Traditional Norms and Parental Investment in Human Capital*

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Abstract

This paper studies the cultural roots of parental behavior concerning children's human capital. We examine the effect of traditional kinship norms on parental investment in children's human capital, with a focus on two predominant forms of kinship norms in developing countries –*matrilineal* and *patrilineal* systems. We use novel survey data from Tanzania to capture detailed parental investment behavior, including time and attention devoted to children's learning. Using a fuzzy spatial regression discontinuity design, we find that matrilineal parents invest less in their children's human capital. For instance, they are less inclined to check their children's homework or discuss their children's performance with teachers. In turn, children from matrilineal backgrounds exhibit lower cognitive skills, captured by standardized test scores in numeracy and literacy. Assessment of various factors suggests that spousal conflict and cooperation, family instability, and labor market conditions are possible mechanisms. Lastly, we evaluate the impact of a nation-building reform designed to challenge ethnic norms. Our findings reveal that this policy failed to effectively counteract the influence of traditional norms.

Keywords: culture, traditional norms, parental investment, human capital, matrilineality.

JEL code: I2, I25, O1, Z1

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1 Introduction

Parental investment is a key driver of human capital formation in children (Cunha and Heckman, 2008; Attanasio et al., 2020a,b; Doepke et al., 2019; Francesconi and Heckman, 2016). However, parental investments vary widely between families and these differences result in large observed inequalities in children's outcomes (Attanasio et al., 2022a). Such inequalities might be particularly salient in low-income countries (Attanasio et al., 2022a; Grantham-McGregor et al., 2007), where governments often lack the capacity to offset insufficient parental investment and bridge the gap in outcomes between children.[1] Thus, to better understand inequality in human capital, unraveling what shapes parental investment choices is crucial.

An emerging literature in economics proposes that, besides household resources, parental preferences and beliefs play a key role in investment decisions. Yet, the origins of these preferences and beliefs remain poorly understood (Attanasio et al., 2022a). This paper aims to address this limitation by studying the effect of cultural norms –the set of traditional norms, preferences, and beliefs that social groups transmit from one generation to another– on how parents invest in their children's human capital.

Specifically, the focus of this study is the culture of kinship norms –matrilineal versus patrilineal systems. In matrilineal kinship systems, lineage is traced through mothers, whereas in patrilineal systems, it is traced through fathers. We focus on kinship norms because they form the backbone of societal organization in many developing countries, especially in Sub-Saharan Africa (Radcliffe-Brown and Forde, 2015). These norms dictate responsibilities within families (such as those towards children), the extent of cooperation among family members (e.g. among spouses), and the management of resources and production.

The literature suggests that matrilineal kinship norms, in contrast to patrilineal norms, are characterized by conflicting allegiances within couples (Fox, 1983), lower spousal cooperation (Douglas, 2013; Gluckman, 1963; Lowes, 2022), higher divorce rates and more extramarital affairs among couples (Loper, 2019), and greater employment in agriculture with limited returns on education (Tene, 2021). These factors can arguably be detrimental to investment in children. Moreover, matrilineal fathers have fewer incentives to invest in their own offspring than their sisters' children (Fox, 1983), leaving fathers and uncles with ambiguous roles and dual loyalties, which in turn might result in underinvestment in children. In short, greater potential for conflict, lower cooperation,

[1] Due to, for example, limited capacity, underdeveloped infrastructure, and weaker institutions, thereby leaving a greater role for parental choices.

less stable family structures, and labor market conditions among matrilineal parents might place them at a disadvantage when it comes to parental investment.

We empirically examine the effect of matrilineal culture on parental investment in their children's education in the context of Tanzania, a country with subnational variation in kinship norms. Tanzania is intersected by the so-called "matrilineal belt", a region comprising matrilineal societies stretching across south-central Africa, from the Atlantic to the Indian ocean. This intersection implies that individuals from both traditionally matrilineal and patrilineal societies live in close proximity, often on opposite sides of the matrilineal belt border. This makes Tanzania an ideal setting for studying the effects of matrilineality on parental investment, allowing us to use the variation in kinship systems at this border in a fuzzy spatial regression discontinuity (RD) setup.

Our main analysis uses data from the Uwezo survey which collects detailed information on parental investment behavior and school-age children's education via large-scale household surveys. The data contain information on three kinds of non-monetary parental investments: checking children's homework, discussing children's performance with their teachers, and attending parents meetings at school. We also observe three kinds of monetary investments made by parents: sending children to preschool, sending children to private school, and paying for extra lessons with a tutor. Another key feature of the Uwezo surveys is that all children in surveyed households are assessed based on their math and reading skills using standardized tests. We use scores from these tests to measure the cognitive ability and educational success of children.

To identify the kinship norms of individuals in the Uwezo data, we use the information in the 2013 survey on the main language spoken in the household. Based on the crosswalk developed by Giuliano and Nunn (2018), we use language to assign each individual to an ethnicity as reported in the *Ethnographic Atlas*, an ethnographic database with records of over 1,200 ethnographic societies around the world (Murdock, 1967). The *Atlas* contains information on traditional cultural practices, including kinship norms, at the ethnicity level, allowing us to create an indicator for matrilineality.

The empirical analysis exploits the fact that the matrilineal belt creates a border between traditionally matrilineal and patrilineal regions within Tanzania. In particular, we link ethnicities to their traditional homelands in the Murdock ethnic group boundary map (Murdock, 1959) using the algorithm proposed by Lowes (2022). Employing a fuzzy spatial RD design, we instrument matrilineality of an individual with the indicator of residency on the matrilineal side of the border. Our main identifying assumption is that the likelihood of belonging to a matrilineal group jumps at the border, while all other determinants are continuous. We present evidence in favor of this assumption, showing that a range of geographic and cultural characteristics are balanced. Interpreting the estimates as the effect of matrilineality further requires the exclusion restriction that crossing the border does not affect the outcomes via other channels. While we view this as a plausible assumption, we also present estimates from reduced-form regressions that do not rely on this exclusion restriction assumption.

We find that matrilineal kinship norms reduce parental investment in children's education. This negative effect is consistent across all six measures of investment and is quantitatively important. For example, matrilineal parents are 46 percent less likely to check their children's homework, 35 percent less likely to discuss the performance of children with their teachers, or 40 percent less likely to send their children to preschool. This substantially lower investment translates into lower levels of learning among matrilineal children, compared to patrilineal ones, as reflected by their lower test scores. For example, children from matrilineal groups score 0.96 standard deviation (SD) lower on the standardized math test and 0.82 SD lower on the standardized English test.

We carry out a battery of sensitivity and robustness checks to validate our findings. We show that our results are robust to accounting for households' socio-economic characteristics, controlling for geographic and ethnic factors, testing various bandwidth ranges, employing different specifications of the RD polynomial, and addressing spatial correlation. To further support our identification strategy, we create placebo parallel borders, 50 km to the southeast and northwest of the matrilineal border, demonstrating that the influence of the matrilineal border is not spurious. Additionally, we confirm that our findings are not driven by gender-specific effects on female children.

Next, we asses various potential mechanisms underlying our baseline findings. First, we present suggestive evidence that matrilineal households in Tanzania exhibit an elevated potential for conflict within couples, decreased spousal cooperation, and less stable family structures marked by extramarital affairs and divorce, in line with previous results for the entirety of Africa (Loper, 2019; Lowes, 2022). Since spousal cooperation and family stability are intuitively related to investment in children, these factors could, in part, explain the lower levels of educational investment we find. Second, as we explore labor market conditions, we find that matrilineal mothers tend to have lower educational attainment, a higher likelihood of employment outside the home, and a greater propensity to work in farming, consistent with the findings of Tene (2021). Consequently, mothers with limited human capital are in a disadvantageous position to invest in their children; they have reduced available time for their children after work; and they have fewer incentives to invest in their children's education due to the perception of lower returns on education within the agricultural sector. Third, we explore whether our results could be attributed to alternative cultural and institutional factors, such as bride price, bride service, historical plough use in agriculture, female participation in agriculture, polygyny, or political centralization (Alesina et al., 2013; Ashraf et al., 2020; Michalopoulos and Papaioannou, 2013; Tene, 2021). Our analysis reveals that these alternative cultural and institutional mechanisms do not explain our findings.

Finally, we conclude our analysis by investigating whether nation-building reforms in the 1970s were able to undo the influence of traditional ethnic norms. Specifically, we focus on the so-called Ujamaa experiment –a large scale policy involving a comprehensive "villagization" program that forcibly resettled numerous rural communities into planned villages. Two of the primary objectives were to replace ethnic identities with a unified national identity (Carlitz et al., 2022; Kurschner, 1974) and to establish primary schools in every planned village (Osafo-Kwaako, 2012; Samoff, 1990). These factors might have diminished the influence of ethnic norms and narrowed the disparities between matrilineal and patrilineal ethnic groups in villagized areas. However, using the intensity of villagization from the 1978 census, our analysis indicates that this wholesale nation-building policy did not effectively suppress the influence of ethnic norms.

Our paper relates to a growing body of literature on the role of parental influence as a fundamental factor in human capital development (Attanasio et al., 2020a,b, 2022a,b; Carneiro et al., 2021; Cunha and Heckman, 2008; Dahl and Lochner, 2012; Doepke et al., 2019; Francesconi and Heckman, 2016). This body of work has delved into the determinants of parental investment in children, placing significant emphasis on preferences and beliefs as key drivers behind the heterogeneity in investment decisions (Attanasio et al., 2022a,b). Yet, a substantial question that remains largely unanswered is the origin of these varying preferences and beliefs. We make a novel contribution to this literature by demonstrating how cultural norms play a crucial role in shaping parental investment choices concerning their children's human capital.

A parallel literature in development economics examines the importance of culture for human capital formation, particularly in ethnically diverse developing countries (Ashraf et al., 2020; Bau, 2021; Collins, 2022; Figlio et al., 2019; La Ferrara and Milazzo, 2017). For example, Ashraf et al. (2020) demonstrate that the culture of bride price moderates the impact of school construction programs on girls' education in Indonesia and Zambia. Bau (2021) explores how the cultural norms of matrilocality and patrilocality influence educational attainment in Indonesia and Ghana, highlighting the impact of policy on culture. La Ferrara and Milazzo (2017) investigate the influence of matrilineality on educational attainment in Ghana. While the prevailing mechanism proposed in these studies revolves around how culture shapes parental behavior, they do not look at specific forms of parental investment and tend to focus on children's educational attainment. Our contribution is to document the relationship between cultural norms and the concrete actions parents take when investing in their children's human capital. We add to this literature by considering how matrilineality affects parental investment across six specific dimensions. Moreover, we are able to capture how cultural norms affect children's learning, as measured by standardized tests. This is a key improvement compared to measuring educational attainment, as years of schooling are only relatively weakly related to actual learning in the context of Sub-Saharan Africa (World Bank, 2017).

Finally, our paper relates to the literature exploring the relationship between traditional norms and various socio-economic outcomes (Alesina et al., 2013; Bargain et al., 2022; Becker, 2021; Gneezy et al., 2009; Jayachandran and Pande, 2017; La Ferrara, 2007; Loper, 2019; Lowes, 2022; Moscona et al., 2020; Robinson et al., 2019; Rossi, 2019). For instance, Lowes (2022) reveals that matrilineality reduces spousal cooperation, while Loper (2019) finds that matrilineal women are more likely to be infected by HIV and exhibit greater promiscuity and infidelity. In this vein, we contribute to this literature by studying the effect of kinship norms on parental investment in education and on educational performance.

Section 2 lays out the background on kinship norms. Section 3 outlines the data. Section 4 describes the empirical strategy. Section 5 presents the main results and the robustness exercises. Section 6 evaluates various mechanisms. Section 7 assesses whether a nation-building policy experiment was successful in undoing the influence of traditional ethnic norms. Section 8 concludes.

2 Background on Kinship Norms

In most high-income countries today, the social significance of extended family and kinship ties is limited (Minkov et al., 2017). Anthropologists refer to these types of kinship norms as *cognatic* descent, where kinship ties are traced through both the mother's and father's sides. These norms, though historically uncommon, have become more prevalent in modern society, prioritizing the nuclear family and the parent-child relationship over extended family relations. However, in many developing countries, extended family ties retain great importance and are usually characterized as either *patrilineal* or *matrilineal* kinship norms. Therefore, these kinship norms are the focal point of our study as they constitute a fundamental form of societal organization within these communities. Kinship and lineage play a crucial role in determining ethnic clan affiliation, which in turn shapes obligations towards family members, the scope and extent of cooperation, and the management of production and resources (Fox, 1983).

Figure 1 provides an overview of kinship ties in matrilineal and patrilineal societies. In patrilineal societies, the children become a part of the father's kin group and inheritance is typically passed down from father to son. When a patrilineal daughter marries, she becomes a part of her husband's kin group and severs ties with her birth family. This system has historically been the most common in the West and is still the most prevalent in many developing countries. In matrilineal societies, on the other hand, children belong to the mother's kin group. Inheritance passes from the maternal uncle to his sister's children, who are always members of the same kin group as married children maintain their birth lineage. This creates a significant asymmetry in marital allegiances: while spouses belong to the same kin group in patrilineal societies, spouses are split into different kin groups in matrilineal societies, as illustrated by the circled couples in Figure 1. These divided loyalties pose a challenge to intra-household cooperation in matrilineal systems, a phenomenon long recognized in anthropology (Douglas, 2013; Fox, 1983; Gluckman, 1963). Recently, economists have also shown interest in exploring how these norms influence decision-making and cooperation within the family (Gneezy et al., 2009; Lowes, 2022).

Recent findings from a field experiment conducted by Lowes (2022) indicate that matrilineal spouses cooperate less with each other than with strangers in a household public goods game. Physiological measurements further reveal that matrilineal spouses experience greater stress symptoms when paired with their partner compared to when paired with a stranger during the experiment. Therefore, the conflicting allegiances of spouses may negatively influence their obligations towards family members, including their children, and consequently, lead to lower joint production of children's human capital. Moreover, in matrilineal societies, the historically important role of the maternal uncle as the main provider is today more ambiguous and may lead to conflict and tension with the father, as noted in ethnographic accounts from a matrilineal society in Tanzania (Beidelman, 2017). Uncles are also less biologically related to the children than fathers, and their more ambiguous role today as providers may reduce total investment in children. Lastly, rates of divorce and extramarital relations are higher in matrilineal societies, as supported by a recent study (Loper, 2019), where such additional instability may put more stress on coordination problems among parents.

Figure 2 shows the global distribution of kinship systems, revealing that matrilineal norms, despite their potential disadvantages for the couple and the family, are still prevalent, particularly in Sub-Saharan Africa. The existence of a kinship system that undermines cooperation between parents is known as "the matrilineal puzzle" in anthropology (Fortunato, 2012), and remains an open question. One hypothesis suggests that matrilineal systems have arisen in environments with high paternal uncertainty, where it may be more advantageous for a man's inclusive fitness to invest in his sister's children instead of his own.

These insights motivate us to investigate the role of matrilineal kinship norms in the formation of human capital. Our main hypothesis is that matrilineal parents are at a disadvantage in parental investment due to coordination problems, divided and conflicting obligations, and impaired incentives associated with matrilineal norms.

3 Data

3.1 Outcome Variables from the Uwezo Survey

The Uwezo initiative of the NGO Twazeza has been conducting large-scale household surveys since 2009, assessing the education of school-age children in Kenya, Tanzania, and Uganda.[2] The surveys are representative at the district level, collecting information on a wide range of educational inputs and outcomes. Our analysis focuses on the 2013 survey conducted in Tanzania. We focus on Tanzania due to the absence of traditionally matrilineal groups residing in Kenya or Uganda. We utilize the 2013 wave as it is the only wave containing information on the main spoken language in the household, which is necessary for matching households to ethnicities and kinship norms. In what follows, we outline the key features of this particular wave that are pertinent to our analysis.

The survey collects information on both non-monetary and monetary parental investment in education through questions directed at parents residing in the household. Specifically, we have data on three non-monetary investment outcomes: i. whether the parent checked their children's homework this week; ii. whether the parent attended any parents' meetings at their children's school in the past year; iii. whether the parent discussed children's performance with their teacher during the previous school term. Additionally, we have three monetary investments: i. preschool attendance for each child;[3] ii. enrollment in private school; iii. whether each child receives extra tuition outside of regular school hours.

[2] For more information, visit https://uwezotanzania.or.tz/.

[3] Preschools charge tuition in Tanzania. For a detailed description of the preschool system in the country, see Bietenbeck et al. (2019).

A key feature of Uwezo is its comprehensive assessment of all children within a sampled household based on their math and language skills, regardless of school attendance. The assessments measure the competencies in the subjects that children should have acquired after two years of schooling according to the Tanzanian school curriculum. The math assessment covers the following six competencies of increasing difficulty: (1) counting the number of objects on a showcard, (2) recognizing numbers, (3) rank ordering of numbers, (4) addition, (5) subtraction, and (6) multiplication. The language assessment is conducted in both English and Swahili and evaluates the following four competencies of ascending complexity: (1) recognizing letters, (2) recognizing words, (3) reading a paragraph, and (4) reading a short story. For each assessment, students' scores correspond to the highest competency level they have attained, with those who do not master even the lowest competency level receiving a score of zero.[4] Importantly, while the assessments measure second-grade competencies, Uwezo has discovered that even significantly older children often fail to master these competencies.

Besides data on parental investment and student competencies, the Uwezo dataset also contains information on children's school enrollment –indicators for whether they ever enrolled in school and their current enrollment status. Importantly for us, we also know the main language spoken in the household. Moreover, we observe household characteristics such as children's gender and age, household size, mother's age and highest education level achieved, mother's literacy, and a household wealth index.

3.2 Variable of Interest from Ethnographic Data and Matching Strategy

To determine the type of descent systems of households in our sample, we use the *Ethnographic Atlas*, an extensive ethnographic database containing records of over 1200 ethnographic societies worldwide (Murdock, 1967). The *Atlas* has been widely utilized in various empirical studies examining the influence of ancestral culture on political and economic development (Alsan, 2015; Gennaioli and Rainer, 2007; Michalopoulos and Papaioannou, 2013), gender norms (Alesina et al., 2013; Tene, 2021), and spousal relationship dynamics (Becker, 2021; Loper, 2019; Lowes, 2022), among others. The *Atlas* encompasses a rich collection of ethnographic records compiled over centuries, aiming to represent lifeways prior to industrialization or first European contact.[5]

[4] The NGO operates independently of the Tanzanian government and the tests do not affect children's school grades or teacher evaluations. Thus, parents and schools are unlikely to influence test performance, which can be problematic with school-administered tests.

[5] Recent research has largely validated the *Atlas* as a meaningful source of information. Across a wide range of dimensions, Bahrami-Rad et al. (2021) find significant associations between multiple

We use the variable *Major mode of descent* from the *Atlas* to identify tribes that practice matrilineal descent.[6] We create an indicator that takes one for matrilineal ethnic groups and zero otherwise. To verify that these ethnicities are indeed matrilineal, we cross-validate the *Atlas* with local ethnographic records on matrilineal tribes in Tanzania (Beidelman, 2017; Brain, 1983; Brian, 1969).

Since Uwezo does not report the ethnicity of the household, we use the language spoken at home to assign ethnicity and descent type to each household. Using the crosswalk by Giuliano and Nunn (2018), we match 97% of the Uwezo sample to a specific ethnicity. Reassuringly, language is intimately tied to ethnicity in Tanzania, with the language often bearing the same name as the corresponding ethnicity.[7]

Lastly, we use the ethnographic data in the *Atlas* as a source of control variables at the ethnicity level. All controls are described in detail in Section A of the Online Appendix.

3.3 Sample Selection and Summary Statistics

The full sample contains 104,162 observations. However, for identification purposes, we restrict the sample to the area surrounding the border created by the matrilineal belt (further details are provided below). Table 1 shows summary statistics for the main sample used in our headline analysis.

4 Empirical Strategy

While individuals typically do not actively select into a specific ethnicity, the causal identification of the effect of kinship norms on parental investment might still be confounded. First, as highlighted in the anthropological and recent economic literature, kinship norms are likely to correlate with historical and geographic factors that might influence parental investment today. For instance, the matrilineal belt region also exhibits geographical features favoring female agricultural labor (Tene, 2021) and cultural

contemporary survey data sources and ancestral ethnic characteristics in the *Atlas*.

[6] Similar to previous work (Lowes, 2022; Loper, 2019; Tene, 2021), we use *v43* of the *Atlas* (see Section A of the Online Appendix for details). Using this variable, Figure A.1 shows the historical geographical distribution of tribes across Africa by descent type. This map is based on *Murdock's Map of Africa* (Nunn and Wantchekon, 2011), originally drawn by Murdock (1959).

[7] One might be concerned about Swahili speakers, as Swahili is the national language. Our identification strategy addresses this potential problem as the estimated treatment effect is on compliers. We also show later on that our main results are robust to excluding Swahili speakers from the sample.

institutions such as bride price (Ashraf et al., 2020). Second, matrilineal descent is associated with high paternal uncertainty, which may lead to reverse causality if high local paternal uncertainty levels lead to the adoption of matrilineal descent (Loper, 2019), and, at the same time, affect fathers' investment behavior today. Third, in Tanzania specifically, the matrilineal belt largely overlaps with the coastal region. This region has historically been more subject to trade and outside influences and was also comparatively wealthier, which may introduce a source of omitted variable bias.

To address these concerns, we employ a spatial fuzzy regression discontinuity design where we make use of the fact that the historical matrilineal belt passes through Tanzania. Since the border of the historical matrilineal belt does not coincide with any actual physical or administrative boundary, we can compare geographically close and very similar societies on each side of the border that are subject to the same national institutions. This allows us to use the ancestral border separating matrilineal and patrilineal tribes as an instrument for matrilineality today.

4.1 Spatial Fuzzy Regression Discontinuity

Our main specification comes from a fuzzy RD strategy, where we instrument the treatment of matrilineality with an indicator of residency on the matrilineal side of the ancestral border. Our fuzzy RD estimator is as follows (Imbens and Lemieux, 2008).

$$\tau_{FRD} = \frac{\lim_{x \downarrow c} \mathbb{E}[Y|X = x] - \lim_{x \uparrow c} \mathbb{E}[Y|X = x]}{\lim_{x \downarrow c} \mathbb{E}[W|X = x] - \lim_{x \uparrow c} \mathbb{E}[W|X = x]} \quad (1)$$

where Y is an outcome of interest, X is the forcing variable (proximity to the matrilineal border located at x) and W is treatment status (speaking a matrilineal language).

The identifying assumption is that the probability of treatment should jump at the cutoff of treatment assignment, i.e. at the matrilineal border:

$$\lim_{x \uparrow c} Pr(W_i = 1|X_i = x) \neq \lim_{x \downarrow c} Pr(W_i = 1|X_i = x)$$

In other words, conditional on the forcing variable, we should expect to see a discontinuity in the share of matrilineal language speakers at the border.

Figure 3 shows the relationship between distance to the border and the probability of speaking a matrilineal language within 50km intervals on both sides. Although the share of matrilineal language speakers is generally higher on the matrilineal side of the border (right of the cutoff), we observe that in close proximity to the border there is some fuzziness in terms of matrilineal and patrilineal speakers. For example, just to the left of the border, we can see non-negligible shares of matrilineal groups, while there are patrilineal groups just inside the matrilineal belt. This is expected, as pointed out by Michalopoulos et al. (2019), since the borders of the ethnographic societies in the Murdock map are not always precise. Therefore, following Michalopoulos et al. (2019), we omit individuals within 10 kms around the border (5 kms on each side). Comparing the top and the bottom plots of Figure 3 reveals that most of the imprecision of the border goes away when applying this "donut." Hence, in our main specification, we employ a donut of 5 km on each side of the border, which significantly improves the fit of the first stage.[8] Our first-stage specification is:

$$W_{i,w} = \alpha + \tau_w M_{i,w} + f(location_w) + X_i\beta + \epsilon_{i,w} \tag{2}$$

where $W_{i,w}$ is the treatment of matrilineality for individual i in ward w, $M_{i,w}$ is an indicator for the matrilineal side of the border at ward-level, $f(location_w)$ is a local polynomial in longitude and latitude, and X is a vector of control variables.

The reduced form-specification, necessary to arrive at the local average treatment effect (LATE), is:

$$Y_{i,w} = \alpha + \tau_y M_{i,w} + f(location_w) + X_i\beta + \epsilon_{i,w} \tag{3}$$

While the reduced-form specification (3) is employed in recent matrilineal papers (Lowes, 2022; Loper, 2019; Tene, 2021), fuzzy RDD instead estimates the LATE, $\hat{\tau}_{FRD} = \frac{\hat{\tau}_y}{\hat{\tau}_w}$ (Imbens and Lemieux, 2008).[9]

We use a local linear polynomial in coordinates as our baseline specification,[10] following the advice of Gelman and Imbens (2019) against the use of higher-order polynomials of the forcing variable.[11] Standard errors are clustered at the ward level.

4.2 Balance on Observed Characteristics

One identifying assumption of the RDD is that all other variables that affect the outcome variable should be continuous at the cutoff. If the border indicator significantly

[8] E.g., the first-stage F-stat goes up from the ballpark of 30 to 50 when we apply the donut approach. In any event, we also show that our results are robust to not applying the donut approach.

[9] In our final regressions, we also employ a triangular kernel so that the weight given to each observation decays with distance from the border (Dell and Olken, 2020).

[10] We use coordinates rather than distance as our preferred forcing variable to account for the fact that treatment is assigned based on a border in two-dimensional space, following recent work using spatial RDD (Dell and Olken, 2020).

[11] Nevertheless, we show with a rich set of robustness checks that our results are insensitive to using a quadratic polynomial in either coordinates or distance.

predicts observed pre-treatment characteristics, this could invalidate the RDD. We test this by using our reduced form specification in (3), where we replace the outcome variable with a set of standardized variables including geographic, ethnic, individual, and household controls.[12]

Figure 4 reports the results of the balance tests. For geographic controls –such as temperature, precipitation, elevation, tsetse suitability, plough suitability– we find that both sides of the border are balanced overall, with the exception of a small difference in soil suitability for agriculture.[13] However, note that, in our robustness regressions controlling for geographic characteristics, soil suitability does not significantly predict parental investment outcomes. Also, if the difference in soil suitability was economically meaningful one would expect to see a difference in the ethnic measure of reliance on agriculture. Yet, there is no significant difference in historical agriculture (see Figure 4).

Strictly speaking, all but the geographic control variables could technically be regarded as endogenous to matrilineal descent, and are, therefore, "bad controls" (e.g., household characteristics). Nevertheless, it is reassuring that groups are balanced on ethnic controls, such as agriculture dependence or settlement patterns.[14] Furthermore, if matrilineal descent affects parental investment today, it arguably also affected investment historically, and we should expect to see some differences in the socio-economic characteristics of matrilineal parents today. As expected, these household characteristics are not balanced and we will further exploit them in our investigation of the underlying mechanisms.

5 Results

5.1 Main Results

We start out with a visual inspection of the reduced form RD results. Figures 5 and 6 illustrate the discontinuities in parents' and children's outcomes just around the matrilineal border. For example, Figure 5 suggests that parents just on the matrilineal side of the border are less likely to check their children's homework, attend parental meetings, or discuss their children's performance with their teachers, compared to parents who are just on the patrilineal side of the border. Similarly, Figure 6 indicates that children

[12] As in our main specification, we use a triangular kernel, and identical bandwidth and cutoff distances of 50 and 5 kms.

[13] The raw soil suitability measure goes from 0 to 1. The difference in soil suitability is merely 0.06, and both sides of the border show high soil suitability for agriculture (with means of 0.85 and 0.91).

[14] Note that historical plough use is absent in the whole sample while polygyny is 100%.

just on the matrilineal side of the border have lower levels of maths, English or Swahili.

Tables 2 and 3 present our main results on the effect of traditional kinship norms on parental investment in education and children's educational outcomes, respectively.[15] Table 2 groups parental investment in education into two categories –non-monetary and monetary. Arguably, the behavioral influence of culture should be more prominent for non-monetary outcomes as these behaviors are voluntary and reflect the beliefs and preferences of parents, whereas monetary outcomes might be more prone to be confounded by income and wealth. Controlling for gender, age dummies, and their interactions, columns (1) to (3) of Table 2 suggest that matrilineal parents are less likely to check their children's homework, discuss their children's performance with teachers, and attend parents' meetings in school (by 46, 35, and 48 percent, respectively) than patrilineal parents. Turning to monetary investments, columns (4) to (6) suggest that matrilineal parents are less likely to send their children to pre-school or a private school, and hire extra tutoring (by 40, 2.5, and 11 percent, respectively). It is worth to note that, in the sample, there are very few parents who send their kids to a private school or hire extra tutoring. Thus, these outcomes have limited variation.

Table 3, instead, shows that matrilineal children's cognitive ability and school outcomes are also negatively affected. Matrilineal children do worse in maths, English, Swahili, and literacy/numeracy, and are less likely to be currently enrolled in school and more likely to be never enrolled in school. For instance, matrilineal children are 31 percent less likely to attain second grade levels in literacy and numeracy (column (4)). Also, they perform 0.82 standard deviation worse on English tests (column (2)).

5.2 Robustness

This section briefly outlines some of the robustness checks we carry out.

In the baseline regressions, to improve the first stage fit, we exclude individuals within a 5-kilometer radius around the border since the borders of the societies in the Murdock map can be imprecise (Michalopoulos et al., 2019). However, including this "donut" region in the sample does not alter previous conclusions, even though the first stage is weaker, with F-statistics decreasing from above 50 to 30 (Tables A.3 and A.4).

One important concern is that households' socio-economic characteristics, such as parental background (e.g. education) and resources (e.g. wealth), could influence parental investments (Attanasio et al., 2020a). Therefore, in Panel A of Table A.5, despite potential concerns of bad control, we additionally account for households' char-

[15] Tables A.1 and A.2 provide the OLS, reduced form, and first stage regressions for comparison.

acteristics, including household size, household wealth index, and mother's age, education and literacy. It is reassuring that the baseline estimates are not driven by these socio-economic characteristics and are largely insensitive to the inclusion of household controls, even though they are arguably endogenous. Coefficient on matrilineality in extra tutoring regression loses significance, column (6), which is not surprising given the very low number of households hiring extra tutoring. Similarly, Panel A of Table A.6 shows that the negative effect of matrilineality on children's educational outcomes carry over when we take into account households' socio-economic characteristics.

The remainder of Tables A.5 and A.6 show the robustness of our results to additional geographic and ethnic controls. Geographic controls are: temperature, precipitation, elevation, tsetse suitability, soil suitability, and plough suitability. Ethnic controls are: settlement patterns, polygyny, plough use, dependence on agriculture, and the year of observation. For example, plough suitability might potentially influence both traditional norms and development patterns (even though Figure 4 shows that it does not predict matrilineality) (Alesina et al., 2013). Alternatively, the level of development approximated by settlement patterns and agriculture might shape both norms and parental behavior. Yet, various panels of Tables A.5 and A.6 suggest that our results are robust to these additional controls, even in the most stringent specification accounting for baseline, household, geographic, and ethnic controls.[16] Thus, our results are not driven by environmental factors conducive to development or ethnic factors capturing the level of development and economic activity.[17]

In the baseline, we employ a local linear polynomial in coordinates following Gelman and Imbens (2019). However, our results are robust to using a quadratic polynomial in either coordinates or distance (Tables A.7 and A.8). In addition, we generate segment fixed effects splitting the border into ten equal-length segments (about 65 km each), leaving variation only within a border segment. Even in this demanding specification (Panel E of Table A.7), coefficients of interest are still significant in non-monetary parental investment regressions, despite the fact that the first stage becomes weak. As argued earlier, non-monetary investment behavior is more likely to be a reflection of cultural preferences and behavior than monetary investments.

In our baseline specifications, we use a bandwidth of 50 kms around the border.

[16] One variable that loses significance is again extra tutoring.

[17] Also note that, due to missing values, we can take into account the exposure of ethnic groups to slave trade only if we assume that the missing values are zero. In this case, adding slave trade exposure to the already existing set of baseline, household, geographic and ethnic controls does not change the coefficients on matrilineal treatment indicator. Moreover, accounting for Christian missions does not alter the results either. The results are available upon request.

Tables A.9 and A.10 reproduce our estimates for the bandwidths of 100 and 25 kms. Results are very similar to our baseline. Additionally, Figures A.2 and A.3 present the sensitivity of the results at 10 km intervals and reassure us that our estimates are rather stable across different bandwidths.

Another concern might be that Swahili is a national language in Tanzania. Given that we are instrumenting our treatment, our identification strategy mostly addresses this potential problem as the estimated local average treatment effect is on compliers. Nevertheless, we show that our main results are robust to excluding Swahili speakers from the sample even though we have less power now (Tables A.11 and A.12).

It is also important to note that our results are not an artefact of spatial correlation. We perform two exercises to address this. First, we adjust the standard errors to account for spatial correlation following Conley (1999). Tables A.13 and A.14 produce the Conley standard errors allowing standard errors to be correlated within the ranges of 5, 10, 25, 50, or 100 km. These spatial-correlation-robust standard errors are similar to the baseline cluster-robust standard errors and the previous conclusions carry over.[18] Second, we generate artificial spatial noise correlated between wards at a range of 50 km to evaluate how well spatially correlated noise can predict our outcome variables. Figures A.4 and A.5 show the distribution of 1000 simulated spatial noise estimates for each of our outcome variables. We find that the distributions of the spatial noise effects are centered around zero and none of the spatial noise estimates come close to our standardized treatment coefficients. For example, the standardized coefficient on matrilineality in *Check homework* regression is -0.165, which is far below the lower tail of the distribution of the spatial noise coefficients. Thus, we conclude that spatial correlation is not sufficient to drive our baseline estimates.[19]

Furthermore, since we observe a discontinuity in the probability of speaking a matrilineal language only at the matrilineal border, we should not expect to see a discontinuity in our outcomes along other arbitrarily drawn borders if matrilineal kinship norms are driving our results. We carry out placebo exercises by drawing artificial parallel borders 50 km to the southeast and northwest of the matrilineal border. Reduced form RD plots with the southeastern placebo borders (Figures A.6 and A.7) as well as the northwestern placebo borders (Figures A.8 and A.9) show virtually no discontinuities (or inconsistent) at the border. In contrast, the reduced form RD plots for the matrilineal border in Figures 5 and 6 show large discontinuities at the cutoff that are consistent

[18]The results are also robust to clustering at the ethnic group level instead of the ward level. The results are available upon request.

[19]Performing this exercise for other correlation ranges, such as 100 km, does not alter the results.

across all of our outcome variables.

Lastly, given the focus of the recent literature on the effect of matrilineality on females (Lowes, 2022; Loper, 2019), in Tables A.15 and A.16, we interact our variable of interest with a female child indicator. The interaction term is never significant in any of the regressions. Therefore, our results are not driven by daughters.

6 Mechanisms

This section evaluates various mechanisms underlying the baseline negative relationships between matrilineality norms and parental investment in human capital.

Data from the Demographic and Health Surveys– To explore the potential channels through which kinship norms influence parental investment, we rely mostly on the Demographic and Health Surveys (DHS) for Tanzania. We use all available waves for which geo-referenced data were collected: 1999, 2010 and 2015 (Boyle et al., 2022). The surveys are cross-sectional and provide nationally representative data on a wide range of demographic and health outcomes. A key advantage of DHS is that the geo-referenced data allow us to identify the locations of surveyed households at a granular level. To ensure respondent confidentiality, coordinates are randomly displaced (following a uniform distribution) between zero and two kilometers for urban households, and between zero and five kilometers for rural households. However, unfortunately, DHS data for Tanzania do not contain any information on ethnicity, and, therefore, we can only conduct reduced form sharp RD analyses based on these data.

DHS provides separate survey data for women, men, children, and all household members. Survey data for women are typically based on interviews with the women while the spouses were absent, as this survey may contain sensitive information, such as control issues faced by the respondent and extramarital affairs.

6.1 Parental Cooperation and Conflict

One can view the formation of children's human capital as a cooperative joint investment project (or a public good), for which parents work together to coordinate their efforts, aiming to achieve better outcomes (Lundberg et al., 2016). Within this framework, the finding by Lowes (2022) of reduced spousal cooperation among matrilineal couples implies that matrilineal parents may face challenges in fostering cooperation on investing in their children's human capital, arguably putting them at a disadvantage compared to patrilineal parents. Therefore, we explore this channel in Tanzania using proxies of cooperation and conflict.

In Table 4, we first look at sources of conflict, as measured by the extent of husbands' control issues over their wives (reported by women). These six binary outcomes encompass various behaviors, ranging from husbands accusing their wives of cheating to insisting on knowing their whereabouts. Column (1) counts the total number of control issues husbands have with their wives' behavior.[20] Column (1) reveals that matrilineal men exhibit a higher number of control issues over their wives compared to patrilineal men. For example, columns (2) and (4) illustrate that matrilineal husbands are more likely to accuse their wives of infidelity and insist on knowing their whereabouts. These findings suggest a higher level of conflict and less room for cooperation among matrilineal couples, in line with Lowes (2022).

Furthermore, in accordance with the findings of Loper (2019), we explore, in Table 5, whether there are other indications of lower cooperation or heightened conflict among matrilineal couples. The regressions presented throughout Table 5 support this proposition. Matrilineal couples exhibit a greater likelihood of experiencing infidelity or extramarital affairs, as well as an elevated propensity for divorce. Consequently, these findings for Tanzania align with the conclusions drawn by Loper (2019) for the whole of Africa, indicating lower cooperation and greater conflict among matrilineal couples.

Higher divorce rates and a higher number of extramarital affairs will mean a childhood marked by greater instability, where fathers are less involved with their children and matrilineal mothers are more likely to rear their children alone or with a subsequent partner. The literature underscores the significance of family structures, such as years spent with a single parent (Demo and Acock, 1988; McLanahan and Booth, 1989; McLanahan and Sandefur, 2009), family transitions (Cooksey and Fondell, 1996; Fomby and Cherlin, 2007) or time devoted by fathers to children (Cooksey and Fondell, 1996; Del Boca et al., 2014), for children's well-being and various other outcomes, including educational attainment.

Considering the findings above, which indicate increased conflict, reduced cooperation, and less favorable family structures among matrilineal parents in Tanzania, it becomes apparent that these factors may contribute to lower parental investments. In such an environment, overall outcome will be a reduced capacity for joint production and a diminished surplus available for investing in children, compounding the adverse effect on parental investment in children.

[20]Due to limited power, Panel A employs an estimation bandwidth of 100 km, while Panel B presents findings using a 50 km bandwidth.

6.2 Labor Market

Next, we turn our attention to the assessment of long-term and labor market outcomes, as presented in Table 6. First and foremost, we observe lower levels of education and literacy among matrilineal women (columns (1) to (3)). This finding aligns with the main negative effects we have identified and can be considered as reflective of long-term outcomes. These results echo the findings of Tene (2021) who also observes a similar adverse impact of matrilineality on education across the African continent.

Importantly, matrilineal women have a higher likelihood of employment than patrilineal women (columns (4) and (5)), especially within the agricultural sector (column (6)). This is consistent with Tene (2021), showing that matrilineal women are more engaged in traditional sectors and less so in white-collar occupations. These findings carry two significant implications. First, time spent by mothers with their kids is an important factor in the production of children's outcomes, including cognitive development. When mothers are employed outside the home, this often translates to reduced time and resources available for their children, ultimately leading to poorer child outcomes (Del Boca et al., 2014). Second, considering that matrilineal households are more involved in farming activities, they may envisage their children's future primarily in agricultural activities. In such scenarios, where children are expected to become future farmers, the returns to education will be perceived lower (Jolliffe, 2004), and therefore, parents will have fewer incentives to invest in their children's education. Indeed, parental beliefs regarding the returns on investments are crucial in shaping parents' choices when it comes to educational investments for their children. As demonstrated by Attanasio et al. (2022b), differences in perceived returns strongly influence actual investment decisions made by parents.[21]

Lastly, we probe in column (6) whether asset ownership, such as land, can play a role in the trade-off between income, employment, and educational investments devoted to children. We find no significant correlation between land ownership and matrilineality.

6.3 Alternative Cultural and Institutional Explanations

The baseline correlations between kinship norms and parental investment could potentially be influenced by other cultural and institutional determinants. Thus, it is essential to evaluate alternative cultural and institutional factors that might contribute to the observed effects. These alternative variables could be ethnically determined and

[21] Wang et al. (2022) also show how parental choices can be influenced by the perception of parents relative to some reference population, such as the norm in parents' village.

play a significant role in shaping outcomes.

For example, existing literature has investigated the impact of various cultural and institutional factors, such as bride price, bride service, historical plough use in agriculture, female participation in agriculture, polygyny, and political centralization, on a range of socio-economic outcomes, including education, gender roles, labor market outcomes, and development (Alesina et al., 2013; Ashraf et al., 2020; Michalopoulos and Papaioannou, 2013; Tene, 2021).

Therefore, we examine several commonly used variables and potential confounders from the literature on culture and socioeconomic outcomes. We aim to assess whether the effects we observe in our baseline analysis remain stable when accounting for these factors. Figure 7 presents how the baseline parameter estimates on matrilineality change when we control for these variables. The dashed vertical lines represent the baseline estimates, while the solid circles indicate how the estimates change when controlling for the corresponding variable. Independently of the outcome, the baseline estimates are quite stable and do not seem to be driven by another underlying cultural or institutional factor. For instance, accounting for the norms of bride price, bride service, polygyny, marriage customs within or outside the clan, animal husbandry, plough use, as well as other institutional factors, including settlements patterns, the level of local jurisdictional hierarchy and the degree of political centralization, does not significantly alter the coefficient estimates on matrilineality.

When we control for matrilocality or matrilineal land inheritance systems, the magnitude of the coefficient becomes even larger, although not statistically different from the baseline estimates. It is worth to note that these variables have limited observations, resulting in imprecise parameter estimates. Despite the lack of statistical significance, one possible interpretation is that matrilocality improves the support mothers receive from their families, and as a consequence, they might respond by further reducing their own parental investments in their children.

7 Can Nation-Building Reforms Undo the Influence of Traditional Ethnic Norms? - The Ujamaa Experiment

In 1967, President Julius Nyerere initiated a transformative movement known as Ujamaa in Tanzania –one of the largest policy experiments in post-colonial Africa. This movement was driven by a multifaceted agenda aimed at reshaping the nation's socio-economic and cultural landscape. One of the core objectives of the Ujamaa movement was to steer Tanzania towards self-reliance, reducing its dependence on Western powers.

This shift in economic self-sufficiency was coupled with a broader vision to cultivate a shared national identity that would transcend ethnic divisions (Carlitz et al., 2022).

Central to the Ujamaa initiative was the modernization of rural areas, which encompassed various initiatives. The most prominent of these was the "villagization" experiment, as part of a large-scale resettlement program between 1973 and 1982 in rural parts of Tanzania (Osafo-Kwaako, 2012). This involved the creation of new planned villages designed to consolidate the scattered rural population. These Ujamaa villages were planned to emphasize both community cohesion and economic self-sufficiency. The villages featured a specific layout, with houses arranged in rows around a central complex including a school and a town hall.

In practice, however, villagization encountered resistance from rural communities as families were reluctant to relocate or send their children to school (Kurschner, 1974). Consequently, the government resorted to forcibly moving a significant number of households into these planned villages. This forced villagization was extensive, with up to 90% of rural households being forcibly relocated when farmers resisted voluntary relocation. Ultimately, despite its ambitious goals, the villagization program largely failed to yield the intended results and was eventually repealed in 1982.

Regarding the implications of this dramatic policy experiment for kinship norms, several factors suggest that the reform may have mitigated the influence of these norms. First, one explicit aim of the Ujamaa reform was to supplant ethnic identities with a unified national identity (Carlitz et al., 2022; Kurschner, 1974). Successful implementation of this goal might have eroded ethnic identities (Carlitz et al., 2022), reducing the influence of ethnic norms and thereby narrowing differences between matrilineal and patrilineal ethnic groups. Second, the establishment of primary schools in every village significantly increased access to education (Osafo-Kwaako, 2012; Samoff, 1990), potentially diminishing the role of parents in children's education and narrowing differences among various ethnic groups. Third, Ujamaa's economic institutions had implications for kinship practices. Decision-making shifted from clan-level structures to elected village councils, and allegiance transitioned from kinship ties to the village community, with profit-sharing occurring at the village level (Coulson, 2013). These changes might also have played a role in limiting the influence of kinship norms.

To investigate whether the wholesale Ujamaa villagization policy suppressed the influence of ethnic norms, we digitized data from the 1978 Tanzanian National Census, a comprehensive dataset covering approximately 2,500 wards and over 10,000 villages, with records of more than 100,000 individuals. This allows us to capture villagization intensity as the share of the population residing in a "planned village" at the ward-level as recorded in the 1978 census. Following Osafo-Kwaako (2012), this measure of treatment intensity, denoted as T_w, is calculated as the ratio of the population in planned villages, $P_{w,planned}$, to the total population in each ward, $P_{w,total}$:

$$T_w = \frac{P_{w,planned}}{P_{w,total}}$$

Importantly for our analysis, families were typically relocated over relatively short distances, not exceeding a few kilometers (Coulson, 2013), mitigating the potential concerns about differential targeting of various ethnic groups. To further validate this in our dataset, Figure A.10 demonstrates that matrilineal ethnic groups were not specifically singled out by the villagization program.

To examine whether the villagization policy weakened the influence of traditional norms, we simply interact our variable of interest, matrilineality, with the intensity of villagization in parental investment regressions. Table 7 reveals that there are no statistically significant estimates for the interaction term of matrilineality and villagization intensity, whereas previous negative matrilineal estimates carry over. This suggests that the cultural legacy associated with matrilineal ethnic identities was not effectively undone by the Ujamaa reform, as it did not significantly alter the influence of kinship norms on parental behavior among matrilineal communities.

8 Conclusion

Differences in parental investment play a pivotal role in shaping disparities in children's human capital across families. However, the exact reasons why some parents invest differently than others are still not fully understood. In this paper, we shed some light on this issue by showing that cultural norms, and in particular, matrilineal kinship norms, affect parental investment in education. Our findings reveal that matrilinel parents make substantially lower monetary and non-monetary investments in their children's education, encompassing activities like checking children's homework or discussing their performance with teachers. Subsequently, educational attainment and learning among children from matrilineal groups are significantly reduced. We also investigate the potential mechanisms behind these results. Evidence points toward reduced spousal cooperation, family instability, and labor market conditions as potential contributors to the lower investment observed among matrilineal parents. Lastly, we explore the impact of a nation-building reform designed to counteract traditional ethnic norms. Our analysis uncovers that this policy did not effectively negate the sway of these entrenched norms.

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Figure 1: Matrilineal (left) and patrilineal (right) kinship systems

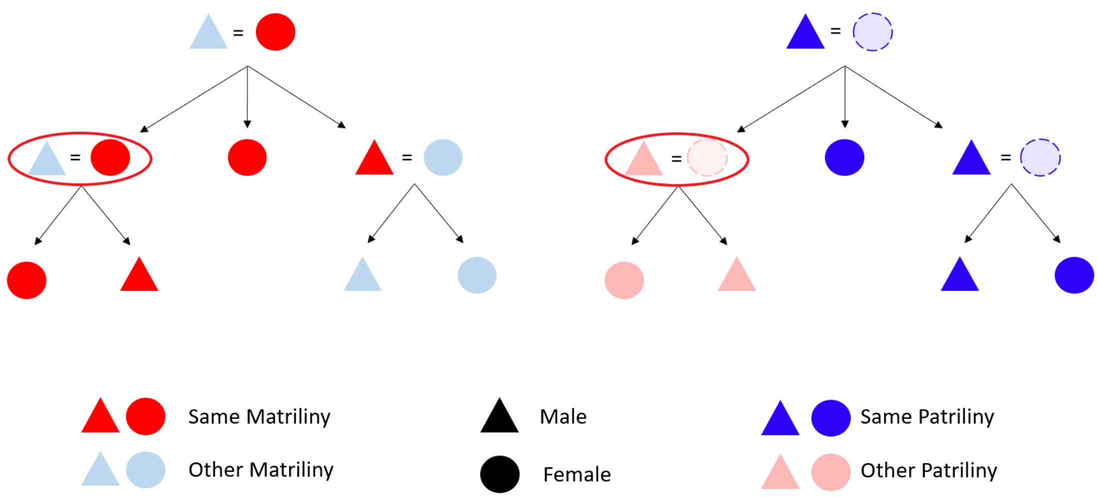


Figure 2: Global distribution of ancestral kinship systems according to the *Ethnographic Atlas*

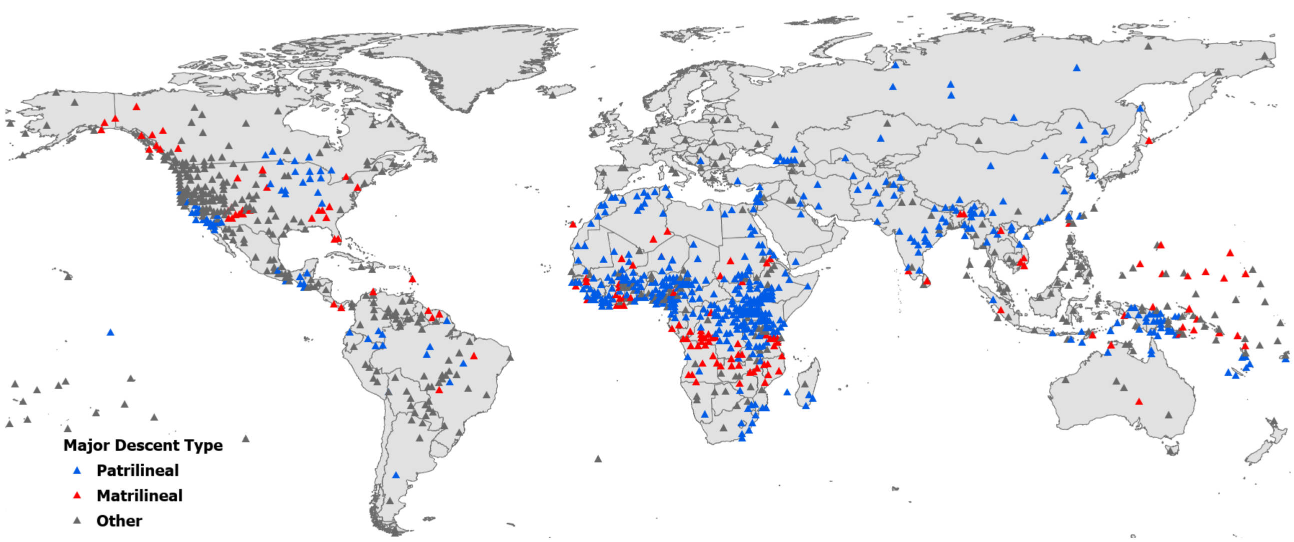
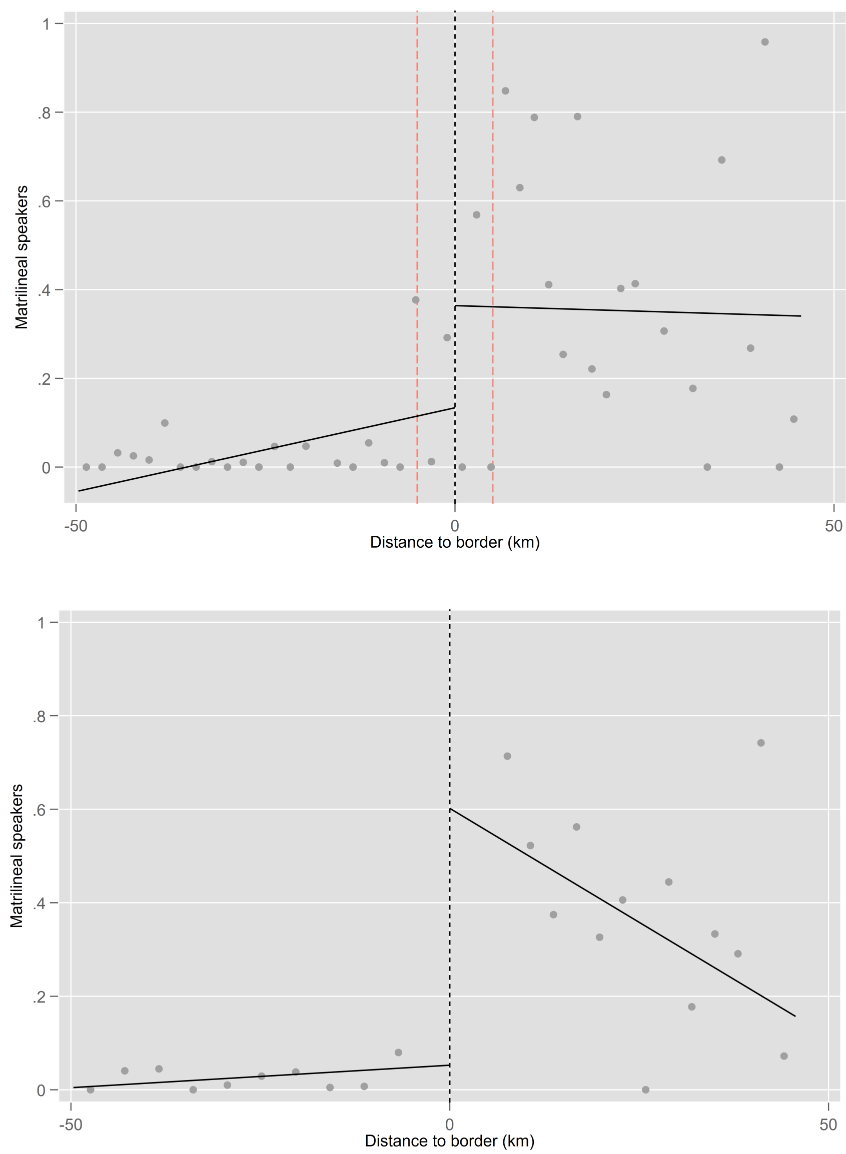
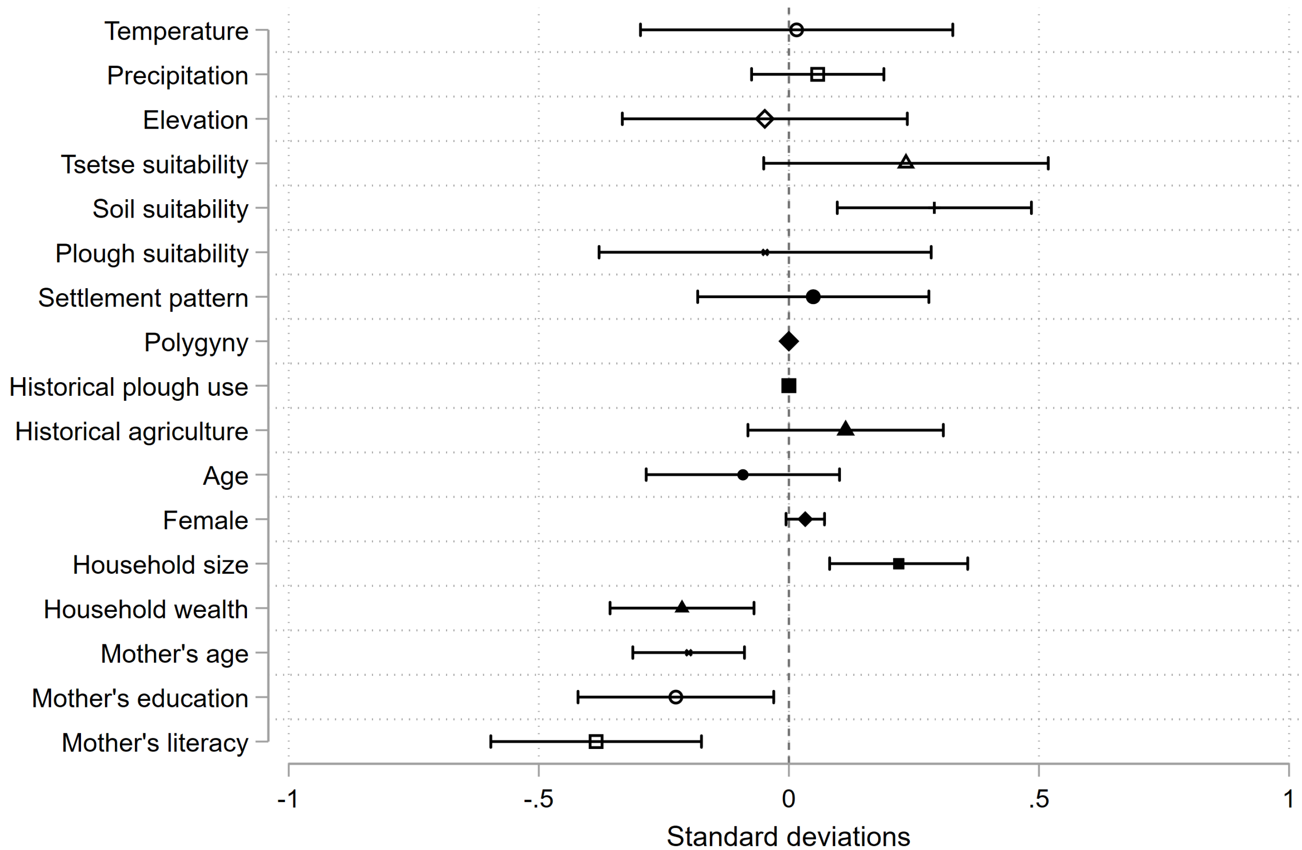


Figure 3: RD plot of matrilineality across the matrilineal border



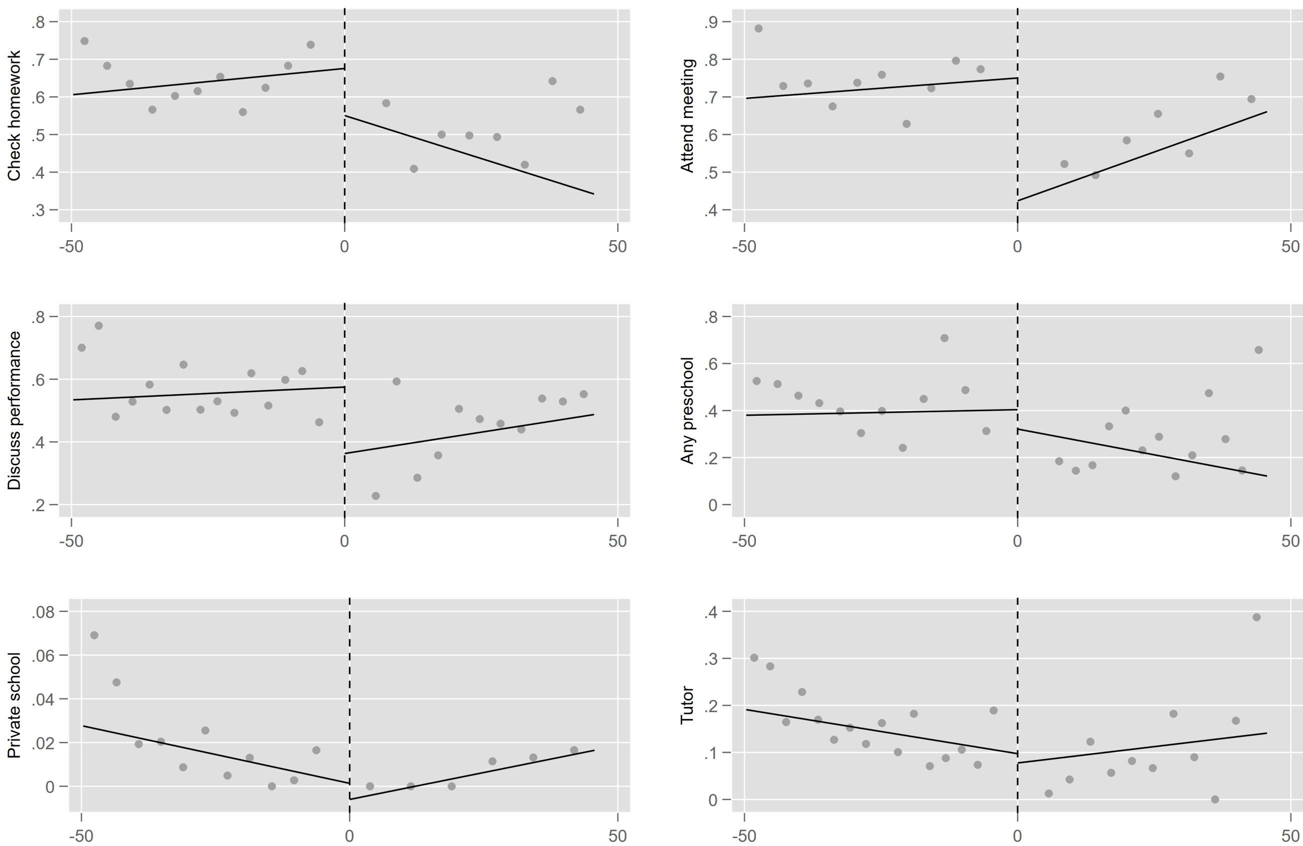
Notes: The top figure shows the shares of matrilineality on each side of the matrilineal belt border together with the dashed red line denoting the region to exclude (5 kms on each side) in donut regressions. The bottom figure shows the shares of matrilineality on each side of the matrilineal belt border after excluding 5 kms on each side.

Figure 4: Balance of covariates



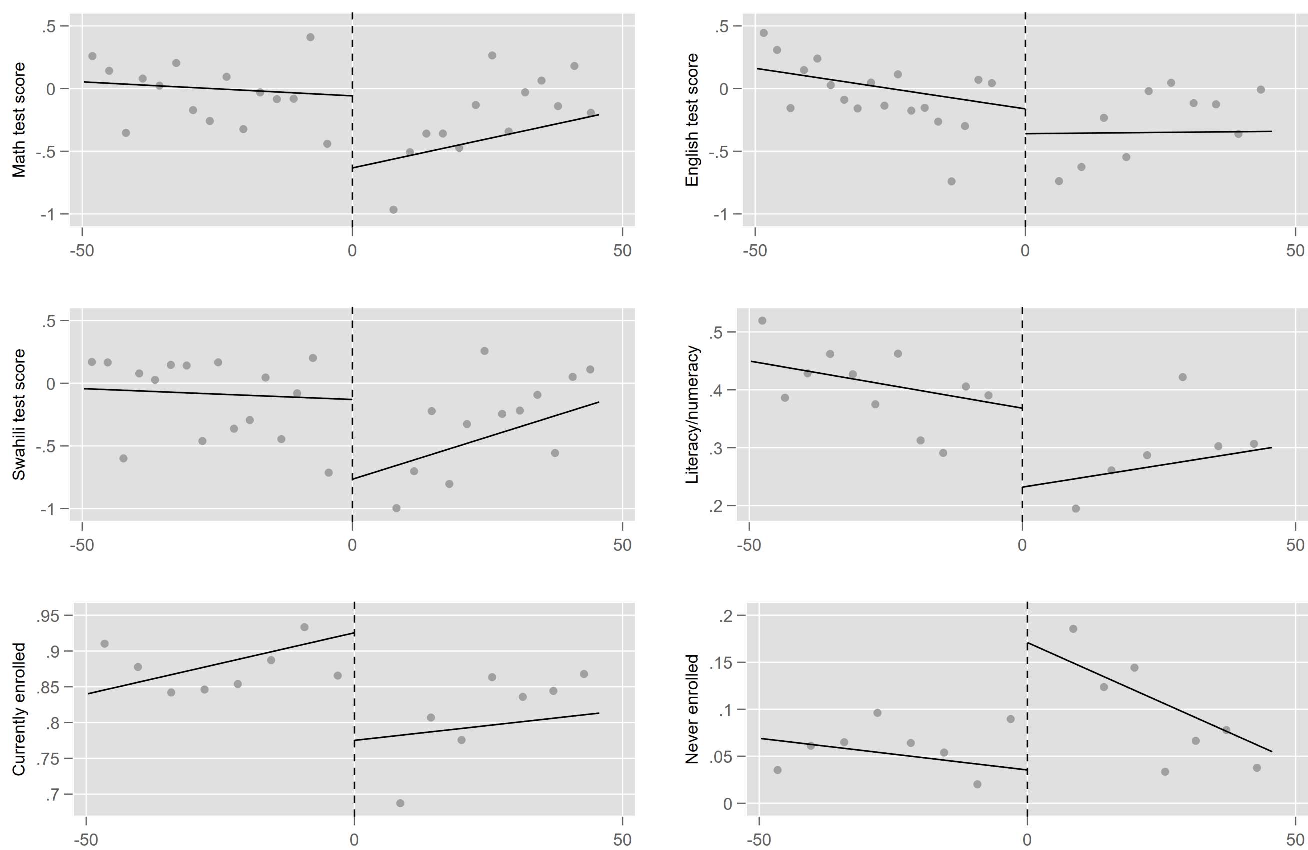
Notes: This figure shows the standardized effects (together with 95% confidence intervals) from regressions of various covariates (vertical axis) on the matrilineal side of the border indicator, conditional on a linear polynomial in latitude and longitude. Standard errors are clustered at the ward level.

Figure 5: Reduced form RD plots for parental investment outcomes



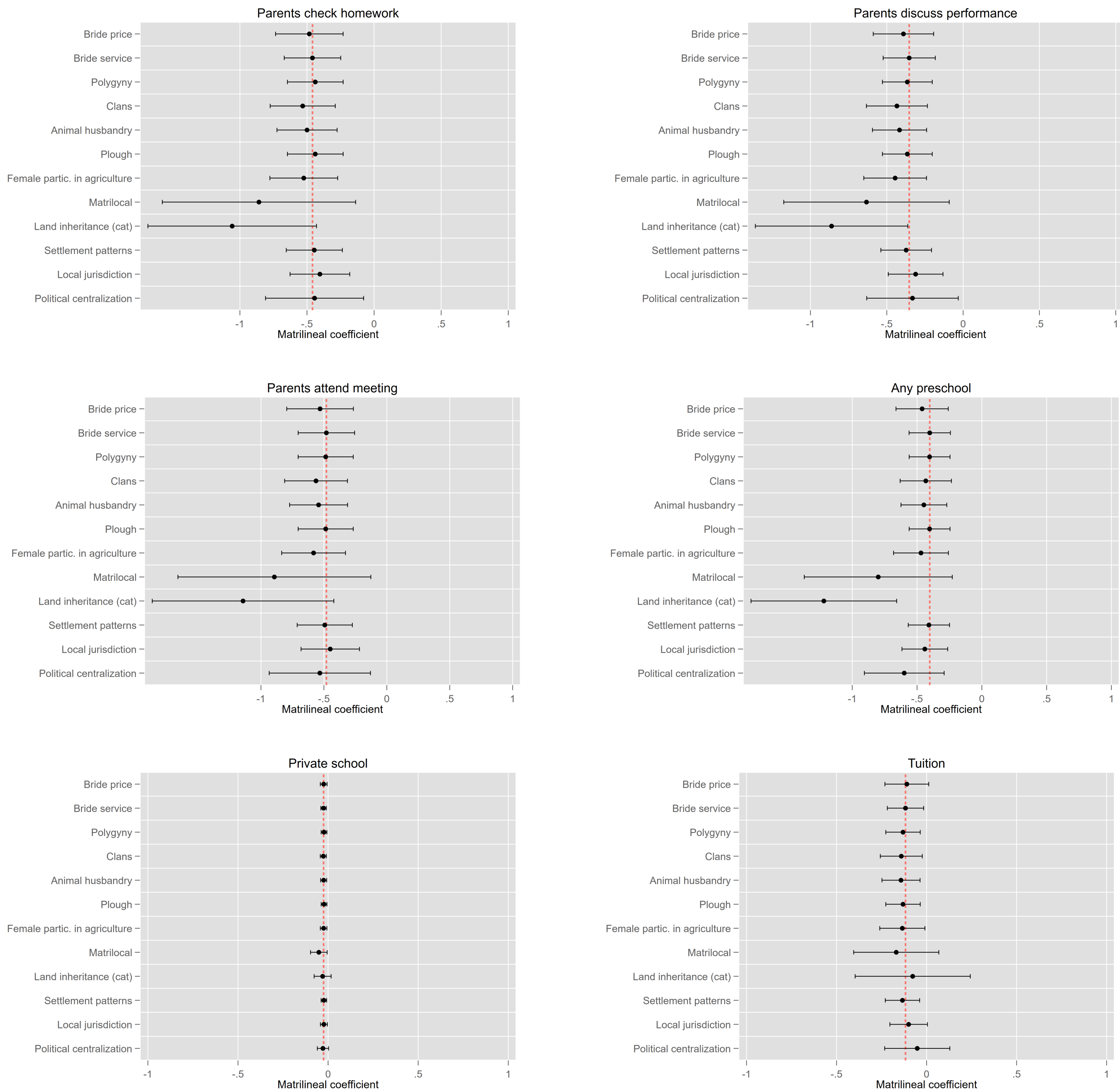
Notes: This figure plots the reduced form effects of being on the matrilineal side of the matrilineal belt border on parental outcomes. 50 km bandwidth with a 5 km donut.

Figure 6: Reduced form RD plots for educational outcomes



Notes: This figure plots the reduced form effects of being on the matrilineal side of the matrilineal belt border on children's educational outcomes. 50 km bandwidth with a 5 km donut.

Figure 7: Alternative cultural and institutional explanations



Notes: This figure shows the estimates of the coefficient of interest on matrilineality (solid circles) (together with 95% confidence intervals) when an alternative cultural or institutional factor is accounted for in the baseline specifications. Vertical axis indicates which variable is controlled for. Red dashed lines are the baseline coefficients on matrilineality in each parental outcome regression in Table 2.

Table 1: Summary statistics

	Full sample		Matrilineal side		Patrilineal side	
	Mean	SD	Mean	SD	Mean	SD
Parental investment in children						
Check homework	0.608	0.49	0.492	0.50	0.662	0.47
Discuss performance	0.546	0.50	0.437	0.50	0.596	0.49
Attend meetings	0.702	0.46	0.589	0.49	0.755	0.43
Preschool	0.371	0.48	0.255	0.44	0.424	0.49
Private school	0.023	0.15	0.007	0.08	0.029	0.17
Tutor	0.164	0.37	0.117	0.32	0.185	0.39
Children's educational outcomes						
Math	–0.075	1.10	–0.289	1.14	0.021	1.07
English	–0.017	1.06	–0.257	1.05	0.094	1.05
Swahili	–0.131	1.10	–0.343	1.15	–0.035	1.06
Literacy/numeracy	0.385	0.49	0.297	0.46	0.425	0.49
Currently enrolled	0.862	0.34	0.809	0.39	0.887	0.32
Never enrolled	0.067	0.25	0.101	0.30	0.051	0.22
Treatment and the instrument						
Matrilineal	0.142	0.35	0.398	0.49	0.024	0.15
Matrilineal side of the border	0.315	0.46	1.000	0.00	0.000	0.00
Baseline controls						
Child's age	11.188	2.81	11.125	2.83	11.217	2.79
Child is female	0.498	0.50	0.505	0.50	0.494	0.50
Household controls						
Household size	6.113	2.64	6.406	3.04	5.979	2.43
Mother's age	37.883	8.95	37.134	8.60	38.227	9.09
Mother's education	0.745	0.52	0.733	0.51	0.751	0.53
Mother is literate	0.694	0.46	0.629	0.48	0.727	0.45
Household wealth	–0.468	1.77	–0.749	1.46	–0.339	1.88
Geographic controls						
Mean temperature	21.301	2.17	21.960	1.80	20.994	2.26
Mean precipitation	871.722	277.38	1020.163	317.63	802.568	225.28
Tsetse fly suitability	12.338	1.22	12.766	0.63	12.138	1.36
Soil suitability	0.863	0.13	0.910	0.10	0.841	0.14
Mean elevation	1058.913	448.59	908.146	373.18	1130.478	463.43
Plough suitability	3930.015	2090.49	3422.052	1829.70	4166.660	2161.25
Ethnic controls						
Dependence on agriculture	5.779	0.96	5.846	1.27	5.748	0.77
Settlement patterns	6.466	1.12	6.493	1.27	6.453	1.05
Plough use	0.000	0.00	0.000	0.00	0.000	0.00
Polygyny	1.000	0.00	1.000	0.00	1.000	0.00
Year of obs. in the EA	1919.562	13.55	1916.510	16.78	1920.965	11.50
Observations	6,934		2,184		4,750	

Notes: Summary statistics.

Table 2: Matrilineality and parental investment in children's education

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.459***	–0.353***	–0.480***	–0.402***	–0.025***	–0.117**
	(0.107)	(0.087)	(0.115)	(0.081)	(0.008)	(0.051)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	53.53	54.41	53.60	56.24	48.65	56.24

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table 3: Matrilineality and children's educational outcomes

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.961***	–0.822***	–0.940***	–0.312***	–0.225***	0.150***
	(0.291)	(0.231)	(0.269)	(0.088)	(0.047)	(0.036)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	58.08	58.44	62.76	58.60	56.24	56.24

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table 4: Parental cooperation and conflict: Husbands' control issues over their wives

	Total no. control issues	Accuses woman of cheating	Tries to limit contact with family	Insists on knowing where she is	Jealous if talks to other men	Does not permit her to meet friends	Does not trust her with money
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: 100 km bandwidth						
Matrilineal	0.358**	0.098***	0.051**	0.085*	0.080*	0.032	–0.002
	(0.139)	(0.035)	(0.022)	(0.050)	(0.048)	(0.034)	(0.032)
Observations	1,146	1,143	1,145	1,145	1,143	1,146	506
	Panel B: 50 km bandwidth						
Matrilineal	0.294*	0.085**	0.046*	0.063	0.069	0.025	–0.003
	(0.154)	(0.039)	(0.026)	(0.056)	(0.056)	(0.043)	(0.035)
Observations	719	716	718	718	716	719	260

Notes: Sharp RD estimates, where matrilineality is captured by an indicator for the matrilineal side of the matrilineal belt border. All specifications employ a sharp RD design and include a local polynomial in latitude and longitude. Included baseline controls: age and survey year FE. Standard errors are clustered at the DHS cluster level.

Table 5: Parental cooperation and conflict: Promiscuity and disagreements

	Infidelity	No. extramarital partners	Divorced	Husband wants fewer children	Husband does not want more children	Decide earnings together
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: 100 km bandwidth			
Matrilineal	0.038*	0.073**	0.018	0.051*	0.110	–0.082
	(0.022)	(0.033)	(0.011)	(0.027)	(0.077)	(0.074)
Observations	5,330	5,330	3,078	836	229	206
			Panel B: 50 km bandwidth			
Matrilineal	0.022	0.046	0.016	0.053*	0.158*	–0.031
	(0.028)	(0.040)	(0.013)	(0.030)	(0.081)	(0.075)
Observations	2,882	2,882	1,748	533	138	129

Notes: Sharp RD estimates, where matrilineality is captured by an indicator for the matrilineal side of the matrilineal belt border. Specifications 1-3 use data from six AIS and three DHS surveys covering the period 1999-2015, while data for specifications 4-6 is only available from the DHS surveys and are split by gender. *Infidelity* is a dummy that is equal to 1 if there is a positive number of extramarital partners, otherwise 0. *Husband wants fewer children* is a dummy equal to 1 if the woman reports that her husband wants fewer children than her. *Husband does not want more children* and *Decide earnings together* are based on the men-only survey. All specifications employ a sharp RD design and include a local polynomial in latitude and longitude. Included baseline controls: age, gender, and survey year FE. Standard errors are clustered at the AIS/DHS cluster level.

Table 6: Labor market

	Labor market outcomes					Farming and land ownership	
	Mother's literacy (Uwezo)	Women's literacy (DHS)	Women's years of schooling (DHS)	Female HH is working (Uwezo)	Woman is working (DHS)	HH is farmer (Uwezo)	Woman owns land alone (DHS)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: 100 km bandwidth						
Matrilineal	–0.187***	–0.103*	–1.114***	0.050	0.064	0.204***	0.012
	(0.040)	(0.056)	(0.419)	(0.054)	(0.039)	(0.055)	(0.034)
Observations	9,176	1,864	1,985	2,970	1,980	10,677	1,756
	Panel B: 50 km bandwidth						
Matrilineal	–0.171***	–0.092	–0.815	0.051	0.081*	0.203***	0.012
	(0.046)	(0.073)	(0.506)	(0.064)	(0.048)	(0.060)	(0.040)
Observations	5,288	1,101	1,168	1,833	1,165	6,328	1,089

Notes: Sharp RD estimates, where matrilineality is captured by an indicator for the matrilineal side of the matrilineal belt border. All specifications employ a sharp RD design and include a local polynomial in latitude and longitude. Included baseline controls: age and survey year FE. Standard errors are clustered at the ward level for the Uwezo sample and at the DHS cluster level for the DHS sample.

Table 7: Did Villagization Policy Undo the Influence of Traditional Ethnic Norms?

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.164*	–0.291***	–0.213**	–0.319**	–0.029*	–0.084
	(0.087)	(0.059)	(0.087)	(0.126)	(0.017)	(0.085)
Matrilineal × Villagization	–0.072	0.128	–0.028	0.140	0.019	0.025
	(0.101)	(0.080)	(0.110)	(0.140)	(0.019)	(0.096)
Villagization	–0.095*	–0.278***	–0.118	0.013	–0.024	–0.088
	(0.054)	(0.055)	(0.078)	(0.118)	(0.016)	(0.054)
Observations	6,613	6,721	6,548	6,929	5,010	6,929

Notes: All specifications use a sharp RD design, 50km bandwidth and include a local polynomial in latitude and longitude. Baseline controls include gender, age dummies, interaction of gender and age dummies. Standard errors are clustered at the ward level.

Online Appendix for
Traditional Norms and Parental Investment in Human Capital

A Data Appendix

A.1 Variable Definitions and Sources

A.1.1 Treatment

Matrilineal: An individual is considered treated if she reports speaking a matrilineal language at home. See Section A.2 for details on matching of matrilineal ethnicities to reported languages spoken at home.

Matrilineal side: A ward is defined as matrilineal if it is located on the matrilineal side of the border that historically separated patrilineal and matrilineal ethnicities (so-called matrilineal belt). We use this variable to instrument for *Matrilineal* treatment. See Section A.3 for details on how the matrilineal border was constructed.

Longitude and Latitude: We use the longitude and latitude coordinates of the centroid of each ward as our main forcing variable. Wards with a centroid coordinate on the matrilineal side (southeast) of the border are defined as matrilineal wards.

Distance to border: We use distance to the border (in kms) as our alternative forcing variable. We compute distance using the "Near tool" in ArcGIS which computes the shortest euclidean distance between each ward's centroid coordinate and the matrilineal border. Distances between matrilineal (non-matrilineal) wards and the border are assigned a positive (negative) sign.

A.1.2 Outcome variables

Our outcome variables come from the Uwezo 2013 survey and we categorize these as *parental investment* and *children's education outcomes.*

Parental Investment in Human Capital

Check homework: A dummy variable indicating whether the parent checks their children's homework or not.

Discuss performance: A dummy variable indicating whether the parent discusses performance with their children's teacher or not.

Attend meetings: A dummy variable indicating whether the parent regularly attends parents' meetings in school or not.

Preschool: A dummy variable indicating whether the child attended preschool for a duration of at least 1 year.
Private school: A dummy variable indicating whether the child is currently enrolled in a private school or not.
Tutor: A dummy variable indicating whether the child receives extra classes or tutoring sessions after school.

Education Outcomes of Children

Math: An age-standardized math score based on a proficiency test in mathematics provided by Uwezo, with mean zero and standard deviation one. The proficiency test covers seven levels of increasing levels of proficiency, from no mathematics skills up to multiplication.
English: An age-standardized English score based on an proficiency test in English provided by Uwezo, with mean zero and standard deviation one. The proficiency test covers five levels of increasing levels of proficiency, from no proficiency up to being able to read and understand a full story.
Swahili: An age-standardized Swahili score based on an proficiency test in Swahili provided by Uwezo, with mean zero and standard deviation one. The proficiency test covers five levels of increasing levels of proficiency, from no proficiency up to being able to read and understand a full story.
Literacy/numeracy: A dummy variable indicating whether the child has attained second grade levels in literacy and numeracy, based on the proficiency in math, English and Swahili.
Currently enrolled: A dummy variable indicating whether the child is currently enrolled in school.
Never enrolled: A dummy variable indicating whether the child has never been enrolled in school. This excludes those who have dropped out of school.

A.1.3 Household characteristics

Household size: The reported number of persons living in the same household as the child.
Mother's education: Categorical variable indicating the mother's level of education, reported either as: no education, primary education, secondary education or post-secondary education.
Mother's literacy: A dummy variable indicating whether or not the mother is literate, based on her ability to read a second grade story.
Household wealth: We use an index of household wealth as a proxy for socio-economic status. We follow Schady et al. (2015) and construct this index based on the first principle component using the following dwelling characteristics and assets: *type of wall at home*, *type of lighting at home*, *number of books in household*, *direct access to clean water*, *has a toilet*, *has access to electricity*,

owns a TV, *owns a radio*, *owns a computer*, *owns a phone*, *owns a car*, *owns a bicycle*, *owns a motorbike*, *owns a cart*, *owns sheep or goats*, *owns a donkey*, *owns a camel* and *owns cattle*. The index is normalized such that it has mean zero and standard deviation one.

A.1.4 Ethnographic and historical characteristics

Major descent type: Similar to previous work on kinship norms (Lowes, 2022; Loper, 2019; Tene, 2021), we use variable *v43: Major descent type* of the Ethnographic Atlas to assign kinship norms. This variable is derived from variables *v17*, *v19* and *v21* in the Ethnographic Atlas.

Dependence on agriculture: A categorical variable with ten different levels indicating the historical level of dependence on agriculture, from 0-5 % to 86-100 % dependence on agriculture for subsistence. From variable *v5* in the Ethnographic Atlas.

Settlement patterns: A categorical variable with eight different levels indicating the type of settlement pattern historically practiced by each ethnicity in increasing complexity, from "fully migratory or nomadic" to "complex settlements of nucleated villages or towns". From variable *v30* in the Ethnographic Atlas.

Year of observation: A categorical variable indicating which decade the original ethnographic information for the Ethnographic Atlas was first recorded.

A.1.5 Geographic characteristics

Mean temperature: The average annual temperature at the ward-level over the period 1970-2000 based on data from the Global Climate Database by Fick and Hijmans (2017), available at http://www.worldclim.org/.

Mean precipitation: The average annual precipitation at the ward-level over the period 1970-2000 based on data from the Global Climate Database by Fick and Hijmans (2017), available at http://www.worldclim.org/.

Mean Tsetse suitability: We calculate the mean Tsetse suitability index aggregated at the ward level using the same methodology as Alsan (2015). Relative humidity and saturation deficit, which are components of this index, are computed using data from the Global Climate Database by Fick and Hijmans (2017), available at http://www.worldclim.org/.

Mean soil suitability: A land quality index aggregated at the ward-level and based on two components of soil quality: soil carbon density and soil alkalinity. Michalopoulos (2012) provides a detailed description on the functional forms that underlie this index, based on the original methodology by Ramankutty et al. (2002). We use data on soil carbon and soil pH values from the Atlas of the Biosphere, available at http://www.sage.wisc.edu/iamdata/, to compute this index.

Mean elevation: The mean elevation at the ward-level based on data from the Global Climate

Database by Fick and Hijmans (2017), available at http://www.worldclim.org/.

Mean plough suitability: We follow Lowes (2022) and define plough suitability as the sum of the FAO crop suitability for wheat, barley and rye, available at https://gaez.fao.org/pages/data-access-download, and aggregate this at the ward-level.

A.2 Matching ethnicity in the Ethnographic Atlas to home language in Uwezo

Our treatment is speaking a language at home associated with an ethnicity that practices matrilineal descent. Table X below shows the ethnicities of Tanzania according to the Ethnographic Atlas and the associated descent type for each ethnicity.

(table with tribes in Tanzania and their descent type?)

We match this to Uwezo using the language bridge by Giuliano and Nunn. and ... . Table X below presents an overview of tribes in Tanzania by descent system and languages associated with each tribe:

(table X here)

Table Y below presents an overview of identified matrilineal languages in the Uwezo 2013 wave with more than 5 recorded observations and the corresponding matrilineal ethnicity in the Ethnographic Atlas. Also add if part of "border sample" and if descent type validated by additional source and which? (ethnographic survey of Africa):

(table Y here)

A.3 The matrilineal border as a RD threshold

A.3.1 The matrilineal border

How we construct the matrilineal border, use Murdock's map with kinship system from Lowes

Figure A.1: Distribution of matrilineal and patrilineal ethnicities in Africa, according to Murdock's Map

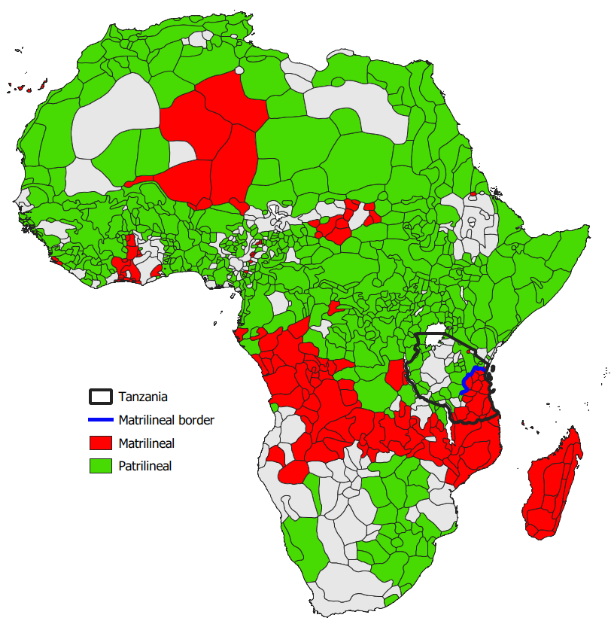
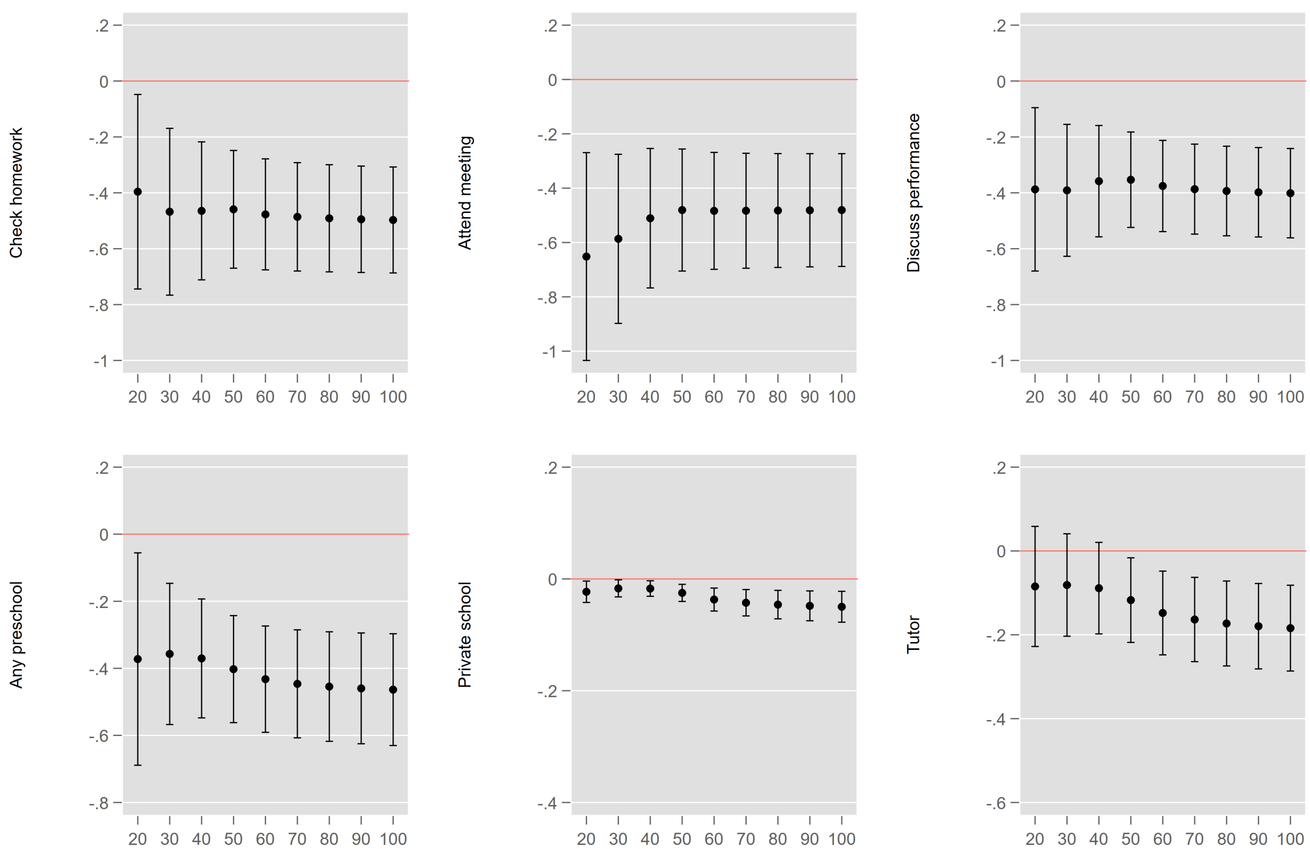
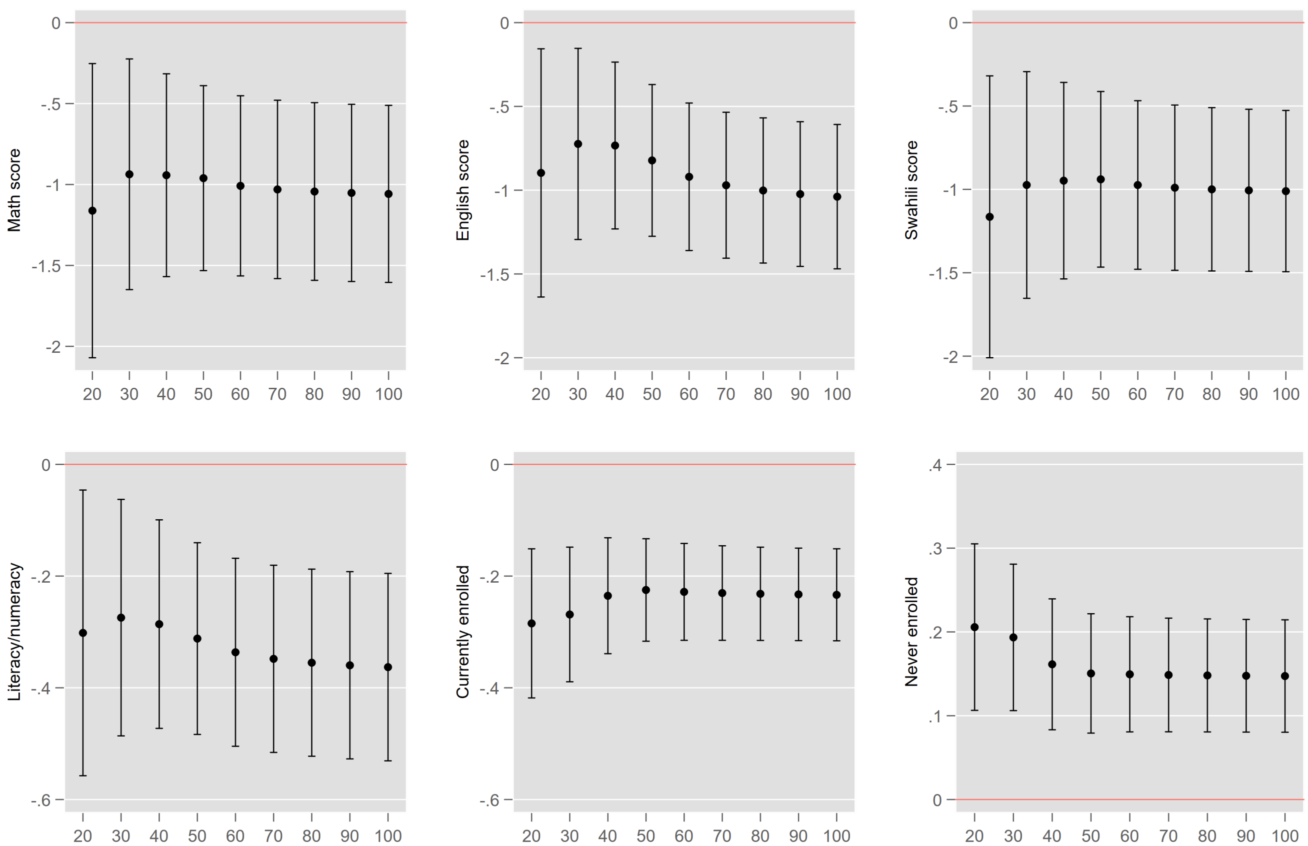


Figure A.2: Bandwidth sensitivity of parental investment outcomes



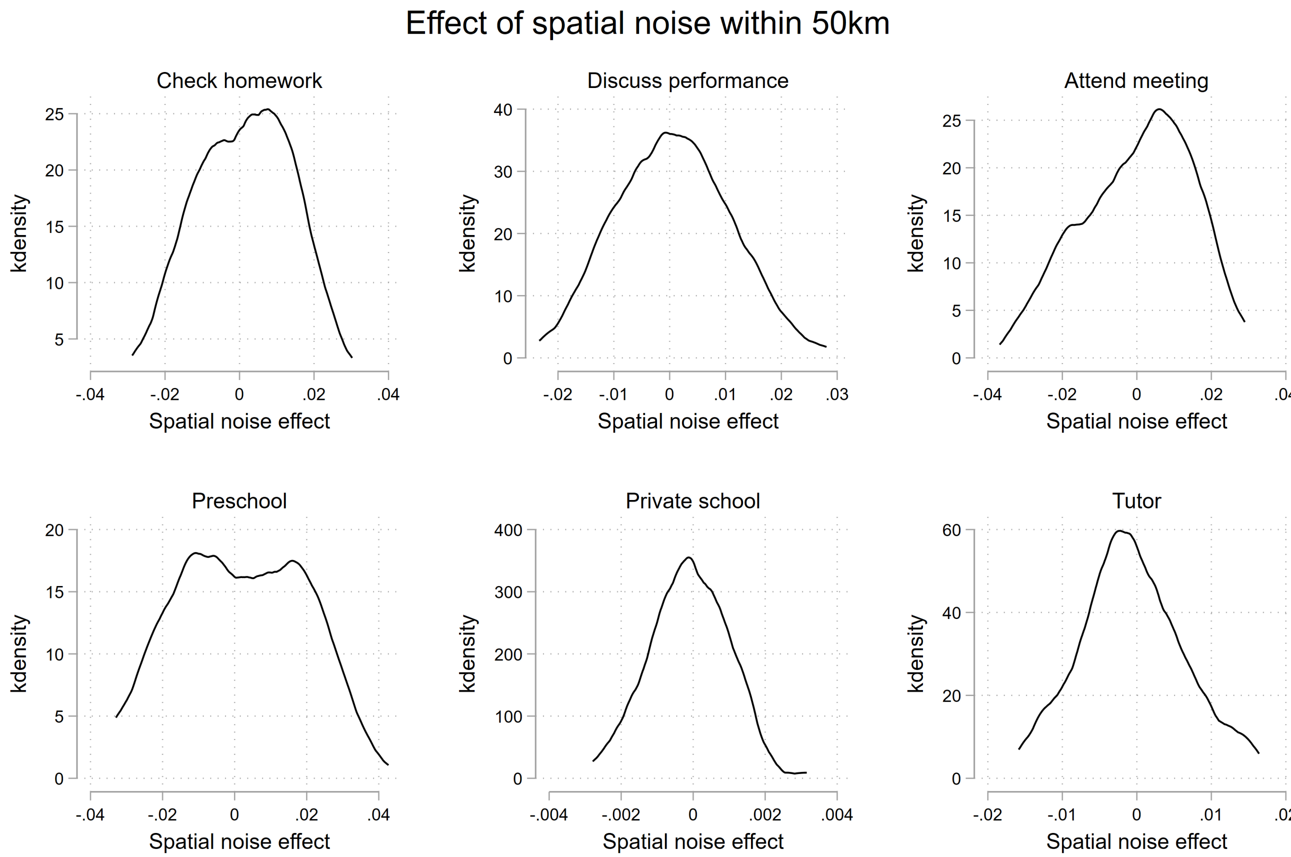
Notes: Various bandwidths at 10-km intervals with a 5-km donut.

Figure A.3: Bandwidth sensitivity of educational outcomes



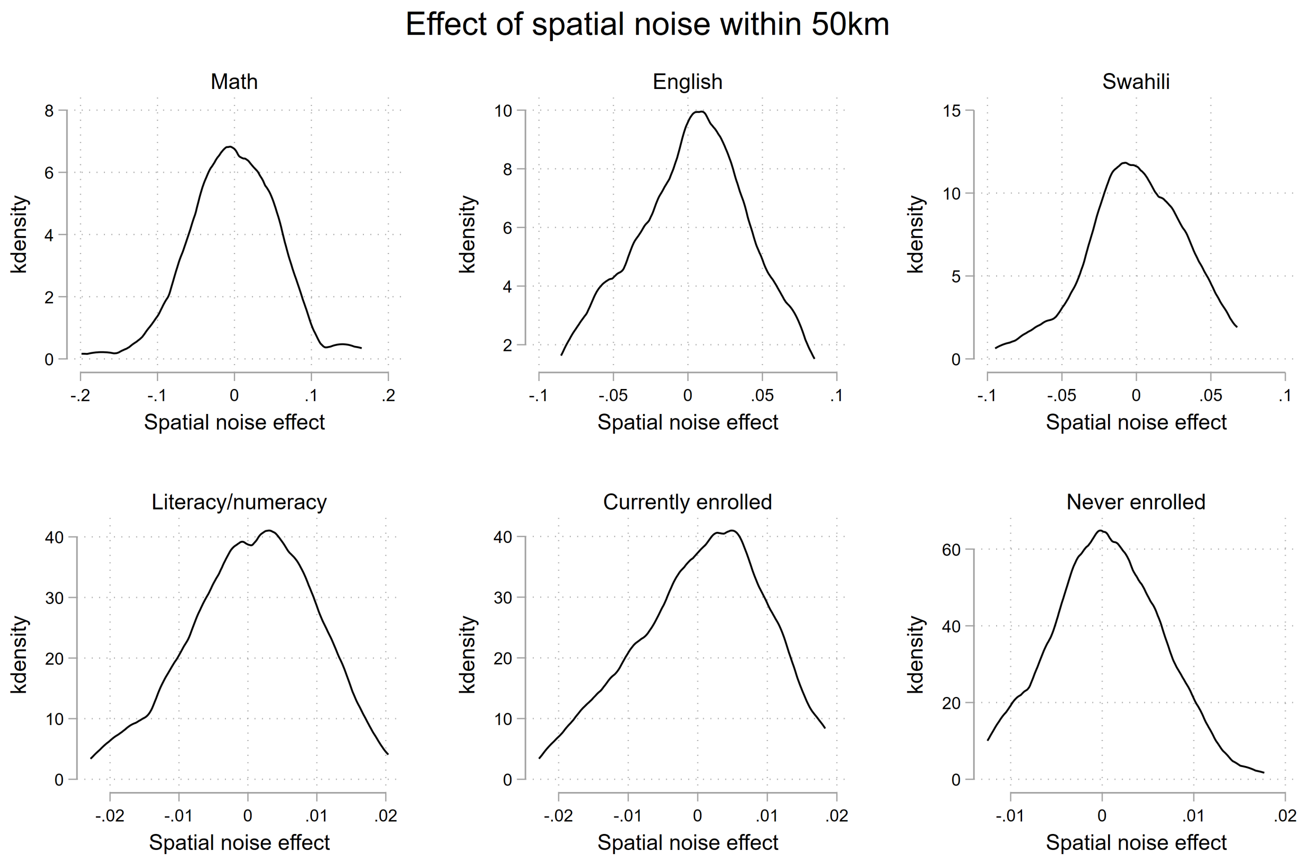
Notes: Various bandwidths at 10-km intervals with a 5-km donut.

Figure A.4: Distribution of spatially correlated noise effects on parental investment outcomes over 1000 simulations



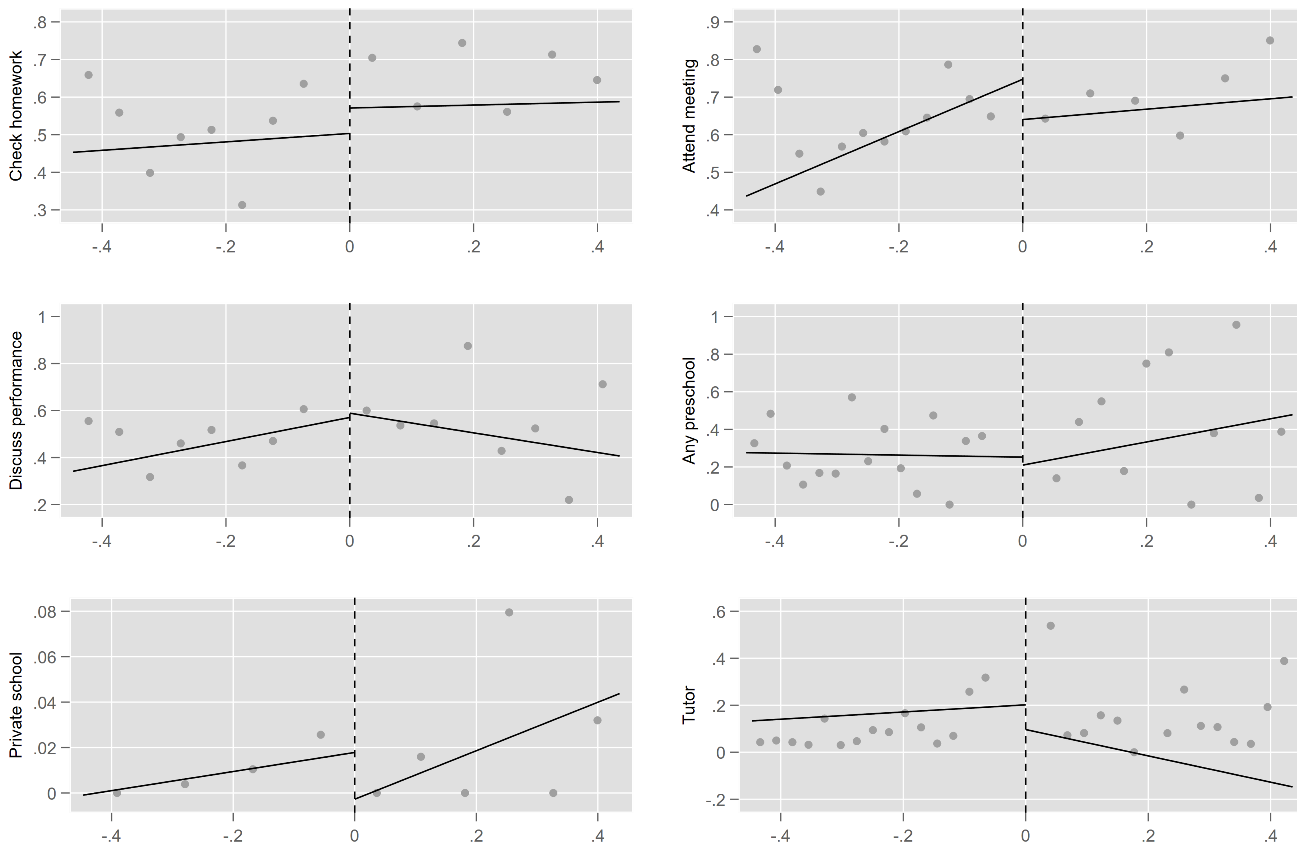
Notes: This figure shows the distribution of the standardized effect of spatially correlated noise on six parental investment outcomes from 1000 simulations. We use a specification and sample similar to our baseline (a regression of each outcome on spatial noise, controlling for individual characteristics and a linear polynomial in coordinates) and replace the treatment variable with artificially generated spatial noise. Spatial noise of a given ward i is correlated with the noise in all other wards within a range of 50 km, where the weights of wards are inversely related to the distance from ward i. The standardized treatment coefficients of all our baseline specifications lie outside (below) the simulated distribution. For example, the standardized coefficient for *Check homework* is -0.165, which is far below the lower tail of the spatial noise distribution.

Figure A.5: Distribution of spatially correlated noise effects on children's educational outcomes over 1000 simulations



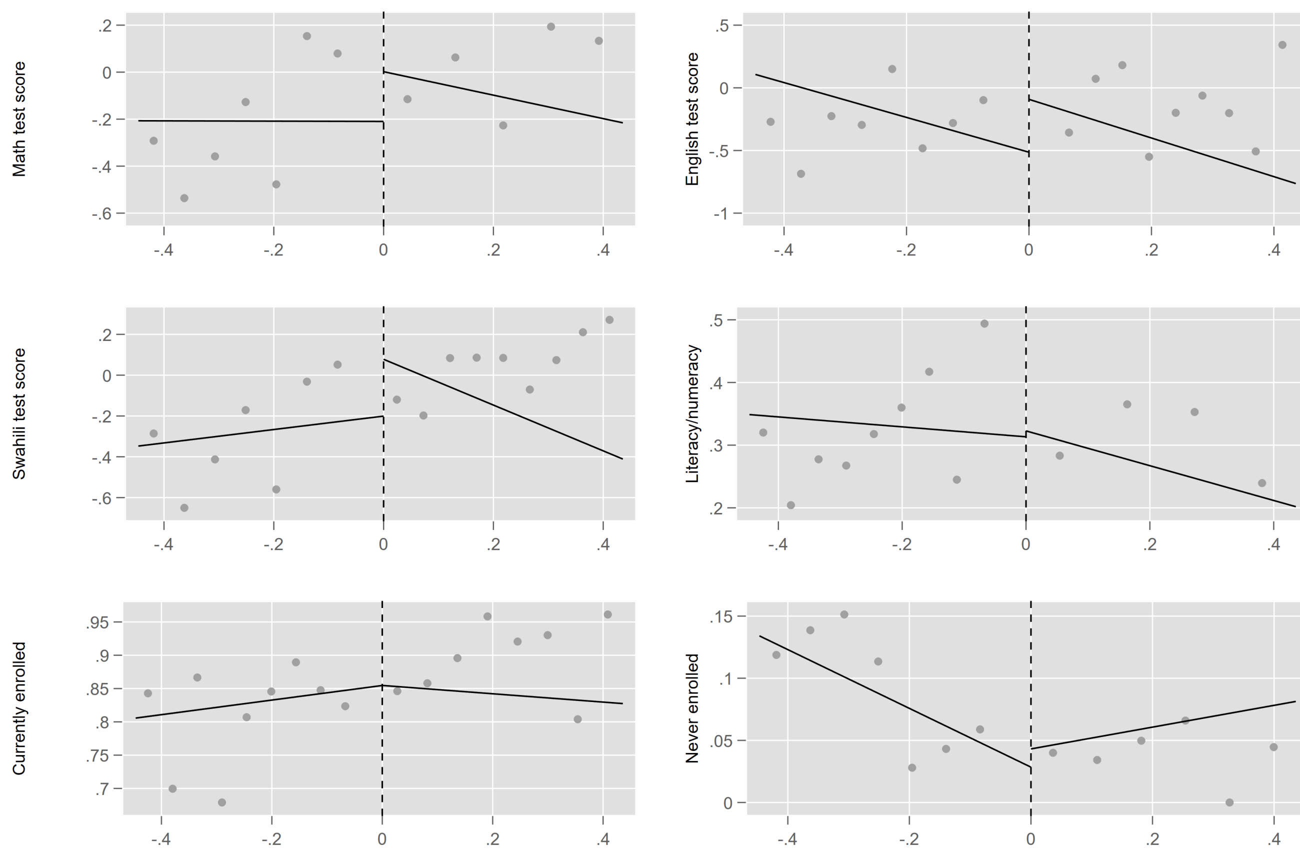
Notes: This figure shows the distribution of the standardized effect of spatially correlated noise on six children's educational outcomes from 1000 simulations. We use a specification and sample similar to our baseline (a regression of each outcome on spatial noise, controlling for individual characteristics and a linear polynomial in coordinates) and replace the treatment variable with artificially generated spatial noise. Spatial noise of a given ward i is correlated with the noise in all other wards within a range of 50 km, where the weights of wards are inversely related to the distance from ward i. The standardized treatment coefficients of all our baseline specifications lie mostly outside the simulated distribution (above for *Never enrolled* and below for the rest). For example, the standardized coefficients for *Math* and *English* are -0.168 and -0.145 respectively, and hence below or at the extreme end of the spatial noise distribution.

Figure A.6: Reduced form RD plots for parental investment outcomes – Placebo treatment with a southeastern border



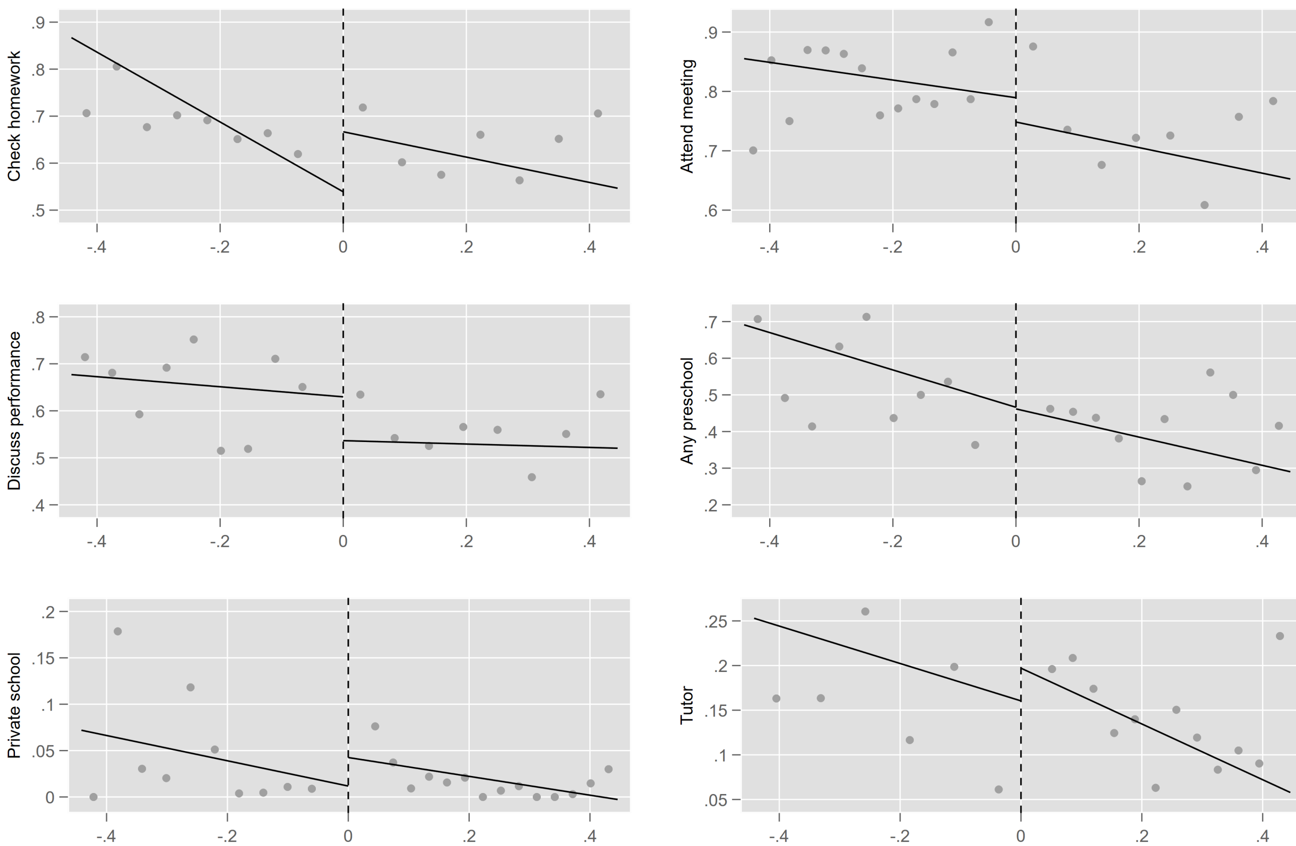
Notes: 50 km bandwidth with a 5 km donut.

Figure A.7: Reduced form RD plots for educational outcomes – Placebo treatment with a south-eastern border



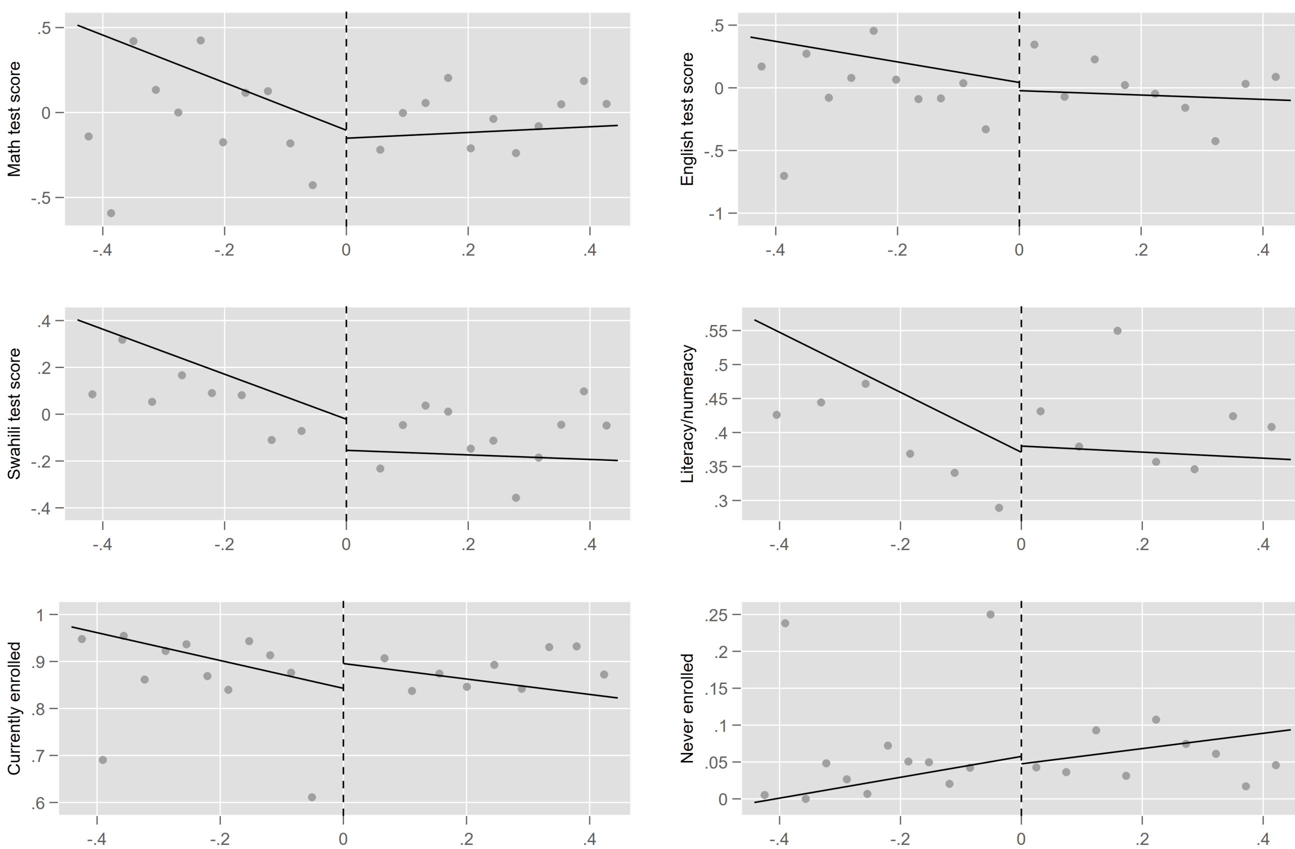
Notes: 50 km bandwidth with a 5 km donut.

Figure A.8: Reduced form RD plots for parental investment outcomes – Placebo treatment with a northwestern border



Notes: 50 km bandwidth with a 5 km donut.

Figure A.9: Reduced form RD plots for educational outcomes – Placebo treatment with a north-western border



Notes: 50 km bandwidth with a 5 km donut.

Figure A.10: No Correlation between Villagization and Matrilineality

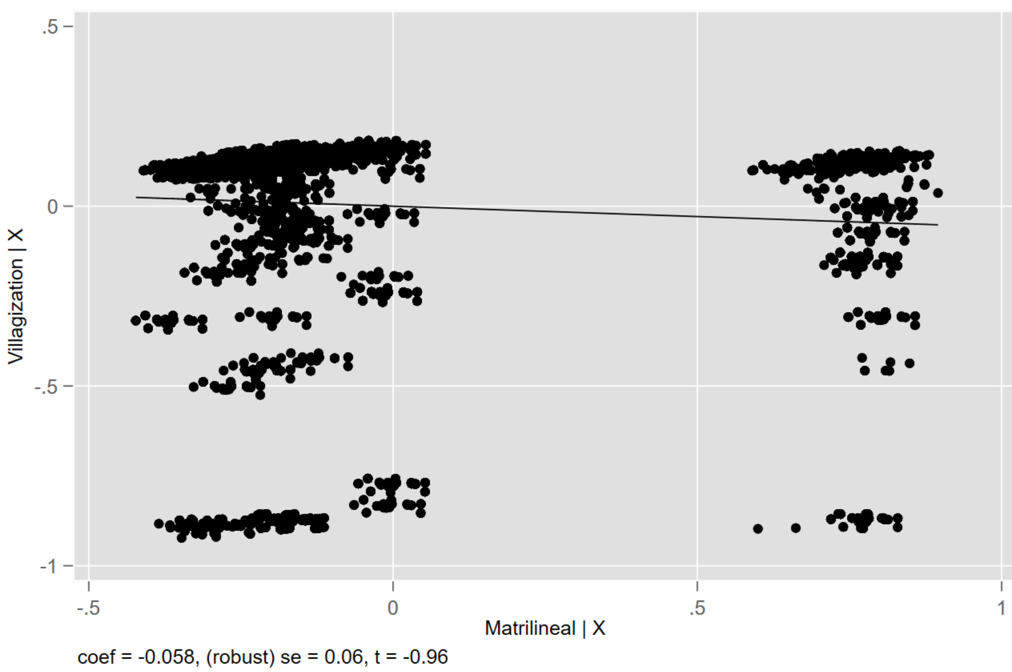


Table A.1: Matrilineality and parental investment in children's education – Baseline OLS, Reduced form, and First stage regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: OLS					
	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
Matrilineal	–0.138***	–0.127***	–0.133***	–0.153***	–0.010***	–0.079***
	(0.043)	(0.035)	(0.045)	(0.046)	(0.003)	(0.020)
	Panel B: Reduced form					
	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
Matrilineal side	–0.224***	–0.174***	–0.234***	–0.200***	–0.012***	–0.058**
	(0.040)	(0.035)	(0.042)	(0.038)	(0.003)	(0.028)
	Panel C: First stage					
	Matrilineal	Matrilineal	Matrilineal	Matrilineal	Matrilineal	Matrilineal
Matrilineal side	0.488***	0.492***	0.487***	0.497***	0.462***	0.497***
	(0.067)	(0.067)	(0.067)	(0.066)	(0.066)	(0.066)
Observations	6,618	6,726	6,553	6,934	5,015	6,934

Notes: Panel A reports OLS regressions of parental investment outcomes on matrilineality. Panel B reports reduced form regressions of parental investment outcomes on the indicator of matrilineal side of the border. Panel C reports first stage regressions of matrilineality on the indicator of matrilineal side of the border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.2: Matrilineality and children's educational outcomes – Baseline OLS, Reduced form, and First stage regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: OLS					
	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
Matrilineal	–0.296*	–0.486***	–0.353**	–0.114***	–0.110***	0.053**
	(0.168)	(0.130)	(0.153)	(0.043)	(0.035)	(0.026)
	Panel B: Reduced form					
	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
Matrilineal side	–0.481***	–0.409***	–0.479***	–0.156***	–0.112***	0.075***
	(0.136)	(0.125)	(0.129)	(0.041)	(0.027)	(0.018)
	Panel C: First stage					
	Matrilineal	Matrilineal	Matrilineal	Matrilineal	Matrilineal	Matrilineal
Matrilineal side	0.501***	0.498***	0.509***	0.502***	0.497***	0.497***
	(0.066)	(0.065)	(0.064)	(0.066)	(0.066)	(0.066)
Observations	5,919	5,931	5,834	6,164	6,934	6,934

Notes: Panel A reports OLS regressions of children's educational outcomes on matrilineality. Panel B reports reduced form regressions of children's educational outcomes on the indicator of matrilineal side of the border. Panel C reports first stage regressions of matrilineality on the indicator of matrilineal side of the border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.3: Matrilineality and parental investment in children's education – Robustness to including the 5-km donut region around the border in the sample

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.435***	–0.358***	–0.396***	–0.352***	–0.038***	–0.159**
	(0.115)	(0.099)	(0.126)	(0.093)	(0.012)	(0.064)
Observations	7,621	7,776	7,545	8,013	5,840	8,013
First-stage F	30.47	30.48	30.25	31.04	24.61	31.04

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.4: Matrilineality and children's educational outcomes – Robustness to including the 5-km donut region around the border in the sample

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–1.126***	–1.042***	–1.046***	–0.371***	–0.223***	0.158***
	(0.333)	(0.272)	(0.318)	(0.101)	(0.052)	(0.041)
Observations	6,851	6,832	6,750	7,124	8,013	8,013
First-stage F	30.38	32.36	32.25	31.02	31.04	31.04

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.5: Matrilineality and parental investment in children's education – Robustness to additional controls

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tuition
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Baseline + household controls					
Matrilineal	–0.410***	–0.294***	–0.445***	–0.401***	–0.024***	–0.062
	(0.107)	(0.088)	(0.115)	(0.086)	(0.008)	(0.055)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	51.84	52.94	51.90	54.24	46.23	54.24
	Panel B: Baseline + geographic controls					
Matrilineal	–0.394***	–0.292***	–0.450***	–0.314***	–0.028***	–0.068
	(0.099)	(0.091)	(0.110)	(0.095)	(0.010)	(0.064)
Observations	6,475	6,584	6,413	6,785	4,897	6,785
First-stage F	48.35	48.97	48.71	51.38	42.96	51.38
	Panel C: Baseline + household + geographic controls					
Matrilineal	–0.345***	–0.226**	–0.415***	–0.321***	–0.026**	–0.008
	(0.100)	(0.090)	(0.110)	(0.096)	(0.011)	(0.064)
Observations	6,475	6,584	6,413	6,785	4,897	6,785
First-stage F	47.32	48.11	47.66	50.26	41.31	50.26
	Panel D: Baseline + ethnic controls					
Matrilineal	–0.525***	–0.432***	–0.592***	–0.548***	–0.034**	–0.132**
	(0.164)	(0.133)	(0.184)	(0.132)	(0.015)	(0.067)
Observations	5,990	6,086	5,934	6,278	4,600	6,278
First-stage F	26.24	26.41	25.79	26.92	24.91	26.92
	Panel E: Baseline + household + geographic + ethnic controls					
Matrilineal	–0.364**	–0.249**	–0.489***	–0.445***	–0.037**	–0.002
	(0.146)	(0.124)	(0.169)	(0.140)	(0.019)	(0.084)
Observations	5,856	5,953	5,803	6,138	4,487	6,138
First-stage F	27.25	27.31	27.00	27.17	23.74	27.17

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Household controls: household size, mother's age, mother's education, mother's literacy, and household wealth. Geographic controls: temperature, precipitation, elevation, tsetse suitability, soil suitability, and plough suitability. Ethnic controls: settlement patterns, polygyny, plough use, dependence on agriculture, and year of observation. Standard errors are clustered at the ward level.

Table A.6: Matrilineality and children's educational outcomes – Robustness to additional controls

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Baseline + household controls					
Matrilineal	–0.830***	–0.672***	–0.798***	–0.276***	–0.184***	0.130***
	(0.285)	(0.227)	(0.264)	(0.089)	(0.046)	(0.036)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	55.90	55.51	60.03	56.26	54.24	54.24
	Panel B: Baseline + geographic controls					
Matrilineal	–1.204***	–0.909***	–1.086***	–0.372***	–0.216***	0.145***
	(0.321)	(0.246)	(0.285)	(0.099)	(0.045)	(0.034)
Observations	5,776	5,790	5,694	6,019	6,785	6,785
First-stage F	54.48	54.85	59.68	54.39	51.38	51.38
	Panel C: Baseline + household + geographic controls					
Matrilineal	–1.093***	–0.777***	–0.968***	–0.342***	–0.179***	0.128***
	(0.317)	(0.245)	(0.285)	(0.103)	(0.044)	(0.036)
Observations	5,776	5,790	5,694	6,019	6,785	6,785
First-stage F	53.72	53.48	58.11	53.34	50.26	50.26
	Panel D: Baseline + ethnic controls					
Matrilineal	–1.175***	–0.841***	–1.115***	–0.368***	–0.308***	0.216***
	(0.387)	(0.282)	(0.360)	(0.122)	(0.060)	(0.047)
Observations	5,341	5,359	5,286	5,564	6,278	6,278
First-stage F	27.96	28.62	28.68	28.36	26.92	26.92
	Panel E: Baseline + household + geographic + ethnic controls					
Matrilineal	–1.393***	–0.808**	–1.181***	–0.406***	–0.253***	0.199***
	(0.467)	(0.318)	(0.408)	(0.149)	(0.069)	(0.055)
Observations	5,207	5,227	5,155	5,428	6,138	6,138
First-stage F	27.34	27.95	27.88	27.74	27.17	27.17

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Household controls: household size, mother's age, mother's education, mother's literacy, and household wealth. Geographic controls: temperature, precipitation, elevation, tsetse suitability, soil suitability, and plough suitability. Ethnic controls: settlement patterns, polygyny, plough use, dependence on agriculture, and year of observation. Standard errors are clustered at the ward level.

Table A.7: Matrilineality and parental investment in children's education – Robustness to different specifications of the RD polynomial

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Linear distance			
Matrilineal	–0.488***	–0.376***	–0.498***	–0.389***	–0.017	–0.030
	(0.126)	(0.113)	(0.143)	(0.116)	(0.012)	(0.074)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	25.73	25.51	25.76	26.44	23.74	26.44
			Panel B: Quadratic distance			
Matrilineal	–0.436***	–0.340***	–0.465***	–0.369***	–0.013	–0.021
	(0.118)	(0.107)	(0.139)	(0.113)	(0.011)	(0.072)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	29.68	29.14	29.68	30.05	26.93	30.05
			Panel C: Linear distance + segment FE			
Matrilineal	–0.531***	–0.502***	–0.529***	–0.349*	–0.018	–0.047
	(0.167)	(0.158)	(0.169)	(0.184)	(0.015)	(0.078)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	19.34	19.79	19.07	20.37	17.95	20.37
			Panel D: Quadratic distance + segment FE			
Matrilineal	–0.455***	–0.447***	–0.473***	–0.307*	–0.012	–0.029
	(0.145)	(0.146)	(0.160)	(0.171)	(0.013)	(0.077)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	20.95	21.40	20.63	21.93	19.63	21.93
			Panel E: Linear coordinates + segment FE			
Matrilineal	–0.724**	–0.748**	–1.014***	–0.359	–0.010	0.047
	(0.325)	(0.301)	(0.371)	(0.301)	(0.026)	(0.129)
Weak IV p-value	0.001***	0.000***	0.000***	0.181	0.688	0.712
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	9.33	9.55	9.01	10.23	9.42	10.23
			Panel F: Quadratic coordinates			
Matrilineal	–0.542**	–0.647**	–0.799***	–0.336	–0.007	–0.185
	(0.269)	(0.266)	(0.273)	(0.272)	(0.022)	(0.122)
Weak IV p-value	0.011**	0.001***	0.000***	0.150	0.738	0.119
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	11.66	12.07	11.77	12.59	10.49	12.59

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Segment fixed effects split the border into ten equally-sized segments. Standard errors are clustered at the ward level.

Table A.8: Matrilineality and children's educational outcomes – Robustness to different specifications of the RD polynomial

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Linear distance					
Matrilineal	–0.694**	–0.639**	–0.767**	–0.279**	–0.206***	0.123**
	(0.340)	(0.307)	(0.331)	(0.110)	(0.069)	(0.049)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	25.52	25.67	27.49	25.91	26.44	26.44
	Panel B: Quadratic distance polynomial					
Matrilineal	–0.672*	–0.638**	–0.732**	–0.271**	–0.192***	0.120**
	(0.344)	(0.296)	(0.327)	(0.108)	(0.067)	(0.048)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	29.15	29.84	31.84	29.86	30.05	30.05
	Panel C: Linear distance + segment FE					
Matrilineal	–1.064**	–0.903**	–1.038**	–0.301**	0.049	–0.037
	(0.478)	(0.395)	(0.421)	(0.126)	(0.080)	(0.060)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	22.33	21.61	23.35	22.17	20.37	20.37
	Panel D: Quadratic distance + segment FE					
Matrilineal	–1.021**	–0.873**	–0.981**	–0.290**	0.067	–0.043
	(0.495)	(0.397)	(0.430)	(0.130)	(0.082)	(0.063)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	23.84	23.36	25.30	23.90	21.93	21.93
	Panel E: Linear coordinates + segment FE					
Matrilineal	–1.991**	–0.681	–1.522**	–0.397*	–0.038	0.107
	(0.861)	(0.595)	(0.743)	(0.231)	(0.129)	(0.087)
Weak IV p-value	0.006***	0.244	0.023**	0.076*	0.774	0.241
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	12.27	11.25	12.41	11.63	10.23	10.23
	Panel F: Quadratic coordinates					
Matrilineal	–1.320*	–0.754	–1.169*	–0.325	–0.144	0.156*
	(0.754)	(0.577)	(0.662)	(0.236)	(0.124)	(0.081)
Weak IV p-value	0.064*	0.215	0.070*	0.171	0.291	0.085*
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	13.55	12.95	14.10	13.28	12.59	12.59

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Segment fixed effects split the border into ten equally-sized segments. Standard errors are clustered at the ward level.

Table A.9: Matrilineality and parental investment in children's education – Robustness to bandwidth

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: 100 km bandwidth					
Matrilineal	–0.479***	–0.411***	–0.496***	–0.510***	–0.045***	–0.216***
	(0.092)	(0.079)	(0.102)	(0.089)	(0.014)	(0.051)
Observations	11,069	11,315	10,910	11,657	8,697	11,657
First-stage F	51.98	52.69	52.18	53.99	44.68	53.99
	Panel B: 25 km bandwidth					
Matrilineal	–0.391**	–0.346**	–0.590***	–0.391***	–0.023*	–0.023
	(0.157)	(0.135)	(0.182)	(0.129)	(0.012)	(0.074)
Observations	2,745	2,817	2,738	2,908	2,019	2,908
First-stage F	30.68	31.98	30.90	33.02	29.18	33.02

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.10: Matrilineality and children's educational outcomes – Robustness to bandwidth

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: 100 km bandwidth					
Matrilineal	–1.074***	–1.076***	–1.003***	–0.394***	–0.240***	0.149***
	(0.265)	(0.212)	(0.233)	(0.085)	(0.039)	(0.032)
Observations	10,226	10,228	10,103	10,577	11,657	11,657
First-stage F	54.82	56.21	58.65	55.73	53.99	53.99
	Panel B: 25 km bandwidth					
Matrilineal	–1.016**	–0.783**	–1.056***	–0.285**	–0.291***	0.211***
	(0.404)	(0.326)	(0.385)	(0.118)	(0.070)	(0.050)
Observations	2,463	2,468	2,427	2,563	2,908	2,908
First-stage F	35.46	33.73	37.05	34.33	33.19	33.19

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.11: Matrilineality and parental investment in children's education – Robustness to excluding Swahili speakers

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.185**	–0.123*	–0.228**	–0.321***	–0.015**	–0.063*
	(0.080)	(0.072)	(0.098)	(0.080)	(0.007)	(0.034)
Observations	3,083	3,145	3,070	3,266	2,146	3,266
First-stage F	84.88	85.26	84.79	90.26	71.59	90.26

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.12: Matrilineality and children's educational outcomes – Robustness to excluding Swahili speakers

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.592**	–0.574***	–0.603**	–0.192**	–0.137***	0.079**
	(0.266)	(0.200)	(0.248)	(0.076)	(0.053)	(0.036)
Observations	2,676	2,712	2,671	2,830	3,266	3,266
First-stage F	97.83	93.03	101.01	97.74	90.26	90.26

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.13: Matrilineality and parental investment in children's education – Robustness to spatial correlation

	Non-monetary investments			Monetary investments		
	Check homework	Discuss perfor-mance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.459***	–0.353***	–0.480***	–0.402***	–0.025***	–0.117**
Cluster: ward	(0.107)	(0.087)	(0.115)	(0.081)	(0.008)	(0.051)
Conley SE, cutoff = 5 km	[0.108]	[0.087]	[0.115]	[0.082]	[0.009]	[0.052]
Conley SE, cutoff = 10 km	[0.108]	[0.088]	[0.115]	[0.083]	[0.009]	[0.052]
Conley SE, cutoff = 25 km	[0.114]	[0.098]	[0.130]	[0.094]	[0.010]	[0.055]
Conley SE, cutoff = 50 km	[0.112]	[0.103]	[0.132]	[0.104]	[0.009]	[0.052]
Conley SE, cutoff = 100 km	[0.132]	[0.126]	[0.143]	[0.113]	[0.009]	[0.037]
Observations	6,618	6,726	6,553	6,934	5,015	6,934

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Spatial correlation is assumed to decay linearly within a cutoff. In brackets, we report results from cutoffs of: 5 km, 10 km, 25 km, 50 km, and 100 km.

Table A.14: Matrilineality and children's educational outcomes – Robustness to spatial correlation

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.960***	–0.822***	–0.939***	–0.312***	–0.225***	0.150***
Cluster: ward	(0.291)	(0.231)	(0.268)	(0.088)	(0.047)	(0.036)
Conley SE, cutoff = 5 km	[0.292]	[0.232]	[0.269]	[0.088]	[0.047]	[0.036]
Conley SE, cutoff = 10 km	[0.291]	[0.232]	[0.268]	[0.088]	[0.047]	[0.037]
Conley SE, cutoff = 25 km	[0.295]	[0.233]	[0.265]	[0.089]	[0.052]	[0.039]
Conley SE, cutoff = 50 km	[0.306]	[0.190]	[0.238]	[0.085]	[0.056]	[0.043]
Conley SE, cutoff = 100 km	[0.339]	[0.140]	[0.243]	[0.088]	[0.060]	[0.047]
Observations	5,919	5,931	5,834	6,164	6,934	6,934

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Spatial correlation is assumed to decay linearly within a cutoff. In brackets, we report results from cutoffs of: 5 km, 10 km, 25 km, 50 km, and 100 km.

Table A.15: Matrilineality and parental investment in children's education – Robustness to female interaction term

	Non-monetary investments			Monetary investments		
	Check homework	Discuss performance	Attend meetings	Preschool	Private school	Tutor
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.432***	–0.399***	–0.516***	–0.439***	–0.037***	–0.117**
	(0.127)	(0.116)	(0.135)	(0.096)	(0.013)	(0.054)
Matrilineal × Female	–0.051	0.089	0.068	0.071	0.021	0.001
	(0.086)	(0.110)	(0.094)	(0.081)	(0.016)	(0.056)
Observations	6,618	6,726	6,553	6,934	5,015	6,934
First-stage F	13.03	12.87	13.11	13.35	11.47	13.35

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.

Table A.16: Matrilineality and children's educational outcomes – Robustness to female interaction term

	Standardized test scores				School enrollment	
	Math	English	Swahili	Literacy/ numeracy	Currently	Never enrolled
	(1)	(2)	(3)	(4)	(5)	(6)
Matrilineal	–0.764**	–0.846***	–0.795***	–0.301***	–0.244***	0.167***
	(0.315)	(0.282)	(0.290)	(0.099)	(0.059)	(0.042)
Matrilineal × Female	–0.371	0.045	–0.275	–0.020	0.036	–0.032
	(0.288)	(0.284)	(0.253)	(0.098)	(0.045)	(0.045)
Observations	5,919	5,931	5,834	6,164	6,934	6,934
First-stage F	12.36	12.33	13.20	12.63	13.35	13.35

Notes: Fuzzy RD estimates, where matrilineality is instrumented with an indicator for the matrilineal side of the matrilineal belt border. All specifications use a bandwidth of 50 km and include a local polynomial in latitude and longitude. Included baseline controls: gender indicator, age dummies, and interactions of gender and age dummies. Standard errors are clustered at the ward level.