Can Policy Crowd Out Culture?

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Abstract

Policies may change the returns to transmitting cultural norms to the next generation with the unintended consequence of changing cultural practices. I study cultural norms that determine whether boys or girls support their parents in their old age in Indonesia and Ghana. These norms play the dual role of increasing old age support while relieving incomplete contracting problems between parents and children. Therefore, parents invest more in the human capital of the child who is more likely to care for them in old age. In both Indonesia and Ghana, the entry and expansion of pension plans crowds out human capital investment in the children targeted by these norms. Moreover, consistent with a model where transmission of the norm is costly, the pension plan also crowds out the practice of the norm. Thus, policy crowds out culture.

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1 Introduction

Culture evolves in response to the conditions in which humans live (Boyd and Richerson, 1988). As Boyd and Richerson (1988) write, "humans adjust their [cultural] phenotypes in response to their environments through learning and rational calculation" (p. 9). Indeed, informal cultural institutions can substitute for complete markets and formal institutions to facilitate better economic outcomes (for example, see Greif (1993)). Then, if modernization is accompanied by more complete markets and formal institutions, it may have the unintended consequence of crowding out traditional cultural practices. In this paper, I test whether this is the case.

I study traditional, ethnicity-level norms that determine whether daughters (matrilocal), sons (patrilocal), or neither gender (neolocal) live with their parents after marriage. I first establish that country-level variation in these norms explains a substantial portion of the cross-country gender gap (4 percent) in the World Economic Forum global gender gap rankings, and this is entirely driven by these norms' association with the economic and education gaps (rather than the health or political gender gaps). I then focus on Ghana and Indonesia, two countries where the census collects ethnicity-level data, and there is significant variation in traditional practices across ethnic groups. In Indonesia, I find that matrilocal norms are associated with greater human capital investment in daughters relative to their male siblings. In Ghana, I find that patrilocal norms are associated with greater human capital investment in sons relative to their female siblings. Both these findings are robust to extensive controls for geographic location, parental socioeconomic status, and other traditional norms. These findings are consistent with a theoretical literature that suggests that imperfectly altruistic parents may invest less than is optimal in their children since their children cannot credibly commit to repaying that investment in the future (Becker et al., 2012; Banerjee, 2004). If matrilocal (patrilocal) norms increase the probability that daughters (sons) support their parents in their old age, then these norms may increase parents' incentives to invest in their children's human capital. This finding is also consistent with work by Ashraf et al. (2016), which shows that bride price norms, which increase the returns on female education for parents, incentivize parents to invest more in their daughters' human capital.

I develop a model consistent with these results in which imperfectly altruistic parents choose whether to educate their children. Furthermore, drawing on insights by Bisin and Verdier (2001), I allow parents to make costly investments to transmit traditional cultural practices to their children. Greater investment in norms increases the portion of a child's utility parents can extract for themselves in their old age. The model yields several novel pre-

dictions. The institution of a pension plan, by offering parents a more attractive way to save, crowds out investment in the intergenerational transmission of the norm. Since investments in the norm and in a child's human capital are complements, as long as pre-existing education levels are not too different between ethnic groups that practice matrilocality, patrilocality, and neolocality, the institution of the pension plan will also crowd out human capital investment more for daughters in matrilocal societies (relative to neolocal and patrilocal societies) and for sons in patrilocal societies (relative to neolocal and matrilocal societies).

In both Ghana and Indonesia, the data are consistent with these predictions. In Indonesia, the 1977 introduction of a pension system, Astek, for workers at medium and large formal sector enterprises (Sudomo, 1985; Muliati, 2013) crowds out human capital investment in matrilocal daughters who are more exposed to the pension plan in their childhood relative to non-matrilocal daughters. Moreover, using a triple-interaction analysis, I exploit additional geographic variation in the roll-out of Astek, and find that the effects of the pension plan were largest among matrilocal daughters who would have been most exposed to the plan. Additionally, in line with the model's predictions, daughters who were more exposed to the introduction of the pension plan in their childhood were less likely to practice matrilocality (living in their parents' household after marriage). Exploiting the expansion of the pension plan to formal sector workers at smaller enterprises in 1992 (Purwoko, 1997) yields qualitatively identical results.

I replicate these analyses in Ghana, exploiting the introduction of the 1972 pension policy, which established the Social Security and National Insurance Trust (SSNIT) to administer compulsory social security in establishments that employed at least 5 workers (Kumado and Gockel, 2003). Patrilocal males who were exposed to the pension plan for longer received fewer years of education than non-patrilocal males and were less likely to practice patrilocality (living in their parents' household after marriage). Finally, an additional prediction of the model is borne out in both Indonesia and Ghana: conditional on education, higher ability girls (boys) in matrilocal (patrilocal) ethnic groups are more likely to practice matrilocality (patrilocality) as adults, consistent with parents investing more heavily in transmitting the norm to children for whom the returns to education are higher.

This paper contributes to several literatures. First, it provides additional empirical evidence that parents are imperfectly altruistic and respond to strategic incentives when they decide how much to invest in their children's human capital (Ashraf et al.,2016; Becker et al., 2012; Banerjee, 2004; Jensen and Miller, 2011). In particular, it complements empirical work on the association between matrilocal and patrilocal practices and human capital investment

in Indonesia (Levine and Kavane, 2003; Rammohan and Robertson, 2012).

Additionally, this paper adds to a nascent literature on the importance of culture for determining the effects of different policies (Ashraf et al., 2016; World Bank, 2015), as well as the growing literature that examines the effects of gender-related cultural norms (Fernandez, 2007; Fernandez, 2011; Fernandez and Fogli, 2009; Alesina et al., 2013; Giuliano, 2014; Alesina et al., 2015).

Most importantly, this paper contributes to the literature on the evolution of culture and attitudes. Most empirical papers in this literature study the effects of large shocks that likely affected culture along many dimensions. For example, Campa and Serafinelli (2015) and Alesina and Fuchs-Schündeln (2007) study the effects of state socialism on attitudes. Other papers study the effect of different historical empires (Peisakhin, 2010; Becker et al., 2014; Grosfeld and Zhuravskaya, 2015; Wysokinskya, 2015). In contrast, this paper studies relatively small policy changes, and finds that a model in which the transmission of norms is costly and individuals are rational can predict heterogeneous responses to these policies by different ethnic groups over just a few years. Moreover, these policies can lead to the rational decline of traditional practices. This illustrates the role modernization and the policies that accompany it can play in crowding out traditional cultural practices by eliminating the incentives that underpinned those practices. Importantly, the crowd out of traditional norms by the pension plans had the unintended consequence of reducing female (male) educational attainment since, while pensions substituted for the role of matrilocal (patrilocal) norms in guaranteeing old age support, they did not help resolve the intergenerational incomplete contracting problem.

The paper is organized as follows. Section 2 provides more details on the origins and distribution of patrilocal and matrilocal norms. Section 3 provides cross-country and within-country evidence on the association of these norms with the gender gap. Section 4 presents a model, consistent with the evidence from section 3, of parental investment in the presence of imperfect altruism. Section 5 tests additional predictions of the model using the timing of the institution and expansion of pension plans in Indonesia and Ghana, section 6 investigates alternative explanations, and section 7 concludes.

2 Patrilocal and Matrilocal Norms

There are several theories in anthropology regarding the origins of matrilocal/patrilocal norms. One of the fathers of kinship studies, Lewis Morgan, argued that early hunter gath-

erer societies were typically matrilineal (lineage and inheritance pass through the mother's line, and a son may inherit from his maternal uncle) because sexual promiscuity made it difficult to identify a child's father (Engels, 1942). While matrilocality does not always accompany matrilineality, these norms frequently appear together since matrilocality increases the likelihood that a female's son will be in the household to inherit. Engels (1942), writing on Morgan's theories, suggests that the switch to patrilineality (and patrilocality) occurred after more monogamous practices made it possible to identify a child's father. Engels argues that this switch typically happened in conjunction with the increasing importance of private property and productive capital, which men wished to pass on to their sons.

An alternative view is that matrilineality tends to occur in horticultural societies where women often have a more dominant role in agriculture (Jones, 2011). Relatedly, Holden and Mace (2003) argues that patrilineality (and therefore, patrilocality) may be more likely to evolve in pastoral societies with access to cattle, where men play a larger role in agricultural production. Jones (2011) also suggests that matrilocality may evolve in societies which need greater cross-cutting ties to strengthen neighboring communities inside a group, since ties of mutual obligation are "carried by the dominant sex" in matrilocal societies. That is, households send their sons to other households through marriage, generating stronger ties between the households. Jones (2011) suggests that these types of ties tend to be more important at a "cultural frontier," where a group faces a threat from the outside.

Some anthropologists have also linked matrilineality to dowry and patrilineality to bride price. For example, Vroklage (1952) suggests that bride price, a payment from the family of the husband to the family of the bride at the time of marriage, compensates the family of the bride for taking the daughter from their lineage group. If bride price is positively associated with female education (Ashraf et al., 2016), to the extent that this hypothesis is true, the negative correlation between bride price and female education would also negatively bias estimates of the association between matrilocality and female education. However, Boserup (1970) has hypothesized that polygamy is also linked with bride price since female agriculture makes wives more valuable (resulting in both more polygamy and more bride price). In this case, if matrilocality is negatively associated with bride price, it may also be negatively associated with polygamy.

While these hypotheses are consistent with the idea that norms may endogeneously respond to changing environmental factors, most evidence suggests that until recently norms have been quite sticky. While it is difficult to trace whether a group was matrilocal or patrilocal during different periods, anthropologists have made progress in tracing the evolu-

tion of norms. They use language trees which show how and when the languages of different groups bifurcated. Combining this information with information on the contemporary norms practiced by groups, anthropologists have used Bayesian algorithms to estimate the probability that a culture was, for example, matrilineal at each node of the tree (for example, see Holden and Mace (2003)). Work by Holden and Mace (2005) suggests that even when matrilocal norms changed endogeneously to patrilocal norms in response to the use of cattle, the change took on the order of five hundred years to occur. Similarly, according to Jones (2011), the balance of evidence suggests that the cultures that today make up Central Africa's "matrilineal belt" were likely matrilineal from early in their history.

I proxy for an ethnicity's modern practices using the practices recorded in the *Ethnographic Atlas* (Murdock, 1967). Following Ashraf et al. (2016) and Alesina et al. (2013), I use the *Ethnologue* (Gordon, 2005) to match the ethnicity or language data collected by the Ghana and Indonesia censuses with the ethnicity-level data on cultural norms available in the *Ethnographic Atlas*. Of the 1,235 ethnic groups for whom data on ethnic norms are available in the *Ethnographic Atlas*, 880 are traditionally patrilocal (71 percent), 155 are traditionally neolocal (13 percent) and 200 are traditionally matrilocal (16 percent). Figures 1 and 2 map the district-level percent of individuals in the census who are matrilocal (in Indonesia) and patrilocal (in Ghana). While the norms are not uniformly distributed in either country, there is still a great deal of geographic variation in matrilocal and patrilocal practices.

Using the *Ethnographic Atlas*, I estimate the correlations between patrilocality and matrilocality and other potentially important norms in appendix table A1. Consistent with some of the theories from the anthropological literature, patrilocality and matrilocality are strongly correlated with bride price, polygamy, and patrilineality and matrilineality across ethnic groups. Consequently, when I present my results, I will always present versions that control for bride price, polygamy, male dominated agriculture, and aboriginal plow use (the norms most frequently linked with gender bias).

However, the correlations between norms may be weaker within countries where the traditional practices of the populations are more homogeneous. In Indonesia, I match more than 800 languages in the 2010 census to 53 ethnic groups in the *Ethnographic Atlas*. Of these, 67 percent are patrilocal (29), 23 percent are neolocal (10), and 9 percent are matrilocal (4). I focus on variation between matrilocality and patrilocality/neolocality, since groups that primarily practice patrilocality or neolocality in Indonesia often practice the other as a

secondary practice (Lebar, ed, 1972).[1] In Ghana, I match 58 ethnic groups in the 2000 census to 24 groups in the *Ethnographic Atlas*. According to this match, 22 groups (92 percent) are patrilocal and 2 (8 percent) are matrilocal. Therefore, I focus on the margin between patrilocality and matrilocality.[2] Table A2 reports the correlations between matrilocality and other norms within Indonesia and between patrilocality and other norms within Ghana. Once we restrict to within-country variation, there is little correlation between matrilocality or patrilocality and other norms. In fact, there is no variation in Ghana in polygamy (all groups are historically polygamous) and aboriginal plow use (no groups had the plow). Only matrilineality is still strongly correlated with matrilocality.[3]

Unfortunately, to date, there has been little work on how matrilocal and patrilocal norms are related to other forms of gender bias besides differences in human capital investment. However, one paper does shed light on this question. Using data from African Demographic and Health Surveys for 18 countries, Alesina et al. (2015) study whether patrilocality[4] predicts either actual violence against women or attitudes toward violence. In both cases, they find no correlation between patrilocality and violence. This finding provides suggestive evidence that patrilocality is not broadly associated with worse attitudes toward women.

In table 1, I test whether historical norms are predictive of modern behavior in the 2000 Ghana census and the 2010 Indonesia census. I code a household as practicing matrilocality if a married daughter lives in the same household as her parents. Similarly, a household practices patrilocality if a married son lives in the same household as his parents. In principle, this is a lower-bound measure of the prevalence of matrilocality or patrilocality since it will not capture cases where a child lives in the same compound or the same village as a parent but does not live in the same household as defined by the census.[5] Odd number regressions

[1]This choice also follows from the fact I created a secondary match of ethnicities in the 2010 Indonesia census to ethnic norms using Lebar, ed (1972) and Strouthes (1993). In this match, relatively few households were patrilocal, consistent with the fact that these ethnic groups in fact follow a mix of practices. In contrast, practice of matrilocality in both matches is highly correlated, and all the results I present using the *Ethnographic Atlas* match replicate using the alternative match.

[2]The coding of patrilocality in this match is strongly correlated with a second match between census-level ethnicities and ethnic norms that I constructed using Gil (1964) and Asante and Mazama, eds (2009). This second match, however, codes the groups that are matrilocal in the match from the *Ethnographic Atlas* as neolocal. Thus, I focus on comparing patrilocal groups to groups that may be matrilocal or neolocal. All the results using the match from the *Ethnographic Atlas* replicate using this second match as well.

[3]Matrilineality does not necessarily imply that daughters inherit. Most frequently, it indicates that sons inherit from their maternal uncles. Thus, in *Status of Women in Pre-Industrial Societies*, Whyte, ed (1978) notes that matrilineal norms need not imply that women will be better off, writing, "It is perfectly possible for the position of women to be as low as the greatest misogynist would desire" (p. 7).

[4]Their paper uses the alternative term for patrilocality, virilocality.

[5]Beaman and Dillon (2012) show that the determining the exact boundaries of a household in low income

report the coefficient of an indicator variable for whether the household head belongs to a traditionally matrilocal or patrilocal ethnicity without any controls. Even number columns control for other potentially important norms: bride price, polygamy, male dominated agriculture, and aboriginal plow use. In both cases, historical norms are predictive of modern-day practices. In Indonesia, the matrilocal norm increases the likelihood a household practices matrilocality by 2.3 percentage points (a 28 percent increase on a base of 8.1 percent). In Ghana, the patrilocal norm increases the likelihood a household practices patrilocality by 3.2 percentage points (a 46 percent increase on a base of 7 percent).[6]

This paper assumes that matrilocal norms increase the probability of old-age support by daughters and that patrilocal norms increase the probability of old age support by sons. I take this view because a daughter or a son living with a parent pays less transfer costs in providing resources to a parent, may share "public" goods with a parent like housing, can be monitored by the parent to ensure that they transfer resources, and can provide care that may be difficult to purchase through the market. Reassuringly, the policy discussion surrounding pension plans in Indonesia is consistent with this interpretation. In discussions of the establishment and expansion of pension plans in Indonesia, both Muliati (2013) and Sudomo (1985) mention the important role that traditional family practices play in guaranteeing old age support. Muliati (2013), in particular, argues that pension plans are increasingly necessary due to changes in "social culture", writing, "Urbanization and the decline in the number of children have changed the family and social structure in Indonesia... Children are also leaving their villages and moving to cities in search of more lucrative employment opportunities. Consequently, the family support system is not as robust as it was in the past, and there is a greater need for the State to assist with the establishment of programs and institutions to care for the elderly." Similarly, Sudomo (1985) writes that government-run pension plans are increasingly important because "the modern family in Indonesia tends to be a small, nuclear family, with much weaker ties to grandparents and other relatives than existed in traditional rural society."

countries is difficult, and the choice of boundaries may affect the results of economic analysis.

[6]If intermarriage is high, we might not expect traditional norms to be as predictive of current behavior. If a wife is matrilocal and a husband is patrilocal, their post-marriage residency decision must violate at least one of their traditional norms. However, even in the recent censuses (the 2010 census in Indonesia and the 2000 census in Ghana), marriages between individuals with conflicting post-marriage residency norms are rare. In Ghana, only 13.8 percent of married household heads have a spouse from an ethnicity with a different post-marriage residency norm. In Indonesia, only 0.16 percent of household heads have a spouse from an ethnicity with a different post-marriage residency norm.

3 Gender Gap

In this section, I provide evidence that matrilocality and patrilocality affect both cross-country gender gaps using data from the 2013 World Economic Forum Gender Gap Scores *and* within-family gender gaps in Ghana and Indonesia. This association motivates the model in the next section, which allows human capital investment to depend on parents' perception of whether a child will care for them in their old age.

3.1 Cross-Country Evidence

To test whether patrilocality is associated with cross-country gender gaps, I combine country-level data on the percent of the population that is traditionally patrilocal based on a match to the *Ethnographic Atlas* created by Alesina et al. (2013) with country-level data on gender gaps from the 2013 World Economic Forum. The World Economic Forum reports measures of gender gaps along 4 sub-indices, as well as an overall index. These sub-indices are "Economic Participation and Opportunity," "Educational Attainment, " Health and Survival," and "Political Empowerment."[7]

Using this country-level data set, I estimate the following regression

$$y_c = \beta_0 + \beta_1 income_c + \beta_2 income_c^2 + \gamma PerPatrilocal_c + \alpha_r + \epsilon_c, \tag{1}$$

where c denotes a country and y_c, the outcome variable may be the combined gender gap score, the economics score, the education score, the health score, or the political score; $income_c$ is country c's gdp per capita, $PerPatrilocal_c$ is the percent of a country's population that belongs to historically patrilocal ethnic groups, and α_r is a continent fixed effect. Table 2 presents the estimates from these regressions. Column 1 estimates equation 1 for the aggregate score but omits the independent variable $PerPatrilocal_c$. Column 2 re-estimates

[7]The "Economic Participation and Opportunity Index" is based on measures of the ratio of female labor force participation over male labor force participation; female wage over male wage for similar work; the ratio of female estimated earned income over male estimated earned income; the ratio of female over male legislators, senior officials and managers; and the ratio of female over male professional and technical workers. The "Educational Attainment" index is based on female over male literacy; female net primary enrollment over male net primary enrollment; female net secondary enrollment over male net secondary enrollment; and female gross tertiary enrollment over male gross tertiary enrollment. The "Health and Survival Index" is based on the sex ratio at birth and the ratio of female health life expectancy over male healthy life expectancy. Finally, the "Political Empowerment" index is composed of the ratio of females with seats in parliament over males with seats; the ratio of females at the ministerial level over males; and the ratio of years of a female head of state (last 50 years) over the male value. For more information on these indices, see Bekhouche et al. (2013).

the regression in column 1 including $Per\ Patrilocal_c$. The inclusion of $PerPatrilocal_c$ increases the percentage of the variation explained by the regressors by 4 percentage points. Additionally, moving from 0 to 100 percent of the population belonging to traditionally patrilocal ethnicities decreases the overall gender gap score by 5 percent. The remaining columns estimate equation 1 for the economics (column 3), education (column 4), health (column 5), and political scores (column 6). The large and significant effect of patrilocality on the overall gender gap in column 2 appears to be driven by its effect on the economics gap (column 3) and the education gap (column 4). In contrast, patrilocality does not significantly affect the health or political gender gaps. This is consistent with the idea that patrilocality largely affects gender gaps through differences in human capital investments. Now that we have established that patrilocality is associated with country-level gender gaps, we consider the association between patrilocality and matrilocality and gender gaps in human capital within *within* countries.

3.2 Within-Country Evidence

To estimate the association between patrilocality and matrilocality and within households differences in school enrollment in Indonesia and Ghana, I use the 2010 census data in Indonesia and the 2000 census data in Ghana from Minnesota Population Center (2011) to estimate:

$$enroll_{ie} = \beta_1 gender_i + \beta_2 gender_i \times norm_e + \tau X_i + HH_j + \epsilon_{ie}, \tag{2}$$

where i denotes a child of the household head between the ages of 5 and 22, e denotes an ethnic group, $enroll_{ie}$ is an indicator variable equal to 1 if a child is enrolled in school and 0 otherwise, $gender_i$ is an indicator variable for the relevant gender (female in Indonesia and male in Ghana), $norm_e$ is an ethnicity-specific indicator variable for whether an ethnic group historically practiced the relevant norm (matrilocality in Indonesia and patrilocality in Ghana), and HH_j is a household fixed effect. X_i contains child-specific controls and depending on the specification, includes age fixed effects, controls for parent educational status interacted with child gender,[8] controls for geographic region (province indicator variables in Indonesia and district indicator variables in Ghana) interacted with gender, and indicators for aboriginal plow use, bride price customs, male dominated agriculture, and polygamy

[8]These consist of indicator variables for whether the father has completed primary school, whether the father's spouse has completed primary school, whether the father works in a high skill sector, whether the father's spouse works in a high skill sector, whether the father works in agriculture, whether the father's spouse works in agriculture, and whether the household head is male.

traditions interacted with child gender.

Tables A3 and A4 document summary statistics for the Indonesia and Ghana census data. The first 9 columns of table A3 provide information on the mean, standard deviation, and number of observations for a variety of child and parent characteristics in Indonesia. Column 10 tests for balance between the matrilocal and non-matrilocal groups, regressing each of the child and parent characteristics on an indicator for matrilocality and controlling for the ethnicity controls and province fixed effects. Along most dimensions, matrilocal and non-matrilocal groups are similar. Fathers are no more educated in matrilocal groups than in patrilocal groups and mothers are no more likely to work in agriculture or in high skill industries. Matrilocal and non-matrilocal women aged 25 to 45 have statistically indistinguishable birth rates after controlling for province and ethnicity fixed effects (2.523 children on average in matrilocal ethnic groups and 2.065 children on average in non-matrilocal ethnic groups). The percent of female children in matrilocal ethnic groups (48.2 percent) and non-matrilocal ethnic groups (48.2 percent) are also not statistically significantly different. The only significant difference is that fathers are 12 percentage points more likely to be employed in agriculture in matrilocal groups. Table A4 provides analogous summary statistics for Ghana. In Ghana, there are strong differences between patrilocal and non-patrilocal groups. Across measures, patrilocal parents are consistently less likely to be in high skill industries, more likely to be employed in agriculture, and less likely to be educated. However, as before, there is no statistically significant difference between fertility in patrilocal groups (3.757 on average) and non-patrilocal groups (3.589 on average) or the percent of children that are female at birth in patrilocal (48.5 percent) and non-patrilocal (48.8 percent) groups. Overall, the comparison between matrilocal and non-matrilocal groups in Indonesia appears to be cleaner than the comparison between patrilocal and non-patrilocal groups in Ghana. Nonetheless, all the findings in Indonesia replicate in Ghana as well.

The estimates from regression equation 2 are in table 3. As the upper-half of the table shows, females in matrilocal households are 1.3-2 percentage points more likely to be enrolled in school relative to their brothers when compared to females in non-matrilocal households in Indonesia. The effect size is stable and significant ($p < 0.01$) across all four specifications. Neither household socioeconomic status (column 2), alternative ethnic norms (column 3), nor geographic location in Indonesia (column 4) appear to explain this result. The estimates are similar in Ghana. Patrilocal males are 1 percentage point more likely to be enrolled in school relative to their sisters when compared to non-patrilocal males in Ghana. While the effect size is not significant in the first 2 columns, the inclusion of the ethnicity level

norms and the district by gender fixed effects in columns 3 and 4 respectively increases the precision of the estimates and the coefficient is significant at either the 5 or 1 percent level. Table A5 reports the regression coefficients using the alternative ethnographic data on post-marriage residency practices by ethnicity; the results are broadly consistent with those in table 3.[9] Both the cross- and within-country regression results suggest that norms which determine which child supports his or her parents in their old age may be linked to human capital investment. In the next session, I present a model in which matrilocal (or patrilocal) norms help resolve intergenerational incomplete contracting problems between parents and children, explaining this association. Additionally, the model allows me to derive several new predictions regarding how these norms will interact with pension plan policies.

4 Model

The evidence in the previous section suggests that matrilocality is associated with greater human capital investments in daughters relative to sons and that patrilocality is associated with greater human capital investment in sons relative to daughters. In this section, I develop a model that explains this relationship in which norms play a dual role; they help resolve the incomplete contracting problem between parents and children, and they allow parents to save for old age. In this model, imperfectly altruistic parents decide how much to invest in the human capital of their children. Since children cannot credibly commit to repay their parents in the future, norms which allow parents to extract a greater portion of the returns to their human capital investment will increase these investments. To develop predictions about how the practice of norms evolves over time, I further allow parents to undertake costly investments in transmitting norms to their children, as long as the parents belong to an ethnic group that traditionally practices the norm.

Under reasonable assumptions, this model has two main predictions. First, the institution and expansion of pension plans will crowd out human capital investment more in daughters (sons) in matrilocal (patrilocal) ethnic groups than non-matrilocal (non-patrilocal) ethnic groups. Second, the institution and expansion of the pension plan will not only crowd out human capital investment; it will also crowd out intergenerational transmission of the norm. Thus, the model provides a mechanism for the role policy can play in crowding out cultural

[9]Unlike the results from the match with the *Ethnographic Atlas*, the Indonesia results are not robust to the inclusion of province fixed effects. The alternative match is only able to determine norms for 23 ethnic groups instead of the 50 in the main match, leading to a reduction in the within-province variation in traditional ethnic norms.

practices.

4.1 Setup

Without loss of generality, I focus on the comparison between a matrilocal household and a neolocal household, but all the predictions of the model will be symmetric for the comparison between a patrilocal and a neolocal household. Parents live for two periods, and each household has a daughter and a son. In the first period, they make investments using their first period income y, and in the second period, they consume the returns on those investments. Therefore, parents make investments to maximize their second period consumption by saving (choice of i), choosing whether or not to educate their daughter ($E \in \{0,1\}$) at cost f_s, choosing whether to educate or not their son ($S \in \{0,1\}$) at cost f_s, and by investing in transmitting the norm (I) if they are matrilocal. Matrilocal parents extract $p(I)$ second period utility from their daughter, where $p' > 0$ and $p'' < 0$, while neolocal parents cannot extract second period utility from their child. This captures the idea that it is difficult for parents to unilaterally establish a new norm for their child to follow since practicing a norm requires coordination between the daughter and her spouse and norms are only reinforced by social stigma in ethnic groups in which the norm traditionally exists.

All uneducated daughters receive the same utility $V^f(0)$, but returns to education differ such that $V_j^f(1) - V^f(0) > 0$, the return to education for a daughter j, is distributed according to F. Similarly, all uneducated sons receive $V^m(0)$, but the returns to education differ such that $V_j^m(1) - V^m(0) > 0$ is distributed according to G. Parents weight the second period utility of sons based on their altruism parameter $\delta \in (0,1)$, and they weight the second period utility of daughters based on their altruism parameter $\gamma \in (0,1)$. Therefore, in *matrilocal groups*, parents solve:

$$\max_{i,I,E,S} (1+r)i + p(I)V^f(E) + \gamma(V^f(E) - p(I)V^f(E)) + \delta V^m(S),$$
$$s.t.\ I + f_s E + f_s S + i \leq y \tag{3}$$

and parents of children in *neolocal societies* solve:

$$\max_{i,I,E,S} (1+r)i + \gamma V^f(E) + \delta V^m(S)$$
$$s.t.\ f_s E + f_s S + i \leq y. \tag{4}$$

Finally, I assume that income constraints do not "bind." That is, a parent who wants to educate one or more of their children can afford to do so. Without additional assumptions, this model yields three predictions.

4.2 Model Predictions

The first of the model's predictions, below, explains the results in section 3.

Proposition 4.1. *Female education rates are higher relative to male education rates in a matrilocal ethnicity than in a neolocal ethnicity. That is,* $\alpha^f_{MAT} - \alpha^m_{MAT} > \alpha^f_{NEO} - \alpha^m_{NEO}$*, where* α^s_{norm} *is the share of gender* s *and ethnic norm norm that is educated.*

Proof. See mathematical appendix. Proposition 4.1 tells us that enrollment rates will be higher for females relative to males in matrilocal societies than non-matrilocal societies. This is consistent with the estimates in tables 2 and 3. The mechanism is simple, since parents are imperfectly altruistic, they may not educate their children even if the returns exceed the costs. Matrilocal norms increase the returns to educating a female child for the parents, lowering the minimum returns to education needed for the parents to educate the child. In contrast, the incentives for matrilocal and neolocal ethnic groups to invest in boys are the same.

Proposition 4.2. *Investment in the norm* I^* *is decreasing in the interest rate* r*.*

Proof. See mathematical appendix. This proposition captures the fact that when the returns to savings go up (for example, because of the creation or expansion of pension plans), intergenerational transmission of matrilocality should decrease. Intuitively, this is because as the returns to savings increase, parents will substitute from investing in transmitting the norm to investing in savings.

Proposition 4.3. I^*_E *is increasing in* $V^f_j(1)$*, a daughter's returns to education.*

Proof. See mathematical appendix. This proposition captures the simple idea that parents will want to invest more in transmitting the norm to children with higher returns to education, since these children will have greater future utility to extract.

The final proposition shows that pension plans will reduce education more for matrilocal females than non-matrilocal females. This proposition is true under one additional assumption:

Assumption 4.1.

$$\frac{f_s + I_1^* - I_0^* + \frac{p(I_0^*)}{p'(I_0^*)}\left(1 + \frac{1+r}{p'(I_0^*)(1-\gamma)V^f(0)}\right)}{f_s} > \frac{F'\left(\frac{(1+r)f_s}{\gamma}\right)}{F'\left(\frac{1+r}{\gamma}(f_s + I_1^* - I_1^* - \frac{p(I_1^*)}{p'(I_1^*)} + \frac{p(I_0^*)}{p'(I_0^*)})\right)},$$

where I_1^* is the equilibrium investment in the norm given that the daughter is educated and I_0^* is the equilibrium investment if she is not educated. This assumption appears complicated, but just captures the idea that the mass of female children on the margin of being educated is not too much greater in non-matrilocal ethnic groups relative to matrilocal ethnic groups. Intuitively, the model shows that the pension plan increases the minimum returns to education needed for a child to be educated more for matrilocal daughters than non-matrilocal daughters. However, since the initial minimum returns a girl needs to be educated are likely to be different in matrilocal and non-matrilocal ethnic groups, the density of daughters at the margin could vary as well. If F is uniform, this assumption will always be satisfied. If the density of daughters at the margin is *greater* in matrilocal societies, this assumption will be satisfied, though that is not a necessary condition. Thus, if F is single-peaked and education levels in Indonesia and Ghana are "low" (daughters with median returns to education are not educated), this assumption will also be satisfied (see Ashraf et al. (2016) and similar arguments in Fabinger and Weyl (2013) and Becker et al. (2010)). Intuitively, one can think of the assumption as being satisfied if initial female education rates are not *too* different in matrilocal and non-matrilocal ethnic groups.

Given this assumption, proposition 4.4 follows:

Proposition 4.4. *When r increases, the share of the female population that is educated in matrilocal ethnic groups, α^f_{MAT}, will fall faster than the share of the female population that is educated, α^f_{NEO} in neolocal ethnic groups. That is, $\frac{d\alpha^f_{MAT}}{dr} < \frac{d\alpha^f_{NEO}}{dr}$.*

Proof. See mathematical appendix. Intuitively, this proposition follows from the fact that there is a complementarity between investing in the norm and investing in education. Increasing the returns to saving then decreases the returns to both, and this effect is self-reinforcing. Therefore, increases to the returns on savings will increase the minimum returns a girl needs to be educated more in matrilocal groups. Thus, as long as the density of girls on the margin of being educated in matrilocal and non-matrilocal groups is not *too* different, as assumption 4.1 guarantees, the share of educated females will decrease more in matrilocal groups relative to non-matrilocal groups.

4.3 Alternative models

Intuitively, higher returns to education among matrilocal females or higher altruism toward matrilocal females may yield similar predictions. To investigate whether this is the case, I derive the predictions of the model when costly transmission is removed from the model and either altruism towards females or the returns to education for females are allowed to vary systematically with matrilocality. The removal of the transmission mechanism will mean that I can no longer derive propositions 4.2 and 4.3 since I no longer model the practice of the norm.

4.3.1 Differential altruism

In this sub-section, I allow the weight that parents put on girls' utilities to differ between matrilocal and non-matrilocal ethnic groups so that $\gamma_{MAT} > \gamma_{NEO}$. Thus, matrilocal parents solve the maximization problem

$$\max_{i,I,E,S}(1+r)i + \gamma_{MAT}V^f(E) + \delta V^m(S)$$
$$s.t.\ I + f_sE + f_sS + i \leq y,$$

and neolocal parents solve

$$\max_{i,I,E,S}(1+r)i + \gamma_{NEO}V^f(E) + \delta V^m(S)$$
$$s.t.\ I + f_sE + f_sS + i \leq y.$$

Given these maximization problems, parents will educate daughters when

$$V_j^f(1) - V^f(0) \geq \frac{(1+r)f_s}{\gamma_{norm}}.$$

Thus, the share of educated daughters will be $\alpha_{norm} = 1 - F(\frac{(1+r)f_s}{\gamma_{norm}})$. Since, $\gamma_{MAT} > \gamma_{NEO}$, the share of daughters receiving education will be higher in matrilocal societies. Since, as before, the problem for boys is the same in matrilocal and neolocal societies, this result yields the same prediction as proposition 4.1. Now, I consider whether differential altruism can also produce proposition 4.4. To do so, I differentiate $\alpha_{NORM} = 1 - F(\frac{(1+r)f_s}{\gamma_{NORM}})$ with respect

to r. The resulting expression is

$$\frac{d\alpha_{norm}}{dr} = -\frac{f_s}{\gamma_{norm}} F'(\frac{(1+r)f_s}{\gamma_{norm}}).$$

Therefore, $\frac{d\alpha_{MAT}}{dr} < \frac{d\alpha_{NEO}}{dr}$ if and only if

$$\frac{\gamma_{NEO}}{\gamma_{MAT}} > \frac{F'(\frac{(1+r)f_s}{\gamma_{NEO}})}{F'(\frac{(1+r)f_s}{\gamma_{MAT}})}. \tag{5}$$

As before, without further assumptions, it is ambiguous whether the derivative of the share of educated females with respect to r is larger in magnitude for matrilocal or non-matrilocal ethnic groups. However, much stronger assumptions are needed to ensure that the magnitude of the effect is larger for matrilocal groups in this model. Since $\gamma_{MAT} > \gamma_{NEO}$, the left hand-side of equation 5 is less than 1. Therefore, for this condition to be true, the mass of matrilocal daughters on the margin of receiving education must be greater than the mass of neolocal daughters at the margin. However, this is not sufficient: the differences in the masses must be great enough to compensate for the fact that matrilocal societies increase the minimum returns to education at which a daughter is educated *less* than neolocal societies in response to an increase in r. Even assuming that the distribution of the returns to education is single-peaked and education rates are low – an assumption that is sufficient but not necessary to deliver proposition 4.4 – will not ensure that increasing r crowds out education more for matrilocal females. Indeed, I am not aware of any plausible assumptions that would deliver this result.

4.3.2 Differential returns to education

To model differential returns, I again assume that $\gamma_{MAT} = \gamma_{NEO}$ and instead assume that the distributions of the returns to education are different for matrilocal and non-matrilocal daughters. To model the idea that the returns to education are greater in matrilocal societies, I assume thatF_{MAT} first order stochastically dominates F_{NEO}. Under this assumption, it is straightforward to show that

$$\alpha_{MAT} = 1 - F_{MAT}(\frac{(1+r)f_s}{\gamma})$$

and

$$\alpha_{MAT} = 1 - F_{NEO}(\frac{(1+r)f_s}{\gamma}).$$

First order stochastic dominance implies that $\alpha_{MAT} > \alpha_{NEO}$, again yielding the same prediction as proposition 4.1. Differentiating with respect to r and rearranging the expressions shows that $\frac{d\alpha_{MAT}}{dr} < \frac{d\alpha_{MAT}}{dr}$ if and only if

$$F'_{NEO}(\frac{(1+r)f_s}{\gamma}) > F'_{NEO}(\frac{(1+r)f_s}{\gamma}).$$

Essentially, matrilocal and non-matrilocal ethnic groups increase the minimum returns needed to be educated by the same amount in response to an increase in r. Therefore, for this expression to be true, there must be more matrilocal females at the margin of being educated than non-matrilocal females. As before, strong assumptions are needed to deliver proposition 4.4. For example, if the F_{MAT} distribution is identical to the F_{NEO} distribution except for a mean-shift to the right, then the assumption that returns are single-peaked and that education rates are low would again deliver this result. However, this assumption may not be attractive when studying the 1992 pension plan expansion since by the mid-1990s, female primary completion rates were quite high in Indonesia. The World Bank development indicators suggest that female primary completion in 1995, the earliest year for which data was available, was 97 percent.

To summarize the findings of this subsection, both greater altruism toward females by matrilocal ethnic groups and great returns to female education for matrilocal ethnic groups can produce proposition 4.1. However, much stronger assumptions and perhaps implausible assumptions are needed to produce proposition 4.4, the prediction that the pension plan expansion will crowd out education for matrilocal females more than non-matrilocal females. Finally, since neither of these models endogenize the transmission of the norm, they cannot produce proposition 4.2, the prediction that the pension plan will crowd out the practice of the norm, or proposition 4.3, the prediction that higher ability daughters will be more likely to practice matrilocality.

5 Additional Predictions

In this section, I test the additional predictions of the model. In the first sub-section, I explore the effects of pension plan entry and expansions on Indonesia and Ghana to test propositions 4.2 and 4.4. I first rely on cohort-level variation in exposure to the pension plan creation or expansion to provide evidence that cohorts who were more exposed to the expansion received less education. Since the estimates using cohort-level variation may be driven by time-trends, I then focus on the creation of Astek and exploit finer geographic variation in the administration of the Astek pension plan. In the second sub-section, I test whether higher ability children are more likely to live with their parents as proposition 4.3 suggests.

5.1 Pension Plan Entry and Expansion

To test whether pension plans indeed crowd out investment in human capital and in the transmission of the norm differentially in matrilocal (patrilocal) societies relative to non-matrilocal (non-patrilocal) societies, I study the effects of three pension plan-related policy changes. The first is the establishment of formal sector pension plans in Indonesia under a government-owned corporation, Astek, in 1977. Astek developed accident, health care, death, and provident fund schemes for employees of medium and large firms (greater than 100 employees). Under the plan, employees were required to save 1 percent of their earnings and employers provided a matching contribution of 1.5 percent. Most funds were allocated to bank time deposits with annual interest rates of 9 percent, and retirees received their benefits in lump-sum form when they retired, as long as they were 55 or older (Kerja, 1982). By the end of 1983, 8,602 employers and 1,960,109 employees were covered by Astek (about 40 percent of the eligible labor force and 4 percent of the labor force between the ages of 20 and 50). Coverage expanded rapidly, and in 1982, the government estimated that 5.5 million employees would be covered by 1988 (Kerja, 1982). The second policy change is the 1992 replacement of Astek with Jamsostek, which expanded the pension plan scheme to cover workers at enterprises of 10 or more employees. This approximately doubled the number of people with insurance policies from 8 million in 1990 to 15 million in 1995 (7.8 percent of the population) (Purwoko, 1997). By 2000, 17 million employees were in Jamsostek (Tambunan and Purwoko, 2002). Additionally, the 1992 law allowed for the formation of private pension plans (Purwoko, 1997). Finally, I study the creation of a social security scheme in Ghana in 1972. The passage of NRCD 127 in 1972 established

the Social Security and National Insurance Trust (SSNIT), which administered a provident scheme that paid lump sum benefits to beneficiaries. The bill mandated compulsory coverage for establishments that employed at least 5 workers; the scheme was optional for smaller establishments (Kumado and Gockel, 2003).

To estimate the differential effects of each policy change, I exploit variation in the number of years an individual was exposed to the change due to her year of birth as well as variation in traditional ethnic norms. Then, for the policies in Indonesia, my regressions take the form

$$y_{ide} = \alpha_e + \beta_1 I_e^{matrilocal} \times years\_unexpos_i + \beta_2 years\_unexpos_i + g(birthyr_i) \times I_e^{matrilocal} + \alpha_d + \mathbf{\Gamma} \boldsymbol{X_{ide}} + \epsilon_{ie} \quad (6)$$

where i denotes an individual and e denotes an ethnicity. y_{ie} is the outcome of interest, which may be practicing matrilocality (a married, adult female living with her parents) or educational outcomes, $years\_unexpos_i$ is the years the child was unexposed to the pension plan based on the difference between the year the plan went into effect and her birth year[10], $g(birthyr_i)$ is a third degree polynomial time trend by birth year, α_d is a geographic region fixed effect (province in Indonesia and district in Ghana), and $\boldsymbol{X_{ike}}$ are additional controls, which, depending on the specification, include geographic fixed effects interacted with $years\_unexpos_i$, the ethnographic norms related to gender bias (male dominated agriculture, aboriginal plow use, polygamy, and bride pride) interacted with $years\_unexpos_i$. I include $g(birthyr_i) \times I_e^{matrilocal}$ to account for any differential time trends between matrilocal and non-matrilocal ethnic groups, and I include the geographic fixed effects and their interactions with $years\_unexpos_i$ to control for geographic heterogeneity which may be correlated with ethnicity-level heterogeneity in the implementation or response to the pension plan. Thus, identification of the key parameter of interest, β_1, comes from the differences in the effect of kinks in $years\_unexpos_i$ in matrilocal and non-matrilocal groups. The sample restricts to married females for the matrilocal practice regressions.

For the 1977 plan, I include females born between 1959 and 1985 in the regression. Therefore, the oldest females were 18 at the time of the pension plan was instituted, and were wholly untreated. The youngest females were -8 and were fully treated. I do not include girls born later than 1985, since I would like females to be at least 25 so they will have completed university education. For the 1992 pension plan, the oldest individuals born after the plan would only be 18 at the time of the 2010 census. Thus, I focus on variation in

[10]At a minimum, a child can be unexposed for 0 years and at a maximum, I assume she can only be exposed for 18 years.

exposure for those born before 1992, using the sample of women born from 1964 to 1992, and restrict my educational outcomes to completing primary and secondary school. The analysis for Ghana is exactly symmetric: in equation 7, $I_e^{matrilocal}$ is replaced by $I_e^{patrilocal}$, and the sample now consists of males rather than females. Since I study a pension program that was instituted in 1972, I restrict the sample to males born between 1954 and 1985. Since the Ghana survey is from 2000 and the youngest individuals in the sample will only be 15 at the time of the census, I focus on primary schooling as a measure of educational attainment.

Table A6 reports the summary statistics used in the two pension plan analyses in Indonesia. Consistent with the idea that there are stronger incentives to educate matrilocal females, matrilocal females are 3-4 percentage points more likely to complete primary school. They are also more likely to live with their parents after marriage. However, they are not more likely to work in high skilled professions or agriculture. Table 4 reports the results from the analyses of the policy changes in Indonesia. Odd numbered columns present the baseline specification and even numbered regressions include the ethnic norm controls interacted with the years unexposed to the pension plan. The results from both 1977 and 1992 are consistent with the predictions of the theoretical model. While the 1977 pension plan had only a marginally significant effect on primary school completion,[11] matrilocal daughters who were unexposed to the pension plan for an additional year were 2 percentage points more likely to complete secondary school and 0.6 percentage points more likely to attend university ($p < 0.01$). An addition year unexposed to the pension plan is also associated with an increase in the practice of matrilocality by 1 percentage point ($p < 0.01$). The effects of the 1992 expansion of the pension plan are similar. Matrilocal daughters who were unexposed to the 1992 expansion for an additional year were 1.8-2.0 percentage points more likely to complete primary school ($p < 0.01$) and 1.1-1.2 percentage points more likely to practice matrilocality after marriage ($p < 0.01$). The program had no significant effect on secondary school completion, though these results may be biased if the younger cohorts – the youngest cohort is 18 at the time of the survey – have not yet had an opportunity to complete secondary school. Table A8 reports the results from the alternative concordance. These estimates are also wholly consistent with the theory.

[11] The large-scale, 1974 primary school building program studied by Duflo (2001) is a potential confounder for the estimates using the institution of the pension plan in 1977. To the extent that the province by years unexposed to the pension plan interactions fail to control for geographic variation in the changes to the costs of school, which may also be correlated with cultural norms, the results for primary schooling may be biased. However, Duflo shows that the effects of the program on schooling beyond primary school are negligible. Therefore, the program is unlikely to explain the association between pension plan exposure and reduced secondary school and university completion for matrilocal females.

Table A7 reports the summary statistics for the Ghana pension sample. As before, patrilocal Ghanians appear to be disadvantaged relative to non-patrilocal Ghanians: they are more likely to practice agriculture and males receive less education (though the gap is even bigger between patrilocal and non-patrilocal females). Table 5 reports the results for the analysis from the policy change in Ghana. As before, odd columns report the baseline specifications and even columns add ethnic norm controls[12] (traditionally male dominated agriculture and bride price) interacted with years unexposed to the pension plan. Like Indonesia, the results from Ghana are consistent with the predictions of the theoretical model. The inclusion of these controls only strengthens the baseline results. Patrilocal males who are exposed to the the pension plan for 1 fewer years in their childhood are 2.5 percentage points more likely to complete primary school ($p < 0.01$). Moreover, an additional year unexposed to the pension plan leads patrilocal males to be 0.5 percentage points more likely to practice patrilocality after marriage ($p < 0.01$). Table A9 replicates these regressions using the alternative ethnographic data drawn from Gil (1964). Again, the results are wholly consistent with the theory and qualitatively similar to the results in table 5.

Up to this point, all of these estimates have relied on the fact that different cohorts were more or less exposed to the pension plan roll out. While I control for time trends in my estimates, it is possible that these results are still biased by underlying differential time trends in educational attainment and the practice of matrilocality for different ethnic groups. I now exploit additional, finer geographic variation in the roll-out of Astek to test if pension plan exposure has a larger effect in areas where access to the pension plan was likely to be greater. All formal sector employees at firms with greater than 100 employees did not receive pension plans overnight in 1977. On the contrary, Astek expanded over time. From 1978 to 1979, its number of enrollees grew by 24 percent; from 1979 to 1980, the number of enrollees grew by 12 percent (Sudomo, 1985). Additionally, compliance with Astek was and is imperfect. For example, in 1983, Sudomo (1985) reports that only 40 percent of eligible individuals were enrolled. I hypothesize that initial enrollment was higher in areas with more Astek branch offices, liaisons, and representatives. While there is very little existent documentation of Astek's initial roll-out, Sudomo (1985) reports the locations of branch offices, liaisons, and representations in 1985. Figure 3 plots the locations of these offices along with geographic variation in ethnic practices in Indonesia.

[12]There is no variation in whether ethnicities are traditionally polygamous or were early adopters of the plow in Ghana. To avoid losing losing a significant fraction of the sample, indicator variables for missing information were also included in the interactions with years unexposed to the pension plan.

Using this additional variation, I estimate

$$y_{ide} = \alpha_{de} + \beta_1 I_e^{matrilocal} \times years\_unexpos_i \times intensity_d + \beta_2 years\_unexpos_i + \beta_3 years\_unexpos_i \times intensity_d + g_d(birthyr_i) \times I_e^{matrilocal} + \mathbf{\Gamma} \boldsymbol{X_{ide}} + \epsilon_{ie}, \quad (7)$$

where α_{de} is a birth-province by ethnicity fixed effect, $intensity_d$ is the total number of offices, representatives, and liaisons in the province per 1000 square miles, $g_d(birthyr_i)$ is now a birth-province specific third-degree polynomial in birth year, and the controls $\boldsymbol{X_{ide}}$ include province fixed effects interacted with $years\_unexpos_i$, and the triple- and double-interactions of the ethnicity-level indicators for polygamy, bride price, aboriginal plow use, and male dominated agriculture with $years\_unexpos_i$ and $intensity_d$.

Table 6 reports the estimates from equation 7. As in table 4, there is no statistically significant effect on primary schooling. However, daughters who were 1 year more unexposed to the pension plan and lived in provinces with 1 additional office per 1,000 miles, were 3.3 percentage points more likely to complete secondary schooling ($p < 0.01$), 1.9 percentage points more likely to attend university ($p < 0.01$) and 0.9 ($p < 0.01$) percentage points more likely to practice matrilocality after marriage. The mean number of branches per 1000 miles is 0.654, indicating that, in the average province, the pension policy reduced secondary school completion by 1.2 percentage points per year of exposure, university enrollment by 1.2 percentage points per year of exposure, and the practice of matrilocality by 0.6 percentage points per year of exposure for matrilocal daughters.

Thus, across the three policy experiments in two countries, the results are remarkably similar. Pension plans crowd out human capital investment more for matrilocal females relative to non-matrilocal females in Indonesia and for patrilocal males relative to non-patrilocal males in Ghana. Moreover, in both countries, exposure to the pension plan crowds out the practice of the norm by patrilocal males (relative to non-patrilocal males) and by matrilocal females (relative to non-matrilocal females).

5.2 Ability and the Practice of Patrilocality and Matrilocality

In this section, I consider an additional test of the theoretical model. Proposition 4.3 indicates that parents will invest more in the transmission of the norm to high ability children who have higher returns to schooling. Therefore, contrary to the standard intuition that high ability children will be more likely to migrate, the theory argues that high ability girls (boys) will be more likely to live with their parents after marriage in matrilocal (patrilocal)

cultures. While the Ghana and Indonesia censuses do not contain rich data on ability, they do ask if individuals are literate. Conditional on the amount of schooling a child receives, literacy may proxy for ability. Thus, the argument is that a child who has completed primary school and is literate is likely to be higher ability than a child who has completed primary school and is not literate. To test proposition 4.3, I estimate

$$y_{ie} = \tau_0 + \tau_1 I_i^{Literate} + \tau_2 I_i^{Primary} + \tau_3 I_i^{Secondary} + \tau_4 I_i^{University} + \alpha_d + \epsilon_{ie},$$

where y_{ie} is an indicator variable for practicing matrilocality (in Indonesia) or patrilocality (in Ghana), $I_i^{Literate}$ is an indicator variable equal to 1 if individual i is literate, $I_i^{Primary}$ is an indicator variable equal to 1 if i has completed primary school, $I_i^{Secondary}$ is an indicator variable equal to 1 if i has completed secondary school, $I_i^{University}$ is an indicator variable equal to 1 if i has completed university, and α_d is a geographic fixed effect (province-level in Indonesia and district-level in Ghana). In Indonesia, the sample consists of married women aged 25-45 and in Ghana it consists of men aged 25-45.[13] Then, proposition 4.3 predicts that τ_1 will be positive.

Table 7 reports the results from these regressions. In both Indonesia, conditional on education, literate females are 3 percentage points ($p < .01$) more likely to live with their parents after marriage. In Ghana, literate males are 1.7 percentage points ($p < 0.01$) more likely to live with their parents after marriage. Both these findings are consistent with the model's prediction that parents will invest more in transmitting the norm to high ability children.

6 Alternative Explanations

In this section, I consider whether alternative drivers could explain the associations I report in the previous sections. One natural question is whether the returns to education are different between matrilocal and non-matrilocal females in Indonesia and patrilocal and non-patrilocal males in Ghana. If matrilocal females and patrilocal males have larger returns to education, this could explain both the correlation between the gender gap and traditional norms and the fact that the crowd out of education by the pension plan is greater among matrilocal daughters and patrilocal sons.

Without random or quasi-random variation in the amount of education an individual

[13] I choose individuals aged 25-45 to avoid any bias due to differential mortality. However, the results are not sensitive to the sample selection.

attains, I cannot directly estimate the returns to education for females in Ghana and males in Indonesia. As a second best, I estimate hedonic regressions, regressing labor market outcomes and proxies for household wealth on educational attainment (indicator variables for primary school completion, secondary school completion, and university completion) and its interaction with matrilocality (in Indonesia) or patrilocality (in Ghana). Additionally, while the 2010 Indonesia Census does not include questions about wages, formal sector workers report their wages in the 1995 Intercensal survey. Therefore, I use the 1995 Intercensal data for these regressions in Indonesia instead of the 2010 census; this has the additional advantage of estimating the association between education and later-life outcomes closer to when the pension plan creation and expansion that I studied occurred. In both Ghana and Indonesia, I restrict my samples to individuals aged 25-45 at the time of the survey to (1) ensure that those included in the sample have completed their education and (2) help ensure that differential mortality does not bias the results.

Table 8 reports the results of this exercise. Column 1 shows that education is not more predictive of employment by matrilocal females relative to non-matrilocal females. Column 2 regresses log wages on the educational attainment measures and their interactions with matrilocality,[14] and shows that the interactions are jointly insignificant predictors of log wages in Indonesia. In column 3, the interactions between matrilocality and education are jointly significant predictors ($p < 0.01$) of the wealth index,[15] but they are systematically negative. Turning to Ghana, in columns 5 and 6, I find that the interactions between the educational attainment measures and the indicator variable for traditional patrilocality are jointly statistically significant predictors of whether an individual is employed and household wealth, but in both cases the coefficients are again systematically negative.

Altogether, in the hedonic regressions, there is little evidence that there are greater returns to education for matrilocal females or patrilocal males. However, I caution against interpreting these estimates as causal. As the model shows, females with lower returns to education will receive education in matrilocal ethnic groups relative to non-matrilocal ethnic groups, and males with lower returns to education will receive education in patrilocal ethnic groups relative to non-patrilocal ethnic groups. Therefore, the model suggests that

[14]The much reduced sample size is because very few women work in the formal sector in 1995.

[15]In Indonesia, the wealth index is formed by predicting the first principal component of a principal components analysis of indicator variables for ownership of a automobile, tv, radio, buffet, stove, bicycle boat, and motor boat (for a discussion of this methodology, see Filmer and Pritchett (2001)). In Ghana, the wealth index is the predicted first component from a principal components analysis of indicator variables for whether a household has a toilet, whether it has electricity, and whether it has running water, and the number of rooms in the house.

the returns to education estimated by these hedonic regressions will be negatively biased for matrilocal females and patrilocal males. This is consistent with the fact that in columns 3, 4, and 5 of table 8, the estimated returns to education are significantly lower for matrilocal females and patrilocal males.

7 Conclusion

This paper provides novel evidence that the practice of traditional norms evolves quickly in response to institutions and policies. If modernization brings more complete markets and new policies, these policies may substitute for traditional practices that formerly resolved problems like old age support, decreasing the incentive to transmit these practices to the next generation. To establish if this is the case, I study norms which determine which child lives with his or her parents after marriage in Ghana and Indonesia. Consistent with a model where these norms resolve incomplete contracting problems between parents and children by increasing parents' ability to share in the returns to human capital investment in their children, I find these norms play a significant role in explaining the gender gap both across and within countries.

I then develop a model in which passing on traditional practices to children is costly. Parents who invest more in passing on the practices are able to claim a higher share of the returns to educating the children who are subject to the norm. This complementarity between the transmission of culture and the education of one's child means that the introduction and expansion of pension plans will crowd out both educating children targeted by the norm *and* the transmission of the norm to the next generation. Indeed, when I study the establishment of pension plans in Ghana and Indonesia, and the expansion of a plan in Indonesia, I find that this is the case. In Indonesia, matrilocal daughters who are exposed to the pension plan for longer receive less education and are less likely to live with their parents after marriage. In Ghana, patrilocal sons who are exposed to the pension plan for longer also receive less education and are also less likely to live with their parents after marriage. I also show, consistent with the model, that higher ability children are more likely to practice matrilocality in matrilocal societies and patrilocality in patrilocal societies.

These results have several implications. First, they provide evidence on how and when cultural practices change. In particular, these results show that policies may unintentionally lead culture to evolve. Moreover, by decoupling old age support from parental investment in children, pension plans had the unintended consequence of crowding out human capital

investments. Along with evidence from Ashraf et al. (2016), this highlights the importance of taking culture into account when considering the effects of policies. Finally, these findings point to a rational role cultural norms can play in determining gender gaps by coordinating human capital investments in a given gender.

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8 Figures

Figure 1: Distribution of Matrilocal Groups in the Indonesia 2010 Census

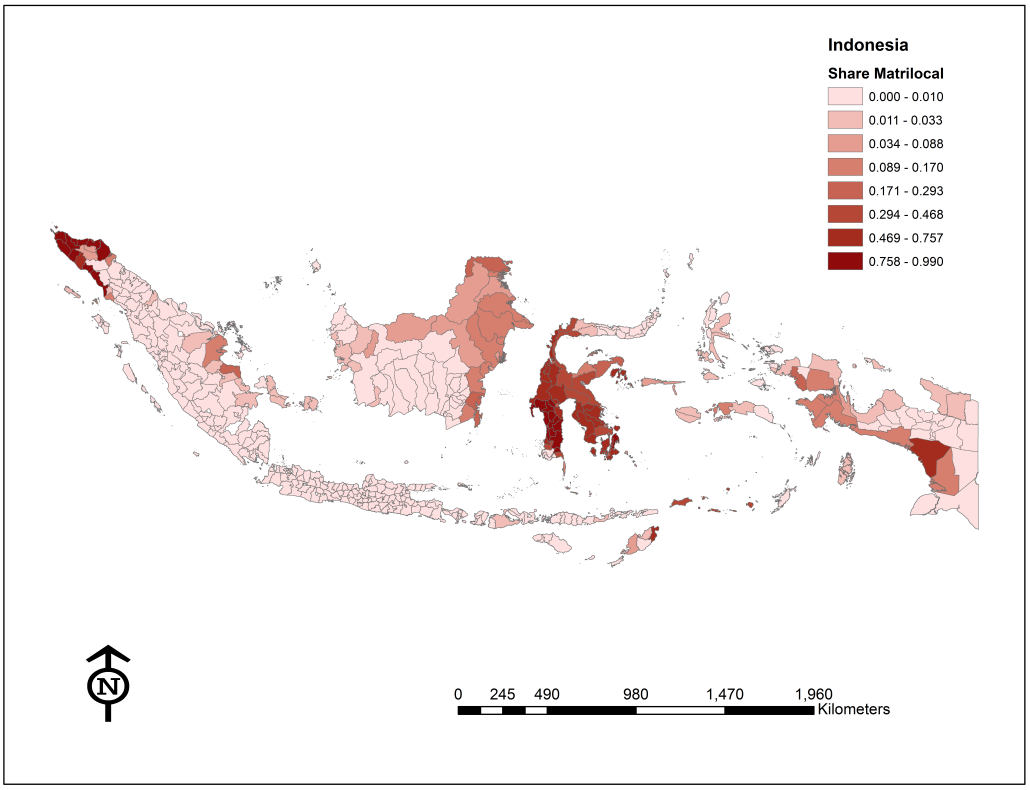


Figure 2: Distribution of Patrilocal Groups in the Ghana 2000 Census

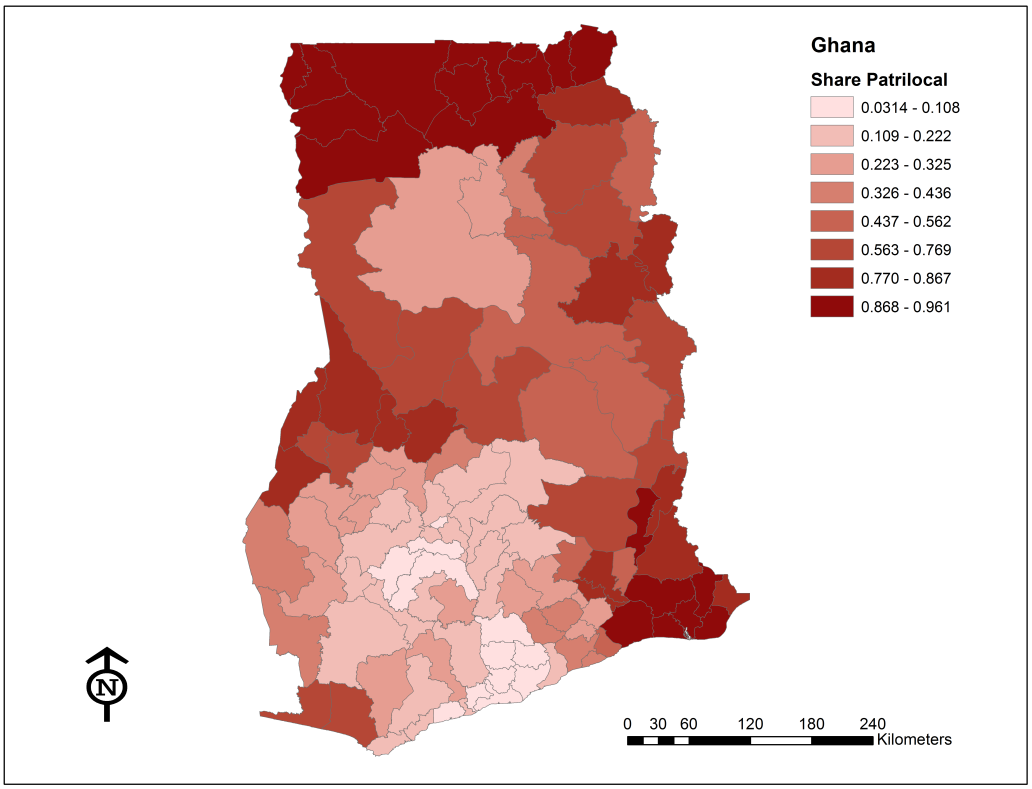
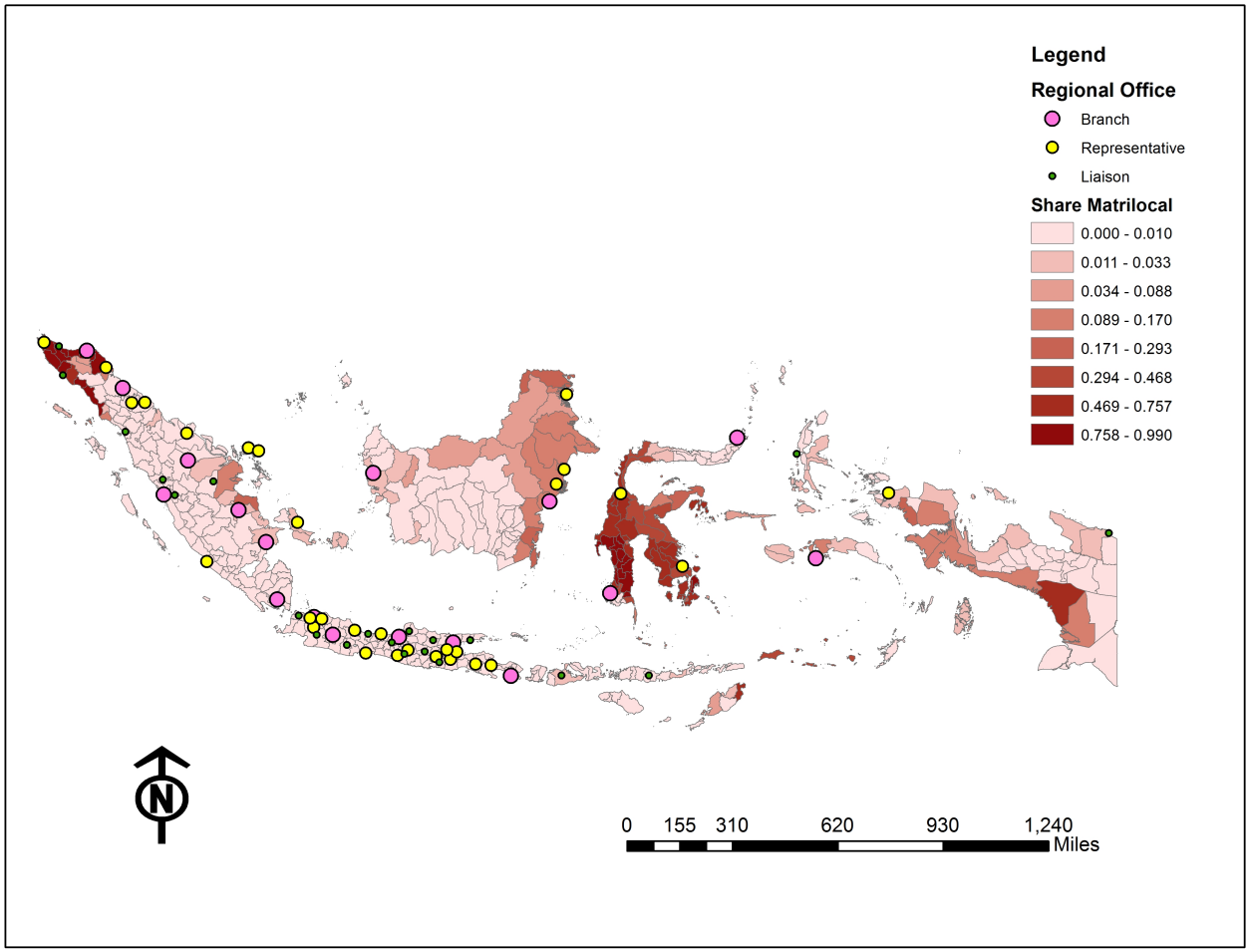


Figure 3: Locations of Astek Offices in Indonesia



9 Tables

Table 1: Association Between Traditional Norms and Current Practices

	(1)	(2)	(3)	(4)
	Indonesia		**Ghana**	
	Household Practices Matrilocality		**Household Practices Patrilocality**	
Matrilocal	0.023***	0.043***		
	(0.006)	(0.010)		
Patrilocal			0.032***	0.023*
			(0.011)	(0.014)
Mean	0.081	0.081	0.070	0.070
Ethnic Norm Controls	N	Y	N	Y
Number of observations	5,955,980	5,955,980	298,245	298,245
Adjusted R^2	0.000	0.001	0.008	0.007
Clusters	43	43	24	24

This table regresses an indicator variable for whether a household practices matrilocality (a married daughter lives in the same household as her parents) or patrilocality (a married son lives in the same household as his parents) on indicator variables for whether the household head belongs to a traditionally matrilocal or patrilocal ethnicity. An observation is a household. Ethnicity controls consist of indicator variables for polygamy, aboriginal plow use, male dominated agriculture, and bride price customs, as well as indicator variables for cases where information on these customs is missing. Standard errors are clustered at the ethnicity level.

Table 2: Effect of Patrilocality on the Gender Gap

	(1) **Score, 2013**	(2) **Score, 2013**	(3) **Economics Score**	(4) **Education Score**	(5) **Health Score**	(6) **Political Score**
Ln (income)	-0.0842**	-0.0520	-0.228***	0.226***	0.00466	-0.210***
	(0.0346)	(0.0368)	(0.0643)	(0.0580)	(0.00601)	(0.0764)
Ln (income)^2	0.00660***	0.00439*	0.0159***	-0.0126***	-0.000239	0.0156***
	(0.00226)	(0.00242)	(0.00433)	(0.00354)	(0.000383)	(0.00515)
Percent Societies Patrilocal		-0.0352***	-0.0516*	-0.0354***	-0.00216	-0.0518
		(0.0135)	(0.0264)	(0.0135)	(0.00197)	(0.0316)
Constant	0.924***	0.835***	1.454***	0.015	0.952***	0.920***
	(0.130)	(0.133)	(0.224)	(0.226)	(0.022)	(0.270)
Mean	.676	.676	.643	.948	.971	.173
Continent FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.219	0.259	0.195	0.493	0.118	0.143
Number of observations	122	122	122	122	122	122

The first column reports the results of the cross country regression of the 2013 World Economic Forum Gender Gap score on log income and log income squared. The second regression includes the percentage of societies in the Ethnographic Atlas that practice patrilocality as an explanatory variable. The remaining columns use the sub-scores of the gender gap score as the outcome variable instead of the overall score. Standard errors are heteroskedasticity robust, and all regressions include continent fixed effects.

Table 3: Association Between Matrilocality and Patrilocality and the Within-Household Gender Gap in Ghana and Indonesia

	(1) **Baseline**	(2) **+SES Controls**	(3) **+Norm Controls**	(4) **+Geography Controls**
			Indonesia	
$I_e^{Matrilocal} \times I_i^{Female}$	0.020***	0.018***	0.014***	0.012***
	(0.002)	(0.003)	(0.005)	(0.004)
Number of observations	6,151,544	5,551,976	5,551,976	5,551,976
Adjusted R^2	0.522	0.515	0.516	0.516
Clusters	43	43	43	43
			Ghana	
$I_e^{Patrilocal} \times I_i^{Male}$	0.011	0.007	0.010**	0.010***
	(0.007)	(0.006)	(0.005)	(0.004)
Number of observations	406,840	266,418	266,418	266,418
Adjusted R^2	0.507	0.517	0.517	0.517
Clusters	24	24	24	24

This table presents difference-in-difference estimates of the association between the interaction between matrilocality and female (Indonesia) and patrilocality and male (Ghana) and enrollment for children of the household head aged 5-22 in the Indonesia 2010 Census and the Ghana 2000 Census. All regressions include household fixed effects. In addition, the baseline regression in column 1 includes age fixed effects. Column 2 adds indicator variables for whether the father has completed primary school, whether the father's spouse has completed primary school, whether the father works in a high skill sector, whether the father's spouse works in a high skill sector, whether the father works in agriculture, whether the father's spouse works in agriculture, and whether the household head is male interacted with child gender. Column 3 includes indicator variables for whether a child belongs to an ethnicity with bride price custom, male dominated agriculture, polygamy, or aboriginal plow use interacted with child gender. Column 4 includes province fixed effects (Indonesia) or district fixed effects (Ghana) interacted with child gender. Data on ethnic norms is drawn from the *Ethnographic Atlas*. Standard errors are clustered at the ethnicity level in the *Ethnographic Atlas*.

Table 4: Effect of the Pension Plan on Educational Outcomes and Practice of Matrilocality in Indonesia

	1977 Creation of Astek							
	(1) **Primary**	(2) **Primary**	(3) **Secondary**	(4) **Secondary**	(5) **University**	(6) **University**	(7) **Practice Matrilocality**	(8) **Practice Matrilocality**
$I_e^{Matrilocal} \times years\_unexpos_i$	0.001	0.005*	0.020***	0.018***	0.006***	0.006***	0.010***	0.010***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.001)	(0.001)
Province FE	Y	Y	Y	Y	Y	Y	Y	Y
Province FE $\times years\_unexpos_i$	Y	Y	Y	Y	Y	Y	Y	Y
Ethnicity FE	Y	Y	Y	Y	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y	Y	Y	Y	Y
Ethnic Norm Interactions	N	Y	N	Y	N	Y	N	Y
Number of observations	4,695,705	4,695,705	4,695,705	4,695,705	4,695,705	4,695,705	4,380,841	4,380,841
Clusters	50	50	50	50	50	50	50	50
Adjusted R^2	0.121	0.123	0.144	0.144	0.032	0.032	0.039	0.039

	(1)	(2)	(3)	(4)	(5)	(6)
	1992 Expansion to Small Formal Sector Enterprises					
	Primary	**Primary**	**Secondary**	**Secondary**	**Practice Matrilocality**	**Practice Matrilocality**
$I_e^{Matrilocal} \times years\_unexpos_i$	0.018***	0.022***	-0.007	-0.007	0.012***	0.011***
	(0.003)	(0.002)	(0.005)	(0.006)	(0.002)	(0.002)
Province FE	Y	Y	Y	Y	Y	Y
Province FE $\times years\_unexpos_i$	Y	Y	Y	Y	Y	Y
Ethnicity FE	Y	Y	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y	Y	Y
Ethnic Norm Interactions	N	Y	N	Y	N	Y
Number of observations	5,382,602	5,382,602	5,382,602	5,382,602	4,331,696	4,331,696
Clusters	50	50	50	50	50	50
Adjusted R^2	0.092	0.093	0.122	0.122	0.086	0.087

This table uses data from the Indonesia 2010 census to estimate the differential effects of years unexposed to the 1977 establishment of compulsory pension plans and the 1992 expansion of these pension plans during childhood on educational outcomes and practice of matrilocality (a married daughter living in the same household as her parents) in matrilocal and non-matrilocal ethnic groups. Data on matrilocal practices are drawn from a match between ethnicity-level census data and the *Ethnographic Atlas*. The education regressions for the 1977 establishment of the plan restrict to females born between 1959 and 1985. The education regressions for the 1992 expansion of the plan restrict to females born between 1964 and 1992. The practice of matrilocality regressions additionally restrict the samples to married individuals. A married female is considered to practice matrilocality if she lives in the same household as at least 1 of her parents. Standard errors are clustered at the ethnicity level.

Table 5: Effect of the Pension Plan on Educational Outcomes and Practice of Patrilocality in Ghana

	(1) **Primary**	(2) **Primary**	(3) **Practice Patrilocality**	(4) **Practice Patrilocality**
$I_e^{Patrilocal} \times years\_unexpos_i$	0.025***	0.025***	0.005***	0.005***
	(0.003)	(0.003)	(0.002)	(0.002)
District FE	Y	Y	Y	Y
District FE $\times years\_unexpos_i$	Y	Y	Y	Y
Ethnicity FE	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y
Ethnic Norm Interactions	N	Y	N	Y
Number of observations	344,937	344,937	170,663	170,663
Clusters	24	24	24	24
Adjusted R^2	0.207	0.207	0.112	0.112

This table uses data from the Ghana 2000 census to estimate the differential effects of years unexposed to the 1972 pension reform in childhood on educational outcomes and practice of patrilocality (a married son living with his parents) in patrilocal and non-patrilocal ethnic groups. Data on patrilocal practices are drawn from a match between ethnicity-level census data and the *Ethnographic Atlas*. The education regressions restrict to males born between 1954 and 1985. The practice of patrilocality regression additionally restricts the sample to married individuals. A married male is considered to practice patrilocality if he lives in the same household as at least 1 of his parents. Standard errors are clustered at the ethnicity level.

Table 6: Triple-Differences Estimates of the Effect of Astek on Educational Outcomes and Practice of Matrilocality in Indonesia

	(1) **Primary**	(2) **Primary**	(3) **Secondary**	(4) **Secondary**	(5) **University**	(6) **University**	(7) **Practice Matrilocality**	(8) **Practice Matrilocality**
$I_e^{Matrilocal} \times years\_unexpos_i \times Intensity_d$	0.002	0.002	0.033***	0.033***	0.019***	0.019***	0.009***	0.009***
	(0.003)	(0.003)	(0.008)	(0.008)	(0.002)	(0.002)	(0.002)	(0.002)
Province FE × Ethnicity FE	Y	Y	Y	Y	Y	Y	Y	Y
Province FE $\times years\_unexpos_i$	Y	Y	Y	Y	Y	Y	Y	Y
$I_e^{Matrilocal} \times years\_unexpos_i$	Y	Y	Y	Y	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y	Y	Y	Y	Y
Ethnic Norm Interactions	N	Y	N	Y	N	Y	N	Y
Number of observations	4,670,402	4,670,402	4,670,402	4,670,402	4,670,402	4,670,402	4,357,678	4,357,678
Clusters	50	50	50	50	50	50	50	50
Adjusted R^2	0.127	0.127	0.150	0.150	0.034	0.034	0.057	0.057

This table uses data from the Indonesia 2010 census to estimate the differential effects of years unexposed to the 1977 establishment of compulsory pension plans during childhood interacted with the intensity of the pension plan roll out in a child's birth province on educational outcomes and the practice of matrilocality (a married daughter living in the same household as her parents) in matrilocal and non-matrilocal ethnic groups. Data on matrilocal practices are drawn from a match between ethnicity-level census data and the *Ethnographic Atlas*. Data on the locations of Astek offices is drawn from Sudomo (1985). The regressions restrict to females born between 1959 and 1985. A married female is considered to practice matrilocality if she lives in the same household as at least 1 of her parents. Standard errors are clustered at the ethnicity level.

Table 7: Ability and the Practice of Patrilocality and Matrilocality in Ghana and Indonesia

	(1) **Indonesia Practice Matrilocality**	(2) **Ghana Practice Patrilocality**
$I_e^{Literate}$	0.030***	0.017***
	(0.001)	(0.003)
Education FE	Y	Y
District FE	Y	Y
Number of observations	302,369	129,017
Adjusted R^2	0.034	0.038

This table uses data from the Ghana 2000 census and the Indonesia 2010 census to estimate the association between literacy and the practice of patrilocality in Ghana and matrilocality in Indonesia. Data on patrilocal and matrilocal practices are drawn from a match between ethnicity/language-level census data and the *Ethnographic Atlas*. The Ghana regression restricts to married, patrilocal males between 25 and 45, and the Indonesia regression restricts to married, matrilocal females between 25 and 45. A married male is considered to practice patrilocality is he lives in the same household as at least 1 of his parents, and an analogous rule is used to determine if married females practice patrilocality. Standard errors are heteroskedasticity robust.

Table 8: Association Between Education and Long-term Outcomes in Ghana and Indonesia

	(1)	(2)	(3)	(4)	(5)
		Indonesia			**Ghana**
	Employed	**Log(wage)**	**Wealth Index**	**Employed**	**Wealth Index**
$I_e^{norm} \times I_e^{Primary}$	-0.028	-0.045	-0.022	-0.025***	-0.123
	(0.027)	(0.038)	(0.089)	(0.007)	(0.077)
$I_e^{norm} \times I_e^{Secondary}$	0.038	0.120*	-0.145	-0.030***	-0.025
	(0.025)	(0.064)	(0.170)	(0.005)	(0.047)
$I_e^{norm} \times I_e^{College}$	-0.004	0.007	-0.274***	0.019	-0.073
	(0.032)	(0.036)	(0.081)	(0.012)	(0.049)
$I_e^{Primary}$	-0.065***	0.332***	0.834***	0.022***	-0.367***
	(0.007)	(0.013)	(0.015)	(0.000)	(0.022)
$I_e^{Secondary}$	0.062***	0.836***	1.219***	-0.103***	-0.001
	(0.017)	(0.015)	(0.026)	(0.001)	(0.009)
$I_e^{College}$	0.150***	0.239***	0.498***	-0.037***	0.186***
	(0.026)	(0.024)	(0.036)	(0.002)	(0.003)
F-statistic	0.89	1.74	15.31	16.60	10.67
Sample	Females	Females	Females	Males	Males
Ethnicity FE	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y
Number of observations	84,498	12,421	84,488	190,990	189,539
Clusters	25	22	25	24	24
Adjusted R^2	0.044	0.443	0.295	0.039	0.113

This table estimates the association between education and labor market outcomes and wealth for matrilocal and non-matrilocal females aged 25-45 in the 1995 Indonesia Intercensal Survey and patrilocal and non-patrilocal males aged 25-45 in the 2000 Ghana Census. I_e^{norm} is an indicator variable equal to 1 if an individual is matrilocal in Indonesia and if an individual is patrilocal in Ghana. In Indonesia, the wealth index is formed by predicting the first principal component of a principal components analysis of indicator variables for ownership of a automobile, tv, radio, buffet, stove, bicycle boat, and motor boat (for a discussion of this methodology, see Filmer and Pritchett (2001)). In Ghana, the wealth index is the predicted first component from a principal components analysis of indicator variables for whether a household has a toilet, whether it has electricity, and whether it has running water, and the number of rooms in the house. Standard errors are clustered at the ethnicity level.

10 Mathematical Appendix

In this section, I prove the propositions in section 4. Before proceeding to the proofs, some preliminaries are helpful. First, because of the linearity of parents' utility functions and the assumption that income constraints are "not binding," parents treat the problem of how much to invest in daughters and how much to invest in sons as separable. Proofs of the separability lemmas are available on request. Second, differentiating equation 3, the maximization problem of matrilocal parents, with respect to I yields an important relationship that will appear in several of the proofs below:

$$(1+r) = p'(I_E^*)(1-\gamma)V^f(E), \tag{8}$$

where I_E^* is the equilibrium investment in the norm as a function of the choice of E. For notational simplicity, I will suppress the subscript j.

Proof of Proposition 4.1.

To prove the proposition, I first show that girls are more likely to be educated in matrilocal societies. The strategy is to show that any girl who is weakly educated in a neolocal society will be strictly educated in a matrilocal society. A neolocal girl is educated if:

$$\begin{aligned}(1+r)(y-f_s-f_sS)+\gamma V^f(1)+\delta V^m(S) &\geq (1+r)(y-f_sS)+\gamma V^f(0)+\delta V^m(S)\\ \gamma(V^f(1)-V^f(0)) &\geq (1+r)f_s\\ V^f(1)-V^f(0) &\geq \frac{(1+r)f_s}{\gamma}. \end{aligned}\tag{9}$$

Then we can define $\Delta V_{NEO}^* = V^f(1)-V^f(0) = \frac{(1+r)f_s}{\gamma}$ as the minimal returns to education a girl needs in a neolocal society to be educated. In a matrilocal society, a girl will be educated, cancelling out the male terms, if:

$$\begin{aligned}(1+r)(y-f_sS-f_s-I_1^*)+p(I_1^*)(1-\gamma)V^f(1)+\gamma V^f(1) \geq\\ (1+r)(y-f_sS-I_0^*)+p(I_0^*)(1-\gamma)V^f(0)+\gamma V^f(0).\end{aligned}\tag{10}$$

To show that girls in matrilocal societies are more likely to be educated than girls in neolocal societies, it is sufficient to show that equation 10 will always be satisfied (and non-binding) if $V^f(1)-V^f(0) = \frac{(1+r)f_s}{\gamma}$. In other words, if a girl's returns to education are sufficiently high enough to be educated in a neolocal society, they will be more than sufficiently high in a matrilocal society. Substituting this expression into $V^f(1)-V^f(0) = \frac{(1+r)f_s}{\gamma}$ produces the

condition:

$$(1+r)(I_0^* - I_1^*) + (1-\gamma)(p(I_1^*)V^f(1) - p(I_0^*)V^f(0)) > 0. \tag{11}$$

Note that we can rewrite equation 8 as $\frac{1+r}{p'(I_E^*)} = (1-\gamma)V^f(E)$. Substituting thing expression into equation 11 gives us

$$\frac{p(I_1^*)}{p'(I_1^*)} - \frac{p(I_0^*)}{p'(I_0^*)} > I_1^* - I_0^*. \tag{12}$$

Define $g(I_E) = \frac{p(I_E)}{p'(I_E)}$. Then, equation 12 will hold if $g(I_1^*) - g(I_0^*) > I_1^* - I_0^*$. Note also that $g(I_1^*) - g(I_0^*) = \int_{I_0^*}^{I_1^*} g'(I)\delta I$. Thus, equation 12 will be satisfied if $g'(I) > 1$. By the quotient rule,

$$g'(I_E) = 1 - \frac{p''(I_E)}{p'(I_E)}, \tag{13}$$

and by assumption $p''(I_E) < 0$ and $p'(I_E) > 0$, so $g'(I_E) > 1$. This shows that girls in matrilocal ethnicities are more likely to be educated than girls in neolocal ethnicities. From the separability of the boys' and girls' problems, it follows that education rates will be the same for boys and girls in matrilocal and neolocal ethnicities. Therefore, girls are more likely to be educated relative to boys in matrilocal ethnicities relative to neolocal ethnicities.

Proof of Proposition 4.2.

The proof has three steps. The first step is to show that an increase in r will reduce I_E^* for both $E = 0$ and $E = 1$. The second step is to show that $I_1^* > I_0^*$, and the third step is to show that an increase in r will increase the share of households choosing $E = 0$. Taken together, these facts imply that an increase in r must reduce overall investment in the norm.

Proof that an increase in r will reduce I_E^*: Recall that I_E^* must satisfy the first order condition in equation 8. Therefore, if r increases, the value of $p'(I_E^*)(1-\gamma)V^f(E)$ must also increase. Since p exhibits diminishing marginal returns, this will occur if I_E^* falls.

Proof that $I_1^* > I_0^*$:

Rewrite the first order condition in equation 8 as:

$$p'(I_E^*) = \frac{1+r}{(1-\gamma)V^f(E)}. \tag{14}$$

By assumption, $V^f(1) > V^f(0)$ and p has diminishing marginal returns, so for the first order condition to be satisfied for both I_1^* and I_0^*, it must be the case that $p'(I_1^*) < p'(I_0^*)$, implying

that $I_1^* > I_0^*$.

Proof that E(r) is weakly decreasing in r:

Here, I show that no household that is not educating their daughter will start educating her in response to an increase in r. Assume $E(r) = 0$. Then, it is sufficient to show that $E(r+\epsilon) = 0 \ \forall \epsilon > 0$. Note that a girl will be uneducated if $U(E = 0, I_0^*(r), S, r) > U(E = 1, I_1^*(r), S, r)$, where U is the parents' utility as a function of E, S, I, and r. If this relationship holds at r, then I can show that it must also hold at $r + \epsilon$. Milgrom and Segal (2002) show that we can apply the envelope theorem despite the fact that E and S are discrete. Applying the unconstrained envelope theorem to both sides of this inequality shows that $\frac{dU(E=1,I_1^*(r),r)}{dr} = y - f_s - f_s S - I_1^*$ and $\frac{dU(E=0,I_0^*(r),r)}{dr} = y - f_s S - I_0^*$. Since $I_0^* < I_1^*$, it follows that $\frac{dU(E=1,I_1^*(r),r)}{dr} < \frac{dU(E=0,I_0^*(r),r)}{dr}$, implying that the benefits to not educating a daughter grow faster than the benefits to educating a daughter as r increases.

Proof of Proposition 4.3.

This follows naturally from the first order condition in equation 8. For the expression to be true, when $V^f(E)$ increases, $p'(I_E^*)$ must fall. Since p has diminishing marginal returns, this will occur when I_E^* increases.

Proof of Proposition 4.4.

To show that the an increase in r causes education rates to fall more for matrilocal ethnicities than neolocal ethnicities, I show that under assumption 4.1, the derivative of the share of educated women in a matrilocal ethnicity with respect to r is more negative than the derivative of the share of educated women with respect to r in a neolocal ethncitiy. In neolocal ethnicities, a woman is educated if

$$V^f(1) - V^f(0) \geq \frac{(1+r)f_s}{\gamma}, \tag{15}$$

so

$$\alpha_{NEO}^f = 1 - F(\frac{(1+r)f_s}{\gamma}). \tag{16}$$

Then,

$$\frac{d\alpha_{NEO}^f}{dr} = -\frac{f_s}{\gamma} F'(\frac{(1+r)f_s}{\gamma}). \tag{17}$$

Now, I show that we can calculate α_{MAT}^f in the same way by showing that if equation 10 holds for $V^f(1)$, it must hold for $V^f(1) + \epsilon$. To see this, use the envelope theorem to

take the derivative of the lefthand and righthand sides of equation 10 with respect to $V^f(1)$. Then, $\frac{dLHS}{dV^f(1)} = p(I_1^*)(1-\gamma)+\gamma > 0$ and $\frac{dRHS}{dV^f(1)} = 0$. Therefore, if equation 10 is satisfied for $V^f(1)$, it must be satisfied for $V^f(1)+\epsilon$. In matrilocal ethnicities, rearranging equation 10 and using the relationship $V^f(E) = \frac{1+r}{p'(I_E^*)(1-\gamma)}$ from equation 8 produces an expression for the minimal returns to education that a girl must have to be educated:

$$V^f(1) - V^f(0) \geq \frac{1+r}{\gamma}\Big(f_s + I_1^* - I_0^* - \frac{p(I_1^*)}{p'(I_1^*)} + \frac{p(I_0^*)}{p'(I_0^*)}\Big). \tag{18}$$

Define $\Delta V_{MAT}^* = \frac{1+r}{\gamma}\Big(f_s + I_1^* - I_0^* - \frac{p(I_1^*)}{p'(I_1^*)} + \frac{p(I_0^*)}{p'(I_0^*)}\Big)$. Therefore,

$$\alpha_{MAT} = 1 - F(\Delta V_{MAT}^*). \tag{19}$$

Now differentiate α_{MAT} with respect to r:

$$\begin{aligned}\frac{d\alpha_{MAT}}{dr} = -F'(\Delta V_{MAT}^*)\Big(&\frac{1}{\gamma}(f_s + I_1^* - I_0^* - \frac{p(I_1^*)}{p'(I_1^*)} + \frac{p(I_0^*)}{p'(I_0^*)}) \\ &+\frac{1+r}{\gamma}(\frac{\partial I_1^*}{\partial r} - \frac{\partial I_0^*}{\partial r} - \frac{p'(I_1^*)^2 - p''(I_1^*)p(I_1^*)}{p'(I_1^*)^2}\frac{\partial I_1^*}{\partial r} \\ &+\frac{p'(I_0^*)^2 - p''(I_0^*)p(I_0^*)}{p'(I_0^*)^2}\frac{\partial I_0^*}{\partial r})\Big).\end{aligned} \tag{20}$$

Using the fact that $\frac{\partial I_E^*}{\partial r} = \frac{1}{p''(I_E^*)(1-\gamma)V^f(E)}$ for $\frac{\partial I_1^*}{\partial r}$ and $\frac{\partial I_0^*}{\partial r}$ and from equation 8, $\frac{p(I_1^*)}{p'(I_1^*)}\Big(1 - \frac{1+r}{p'(I_1^*)(1-\gamma)V^f(1)}\Big) = 0$, $\frac{d\alpha_{MAT}}{dr} < \frac{d\alpha_{NEO}}{dr}$ if and only if

$$\frac{f_s + I_1^* - I_0^* + \frac{p(I_0^*)}{p'(I_0^*)}\Big(1 + \frac{1+r}{p'(I_0^*)(1-\gamma)V^f(0)}\Big)}{f_s} > \frac{F'\Big(\frac{(1+r)f_s}{\gamma}\Big)}{F'\Big(\frac{1+r}{\gamma}(f_s + I_1^* - I_1^* - \frac{p(I_1^*)}{p'(I_1^*)} + \frac{p(I_0^*)}{p'(I_0^*)})\Big)},$$

which is satisfied by assumption 4.1. Note that the left-hand side of the inequality will always be greater than or equal to 1, capturing the fact that the minimum returns for a girl to be educated will increase more in response to r in matrilocal societies. The right-hand side captures the fact that the density of girls on the margin may differ in matrilocal and non-matrilocal societies. The inequality will not be true if the density of girls at the margin in neolocal societies is much greater than the density in matrilocal societies. The fact that this inequality is satisfied implies that education rates fall faster for girls in matrilocal ethnicities than for boys in response to the pension plan expansion.

11 Appendix Tables

Table A1: Association Between Matrilocality and Patrilocality and Other Traditional Practices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Indicator variable for patrilocal						**Indicator variable for matrilocal**				
Plow	-0.057						-0.031					
	(0.060)						(0.051)					
Bride Price		0.134***						-0.128***				
		(0.030)						(0.025)				
Male Dominated Agriculture			-0.050						0.024			
			(0.034)						(0.029)			
Agriculture Dependence				-0.020						-0.024		
				(0.027)						(0.023)		
Polygamy					0.133***						-0.063**	
					(0.036)						(0.031)	
Patrilineal						0.377***						
						(0.027)						
Matrilineal												0.543***
												(0.029)
Region FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	1,135	1,235	934	1,235	1,208	1,220	1,135	1,235	934	1,235	1,208	1,220
Adjusted R^2	0.339	0.352	0.327	0.341	0.362	0.436	0.288	0.304	0.269	0.289	0.303	0.456

This table regresses indicator variables for practicing matrilocality or patrilocality on indicator variables for other ethnicity-level norms. All regressions control for region (sub-continent) fixed effects. The data is drawn from Murdock's *Ethnographic Atlas*. Standard errors are heteroskedasticity robust.

Table A2: Association Between Matrilocality and Patrilocality and Other Traditional Practices Within Indonesia and Ghana

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Indonesia						**Ghana**	
			Indicator variable for matrilocal						**Indicator variable for patrilocal**	
Plow	-0.048									
	(0.103)									
Bride Price		-0.022					0.111			
		(0.092)					(0.169)			
Male Dominated Agriculture			0.038					0.056		
			(0.135)					(0.198)		
Agriculture Dependence				0.032					-0.091	
				(0.091)					(0.064)	
Polygamy					-0.100					
					(0.120)					
Matrilineal						0.975***				
						(0.025)				
Patrilineal										0.167
										(0.113)
Number of observations	37	43	31	43	42	43	24	15	24	23
Adjusted R^2	-0.023	-0.023	-0.031	-0.022	-0.001	0.725	-0.014	-0.070	-0.037	0.044

This table regresses indicator variables for practicing matrilocality or patrilocality on indicator variables for other ethnicity-level norms using within Indonesia and within Ghana variation. Regressions for polygamy and aboriginal plow use are excluded for Ghana since all ethnic groups in Ghana historically practiced polygamy and no ethnic groups had the plow. The data is drawn from Murdock's *Ethnographic Atlas*. Standard errors are heteroscedasticity robust.

Table A3: Summary Statistics for Children Aged 5-22 in the Indonesia 2010 Census

	(1) **Mean**	(2) **SD**	(3) **N**	(4) **Matrilocal**	(5) **SD**	(6) **N**	(7) **Non-Matrilocal**	(8) **SD**	(9) **N**	(10) **Coefficient**	(11) **Se**
				Males							
Matrilocal	0.048	0.213	3,246,317.000	1.000	0.000	154,317.000	0.000	0.000	3,092,000.000		
Enrolled	0.667	0.471	3,246,317.000	0.650	0.477	154,317.000	0.668	0.471	3,092,000.000	-0.027	0.028
Father Primary	0.858	0.349	3,009,543.000	0.778	0.416	138,634.000	0.862	0.345	2,870,909.000	0.012	0.039
Mother Primary	0.842	0.364	3,161,320.000	0.776	0.417	150,944.000	0.846	0.361	3,010,376.000	0.053	0.040
Father Employed in High Skill Industry	0.045	0.207	3,009,543.000	0.034	0.182	138,634.000	0.045	0.208	2,870,909.000	-0.012	0.007
Father Employed in Agriculture	0.405	0.491	3,009,543.000	0.660	0.474	138,634.000	0.392	0.488	2,870,909.000	0.117**	0.050
Mather in High Skill Industry	0.041	0.199	3,161,320.000	0.039	0.195	150,944.000	0.042	0.200	3,010,376.000	0.001	0.011
Mother in Agriculture	0.253	0.435	3,161,320.000	0.390	0.488	150,944.000	0.246	0.431	3,010,376.000	0.002	0.048
				Females							
Matrilocal	0.048	0.213	2,905,227.000	1.000	0.000	138,491.000	0.000	0.000	2,766,736.000		
Enrolled	0.708	0.455	2,905,227.000	0.701	0.458	138,491.000	0.709	0.454	2,766,736.000	-0.016	0.026
Father Primary	0.866	0.340	2,699,037.000	0.784	0.412	124,704.000	0.870	0.336	2,574,333.000	0.011	0.040
Mother Primary	0.853	0.355	2,833,305.000	0.784	0.411	135,629.000	0.856	0.351	2,697,676.000	0.051	0.041
Father, High Skilled Industry	0.046	0.211	2,699,037.000	0.035	0.185	124,704.000	0.047	0.212	2,574,333.000	-0.012	0.007
Father Agriculture	0.393	0.488	2,699,037.000	0.658	0.474	124,704.000	0.380	0.485	2,574,333.000	0.124**	0.050
Mother, High Skilled Industry	0.043	0.204	2,833,305.000	0.040	0.196	135,629.000	0.044	0.204	2,697,676.000	0.000	0.011
Mother Employed in Agriculture	0.243	0.429	2,833,305.000	0.387	0.487	135,629.000	0.235	0.424	2,697,676.000	0.009	0.047
				Women Aged 25-45							
Number of Children	2.086	1.563	3,858,633.000	2.523	2.012	176,669.000	2.065	1.535	3,681,964.000	0.106	0.115
Percent Female Children	0.482	0.369	3,321,873.000	0.482	0.335	144,616.000	0.482	0.370	3,177,257.000	0.000	0.001

This table provides summary statistics for children of households aged 5-22 in the Indonesia 2010 census. The first two columns give the mean, SD, and number of observations for the whole sample. The next three columns give the mean, SD, and number of observations for children from historically matrilocal ethnic groups according to the *Ethnographic Atlas* and columns 7, 8, 9 give the means, SD, and number of observations for non-matrilocal groups. Column 10 tests for balance: it regresses the row-name variables on an indicator variable for belonging to a matrilocal ethnicity, controlling for the ethnicity controls (polygamy, bride price, male dominated agriculture, and aboriginal plow use) and province fixed effects. Standard errors are clustered at the ethnicity level.

Table A4: Summary Statistics for Children Aged 5-22 in the Ghana 2000 Census

	(1) **Mean**	(2) **SD**	(3) **N**	(4) **Patrilocal**	(5) **SD**	(6) **N**	(7) **Non-Patrilocal**	(8) **SD**	(9) **N**	(10) **Coefficient**	(11) **Se**
					Males						
Patrilocal	0.493	0.500	220,368.000	1.000	0.000	108,583.000	0.000	0.000	111,785.000		
Enrolled	0.604	0.489	220,368.000	0.535	0.499	108,583.000	0.671	0.470	111,785.000	-0.139*	0.072
Father Primary	0.489	0.500	169,089.000	0.355	0.478	87,523.000	0.634	0.482	81,566.000	-0.245**	0.110
Mother Primary	0.329	0.470	197,368.000	0.220	0.414	97,424.000	0.435	0.496	99,944.000	-0.181***	0.054
Father Employed in High Skill Industry	0.065	0.247	158,428.000	0.057	0.232	81,554.000	0.074	0.262	76,874.000	-0.018*	0.009
Father Employed in Agriculture	0.639	0.480	158,428.000	0.709	0.454	81,554.000	0.564	0.496	76,874.000	0.105**	0.045
Mather in High Skill Industry	0.044	0.205	176,084.000	0.036	0.186	85,744.000	0.051	0.220	90,340.000	-0.014***	0.004
Mother in Agriculture	0.608	0.488	176,084.000	0.659	0.474	85,744.000	0.560	0.496	90,340.000	0.065*	0.031
					Females						
Patrilocal	0.478	0.500	203,207.000	1.000	0.000	97,173.000	0.000	0.000	106,034.000		
Enrolled	0.582	0.493	203,207.000	0.517	0.500	97,173.000	0.642	0.479	106,034.000	-0.133*	0.075
Father Primary	0.515	0.500	149,179.000	0.378	0.485	75,534.000	0.655	0.475	73,645.000	-0.245*	0.114
Mother Primary	0.350	0.477	184,838.000	0.241	0.428	88,316.000	0.450	0.497	96,522.000	-0.178***	0.057
Father, High Skilled Industry	0.069	0.254	139,724.000	0.062	0.241	70,439.000	0.077	0.266	69,285.000	-0.016	0.010
Father Agriculture	0.611	0.488	139,724.000	0.685	0.465	70,439.000	0.535	0.499	69,285.000	0.114**	0.046
Mother, High Skilled Industry	0.047	0.212	165,142.000	0.038	0.191	77,902.000	0.056	0.229	87,240.000	-0.018***	0.005
Mother Employed in Agriculture	0.576	0.494	165,142.000	0.632	0.482	77,902.000	0.526	0.499	87,240.000	0.074**	0.034
					Women Aged 25-45						
Number of Children	3.665	2.617	235,925.000	3.757	2.624	106,154.000	3.589	2.608	129,771.000	0.046	0.035
Percent Children Female at Birth	0.486	0.309	210,778.000	0.485	0.307	95,643.000	0.488	0.311	115,135.000	0.002	0.002

This table provides summary statistics for children of households aged 5-22 in the Ghana 2000 census. The first two columns give the mean, SD, and number of observations for the whole sample. The next three columns give the mean, SD, and number of observations for children from historically patrilocal ethnic groups according to the *Ethnographic Atlas* and columns 7, 8, 9 give the means, SD, and number of observations for non-patrilocal groups. Column 10 tests for balance: it regresses the row-name variables on an indicator variable for belonging to a patrilocal ethnicity, controlling for the ethnicity controls (polygamy, bride price, male dominated agriculture, and aboriginal plow use) and district fixed effects. Standard errors are clustered at the ethnicity level.

Table A5: Association Between Matrilocality and Patrilocality and the Within-Household Gender Gap in Ghana and Indonesia Using Alternative Ethnographic Data

	(1) **Baseline**	(2) **+SES Controls**	(3) **+Geography Controls**
		Indonesia	
$I_e^{Matriloal} \times I_e^{Female}$	0.015***	0.015***	-0.001
	(0.006)	(0.005)	(0.004)
Number of observations	4,775,991	4,286,046	4,286,046
Adjusted R^2	0.525	0.519	0.519
Clusters	23	23	23
		Ghana	
$I_e^{Patrilocal} \times I_e^{Male}$	0.019*	0.015**	0.017***
	(0.010)	(0.007)	(0.005)
Number of observations	434,217	285,585	285,585
Adjusted R^2	0.503	0.512	0.513
Clusters	56	56	56

This table presents difference-in-difference estimates of the association between the interaction between matrilocality and female (Indonesia) and patrilocality and male (Ghana) and enrollment for children of the household head aged 5-22 in the Indonesia 2010 Census and the Ghana 2000 Census using alternative data on ethnicity-level, traditional practices regarding residency after marriage. All regressions include household fixed effects. In addition, the baseline regression in column 1 includes age fixed effects. Column 2 adds indicator variables for whether the father has completed primary school, whether the father's spouse has completed primary school, whether the father works in a high skill sector, whether the father's spouse works in a high skill sector, whether the father works in agriculture, whether the father's spouse works in agriculture, and whether the household head is male interacted with child gender. Column 3 includes province fixed effects (Indonesia) or district fixed effects (Ghana) interacted with child gender.

Table A6: Summary Statistics for Females in Indonesia Pension Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				1977 Sample							
		Full Sample			**Matrilocal**			**Non-Matrilocal**			
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Difference	Se
Matrilocal	0.046	0.209	4,693,486.000	1.000	0.000	214,619.000	0.000	0.000	4,478,867.000		
Practicing Matrilocality	0.073	0.260	4,693,486.000	0.087	0.281	214,619.000	0.072	0.259	4,478,867.000	0.024***	0.006
Primary	0.876	0.330	4,693,486.000	0.828	0.377	214,619.000	0.878	0.328	4,478,867.000	0.070*	0.038
Secondary	0.317	0.465	4,693,486.000	0.254	0.435	214,619.000	0.320	0.467	4,478,867.000	-0.054	0.098
Employed in Agriculture	0.404	0.491	2,455,637.000	0.575	0.494	116,644.000	0.395	0.489	2,338,993.000	-0.020	0.103
Employed in High Skill Industry	0.107	0.310	2,455,637.000	0.119	0.323	116,644.000	0.107	0.309	2,338,993.000	-0.013	0.047
				1992 Sample							
		Full Sample			**Matrilocal**			**Non-Matrilocal**			
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Difference	Se
Matrilocal	0.046	0.210	5,380,059.000	1.000	0.000	248,405.000	0.000	0.000	5,131,654.000		
Practicing Matrilocality	0.092	0.289	5,380,059.000	0.106	0.308	248,405.000	0.091	0.288	5,131,654.000	0.034***	0.007
Primary	0.913	0.282	5,380,059.000	0.873	0.333	248,405.000	0.915	0.279	5,131,654.000	0.063**	0.031
Secondary	0.369	0.482	5,380,059.000	0.309	0.462	248,405.000	0.372	0.483	5,131,654.000	-0.047	0.097
Employed in Agriculture	0.368	0.482	2,535,921.000	0.567	0.495	118,142.000	0.358	0.479	2,417,779.000	-0.023	0.099
Employed in High Skill Industry	0.108	0.310	2,535,921.000	0.122	0.327	118,142.000	0.107	0.309	2,417,779.000	-0.011	0.042

This table reports summary statistics from the 2010 Indonesia census for the samples used in the Indonesia pension plan analysis. The sample for the analysis of the 1977 pension plan consists of females born between 1959 and 1985. The sample for the analysis of the 1992 pension plan expansion consists of females born between 1964 and 1992. Differences are based on a regression with the row name as the outcome variable and matrilocality as the independent variable controlling for province fixed effects and cultural traditions from the *Ethnographic Atlas* (polygamy, bride price, aboriginal plow, and male dominated agriculture).

Table A7: Summary Statistics for Males in Ghana Pension Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		Full Sample			**Patrilocal**			**Non-Patrilocal**			
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Difference	Diff, Se
Patrilocal	0.444	0.497	381,634.000	1.000	0.000	169,510.000	0.000	0.000	212,124.000		
Practicing Patrilocality	0.074	0.261	381,634.000	0.088	0.283	169,510.000	0.062	0.242	212,124.000	-0.011*	0.006
Primary	0.644	0.479	381,634.000	0.564	0.496	169,510.000	0.708	0.455	212,124.000	-0.106**	0.039
Secondary	0.151	0.358	381,634.000	0.140	0.347	169,510.000	0.161	0.367	212,124.000	-0.011	0.015
Employed in Agriculture	0.507	0.500	288,768.000	0.598	0.490	127,842.000	0.435	0.496	160,926.000	0.073	0.014
Employed in High Skill Industry	0.049	0.215	288,768.000	0.044	0.206	127,842.000	0.052	0.222	160,926.000	-0.006	0.004

This table reports summary statistics from the 2000 Ghana census for the samples used in the Ghana pension plan analysis. The sample for the analysis of the 1972 pension plan consists of males born between 1954 and 1985. Differences are based on a regression with the row name as the outcome variable and matrilocality as the independent variable controlling for province fixed effects and cultural traditions from the *Ethnographic Atlas* (polygamy, bride price, aboriginal plow, and male dominated agriculture).

Table A8: Effect of the Pension Plan on Educational Outcomes and Practice of Patrilocality in Indonesia Using Alternative Ethnographic Data

	1977 Creation of Astek			
	(1)	(2)	(3)	(4)
	Primary	**Secondary**	**University**	**Practice Matrilocality**
$I_e^{Matrilocal} \times years\_unexpos_i$	0.009***	0.024***	0.008***	0.009***
	(0.002)	(0.005)	(0.002)	(0.002)
Province FE	Y	Y	Y	Y
Province FE $\times years\_unexpos_i$	Y	Y	Y	Y
Ethnicity FE	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y
Number of observations	3,762,221	3,762,221	3,762,221	3,538,194
Clusters	23	23	23	23
Adjusted R^2	0.113	0.108	0.023	0.041
	(1)	(2)	(3)	
	1992 Expansion to Small Formal Sector Enterprises			
	Primary	**Secondary**	**Practice Matrilocality**	
$I_e^{Matrilocal} \times years\_unexpos_i$	0.009***	0.024***	0.011***	
	(0.003)	(0.005)	(0.001)	
Province FE	Y	Y	Y	
Province FE $\times years\_unexpos_i$	Y	Y	Y	
Ethnicity FE	Y	Y	Y	
Time Trend Controls	Y	Y	Y	
Ethnic Norm Interactions	N	N	N	
Number of observations	3,762,221	3,762,221	3,479,998	
Clusters	23	23	23	
Adjusted R^2	0.113	0.108	0.090	

This table uses data from the Indonesia 2010 census to estimate the differential effects of years unexposed to the 1977 establishment of compulsory pension plans and the 1992 expansion of these pension plans during childhood on educational outcomes and practice of matrilocality (a married daughter living in the same household as her parents) in matrilocal and non-matrilocal ethnic groups. These analyses use the alternative ethnographic data based on Lebar, ed (1972) and Strouthes (1993). The education regressions for the 1977 establishment of the plan restrict to females born between 1959 and 1985. The education regressions for the 1992 expansion of the plan restrict to females born between 1964 and 1992. The practice of matrilocality regressions additionally restrict the samples to married individuals. A married female is considered to practice matrilocality is she lives in the same household as at least 1 of her parents. Standard errors are clustered at the ethnicity level.

Table A9: Effect of the Pension Plan on Educational Outcomes and Practice of Patrilocality in Ghana Using Alternative Ethnographic Data

	(1) **Primary**	(2) **Practice Patrilocality**
$I_e^{Patrilocal} \times years\_unexpos_i$	0.029***	0.008***
	(0.005)	(0.003)
District FE	Y	Y
District FE $\times years\_unexpos_i$	Y	Y
Ethnicity FE	Y	Y
Time Trend Controls	Y	Y
Number of observations	371,231	183,402
Clusters	56	56
Adjusted R^2	0.214	0.110

This table uses data from the Ghana 2000 census to estimate the differential effects of years unexposed to the 1972 pension reform in childhood on educational outcomes and practice of patrilocality (a married son living with his parents) in patrilocal and non-patrilocal ethnic groups. Data on patrilocal practices come from the alternative ethnographic data source, Gil (1964). The education regressions restrict to males born between 1954 and 1985. The practice of patrilocality regression additionally restricts the sample to married individuals. A married male is considered to practice patrilocality is he lives in the same household as at least 1 of his parents. Standard errors are clustered at the ethnicity level.