) may not be precisely captured. Thus, the interpretation of the causal effects on higher education should be taken with caution as it may be biased in either direction. Second, although Agüero and Ramachandran (2020) conducted a placebo test using data from neighboring countries, we cannot produce a similar test due to data limitations in the Maghreb region. Finally, since we do not have detailed data on academic performance or school equipment, we cannot check how the language policy affected the quality of education. Given that years of schooling may not necessarily correspond to the quality of human capital (Singh, 2020), the lack of performance data available and our use of census data implies we cannot comment on the policy's effect on the quality of human capital. As suggested by Angrist and Lavy (1997), the quality of education in this case is also critical to consider.

7 Conclusion

Over the last decades, researchers have extensively examined how education policies affect students' educational attainment and academic performance in developing countries. However, more research is needed to understand the heterogeneous and intergenerational impacts of such policies, especially in light of concerns about a global learning crisis.

In our research, we study the direct as well as the intergenerational impact of the 1983 language policy in Morocco. As Angrist and Lavy (1997) demonstrated, this language policy had negative effects on occupational outcomes because students became on average less fluent in French. We complement their findings by showing the heterogeneous and intergenerational impacts of the language policy. First, using the triple difference approach, we show that the language policy relatively positively affected girls' educational outcomes. However, we could not find any strong heterogeneity by mother tongue. Second, using the regression discontinuity design, we show that disruption to education in one generation also negatively affects the educational outcomes of their children. We find this to be particularly significant between mothers and their children.

The findings from this paper have important policy implications as they indicate the possibility that the choice of language(s) of instruction can heterogeneously affect different groups of students. For Morocco and North Africa, gender seems to be an important dimension to consider. Given our results, language could be an important equalizer in closing the gender gap in education. In the case of Morocco and its persistent language struggle, it would also be valuable to explore mother tongue instruction since neither Classical Arabic nor French qualifies as one. The immediate shock to educational attainment and the long-lasting impact also indicates the importance of language planning, preparing teachers and resources to practically make changes in the language of instruction successful. Now that the language policy in Morocco has been reversed, this reaction to changes in language and the ultimate heterogeneous effects are critical to consider. From a broader perspective, language policies in the Maghreb, like Morocco's, could be powerful in driving educational outcomes in the region. For example, we believe this evidence from Morocco is highly relevant for the language discussion in Algeria as well given their similar development trajectories (Florensa, 2016) and language situation with Amazigh minorities (Weinstein and Thayer, 1990).

There are many remaining questions for future research to uncover. Our subject of study is not that of a mother tongue, but rather more the removal of a foreign one. More research is needed to better understand whether there is a language premium in French fluency, and if so, for whom. To advance the understanding of mother tongue instruction in Morocco and neighboring countries, exploring the effects of the introduction of Amazigh as a language subject in public primary schools in 2003 could prove valuable to the ongoing language debate. For example, Aissati et al. (2011) investigate the language planning policy behind the Amazigh curriculum, but the effects of the policy are yet to be explored. In addition, in the interest of increasing the inclusiveness of education, research on the salience of the urban-rural and gender gaps in education in North Africa, as suggested by Alesina et al. (2021), is also essential to advance. Overall, we recommend future research to further expand the literature on education in the Maghreb region where lack of data has previously been a hinder. Similar language policies were implemented in Tunisia and Algeria. Unlike Morocco, Algeria's Arabization policy was implemented across all levels of education (Angrist and Lavy, 1997). A comparison between the effects of the language policies in Algeria versus Morocco would be interesting with the intent to explore the role of inconsistent language planning widely discussed in the case of Morocco. Finally, we also see the importance of better comprehending the long-term impacts of language choices in education, particularly in advancing the discussion around mother tongue versus foreign languages. The study of intergenerational transmission of language and education in the context of Africa has just begun.

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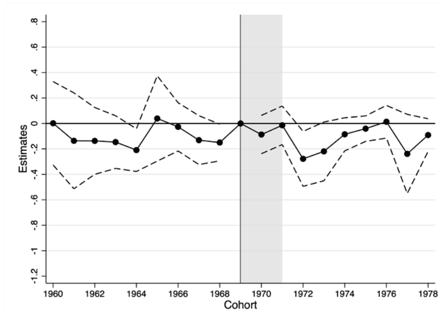
Appendix A – Additional Events Studies

A1. Additional Events Studies by Mother Tongue

(a) Completion of Some University

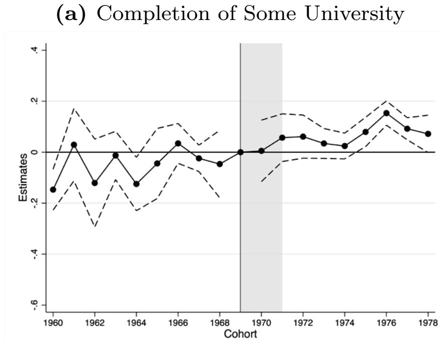


(b) Literate

Figure 6: Additional Triple Difference Event Studies in Educational Attainment by Mother Tongue
Note: Each figure plots the triple difference estimates of Equation 1 for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey shaded area shows the first two cohorts affected by the policy in 1983.

A2. Additional Events Studies by Gender

(a) Completion of Some University



(b) Literate

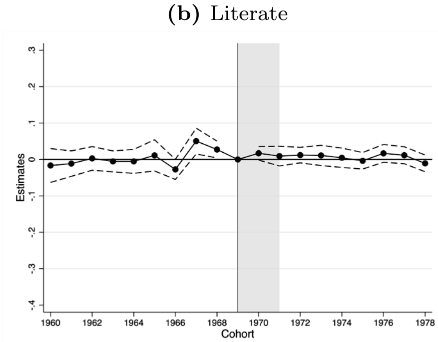
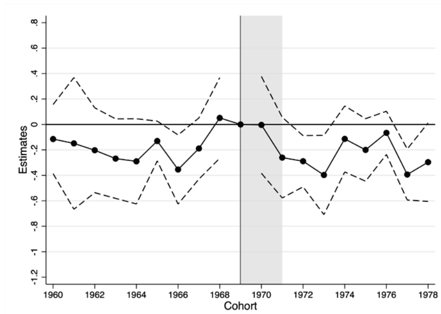


Figure 7: Additional Triple Difference in Educational Attainment by Gender
Note: Each figure plots the triple difference estimates of Equation 2 for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey-shaded area shows the first two cohorts affected by the policy in 1983.

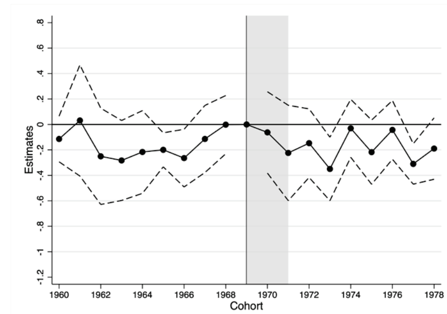
Appendix B – Robustness Checks for Triple Difference

B1. Event Studies of Robustness Checks by Mother Tongue

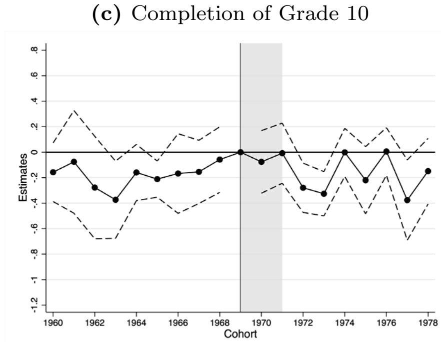
(a) Completion of Grade 6



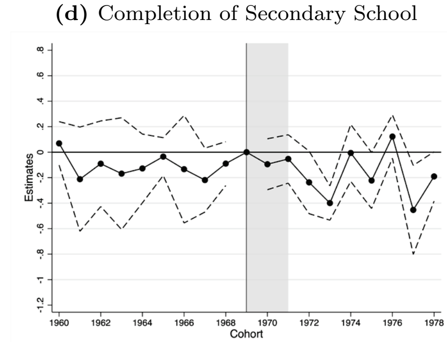
(b) Completion of Middle School



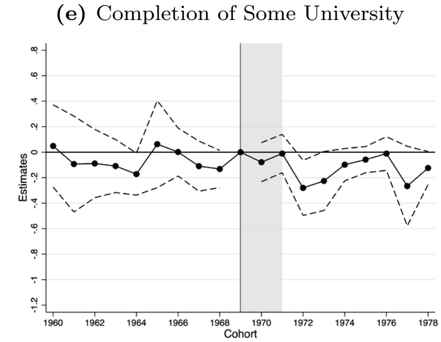
(c) Completion of Grade 10



(d) Completion of Secondary School



(e) Completion of Some University



(f) Completion of University

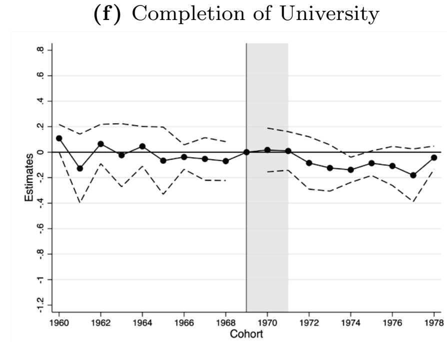


Figure 8: Robustness Checks – Triple Difference in Educational Attainment by Mother Tongue Part 1

Note: Each figure plots the triple difference estimates of Equation 1 including province specific time trends for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey-shaded area shows the first two cohorts affected by the policy in 1983.

(a) Literate

(b) Years of Schooling

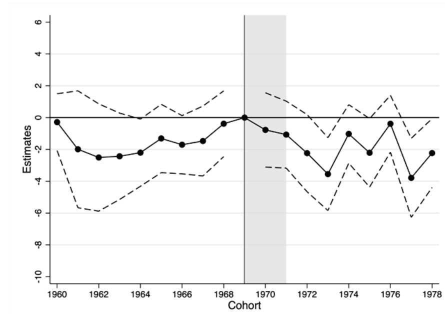
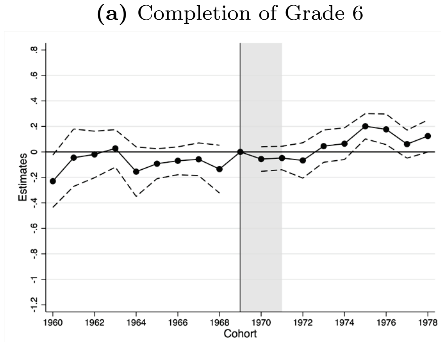


Figure 9: Robustness Checks – Triple Difference in Educational Attainment by Mother Tongue Part 2
Note: Each figure plots the triple difference estimates of Equation 1 including province specific time trends for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey-shaded area shows the first two cohorts affected by the policy in 1983.

B2. Event Studies of Robustness Checks by Gender

(a) Completion of Grade 6



(b) Completion of Middle School

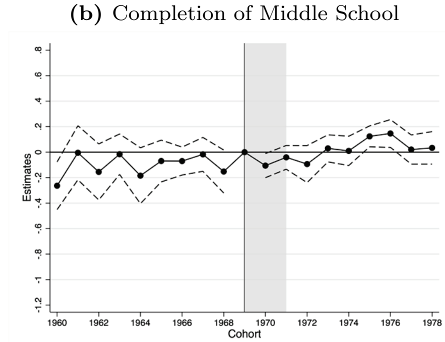
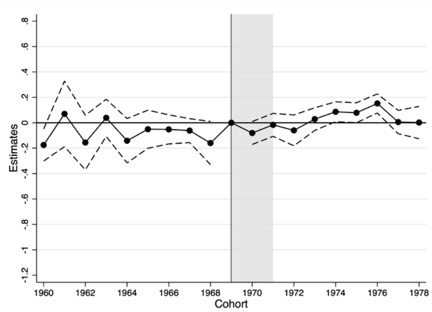


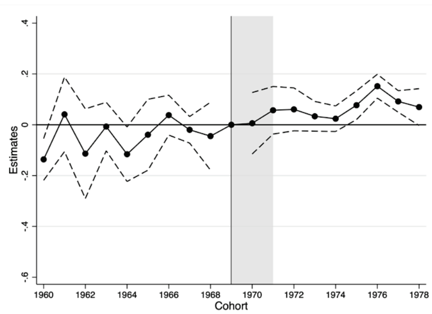
Figure 10: Robustness Checks - Triple Difference in Educational Attainment by Gender Part 1
Note: Each figure plots the triple difference estimates of Equation 2 including province specific time trends for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey shaded area shows the first two cohorts affected by the policy in 1983.

(a) Completion of Grade 10

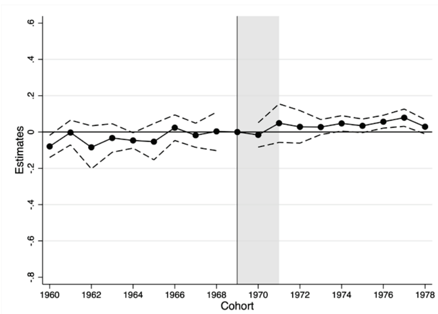


(b) Completion of Secondary School

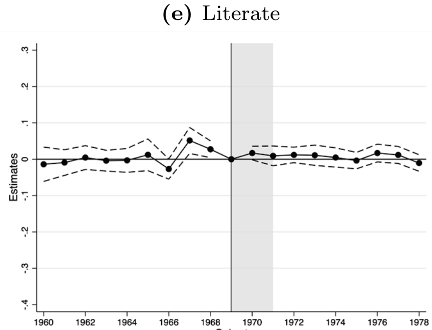
(c) Completion of Some University



(d) Completion of University



(e) Literate



(f) Years of Schooling

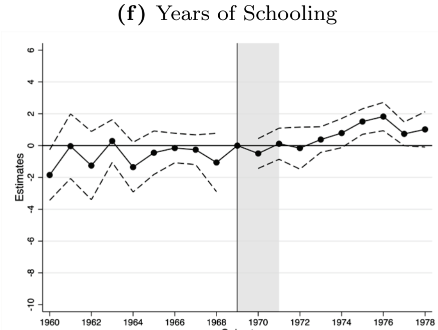


Figure 11: Robustness Checks - Triple Difference in Educational Attainment by Gender Part 2

Note: Each figure plots the triple difference estimates of Equation 2 including province specific time trends for each birth cohort, which are connected by the solid line. The dashed lines represent the 95% robust confidence intervals clustered by province. Each regression controls for province and cohort fixed effects. The grey shaded area shows the first two cohorts affected by the policy in 1983.

B3. Tables of Robustness Checks by Mother Tongue

Table 9: Triple Difference Estimates By Mother Tongue Including Province-Specific Time Trends

	(1) Years of Schooling	(2) Literate	(3) Grade 5-6	(4) Middle School Completed	(5) Grade 9-10	(6) Secondary School Completed	(7) Grade 12+	(8) University Completed
Treated x Program Intensity x Arabic	-0.421	0.002	-0.062	-0.018	0.016	-0.054	-0.060	-0.053*
	(0.540)	(0.022)	(0.053)	(0.056)	(0.056)	(0.043)	(0.067)	(0.030)
Treated x Program Intensity	0.861	-0.011	0.066	0.046	0.014	0.094**	0.131*	0.114***
	(0.579)	(0.024)	(0.065)	(0.060)	(0.062)	(0.042)	(0.068)	(0.030)
Treated x Arabic	0.014	-0.000	0.030*	0.005	-0.008	-0.006	-0.007	-0.005
	(0.139)	(0.006)	(0.015)	(0.015)	(0.016)	(0.015)	(0.014)	(0.009)
Program Intensity x Arabic	-1.524***	-0.042***	-0.168**	-0.158**	-0.177**	-0.118*	-0.067	-0.030
	(0.502)	(0.013)	(0.069)	(0.067)	(0.069)	(0.065)	(0.052)	(0.021)
Arabic	0.968***	0.018***	0.095***	0.109***	0.094***	0.075***	0.044***	0.025***
	(0.167)	(0.005)	(0.025)	(0.020)	(0.017)	(0.015)	(0.012)	(0.008)
Constant	5.593***	0.975***	0.348***	0.108***	0.056***	0.090***	0.029**	0.027***
	(0.143)	(0.004)	(0.019)	(0.016)	(0.015)	(0.013)	(0.011)	(0.008)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province-Specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130019	130019	130019	130019	130019	130019	130019	130019

Note: Each column shows coefficients for different outcomes. All regressions include province, birth cohort fixed effects and province-specific time trends. Standard errors in parentheses are clustered at the province level. Arabic refers to Moroccan Arabic speakers. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

B4. Tables of Robustness Checks by Gender

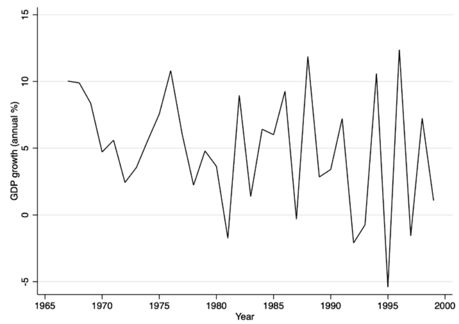
Table 10: Triple Difference Estimates by Gender Including Province-Specific Time Trends

	(1) Years of Schooling	(2) Literate	(3) Grade 5-6	(4) Middle School Completed	(5) Grade 9-10	(6) Secondary School Completed	(7) Grade 12+	(8) University Completed
Treated x Program Intensity x Female	1.476***	0.001	0.164***	0.133***	0.114***	0.118***	0.115***	0.069***
	(0.358)	(0.008)	(0.046)	(0.047)	(0.040)	(0.035)	(0.025)	(0.011)
Treated x Program Intensity	-0.185	-0.009	-0.039	-0.023	-0.022	-0.014	0.010	0.024*
	(0.239)	(0.008)	(0.030)	(0.028)	(0.036)	(0.027)	(0.020)	(0.012)
Treated x Female	-0.282**	0.002	-0.064***	-0.029*	-0.022*	-0.021*	-0.004	-0.004
	(0.118)	(0.004)	(0.016)	(0.016)	(0.012)	(0.011)	(0.008)	(0.005)
Program Intensity x Female	-0.761	0.006	-0.095	-0.112*	-0.088	-0.074	-0.049	-0.031
	(0.573)	(0.008)	(0.062)	(0.063)	(0.056)	(0.051)	(0.040)	(0.023)
Female	0.350**	-0.005	0.068***	0.071***	0.039**	0.038**	0.009	0.008
	(0.164)	(0.003)	(0.019)	(0.019)	(0.017)	(0.014)	(0.010)	(0.006)
Constant	6.234***	0.989***	0.396***	0.171***	0.115***	0.137***	0.062***	0.046***
	(0.073)	(0.002)	(0.008)	(0.008)	(0.008)	(0.007)	(0.005)	(0.004)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province-Specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	130019	130019	130019	130019	130019	130019	130019	130019

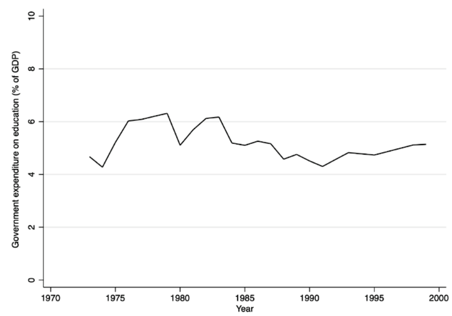
Note: Each column shows coefficients for different outcomes. All regressions include province, birth cohort fixed effects and province-specific time trends. Standard errors in parentheses are clustered at the province level. Arabic refers to Moroccan Arabic speakers. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Appendix C – Confounding Effects of Financial Crisis

(a) Annual GDP Growth



(b) Government Expenditure by % of GDP



(c) Government Expenditure By Education Level

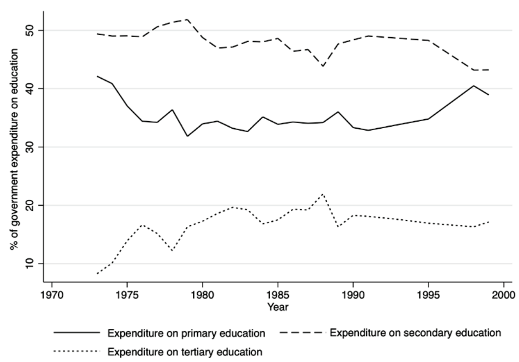
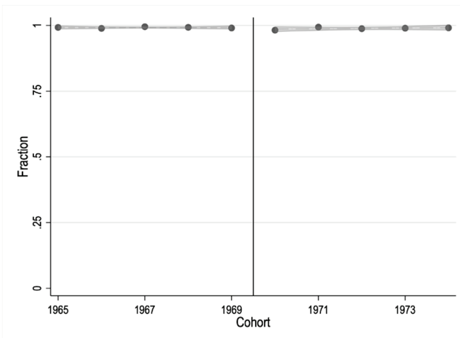


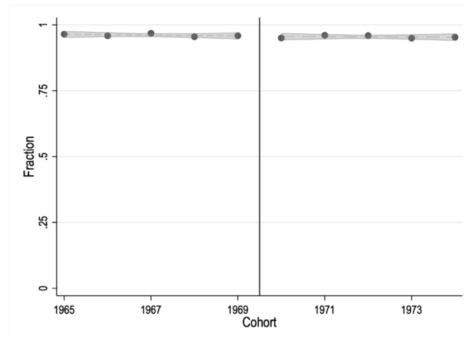
Figure 12: Macroeconomic Indicators for Morocco – 1983 Financial Crisis Confounding Effects Check
Source: Author tabulations using data from World Bank (2022).

Appendix D – Covariate Smoothness for Fathers

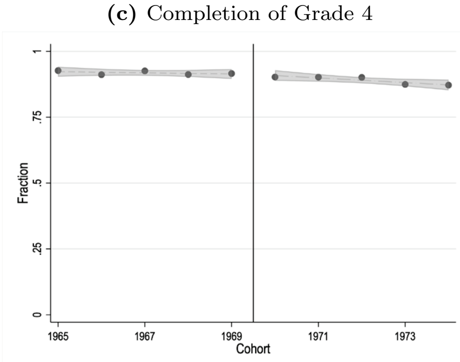
(a) Completion of Grade 2



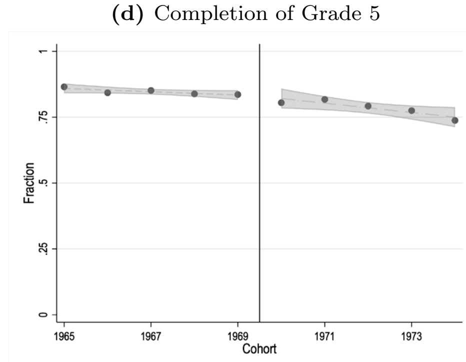
(b) Completion of Grade 3



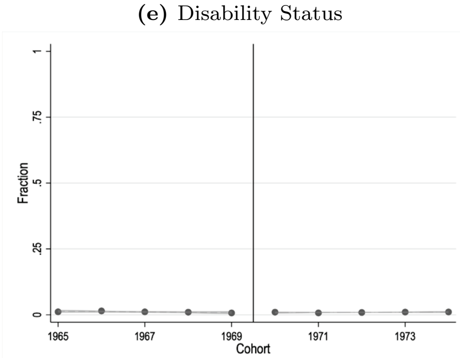
(c) Completion of Grade 4



(d) Completion of Grade 5



(e) Disability Status



(f) Share of Moroccan Arabic Speakers

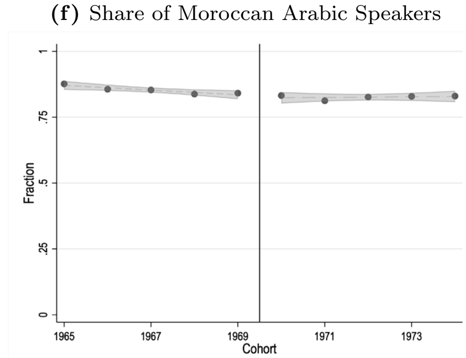
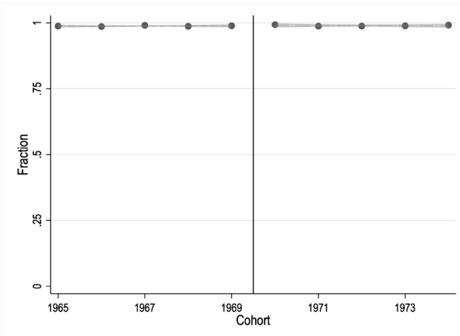


Figure 13: Covariate Smoothness for Fathers

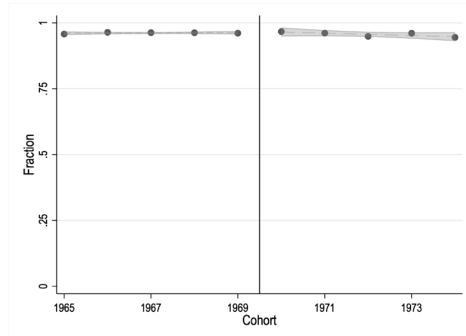
Note: Each dot shows the cohort means of the corresponding variables. Linear lines are fit separately before and after the language policy. The shaded areas around the lines show confidence intervals of 95%.

Appendix E – Covariate Smoothness for Mothers

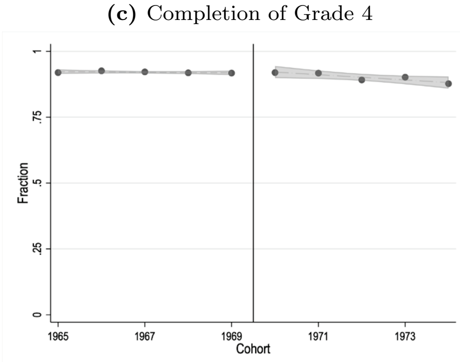
(a) Completion of Grade 2



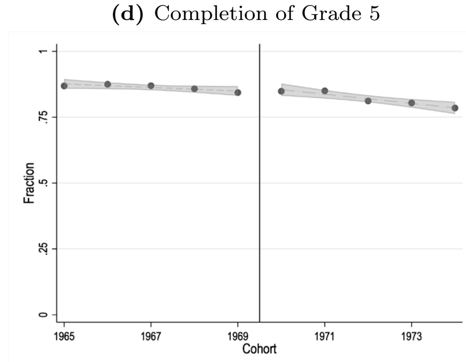
(b) Completion of Grade 3



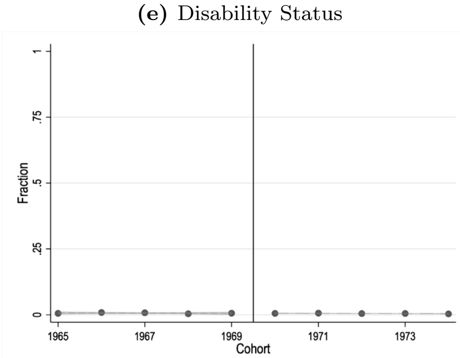
(c) Completion of Grade 4



(d) Completion of Grade 5



(e) Disability Status



(f) Share of Moroccan Arabic Speakers

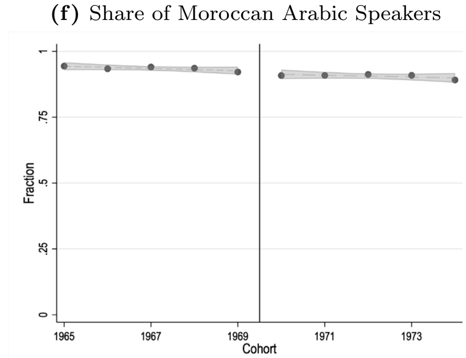


Figure 14: Covariate Smoothness for Mothers

Note: Each dot shows the cohort means of the corresponding variables. Linear lines are fit separately before and after the language policy. The shaded areas around the lines show confidence intervals of 95%.

Appendix F – Robustness Checks for Regression Discontinuity

Table 11: Intergenerational Transmission of Human Capital (with FE of Children's Age, Location, and Gender) Part 1

	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
	(1)	(2)	(3)	(4)	(5)
Panel A: Fathers' Years of Schooling as an Endogenous Variable					
y^{Father}	-0.038	0.022	0.016	0.030	-0.006
	(0.026)	(0.024)	(0.021)	(0.018)	(0.014)
Cohort	-0.016**	-0.003	-0.005	0.001	-0.006
	(0.008)	(0.007)	(0.006)	(0.006)	(0.004)
Cohort x Treated	-0.002	0.000	0.003	0.005*	0.006**
	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
F-statistics	14.722	14.722	14.722	14.722	14.722
Observations	20952	20952	20952	20952	20952
Panel B: Mothers' Years of Schooling as an Endogenous Variable					
y^{Mother}	-0.005	-0.038	0.018	0.033	0.038*
	(0.020)	(0.025)	(0.022)	(0.023)	(0.022)
Cohort	-0.002	-0.014*	0.001	0.003	0.004
	(0.006)	(0.008)	(0.007)	(0.007)	(0.007)
Cohort x Treated	-0.004**	-0.004	-0.004*	0.002	0.001
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
F-statistics	11.482	11.482	11.482	11.482	11.482
Observations	34594	34594	34594	34594	34594

Note: Robust standard errors are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Table 12: Intergenerational Transmission of Human Capital (with FE of Children's Age, Location, and Gender) Part 2

	Grade7	Grade8	Middle	Grade10	Grade11	Secondary	Grade 13	University	Total Years
	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Panel A: Fathers' Years of Schooling as an Endogenous Variable									
y^{Father}	-0.008	0.001	0.004	0.004	0.003	0.003	0.001	-0.000	0.030
	(0.011)	(0.010)	(0.008)	(0.006)	(0.006)	(0.005)	(0.003)	(0.000)	(0.073)
Cohort	-0.005	-0.000	0.003	0.002	0.002	0.002	0.001	-0.000	-0.026
	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.000)	(0.023)
Cohort x Treated	0.004**	0.002	-0.002	-0.000	-0.001	-0.002**	-0.000	0.000	0.014
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.012)
F-statistics	14.722	14.722	14.722	14.722	14.722	14.722	14.722	11.482	14.722
Observations	20952	20952	20952	20952	20952	20952	20952	20952	20952
Panel B: Mothers' Years of Schooling as an Endogenous Variable									
y^{Mother}	0.051**	0.026	0.046**	0.023**	0.008	-0.008	-0.003	0.000	0.193**
	(0.022)	(0.017)	(0.018)	(0.011)	(0.008)	(0.007)	(0.004)	(0.002)	(0.097)
Cohort	0.008	0.002	0.010*	0.005	0.002	-0.003	-0.001	0.000	0.016
	(0.007)	(0.006)	(0.006)	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.032)
Cohort x Treated	0.003	0.004**	0.001	0.001	0.000	0.001	0.000	-0.000	0.000
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.011)
F-statistics	11.482	11.482	11.482	11.482	11.482	11.482	11.482	11.482	11.482
Observations	34594	34594	34594	34594	34594	34594	34594	34594	34594

Note: Robust standard errors are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.