CAN POLICY CHANGE CULTURE? GOVERNMENT PENSION PLANS AND TRADITIONAL KINSHIP PRACTICES

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Abstract

Policies may change the incentives that allow cultural practices to persist. To test this, I study matrilocality and patrilocality, kinship traditions that determine daughters' and sons' post-marriage residences and thus, which gender lives with and supports parents in their old age. Two separate policy experiments in Ghana and Indonesia show that pension policies reduce the practice of these traditions. I also show that these traditions incentivize parents to invest in the education of children who traditionally co-reside with them. Consequently, when pension plans change cultural practices, they also reduce educational investment. This finding further demonstrates that policy can change culture.

Keywords: cultural transmission, cultural change, kinship traditions, intergenerational transfers.

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1 Introduction

Cultural traditions evolve in response to the conditions in which humans live[1] (Boyd and Richerson, 1988) and can facilitate better outcomes by alleviating market incompleteness and substituting for laws or policies (Greif, 1993). As modernizing countries adopt new policies, culture may change. This paper provides some of the first evidence on whether policies lead to cultural change by studying traditional, ethnicity-level practices that determine whether daughters (matrilocal), sons (patrilocal), or neither gender (neolocal) live with their parents after marriage. In so doing, it also adds to a nascent literature in economics building on anthropologists' recognition of the importance of kinship traditions for economic outcomes, particularly in low-income countries.

I hypothesize that matrilocal and patrilocal practices have two important effects. First, they ensure old age support for parents in the absence of pension plans and savings mechanisms by designating which children will care for parents in their old age.[2] Second, they provide parents with an additional incentive to invest in the human capital of these children since they are more likely to share in the labor and marriage market returns of their human capital investments. This second effect is consistent with a growing 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., 2016; Banerjee, 2004; Ashraf et al., forthcoming). Under this hypothesis, large-scale social programs like pension plans weaken the incentives to practice matrilocality and patrilocality. This also undermines parents' incentives to invest in the human capital of matrilocal (patrilocal) daughters (sons). Thus, observing changes in educational investment related to changes in the practice of matrilocality and patrilocality provides an additional measure of cultural change beyond directly observing changes in cultural practices.

I formalize these hypotheses in a simple two-period model where parents can choose to educate their children in the first period as a savings device for the second period. As in Bisin and Verdier (2001), where parents transmit preferences to their children, I allow parents to choose whether to transmit matrilocal or patrilocal cultural practices to their children. The model gives rise to matrilocal, patrilocal, and neolocal equilibria and generates three testable predictions. First, education rates are higher for daughters relative to sons in matrilocal versus neolocal and

[1]As anthropologists Boyd and Richerson (1988) write, "humans adjust their [cultural] phenotypes in response to their environments through learning and rational calculation" (p. 9).

[2]Jayachandran (2015) reviews the literature on patrilocality and its link to old age support by sons, Banerjee et al. (2014) show that parents perceive children as an importance source of old age support in China, and Jensen and Miller (2017) shows that in India living together is important for children providing parents with old age support.

patrilocal equilibria (and vice versa for patrilocal equilibria). Second, if a sufficiently large pension plan is introduced to a large enough portion of the population, matrilocal/patrilocal equilibria with higher levels of education no longer exist. Therefore, the introduction of pension plans reduces both the practice of matrilocality (patrilocality) and female (male) education. Third, the effects of offering the plan to a larger share of the population on the share of the population that is educated or practices the kinship traditions are non-linear since once the share of individuals offered the plan passes a threshold, the matrilocal/patrilocal equilibria cease to exist.

I test the predictions of the model in Indonesia and Ghana.[3] While the primary analyses are in Indonesia, where there is more detailed data on the roll out of the pension plan, the analyses from Ghana provide evidence that these results are externally valid. As the model predicts, in Indonesia, females in traditionally matrilocal groups are more likely to be enrolled in school relative to their brothers when compared to females from non-matrilocal groups. In Ghana, the same is true for males from traditionally patrilocal ethnic groups.

Turning to the Indonesian pension plan, I provide – to my knowledge – the first estimates of the effects of the 1977 introduction of a pension system, Astek, on education and cultural practices.[4] Triple-differences analyses exploit ethnicity-level variation in traditional customs, variation in pension plan exposure based on birth year, and geographic variation in the intensity of the roll out. They show that the pension plan differentially reduced educational investments in females from traditionally matrilocal ethnic groups. These women were also less likely to practice matrilocality as adults. In line with the model, the effects of the intensity of the plan's roll out on both the practice of matrilocality and education are non-linear.

In Ghana, I exploit the timing of the introduction of a 1972 pension policy to provide estimates of this policy's effect on education and cultural practices. Males from traditionally patrilocal ethnic groups who were exposed to the pension plan for longer received less education than non-traditionally patrilocal males and were less likely to practice patrilocality as adults. Thus, the results from Indonesia replicate in a very different setting.

This paper contributes to several literatures. It builds on the literature on the evolution of cultural practices and attitudes (Giuliano and Nunn, 2016; Lowes et al., 2017; Bidner and Francois, 2011; Anderson and Bidner, 2015). Most empirical papers in this literature study the effects of large shocks that likely affected culture along many dimensions. For example, Campa and Serafinelli (forthcoming) and Alesina and Fuchs-Schündeln (2007) study the effects of state

[3]Unlike most potential settings, Indonesia and Ghana have within-country variation in matrilocality/patrilocality across ethnic groups. Both have also introduced pension plans in the recent past.

[4]Sudomo (1985), Muliati (2013) and Perusahan Umum Asuransi Sosial Tenaga Kerja (1985) discuss this policy in more detail.

socialism on attitudes. Other papers study the effect of different historical empires (Peisakhin, 2010; Becker et al., 2015; Grosfeld and Zhuravskaya, 2015; Wysokinskya, 2015). In contrast, this paper studies relatively small policy changes[5] that come with modernization and shows that these policies can lead to cultural change.

Additionally, this paper contributes to a growing literature on the importance of family ties and kinship practices for economic outcomes (Alesina and Giuliano, 2013; Alesina et al., 2015; Alesina and Giuliano, 2011; Enke, forthcoming; La Ferrara, 2007; Lowes, 2016; Schulz, 2018; Akbari et al., 2018; Moscona et al., 2017). While anthropologists have long belived that these kinship traditions are an important driver of outcomes in low-income countries, this understanding is relatively new in economics. I contribute to this literature by showing how a specific set of kinship practices – matrilocality and patrilocality – affect human capital investment.[6]

Finally, this paper also adds to an emerging literature on the importance of culture for determining the effects of different policies (Ashraf et al., forthcoming; World Bank, 2015; Ebenstein, 2014; La Ferrara and Milazzo, 2017, Schoellman and Tertilt, 2006; Tertilt, 2005), as well as the growing literature that examines the effects of gender-related cultural traditions (Fernández, 2007; Fernández, 2011; Fernández and Fogli, 2009; Tertilt, 2006; Alesina et al., 2013; Giuliano, 2014; Alesina et al., 2015; Corno et al., 2016; Corno et al., 2015; Gneezy et al., 2009; Becker, 2018; Jayachandran and Pande, 2017).

The paper is organized as follows. Section 2 provides an overview of patrilocal and matrilocal traditions. Section 3 develops a simple model of parental investment in education and the transmission of cultural traditions in the presence of imperfect altruism. Section 4 tests the predictions of the model about the gender gap in education in Indonesia and Ghana. Section 5 turns to the primary analysis of the paper, testing whether the introduction of the pension plan differentially reduced female education and the transmission of matrilocality among traditionally matrilocal groups in Indonesia. Section 6 replicates the key findings for patrilocality in Ghana. Section 7 reports additional findings and investigates alternative explanations, and Section 8 concludes.

[5] In this sense, this paper is related to Gruber and Hungerman (2007), who show that the New Deal's "modernization" policies crowded out the informal social safety net of church-based charitable spending.

[6] Two related papers study the relationship between kinship traditions and human capital investment in Indonesia. Levine and Kavane (2003) use the Indonesia Family Life Survey data set to study the relationship between patrilocality (as determined by an expert respondent at the village-level) and gender biased investment in Indonesia and do not find a strong relationship. Rammohan and Robertson (2012) find a strong negative relationship between ex post migration and female education in the IFLS. The analysis on the link between kinship traditions and human capital in this paper differs from these papers both by using a different, larger data set and a different definition of matrilocality drawn from the anthropological literature, and also by providing symmetric results on patrilocality in Ghana. By exploiting exogeneous variation from pension plan introductions to show that reducing the practice of matrilocality and patrilocality reduces the education of the targeted gender, this paper also provides more evidence that the link between these kinship traditions and education is causal.

2 Patrilocal and Matrilocal Customs

In this section, I first document how I classify ethnic groups as matrilocal and patrilocal and the variation in these measures. Then, to provide context for the analyses in this paper and identify potential sources of bias, I discuss theories on the origins of matrilocality and patrilocality from the anthropological literature. Finally, to validate the anthropological data, I show that, even in recent data sets, the assignment of these ethnicity-level traditions predicts matrilocal and patrilocal practices.

2.1 Variation in Matrilocality and Patrilocality

My analysis requires the measurement of the traditional post-marriage residency practices of different ethnic groups. To do so, I use data from the *Ethnographic Atlas* (Murdock, 1967), which codes ethnic groups' traditional, pre-modernization cultural practices.[7] To arrive at ethnicity-level measures of traditional matrilocality and patrilocality in the Indonesian and Ghanian censuses, I follow methods developed by Ashraf et al. (forthcoming) and Alesina et al. (2013). I use the *Ethnologue* (Gordon, 2005) to match the ethnicity or language data collected by the censuses with the ethnicity-level data on cultural practices available in the *Ethnographic Atlas*.

In Indonesia, I match 810 of the 827 languages in the 2010 census to groups with information on post-marriage residence (matrilocality, neolocality or patrilocality) in the *Ethnographic Atlas*. Of these, 51 percent are patrilocal (411), 32 percent are neolocal (253), and 17 percent are matrilocal (137). 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, 1972).[8]

In Ghana, I successfully match 53 of the 57 ethnic groups in the 2000 census to groups with information on post-marriage residence in the *Ethnographic Atlas*. According to this match, 31

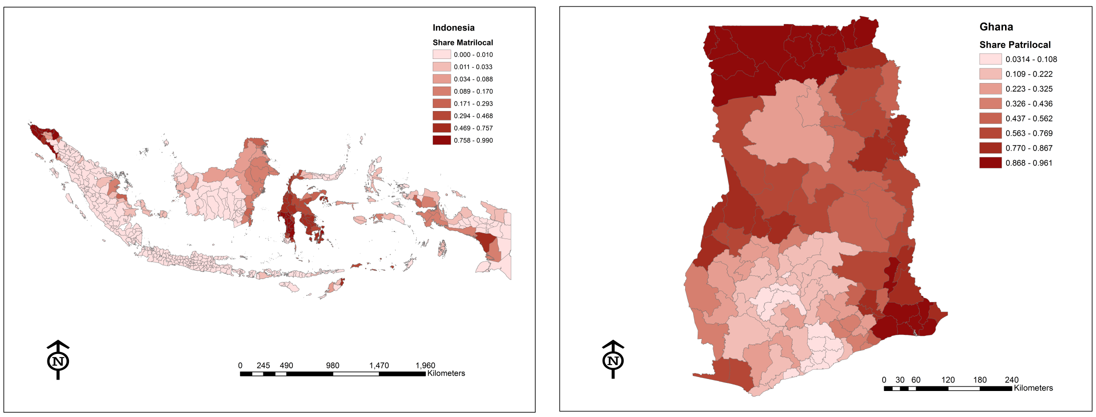
[7] Of the 1,235 ethnic groups for whom data on ethnicity-level practices are available in the *Ethnographic Atlas*, 880 are traditionally patrilocal (71 percent), 155 are traditionally neolocal (13 percent) and 200 are traditionally matrilocal (16 percent).

[8] This choice follows from two additional pieces of information. The first piece of information come from the *Ethnographic Atlas*, which reports both the primary post-marriage residential practice, which is what is used for the coding in this paper, and the alternative practice. According to the *Ethnographic Atlas*, less than 1 percent of individuals who report matrilocality as their primary practice have an alternative practice. In contrast, among those who report patriocality as their primary form, 83 percent report neolocality as an alternative. The second piece of information comes from a secondary match that I created of large ethnic groups in the 2010 Indonesia census to ethnic traditions using Lebar (1972) and Strouthes (1993). In this match, 50 percent of individuals who were coded as patrilocal according to the *Ethnographic Atlas* are now coded as neolocal, consistent with the fact that in Indonesia, nominally patrilocal and neolocal ethnic groups actually follow a mix of these practices. However, the coding of matrilocality was very stable across concordances. 99 percent of individuals coded as matrilocal according to the *Ethnographic Atlas* are also coded as matrilocal according to the alternative concordance.

groups (58 percent) are patrilocal and 22 (42 percent) are matrilocal. In an alternative match using Gil (1964) and Asante and Mazama (2009), the majority of the groups coded as matrilocal in this match are neolocal. Therefore, I focus on the margin between patrilocality and neolocality/matrilocality.[9]

Using this assignment of matrilocality and patrilocality, I map the geographic variation in these practices. Figure 1 reports the district-level percent of individuals in the census who belong to traditionally matrilocal (in Indonesia) and patrilocal (in Ghana) ethnic groups. While these traditions are not uniformly distributed in either country, there is still a great deal of geographic variation in matrilocal and patrilocal traditions.

Figure 1: Distribution of Matrilocal Groups in Indonesia and Patrilocal Groups in Ghana



The figure reports the percent of the population in a district that traditionally practices matrilocality in the Indonesia 2010 census (left) and traditionally practices patrilocality in the Ghana 2000 census (right) according to an ethnicity-level match with the *Ethnographic Atlas*.

2.2 Origins of Matrilocality and Patrilocality

Theories in anthropology on the origins of matrilocality and patrilocality shed light on other cultural traits that could be correlated with these traditions. One theory argues that early hunter gatherer societies were typically matrilineal (lineage and inheritance pass through the mother's line, and a son usually inherits from his maternal uncle) because sexual promiscuity made it difficult to identify a child's father (Engels, 1942). Matrilocality and matrilineality may in turn be correlated since matrilocality allows children to grow up with their mother's family, which is their lineage group under matrilineality.[10]

[9]If a group is primarily patrilocal according to the *Ethnographic Atlas*, the second match agrees 76 percent of the time. This second match, however, never codes groups as matrilocal. The majority of the groups that are matrilocal in the match from the *Ethnographic Atlas* (92 percent) are coded as neolocal.

[10]Matrilineality doesn't typically imply women inherit. In *Status of Women in Pre-Industrial Societies*, Whyte (1978) notes that in matrilineal societies, "It is perfectly possible for the position of women to be as low as the

An alternative theory 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) argue 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.

Finally, 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.

Using data from the *Ethnographic Atlas*, I examine whether across- and within-country correlations in traditional practices are consistent with these theories. I also test whether matrilocality and patrilocality are correlated with other characteristics believed to be related to gender-biased behavior. Appendix Table A1 estimates the correlation between ethnicity-level matrilocality and patrilocality and aboriginal plow use, polygamy, bride price, male-dominated agriculture, and matrilineality. Consistent with the anthropological literature, patrilocality and matrilocality are strongly correlated with bride price and matrilineality across ethnic groups.

However, the correlations between these traditions and matrilocality and patrilocality may be weaker within countries, where the traditional practices of the populations are more homogeneous. Appendix Table A2 reports the correlations between matrilocality and other traditions within Indonesia and between patrilocality and other traditions within Ghana. I run these regressions at the individual instead of the ethnic group level to allow larger ethnic groups to have more weight, as they do in my main analysis, and cluster the standard errors at the ethnicity level. As the table shows, there is no variation in Ghana in polygamy (all groups are historically polygamous) and aboriginal plow use (no groups had the plow). In Ghana, only male-dominated agriculture is highly correlated with patrilocality. Within Indonesia, bride price and male-dominated agriculture are not correlated with matrilocality, while aboriginal plow use, polygamy, and matrilineality are. Altogether, though patrilocality and matrilocality are correlated with other cultural traditions in both countries, none of these relationships are systematic across countries.[11] Nonetheless, throughout this paper, I control for a set of cultural traditions that have been linked with gender-biased behavior consisting of aboriginal plow use, bride price, male-dominated agriculture, and polygamy.

greatest misogynist would desire" (p. 7).

[11]Matrilocality and patrilocality may still be associated with gender biased attitudes that are not measured by the *Ethnographic Atlas*. While research in this area is limited, Alesina et al. (2015) provide evidence that there is no correlation between patrilocality and domestic violence or attitudes toward violence against women in 18 Sub-Saharan African countries.

2.3 Modern Practice of Matrilocality and Patrilocality

I now validate my ethnicity-level measures of matrilocality and patrilocality from the *Ethnographic Atlas* by testing whether they predict modern behavior. I use the 2000 Ghana census, the 2010 Indonesia census,[12] and the 2000 and 2007 rounds of the Indonesia Family Life Survey[13] (IFLS), which provides more detailed data on matrilocal practices. In the censuses, I code a household as practicing matrilocality (patrilocality) if a married daughter (son) lives in the same household as her parents. This is a lower-bound measure of the prevalence of these traditions. It does 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 census household.[14] Neither does it capture cases where matrilocality and patrilocality are not possible because there are no living parents or married children.

Columns 1–2 and 5–6 of Table 1 report the coefficients from regressions of the practice of matrilocality and patrilocality in the censuses on indicator variables for whether the household head belongs to a traditionally matrilocal or patrilocal ethnicity. Historical traditions are predictive of modern-day practices, and given that I will show that the pension plan reduces these practices, these relationships were likely stronger when the pension plan was introduced. In Indonesia, belonging to a matrilocal ethnicity increases the likelihood a household practices matrilocality by 2.3 percentage points (28 percent). In Ghana, belonging to a patrilocal ethnicity increases the likelihood a household practices patrilocality by 2.6 percentage points (37 percent).

I next replicate these tests of the predictive power of matrilocal traditions using the IFLS data. Unlike the censuses, the IFLS asks respondents whether each of their biological parents lives with them. Respondents may answer yes to this question even if the parent does not appear in the household roster on the day of the survey. The results from the IFLS suggest that the census measure of the pervasiveness of matrilocality is a lower-bound. Compared to the 8 percent of households practicing matrilocality in the census, 15 percent of married females in the IFLS report that one or both of their biological parents lives with them. Columns 3 and 4 show that belonging to a matrilocal ethnicity is associated with a 8-18 percentage point increase in practicing matrilocality (53-120 percent).

[12]Both censuses are provided by the Minnesota Population Center (2011).

[13]These are the only rounds of the IFLS that include ethnicity data.

[14]Beaman and Dillon (2012) show that determining the exact boundaries of a household in low-income countries is difficult, and the choice of boundaries may affect the results of economic analysis.

Table 1: Association Between Cultural Traditions and Current Practices

	(1)	(2)	(3)	(4)	(5)	(6)
	Indonesia 2010 Census		**Indonesia Family Life Survey**		**Ghana 2000 Census**	
	HH Practices Matrilocality		Respondent Practices Matrilocality		HH Practices Patrilocality	
Matrilocal Ethnicity	0.023***	0.036***	0.079***	0.176***		
	(0.011)	(0.011)	(0.015)	(0.033)		
			[0.000]	[0.000]		
Patrilocal Ethnicity					0.026**	0.023*
					(0.012)	(0.013)
Ethnicity Tradition Controls	N	Y	N	Y	N	Y
Muslim Control	N	Y	N	Y	N	Y
Mean Dep. Var.	0.081	0.081	0.150	0.150	0.070	0.070
Number of observations	5,955,980	5,951,403	5,610	5,606	346,498	346,498
Clusters	801	801	25	25	54	54
Adjusted R^2	0.000	0.002	0.013	0.014	0.003	0.007

For the census data sets, 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 then a household. For the Indonesia Family Life Survey (rounds 3 and 4), this table regresses an indicator variable equal to 1 if a female, married respondent between the ages of 25 and 45 reports one or both of her biological parents live with her on an indicator variable for whether the respondent belongs to a matrilocal ethnic group. Then, an observation is an individual. 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. Due to the relatively small number of clusters in the IFLS, wild bootstrapped p-values appear in the brackets for these regressions. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

3 Theoretical Framework

In this section, I develop a simple model to capture the relationship between the intergenerational transmission of co-residence traditions, education, and pension policies to motivate the empirical analysis in Sections 4–6. In the first subsection, I describe the parent's decision problem, where an imperfectly altruistic parent decides whether or not to educate and whether or not to transmit a cultural tradition to her son or daughter. The existence of the cultural tradition allows the parent to "save" for old age by investing in the human capital of the same child to whom she transmits the tradition. There is a reduced-form cultural externality: transmission of the tradition is more successful if more co-ethnics transmit it. In the second subsection, I characterize the parent's equilibrium actions. Reflecting the empirical reality that matrilocal, patrilocal, and neolocal ethnic groups co-exist, I show that all three types of equilibria exist. Thus, different ethnic groups can be in different equilibria. In a neolocal equilibrium, cultural traditions are never transmitted. In a matrilocal/patrilocal equilibria, parents who educate a child of the targeted gender also transmit the tradition. Then, education rates for the targeted gender are high relative to in the neolocal equilibrium or the equilibrium that targets the other gender. When pension plans are sufficiently large, they completely crowd-out parents "saving" through investing in the child's human capital and transmitting the tradition. Then, the matrilocal/patrilocal equilibria cease to exist. Due to the cultural externality, this occurs even if only part of the population is treated with the pension plan. Thus, the model generates three testable predictions: (1) education rates are higher for the targeted gender relative to the other gender in the matrilocal/patrilocal equilibria relative to the neolocal equilibrium, (2) the introduction of pension plans reduces both education and the practice of the cultural tradition, and (3) the share of the population exposed to the pension plan will have non-linear effects on education and the practice of matrilocality/patrilocality.

Setup

The decision-maker in the model is the parent who has a male and female child (types m and f). The decision-maker is indexed by her children's returns to education, v^m and v^f, which vary with ability. These are independent draws from the distribution function F. The parent lives for two periods but make decisions only in the first period. In period 1, she decides whether or not to transmit the cultural tradition to one of her children and whether or not to invest in the child's education. The parent can only transmit the tradition to one gender, as the household cannot simultaneously have two conflicting traditions. Intuitively, this constraint captures the fact that part of transmitting a tradition is practicing it oneself, and a household cannot simultaneously practice patrilocality and matrilocality. The parent consumes in both periods and also have some altruism towards her children. Suppressing the indices v^f and v^m, the parent's preferences are represented by

$$\begin{aligned} U^p(e^f,e^m,i^f,i^m,\mathbf{I}) =& u(c_1^p(e^f,e^m,i^f,i^m,\mathbf{I})) \\ &+\beta E\left(u(c_2^p(e^f,e^m,i^f,i^m,\mathbf{I}))+\gamma U^f(e^f,i^f,I^f)+\gamma U^m(e^m,i^m,I^m)\right), \end{aligned}$$

where $c_1^p > 0$ and $c_2^p > 0$ are vectors of the parent's consumption of two different goods in periods 1 and 2, and U^k is the utility of a child of type $k \in \{f,m\}$ in period 2. The parameter γ measures the parent's altruism toward the children, while β measures the parent's discount rate. The parent's choice variables are $e^k \in (0,1)$ and $i^k \in (0,1)$, which denote discrete investments in education and transmitting the tradition. For education, this assumption matches the reality in low-income countries, where parents often believe that all or most of the returns to education come from completing a given level of schooling (e.g. primary or secondary). $\mathbf{I}$ is the vector of the aggregate investments $I^f = E(i^f)$ and $I^m = E(i^m)$, which sum the individual investments by co-ethnics in i^m and i^f and capture the extent to which the rest of society invests in the different traditions. The utility functions of the parent and the children are assumed to be quasi-linear over two goods. So, $u = U^f = U^m = log(c_{t,1}^k) + c_{t,2}^k$, where t indexes the time period.

Intuitively, the first good can be thought of as the necessities required for subsistence, such as food and housing. Children in the second period are assumed to be at an interior solution, where their income is high enough that they spend on both goods. The parent is assumed to be at the interior solution in the first period and a corner solution in the second period, where she only spends on the log good. This captures the fact that the retiree's income is low and often close to subsistence. Since the retiree's income is low, quasi-linear utility provides the parent with an incentive to transfer income across periods.

For simplicity, the model abstracts away from borrowing and formal sources of saving. This is consistent with the fact that most of the population in Indonesia and Ghana in the 1970s (the period I study) had little access to the formal banking sector.[15] Total parental consumption in period 1 is equal to some exogenous income y_1 net of the cost of education d_e for each child and the cost of transmitting the tradition d_i, as well as an exogenous pension payment p. Then,

$$\sum_j c^p_{1,j}(e^f, e^m, i^f, i^m) = y_1 - \sum_{k \in \{f,m\}} d_e e^k - \sum_{k \in \{f,m\}} d_i i^k - p,$$

where j indexes a consumption good. Parental consumption in period 2 is equal to exogenous income y_2 plus transfers from the child and pension returns. Normalizing transfers when $e^f = e^m = 0$ to be zero, we can write

$$\sum_j c^p_{2,j}(e^f, e^m, i^f, i^m) = y_2 + \sum_{k \in \{f,m\}} \tau^k e^k s^k + rp,$$

where r is the returns from the pension, τ^k is the transfers from the child k when $e^k = 1$, and s^k is a binary random variable. The assumption that transfers increase in a child's education could be due to educational returns in either the labor or marriage markets.[16]

I assume that the child k only pays the transfer to the parent if $s^k = 1$, otherwise reneging on the tradition. Furthermore, I assume that the probability that $s^k = 1$ is given by $g(i^k, I^k)$, representing a reduced-form cultural externality. By assumption, $g(0, I^k) = 0$, $g(i^k, 0) = 0$, and

[15] As late as 2011, 30–40 years after the pension plans I study were introduced and the first year for which data is available, only 20 percent of adult Indonesians and 29 percent adult Ghanians had savings accounts (World Bank, 2018).

[16] Ashraf et al. (forthcoming) show that marriage market matching in Indonesia is highly assortative in education. Thus, parents of more educated matrilocal daughters in Indonesia benefit from both the labor market returns to education and the increased quality/income of the daughter's spouse.

$\frac{\partial g(1,I^k)}{\partial I^k} > 0$. Hence, the expected utility of consumption in period 2 for the parent is

$$E(u(c_2^p(e^f,e^m,i^f,i^m,\mathbf{I}))) = \sum_{k\in\{f,m\}} \mathbf{1}_{i^k=1}\Big(g^k(i^k,I^k)u\left(y_2+\tau^k e^k+rp\right)+(1-g^k(i^k,I^k))u(y_2+rp)\Big)$$
$$+\mathbf{1}_{i^f+i^m=0}u(y_2+rp),$$

where $\mathbf{1}_{i^k=1}$ is an indicator variable equal to 1 if $i^k=1$ and $\mathbf{1}_{i^f+i^m=0}$ is an indicator variable equal to 1 if $i^f+i^m=0$. A child k's consumption is then

$$\sum_j c_j^k(e^k,i^k) = b^k+s^k e^k(v^k-d_\tau)+(1-s^k)e^k v^k,$$

where b^k is the child's baseline income if she does not receive any education, and d_τ is the cost of making the transfer τ to the parent for each child.[17] Note the subscript for t is suppressed as the child only consumes in the second period. Thus, a child k's expected utility is given by

$$E(U^k) = g(i^k,I^k)u(b^k+s^k e^k(v^k-d_\tau))+(1-g(i^k,I^k))u(b^k+e^k v^k).$$

The function $g(i^k,I^k)$ is an important ingredient in the model because it captures the importance of culture for ensuring that children provide old-age support. As noted by anthropologists, co-residence traditions require "interlocking and coordinated social exchange" (Jordan and Mace, 2009). If parents unilaterally try to change or instill a new co-residence tradition, this tradition would conflict with the tradition of the child's eventual spouse.[18] Additionally, when following cultural traditions is costly, social stigma may play a powerful role in enforcing the tradition. The cultural externality explains both why culture can be sticky in some circumstances (e.g. it is impossible for parents to unilaterally deviate to matrilocality in a neolocal society) and also why traditional practices may exhibit tipping point behavior, disappearing quickly when the underlying economic environment changes.

With some abuse of notation, parents belong to one of two exogenously assigned types: a fraction λ pay p into the pension program and receive returns rp, whereas $1-\lambda$ pay nothing into the pension program and receive no returns. I consider the one-shot static Nash equilibrium

[17] This formulation allows for the fact that it may cost less than τ for the child to provide the parent with a transfer of τ, as may be the case if parents and children share public goods. $d_\tau = \tau$ is therefore a special cause of the model.

[18] This reasoning assumes that individuals marry within their own ethnic group, and the data is consistent with this assumption. In the Indonesia 2010 census, only 0.16 percent of household heads have a spouse from an ethnicity with a different post-marriage residency practice. In the Ghana 2010 census, only 13.8 percent of married household heads have a spouse from an ethnicity with a different post-marriage residency practice.

of this game.

3.1 Predictions

Now, we characterize the types of equilibria this model can have, and relate them to the pension parameters p and λ. Before proceeding to the propositions, I define a "matrilocal" equilibria to be an equilibria where $I^f > I^m$ and a "patrilocal" equilibria to be an equilibria where $I^m > I^f$. Matrilocal and patrilocal equilibria are "gendered equilibria." A "neolocal" equilibria is one where $I^f = I^m = 0$.

Proposition 1. *There are three types of equilibria: matrilocal equilibria, patrilocal equilibria, and a neolocal equilibrium. The neolocal equilibrium always exists. Denote by α^k the share of children of gender k who are educated. Then, $\alpha^f_{mat} - \alpha^m_{mat} > \alpha^f_{neo} - \alpha^m_{neo} > \alpha^f_{pat} - \alpha^m_{pat}$.*

Proof. See Appendix A.

It is clear that a neolocal equilibrium will always exist since, if $I^k = 0$, $g^k(i^k, 0) = 0$, and it is never rational to invest in the tradition. However, gendered equilibria may also exist if enough individuals choose to invest in the tradition. In these equilibria, all parents who educate a child of the targeted gender will also choose to transmit the tradition to her since the returns to transmitting the tradition do not depend on v^k. Since the decision to invest in the tradition depends on the share of co-ethnics who invest in the tradition, a gendered equilibrium is characterized by a fixed point in I^k. There, the number of parents who invest in the predominant tradition I^k is also equal to the number of children of the targeted gender who are educated. Transmitting the tradition creates an additional incentive to invest in the child's education as a way of "saving" for old age, increasing education rates for that gender. As the matrilocal equilibrium generates stronger incentives to educate females relative to males, the female education rate net of the male education rate is higher in the matrilocal equilibrium than the neolocal and patrilocal equilibria. The opposite is true for the patrilocal equilibrium.

Now consider the effects of increasing the size of the pension payments p.

Proposition 2. *There exists p^H such that if $p > p^H$, no household that receives the pension plan will invest in transmitting the tradition.*

Proof. See Appendix A.

Receiving the pension plan increases a household's second period income, reducing the value of saving through transfers from their child. Thus, when the value of the pension payments is high enough, households no longer invest in transmitting the tradition. Indeed, raising second period income on its own could eventually lead households to stop transmitting the cultural tradition, even if $d_i = 0$, as long as d_τ, the cost of a child making a transfer to his parent, is sufficiently high.[19] As second period incomes increase, parents will no longer value the additional consumption extracted from their children more than the loss to the child's utility of making those transfers, capturing the fact that higher incomes and economic development can themselves lead the gendered equilibria to disappear.

To better understand the properties of the equilibria, we consider the conditions under which the matrilocal equilibria exist. Let $i^{f*}(v^f, e^f, I^f)$ be the parent's equilibrium investment in the tradition conditional on the child's ability, the choice of investment in education, and the response of other families. The parent will invest in a daughter's education if the returns to educating are higher than not educating

$$\max_{e^m} U^p(1, e^m, i^{f*}(v^f, 1, e^m, I^f), 0, \mathbf{I}) \geq \max_{e^m, i^m} U^p(0, e^m, 0, i^m, \mathbf{I}),$$

Substituting and rearranging gives a cut-off value $v^{f*}(I^f)$ for ability such that the child is educated if, and only if, $v^f > v^{f*}(I^f)$.[20]

The parent will choose to invest in the tradition if, and only if the utility from investing in transmitting the tradition to an educated daughter is higher than the utility of not transmitting it,

$$U^p(1, e^m, 1, 0, \mathbf{I}) \geq U^p(1, e^m, 0, i^{m*}, \mathbf{I}).$$

Rearranging this implies that investment in the tradition is only optimal if I^f is sufficiently high such that $I^f \geq I^{f*}$.[21] Crucially, I^{f*} does not depend on v^f, hence, if $I^f \geq I^{f*}$, then every parent who educates their child will also invest in the tradition, so $I^f = 1 - F(v^{f*})$.

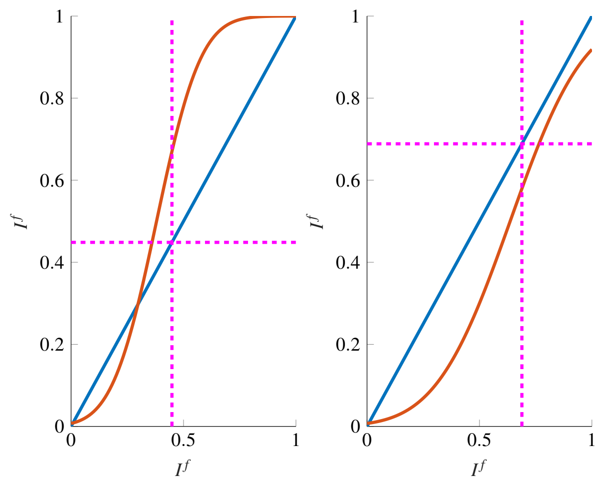
These relationships are depicted graphically for matrilocal and neolocal equilibria in Figure 2. The left panel of Figure 2 shows an example with three candidate equilibria, which are the points where the red line (the share of parents who would invest in education given I^f) intersects the blue line (the 45 degree line). The three candidates for an equilibrium are the case where no one invests $I^f = 0$, everyone invests $I^f = 1$, and an intermediate case where only some fraction invest in matrilocality. In this example, the intermediate case is not an equilibrium since $I^f < I^{f*}$ (shown by the dotted lines). Hence, the model in the left-panel has equilibria where everyone invests in matrilocality and where no-one invests in it.

[19] One important cost of making the transfer could be the cost of not migrating to pursue better work opportunities.

[20] $v^{f*} = \frac{d_i + d_e}{\beta\gamma} + \frac{g(i^{f*}, I^f)\Big(\log(y_2 + rp) + \gamma d_\tau - \log(y_2 + rp + \tau)\Big)}{\gamma}$, where i^{f*} is the equilibrium investment in transmitting the tradition given $e^f = 1$.

[21] I^{f*} is characterized by $\beta g(1, I^{f*})\Big(\log(y_2 + rp + \tau) - \log(y_2 + rp) - \gamma d_\tau\Big) = d_i$.

Figure 2: Existence of the Matrilocal Equilibrium and the Introduction of the Pension Plan



This figure illustrates that when there is a fixed point in the number of households that educate their daughters, $1-F(v^{f*}(I^f))$, and the number of households who transmit the matrilocal tradition, I^f, and it satisfies incentive compatibility constraints (dotted lines), there is a matrilocal equilibrium (left). If no such fixed point exists, there is no matrilocal equilibrium (right).

In the right panel, we increase the size of pension payments from zero to a positive number. Increased second period income reduces the value of transmitting the cultural tradition. So, the pension plan increases the cut-off I^{f*} since the tradition needs to be practiced more widely to make the investment worthwhile. At the same time, the pension plan also increases v^{f*} for every value of I^f since it reduces the payoffs of saving through the child. This causes the red line $1-F(v^{f*}(I^f))$ to move to the right (a stochastically dominated shift in the counter-cumulative distribution). In this case, the matrilocal equilibrium ceases to exist, and only the neolocal equilibrium is left.

In this comparative static exercise, for an ethnic group initially in the neolocal equilibrium, there is no decrease in education due to the pension plan. However, for the matrilocal equilibrium, there is potentially a drastic decrease in female education. If the starting point is a gendered equilibrium, the pension policy may eliminate this equilibrium, and cause a discontinuous switch to the neolocal equilibrium, which has a lower rate of education for children of the targeted gender.

The next proposition shows that a similar effect can occur, holding fixed the size of pension payments p, in response to an increase in pension coverage λ.

Proposition 3. *There exists $\lambda^H < 1$ such that if $\lambda > \lambda^H$ and $p > p^H$, a gendered equilibria no longer exists.*

Proof. See Appendix A.

If those who receive the pension plan cease to practice the tradition, the returns to transmitting the tradition for other households will fall due to the cultural externality. Therefore, when enough households receive the pension plan, the conditions for a gendered equilibrium will no longer be satisfied, even for households who did not receive the pension plan. The gendered equilibrium ceases to exist. Then, the practice of gendered traditions falls even for those whose parents were not eligible for the plan.

Propositions 2 and 3 suggest that the introduction and expansion of a compulsory pension program will differentially reduce education for ethnicities that practice gendered co-residence traditions prior to the introduction of the pension plan by breaking down the tradition. Proposition 3 shows that even households who are not treated directly by the pension program can undergo dramatic changes in both the practice of the tradition and investment in education due to equilibrium effects. Because large effects of the expansion occur when the equilibrium switches, Proposition 3 also suggests that the share of the population treated by a pension plan will have non-linear, inverse U-shaped effects on both education and the practice of the cultural traditions.

4 Matrilocality, Patrilocality, and the Gender Gap

In this section, I test the first prediction of the model – that female education rates will be higher relative to male education rates for traditionally matrilocal ethnic groups and vice versa for patrilocal ethnic groups.

Empirical Strategy

To estimate the association between patrilocality and matrilocality and within-household differences in school enrollment in Indonesia and Ghana, I use the 2010 census data in Indonesia and the 2000 census data in Ghana to estimate:

$$enroll_{ie} = \beta_1 I_i^{Gender} + \beta_2 I_i^{Gender} \times I_e^{Tradition} + \mathbf{\Gamma X}_{ie} + HH_j + \varepsilon_{ie}, \quad (1)$$

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. I_i^{Gender} is an indicator variable for the relevant gender (female in Indonesia and male in Ghana), $I_e^{Tradition}$ is an ethnicity-specific indicator variable for an ethnic group's traditional practice (matrilocality in Indonesia and patrilocality in Ghana), and HH_j is a household fixed effect. I focus on the sample aged 5–22 since this group is of the appropriate ages to be enrolled in school, including college. $\mathbf{X_{ie}}$ contains child-specific controls and age fixed effects, and depending on the specification, includes controls for parental educational and socioeconomic status,[22] controls for geographic region (province indicator variables in Indonesia and district indicator variables in Ghana), a control for whether the household head is male, and indicators for aboriginal plow use, bride price customs, male-dominated agriculture, and polygamy traditions, all interacted with child gender. This regression estimates the effect of matrilocality or patrilocality on the gender gap in enrollment for male and female siblings in the same household. β_2, the relative effect on enrollment of being a traditionally matrilocal female or patrilocal male, is the coefficient of interest, and we predict that $\beta_2 > 0$.

By examining the gender gap between siblings, I control for differences in the access to schooling or household wealth that could be associated with ethnicity-level traditions and affect enrollment. Including rich socioeconomic and geographic controls interacted with gender accounts for socioeconomic and geographic variables that could be correlated with cultural traditions and could affect the gender gap in education.

To inform potential sources of bias in regression equation (1), the top panels of Appendix Tables A3 and A4 document summary statistics and balance by traditional practice for the Indonesia and Ghana census data used in these regressions respectively. Along most dimensions, matrilocal and non-matrilocal groups in Indonesia are similar. Conditional on year and province of birth, the main differences are that matrilocal mothers are more likely to have completed primary schooling – consistent with the hypothesis that matrilocality incentivizes educational investment in women – and matrilocal individuals are much more likely to be Muslim. Consequently, in both countries, I also include a control for whether the respondent is Muslim and its interaction with gender.

In Ghana, Appendix Table A4 shows that there are strong differences between patrilocal and non-patrilocal groups, indicating that patrilocal groups are poorer and less educated than non-patrilocal groups. However, Muslim is not correlated with patrilocality.

Results

The estimates from regression equation (1) are in Table 2. As the upper-half of the table shows, females in matrilocal households are 1.2-2 percentage points more likely to be enrolled in school relative to their brothers when compared to females in non-matrilocal households in Indonesia. Neither the gender interactions with household socioeconomic status (column 2), alternative ethnic traditions (column 3), nor geographic location in Indonesia (column 4) appear

[22] 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, and whether the father's spouse works in agriculture.

to explain this result. While the yearly differences in the likelihood of enrollment appear small, they accumulate. Adding up the 18 years a child could have been enrolled in school between the ages of 5 and 22, this indicates that there will be a gap in educational attainment of 0.22–0.36 years of schooling between matrilocal and non-matrilocal females (relative to their brothers). For comparison, Duflo (2001) finds that an additional school per 1,000 children increases male years of schooling in Indonesia by 0.12-0.19 years. Thus, belonging to a matrilocal ethnic group increases years of schooling by about the same amount as 1 to 2 extra primary schools per 1,000 children.

The estimates are similar in Ghana. Patrilocal males are approximately 1 percentage point more likely to be enrolled in school relative to their sisters when compared to non-patrilocal males in Ghana. This implies a difference of 0.18 years of educational attainment. While the effect size is not significant in the first two columns, the inclusion of the gender interactions with ethnicity level traditional practices and the district by gender fixed effects in columns 3 and 4 increases the precision of the estimates.

Additionally, the results for Indonesia and Ghana are not driven by the selection of a sample of children aged 5-22. Appendix Table A5 re-estimates equation (1) for a sample of children aged 5-18 and shows that the results are similar in this smaller sample.

I now examine whether these findings apply more broadly outside of Indonesia and Ghana. Appendix B combines country-level gender gap data with data on the percent of a country's population that is traditionally matrilocal or patrilocal to verify the model's gender gap prediction globally. Appendix Table A6 reports the results of these regressions and shows that the percent of the population that is traditionally matrilocal and patrilocal affects the gender gap in the expected directions, consistent with the within-county findings from Indonesia and Ghana. Together, traditional patrilocality and matrilocality explain 4 percent of the global gender gap.

5 Pension Plan Introduction in Indonesia

In this section, I test whether the introduction of pension plans in Indonesia differentially reduced female education and the practice of matrilocality among traditionally matrilocal groups in Indonesia. I describe the details of the pension plan, my empirical strategy, results, and robustness checks.

5.1 Astek

Astek was founded in Indonesia in 1977 and 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

Table 2: Association Between Matrilocality and Patrilocality and the Within-Household Gender Gap in Enrollment in Indonesia and Ghana

	(1) **Baseline**	(2) **+SES Controls**	(3) **+Custom Controls**	(4) **+Geography Controls**
			Indonesia	
$I_e^{Matrilocal} \times I_i^{Female}$	0.020***	0.018***	0.012**	0.012**
	(0.003)	(0.004)	(0.006)	(0.005)
Mean Dep. Var.	0.687	0.698	0.698	0.698
Number of observations	6,151,544	5,549,884	5,549,884	5,549,884
Clusters	801	800	800	800
Adjusted R^2	0.522	0.515	0.515	0.516
			Ghana	
$I_e^{Patrilocal} \times I_i^{Male}$	0.011	0.006	0.010**	0.010*
	(0.008)	(0.007)	(0.005)	(0.005)
Mean Dep. Var.	0.598	0.595	0.595	0.595
Number of observations	406,840	266,418	266,418	266,418
Clusters	53	53	53	53
Adjusted R^2	0.507	0.517	0.517	0.517

This table reports difference-in-difference estimates of the association of the interaction between traditional matrilocality and female (Indonesia) and traditional patrilocality and male (Ghana) with enrollment for children of the household head aged 5-22 in the Indonesia 2010 Census and the Ghana 2000 Census. All regressions include household and age fixed effects. In addition, 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, whether the household head is male, and whether the individual is muslim interacted with child gender. Column 3 includes indicator variables for whether a child belongs to an ethnicity with a 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 practices is drawn from the *Ethnographic Atlas*. Standard errors are clustered at the ethnicity level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

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 (Perusahan Umum Asuransi Sosial Tenaga Kerja, 1985). By the end of 1983, 8,602 employers and 1,960,109 employees were covered by Astek. Coverage expanded rapidly, and in 1985, the government estimated that 5.5 million employees would be covered by 1988 (Perusahan Umum Asuransi Sosial Tenaga Kerja, 1985). While a minority of workers were employed at large firms in the formal sector, the percent of affected individuals (due to having an affected worker in their household) is much greater than the percent of affected workers. Though I cannot observe formal sector workers explicitly in the census, I can assign individuals as likely to be in the formal sector based on their occupation category.[23] Based on this assignment, 12 percent of adults are in the formal sector, but 35 percent of children between the ages of 5 and 18 live in a household where at least one individual is employed in the formal sector.

5.2 Empirical Strategy

Linear Specification

My main empirical strategy is a triple-differences. This strategy exploits the fact that two pieces of variation determine the degree to which females in the 2010 Indonesia census were affected by the introduction of Astek. First, if a daughter was sufficiently old when the pension plan was introduced, it will be too late for the pension plan to affect parents' educational investments and transmission of the cultural tradition. These investments will have already been made. Second, when the plan was introduced, some geographic areas were more intensively treated by the pension plan than others. The cohort variation can be combined with this geographic variation to create a difference-in-differences estimator of the effect of the pension plan in Indonesia.[24] Additonally, since I am interested in the *differential* effect of the pension plan on traditionally matrilocal groups, I also exploit variation in whether a female belongs to a traditionally matrilocal ethnic group. Combining the geographic, cohort, and ethnicity-level variation results in the final triple-differences strategy.

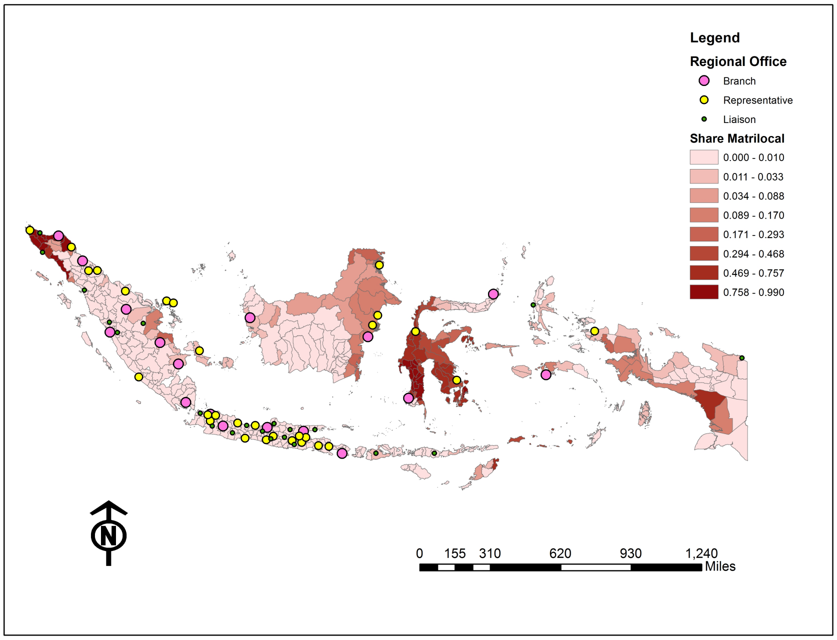
Geographic variation in Astek's rollout comes from the fact that Astek expanded its coverage over time and initial compliance was imperfect. From 1978 to 1979, the number of enrollees grew by 24 percent, and from 1979 to 1980, it grew by 12 percent. By 1983, only 40 percent of eligible individuals were enrolled (Sudomo, 1985). Thus, I exploit the fact that areas with

[23] I consider occupations likely to be in the formal sector if they are coded as "estate" (large-scale) agriculture, manufacturing, electricity and gas, info and communications, finance, education, or health in the 2010 Census.

[24] This identification strategy is similar to the one used by Duflo (2001) to estimate the effect of the INPRES school construction on education outcomes in Indonesia.

more Astek branch offices, liaisons, and representatives likely had higher initial enrollment. Perusahan Umum Asuransi Sosial Tenaga Kerja (1985) reports the locations of these offices in 1982, and Figure 3 plots their locations.

Figure 3: Locations of Astek Offices in Indonesia



The figure documents the locations of the Astek pension plan offices in Indonesia in 1982 according to Perusahan Umum Asuransi Sosial Tenaga Kerja (1985).

Using the cohort, geographic, and ethnicity-level variation, I estimate the triple-differences regression for a sample of females born between 1959 and 1985

$$\begin{aligned} y_{icpe} = &\beta_1 I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p + \beta_2 I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p + \alpha_{cp} + \alpha_e \\ &+ \sum_p \gamma_p I_e^{Matrilocal} + \sum_c \lambda_c I_e^{Matrilocal} + \mathbf{\Gamma X}_{ipe} + \varepsilon_{icpe}, \end{aligned} \tag{2}$$

where i denotes an individual, c denotes the individual's birth year, p denotes the province of an individual's birth, and e denotes an ethnic group. The outcomes of interest, y_{icpe}, consist of indicator variables for completing primary and secondary schooling, attending university, and an indicator variable for practicing matrilocality (a married woman living in the same household as at least one of her parents). $Intensity_d$ is the number of pension offices per 1,000 square miles in province p, $I_e^{Matrilocal}$ is an indicator variable equal to 1 if an individual belongs to a traditionally matrilocal ethnic group, and $I_c^{Part\_Treat}$ and $I_c^{Full\_Treat}$ indicate the individual's exposure to the plan based on her birth year. $I_c^{Part\_Treat}$ is equal to 1 if a woman was between 6 and 12 when the plan was instituted. $I_c^{Full\_Treat}$ is an indicator variable equal to 1 if she was 6 or younger. α_{cp} is a province by birth year fixed effect, α_e are ethnic group fixed effects, and $\sum_p \gamma_p I_e^{Matrilocal}$ and $\sum_c \lambda_c I_e^{Matrilocal}$ allow the birth province and cohort fixed effects to depend on whether a woman belongs to a matrilocal ethnic group or not. Together, the fixed effects subsume all the relevant double-interactions in this triple-differences specification.

$\boldsymbol{X}_{ipe}$ is a vector of controls. To control for differential time trends, it includes a linear trend in birth year whose coefficient is allowed to vary at the province by matrilocal level. To control for the fact that matrilocality may be correlated with other traditions or religion, it also includes triple interactions between $I_e^{Intensity}$ and $I_c^{Full\_Treat}$ and $I_e^{Part\_Treat}$ and other ethnic traditions,[25] as well as Muslim by birth province by cohort fixed effects. To control for other programs that were on-going during the same period in Indonesia, I also aggregate the controls for the INPRES school construction and water sanitation programs from Duflo (2001) to the province-level and include interactions between matrilocal by birth year fixed effects and these controls in the regressions.[26] The coefficients of interest are β_1 and β_2. If there is crowd out, as the model predicts, $\beta_1 < 0$, $\beta_2 < 0$. As fully treated females are more intensively treated than partially treated females, we also expect that the magnitude of β_1 is greater than β_2.

I include females born between 1959 and 1985 so that the oldest females were 18 at the time the pension plan was instituted and were wholly untreated during their childhood. The youngest females were -8 and were fully treated. I do not include women born later than 1985 so that women are at least 25 when they are observed. Those who will go to university have already done so, and most are married, allowing me to test for the practice of matrilocality. When I estimate the effects of the pension plan on the practice of matrilocality, I restrict the sample to married women, since unmarried women cannot be observed practicing matrilocality. The bottom panel of Appendix Table A3 reports summary statistics for the sample used in these regressions.

The triple-differences approach allows me to address several potential sources of bias in the estimates. One natural concern is that pension plans were established in response to concerns about lack of old age support driven by declines in the practice of matrilocality. Since I exploit geographic variation in the plan's intensity, I control for belonging to a traditionally matrilocal ethnic group by birth year fixed effects, absorbing any generalized declines in the practice of

[25] These consist of traditional polygamy, aboriginal plow use, male-dominated agriculture, and bride price. To avoid losing a significant fraction of the sample, missing values were set to 0 and indicator variables for missing information were also included in the triple and double interactions.

[26] I was unable to match these data at the district-level because district boundaries have changed substantially in Indonesia between the collection of the 1995 survey data used by Duflo (2001) and the collection of the 2010 census data used in this paper.

matrilocality. Along with ethnicity fixed effects, this also absorbs any level differences between matrilocal and non-matrilocal ethnic groups. Therefore, my key coefficients of interest, β_1 and β_2, will only be biased if matrilocality was declining faster in areas that then received more pension offices. This is unlikely to be the case since pension plan offices were not initially targeted to areas with more matrilocal ethnic groups (Figure 3). However, I further address this concern by controlling for matrilocal by province-specific linear time trends so that the effects of the plan are identified from the discontinuous effect of being exposed to the plan during childhood.

Another concern is that there are differential educational trends between matrilocal and non-matrilocal groups. The triple-differences identification strategy also accounts for this by including controls for matrilocal by birth cohort fixed effects. Similarly, while more heavily traditionally matrilocal areas may have different time trends, different returns to education, or have received different policies that affect the practice of matrilocality or female education, the inclusion of province by cohort fixed effects absorbs this variation. Analogously, while $Intensity_p$ is not randomly distributed across provinces, birth province by matrilocal fixed effects absorb these level differences across provinces. Thus, the identifying variation for β_1 and β_2 comes from comparing traditionally matrilocal and non-matrilocal females of the same age in the same geographic regions who therefore face similar labor markets.

Non-linear Effects

Equation (2) treats the effects of the intensity of treatment as linear. However, the model predicts that the effect of the pension plan on matrilocal females will increase with share of the population treated up until the point the matrilocal equilibrium ceases to exist. Thus, we expect the pension plan effects to be non-linear in share of the population that is affected. Using the number of pension plan offices as a proxy for the share treated, I directly test whether this is the case by estimating

$$\begin{aligned} y_{icpe} =& \beta_1 I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p + \beta_2 I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p \\ &+ \beta_3 I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p^2 + \beta_4 I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p^2 + \alpha_{cp} \\ &+ \alpha_e + \sum_p \gamma_p I_e^{Matrilocal} + \sum_c \lambda_c I_e^{Matrilocal} + \mathbf{\Gamma X}_{ipe} + \varepsilon_{icpe}. \end{aligned} \tag{3}$$

If the treatment effect is non-linear in the way the model predicts, then $\beta_1 < 0$, $\beta_2 < 0$, $\beta_3 > 0$, $\beta_4 > 0$.

Event Study Specification

Though the triple-differences procedure accounts for many potential identification concerns, β_1 and β_2 will still be biased if traditionally matrilocal groups in more intensively treated areas experience non-linear differential time-trends. To establish if trends are parallel prior to the treatment, and if the timing of the effects I measure coincides with the pension plan, I also plot event study graph versions of equations (2) and (3). These graphs plot the differential effect on matrilocal females of being born in a province with a higher intensity of treatment by cohort.

To plot these graphs I follow a two-step procedure. If I include both the interactions between birth groups indicator variables and $Intensity_p \times I_e^{Matrilocal}$ and controls for linear differential time trends at the matrilocal by birth province level in the same regression, these two sets of explanatory variables will be almost collinear. So, I first estimate equation (2) and subtract out the estimated effects of the differential, linear time trends. Then, I estimate the event study regression using the residual variation in the outcome variable as the new outcome. In the second step, the event study analogue of equation (2) is

$$\begin{aligned}\tilde{y}_{icpe} = &\sum_g \tau_g I_e^{Matrilocal} \times I_c^{c\in g} \times Intensity_p + \alpha_{cp} + \alpha_e + \sum_p \gamma_p I_e^{Matrilocal} + \sum_c \lambda_c I_e^{Matrilocal} \\ &+ \mathbf{\Gamma X}_{ipe} + \varepsilon_{icpe},\end{aligned} \tag{4}$$

where $\tilde{y}_{icpe}$ is the outcome variable, which has been residualized for time trends, $\sum_g$ sums over three-year birth cohort bins, and $I_c^{c\in g}$ is an indicator variable equal to 1 if a cohort c is in bin g. To allow for more pre-treatment periods, I extend the sample used in these regressions to include those born in or after 1954. I plot the coefficients τ_g. I expect that τ_g will be indistinguishable from 0 for cohorts who were too old to be affected by the pension plan, indicating that pre-trends are parallel. For cohorts who are young enough to be treated, I expect $\tau_g < 0$.

To construct an event study analogue of equation (3), I instead estimate equation (3) in the first step. In the second step, I estimate

$$\begin{aligned}\tilde{y}_{icpe} = &\sum_g \tau_{1,g} I_e^{Matrilocal} \times I_c^{c\in g} \times Intensity_p + \sum_g \tau_{2,g} I_e^{Matrilocal} \times I_c^{c\in g} \times Intensity_p^2 \\ &+ \alpha_e + \sum_p \gamma_p I_e^{Matrilocal} + \sum_c \lambda_c I_e^{Matrilocal} + \mathbf{\Gamma X}_{ipe} + \varepsilon_{icpe}.\end{aligned} \tag{5}$$

To arrive at a single treatment effect that I can plot for each cohort, I use equation (5) to predict the treatment effect for each cohort when $Intensity_p$ takes the average value for a traditionally matrilocal female (0.103). The event study graph plots these predicted treatment effects. As before, pre-trends are parallel if the predicted treatment effects are indistinguishable from 0 for cohorts who are too old to be affected by the pension plan. For cohorts young enough to be affected, I expect the predicted treatment effects to be negative and significant.

5.3 Results

Linear Specification

The odd columns of Table 3 report the estimates for equation (2). As predicted, for all four outcomes, the pension program has differentially negative effects on fully treated matrilocal females, though the effect is not significant for the practice of matrilocality. These effects are typically larger for females who were younger when the pension plan was instituted. Based on the estimates, the average fully treated woman from a matrilocal ethnic group decreased her likelihood of completing primary school by 1 percentage point and her likelihood of completing secondary school by 0.6 percentage points.

Non-Linear Specification

Since the model indicates that the effects of pension plan exposure should be non-linear, I now test if this is the case by estimating equation (3). The even columns of Table 3 report these results, which confirm the model's predictions. The effect of the pension program on treated, matrilocal women is again always negative and is both economically and statistically significant across outcomes. The average fully treated matrilocal women would decrease her relative likelihood of primary completion by 6.7 percentage points (7.6 percent), secondary completion by 3.3 percentage points (10 percent), university attendance by 1.1 percentage points (20 percent), and her likelihood of practicing matrilocality by 2.1 percentage points (27 percent).[27] These effects are economically significant. For comparison, Ashraf et al. (forthcoming) show that the addition of 1 school per 1,000 children in an Indonesian school district increases primary completion among females who practice traditional bride price by 2.6 percentage points. Thus, the pension plan's effect on matrilocal females' primary schooling is equivalent to reducing the number of schools in a district by 2.6 per 1,000.

Event Study Specifications

To evaluate whether the results are likely to be driven by differential trends, I next use event study graphs to test whether more intensively treated matrilocal females experience differential pre-trends. Figure 4 plots the coefficient estimates from equation (4) for primary completion and the practice of matrilocality.

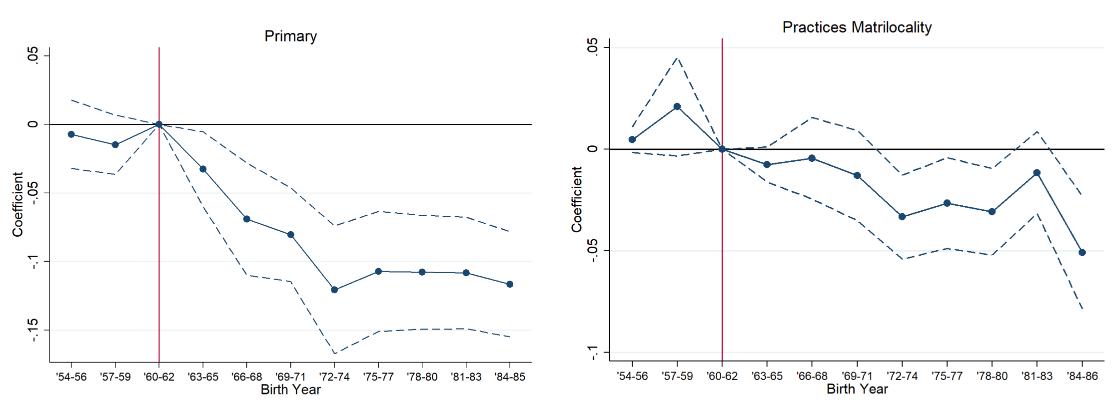
[27]Despite the inclusion of controls for the INPRES school construction program, one potential identification concern is that the primary school construction program occurred during a similar period to the institution of the pension plan, and this may have also affected educational outcomes. Importantly, Duflo (2001) shows that this program mainly affected primary schooling. Therefore, it is unlikely to be responsible for the effects on secondary schooling and university enrollment.

Table 3: The Effects of the Introduction of Astek on Indonesian Women's Educational Outcomes and the Practice of Matrilocality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Primary		**Secondary**		**University**		**Practice of Matrilocality**	
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p$	-0.048*	-0.443***	-0.018	-0.145*	-0.029**	-0.028	0.005	-0.042
	(0.026)	(0.122)	(0.018)	(0.074)	(0.014)	(0.034)	(0.014)	(0.040)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p$	-0.097***	-0.671***	-0.061***	-0.335**	-0.025	-0.111**	-0.029	-0.209**
	(0.036)	(0.247)	(0.023)	(0.133)	(0.026)	(0.051)	(0.025)	(0.097)
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p^2$		0.054***		0.017*		-0.000		0.006
		(0.015)		(0.009)		(0.004)		(0.005)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p^2$		0.078**		0.037**		0.012		0.025**
		(0.031)		(0.017)		(0.008)		(0.012)
Province by Matrilocal FE	Y	Y	Y	Y	Y	Y	Y	Y
Ethnicity FE	Y	Y	Y	Y	Y	Y	Y	Y
Province by Birth Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Muslim by Province by Birth Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Cultural Trait Interactions	Y	Y	Y	Y	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y	Y	Y	Y	Y
Mean Dep. Var	0.881	0.881	0.318	0.318	0.055	0.055	0.079	0.079
Number of observations	4,689,943	4,689,943	4,689,943	4,689,943	4,689,943	4,689,943	4,375,782	4,375,782
Clusters	810	810	810	810	810	810	809	809
Adjusted R^2	0.168	0.168	0.187	0.187	0.050	0.050	0.056	0.056

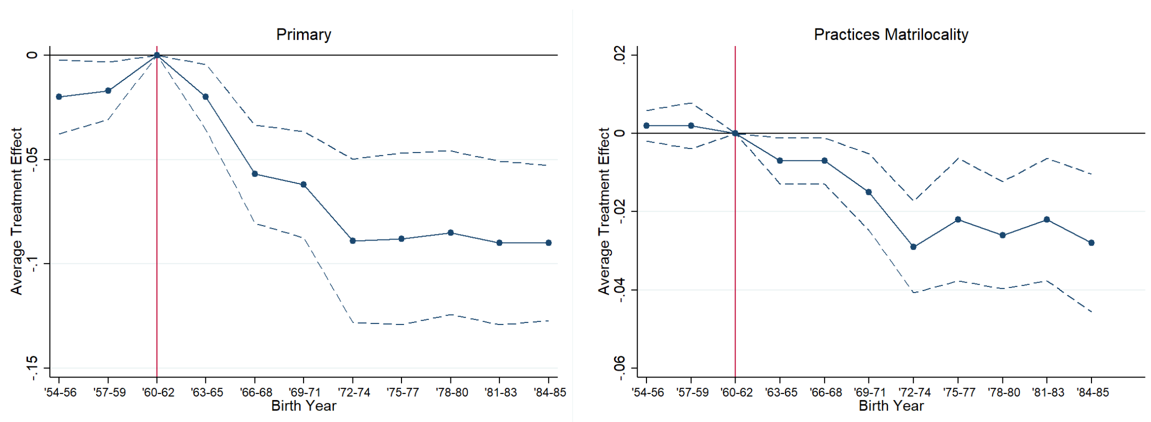
This table reports triple-differences estimates of the effect of the 1977 institution of the Astek pension plan, exploiting the interaction between years exposed to the plan (partial treatment indicates a woman was 6-12 when the pension plan was initiated and full treatment indicates that she was younger than 6), intensity of treatment (number of branches in the province per 1,000 square miles), and whether a woman belongs to a matrilocal ethnic group. e denotes an ethnic group, c denotes a birth year, and p denote's an individual's province of birth. The sample consists of women born between 1959 and 1985 in the 2010 Indonesia census. Cultural trait interactions include ethnicity-level controls for the interaction between traditional plow use, male-dominated agriculture, polygamy, and bride price with $Intensity_p$, indicator variables for partial and full treatment, and the relevant double interactions. Time trend controls are a linear trend in birth year, which is allowed to have different coefficients at the matrilocal by birth province level. Standard errors are clustered at the ethnic group level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Figure 4: Event Study Graphs for the Institution of Pension Plans in Indonesia (Assuming Intensity of Pension Exposure has a Linear Effect)



These figures graph the coefficients for the interaction between belonging to a traditionally matrilocal ethnic group, being born in a 3 year cohort-group, and the intensity of treatment by the Astek pension plan (as measured by the number of pension plan offices in the province per square mile) for completing primary school (left) and practicing matrilocality (right). Graphs were created following a two-step process where linear time trends were estimated first with equation (2) and then the coefficients of interest were estimated using the residual variation. Confidence intervals are at the 95 percent level.

Figure 5: Event Study Graphs for the Institution of Pension Plans in Indonesia (Allowing Intensity of Pension Exposure to have a Non-Linear Effect)



These figures graph the estimated treatment effect for matrilocal females in a province with the average number of pension plan offices per 1,000 square miles (0.101), allowing for quadratic treatment effects in $Intensity_p$ (even columns of Table 3). The outcomes are completing primary school (left) and practicing matrilocality (right). Graphs were created following a two-step process where linear time trends were estimated first with an augmented version of equation (2) that also includes $I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p^2$ and $I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p^2$, and then the coefficients of interest were estimated using the residual variation. Confidence intervals are at the 95 percent level.

Plotting the results in this way is particularly informative for primary schooling, since we should not expect individuals who were much older than 12 (and no longer in primary school if they progressed through school on-track) to be affected by the institution of the plan. In contrast, it less clear at what age the plan would cease to affect the transmission of matrilocality. The primary education figure indeed indicates that the treatment effects are not driven by pre-trends, with no significant effect of the plan on the outcomes of students who were already too old to attend primary school. The lack of pre-trends also suggests that the regression results are not picking up "reverse causality," where the decline in matrilocality causes the government to institute pension plans. In both figures, the timing of the treatment effects also coincides with the introduction of the pension plans, with small negative effects first appearing for the group that was 12-14 when the pension plan was introduced and gradually increasing thereafter.

Figure 5 plots an analogous figure for the regressions that allow the exposure to pension plan offices to have quadratic effects (equation (5)). As before, there is no evidence that pre-trends drive the results, again suggesting that the results are not driven by reverse causality. The timing of the treatment effects again coincides with the introduction of the pension plan, and the treatment effects are more pronounced when pension plan exposure is allowed to have non-linear effects.

5.4 Robustness

In this subsection, I provide additional evidence of the robustness of the main results. First, to further rule out that the differential pension plan effects are driven by pre-trends or reverse causality, I re-estimate equations (2) and (3) with more flexible controls for differential time trends. Second, since the model predicts that traditionally matrilocal females will have higher baseline education levels, I account for the possibility that the pension plan has differential effects on groups with higher baseline levels of education. Finally, to rule out the possibility that the non-linear effect of the pension plan is driven by the fact that the pension plan has larger effects in places with fewer matrilocal females, I allow the effects of the policy to depend on province composition as well as $Intensity_p$.

Robustness to Flexible Time Trends Controls

The triple-differences approach in the baseline specifications non-parametrically controls for differential time trends between matrilocal and non-matrilocal females that are the same across provinces. While it also includes controls for birth province by matrilocal-specific linear time trends, the estimates could still be biased by non-linear birth province by matrilocal time trends. This could be the case if, for example, the government strategically rolled out the pension plan earlier in places where traditional matrilocality was declining faster. To account for this potential bias, in Panel A of Appendix Table A7, I include controls for third degree polynomial time trends, which are allowed to vary at the birth province by matrilocal level. This conservative specification includes an additional 104 time trend controls. Despite this, the pattern and magnitude of the results is very similar to the more parsimonious regressions. The effects for the practice of matrilocality are even stronger than before.

Robustness to Baseline Education Controls

Since matrilocal ethnic groups may have different baseline educational levels relative to non-matrilocal groups, I next verify that the results are not driven by the fact that matrilocal mothers are more educated than non-matrilocal mothers. For each ethnic group, using women aged 55–65, who are too old to appear in the sample, I calculate the percent of women who finished primary and secondary school and attended university.[28] Cautioning that these are endogenous controls and may account for part of the treatment effect, I triple-interact these three variables with $Intensity_p$ and either $I_c^{Full\_Treat}$ or $I_c^{Part\_Treat}$. I include these as controls in equations (2) and (3), along with their double interactions with birth year and birth province fixed effects. Panel B of Appendix Table A7 reports the results from this robustness test. As with Panel A, the pattern of results is consistent with pension plans differentially reducing both education and the practice of matrilocality for females from traditionally matrilocal ethnic groups.

Robustness to District Composition

A final concern is that though the pension plan appears to have non-linear effects, this is because the pension plan had larger effects on traditionally matrilocal females in areas where traditional matrilocality is less common. Since $Intensity_p$ is typically lower in areas with more traditionally matrilocal individuals, this could give the appearance of a non-linear pension plan effect. To account for this, I calculate the share of individuals 55–65 (the group too old to be in the sample) who are traditionally matrilocal by birth province. I then include the interactions between this variable, $I_e^{Matrilocal}$, and $I_c^{Full\_Treat}$ and $I_c^{Part\_Treat}$ as controls in equation (3). These controls account for the correlation between intensity and the prevalence of matrilocality. Appendix Table A8 shows that the results are unchanged.

6 External Validity: The Introduction of Social Security in Ghana

Having established that the introduction of Astek reduced both education and the practice of matrilocality for traditionally matrilocal females, I now test whether pension plans also reduced

[28] Including these controls results in a smaller sample since, for some small ethnic groups, there are no women aged 55–65 in the census for whom I can calculate these educational attainment rates.

education and the transmission of patrilocality for patrilocal males in Ghana. These analyses provide evidence that the results in Indonesia are externally valid. Additionally, Ghana and Indonesia are substantially different contexts, and matrilocality and patrilocality are correlated with very different things within these countries. It is unlikely that the same omitted factor would drive the results in both settings. In this section, I briefly describe the details of the Ghana pension plan (NRCD 127), my empirical strategy, results, and robustness checks.

6.1 NRCD 127

In 1972, the passage of NRCD 127 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 and was optional for smaller establishments (Kumado and Gockel, 2003). Employees affected by the program paid 5 percent of their salaries, while employers made a matching contribution of 12.5 percent, and these contributions were held in government bonds. Employees then received the benefits at retirement age (55 for men and 50 for women).

6.2 Empirical Strategy

Difference-in-Differences

Unlike in Indonesia, I do not observe geographic variation in exposure to the Ghana pension plan. Instead, in my first set of specifications, I exploit ethnicity-level variation in traditional patrilocality and cohort variation in the degree to which males were affected by the passage of the plan. This difference-in-differences regression is given by

$$y_{icpe} = \beta_1 I_e^{Patrilocal} \times I_c^{Part\_Treat} + \alpha_e + \alpha_{pc} + \Gamma \boldsymbol{X}_{ie} + \varepsilon_{icpe}, \tag{6}$$

where the subscripts are defined as before except for p, which now indexes districts, and $\boldsymbol{X}_{ie}$ includes Muslim by birth year fixed effects, a linear trend in birth year interacted with $I_e^{Patrilocal}$, and the ethnicity-level tradition controls (traditional bride price and male-dominated agriculture) interacted with $I_c^{Part\_Treat}$.[29] The sample consists of males born between 1954 and 1975.[30] β_1 captures the differential effect of greater exposure to the pension plan on traditionally patrilocal males, and we expect $\beta_1 < 0$ for education and the transmission of patrilocality. The bottom panel of Appendix Table A4 reports summary statistics for this sample.

[29] There is no variation in the remaining controls for ethnicity-level traditions (polygamy and aboriginal plow use) in Ghana.

[30] The choice of 1954 allows for the inclusion of the birth years from 18 years prior to the institution of the pension plan, analogous to starting the sample in 1959 for the Astek sample. As with Astek, I only include individuals who are at least 25 at the time of the survey to ensure most of the group has completed their education and married. Since the Ghana census took place in 2000, this includes individuals born before 1975.

One of the main differences between this estimating equation and the equation for Astek is that $I_c^{Part\_Treat}$ now includes all individuals who were 12 or under when the pension plan was instituted, including those younger than 6. Separating the fully treated and the partially treated would lead to a much smaller fully treated group relative to Indonesia, where the census is from 2010 instead of 2000. The composition of a fully-treated group consisting of those 6 or under when the plan was adopted would be meaningfully different, with only 3 cohorts born after the institution of the plan instead of 8.

The inclusion of district by birth year fixed effects (α_{pc}) accounts for geographic variation in the labor market returns to schooling or access to schooling over time. Then, β_1 in equation (6) is identified by variation among individuals from different ethnic groups born in the same district and the same year. The inclusion of a control for differential linear time trends for patrilocal individuals helps account for any differential underlying trends in education (e.g. changes in access to education or the returns to education) or the practice of patrilocality that are not associated with the pension plan. Controlling for ethnicity fixed effects (α_e) accounts for any level differences between traditionally patrilocal and non-patrilocal ethnic groups.

Triple-Differences

Since I do not have geographic variation in the plan roll out, for educational outcomes, I also exploit differences in gender as an additional source of variation. The model implies that the pension plan will affect male education more than female education among traditionally patrilocal groups. Thus, using both males and females, I estimate the triple-differences regression

$$y_{icpeg} = \beta_1 I_e^{Patrilocal} \times I_c^{Part\_Treat} \times I_i^{Male} + \alpha_{eg} + \alpha_{pcg} + \sum_j \phi_j I_e^{Patrilocal} \times I_c^{c=j} + \mathbf{\Gamma X}_{ieg} + \varepsilon_{icpeg}, \tag{7}$$

where g denotes gender, so α_{pcg} is a district by gender by birth year fixed effect. $\sum_j \phi_j I_e^{Patrilocal} \times I_c^{c=j}$ controls for birth cohort by patrilocal fixed effects. $\mathbf{X}_{ieg}$ consists of the same set of controls as before except that the linear time trend is now allowed to vary at the male by patrilocal ethnic group level, as are the ethnicity-level controls. The same strategy cannot be used to study the practice of patrilocality since patrilocal men are likely to marry patrilocal women, so women's practices will also be affected by the pension plan. β_1, the differential effect of the pension plan on patrilocal males, is then the coefficient of interest, and we expect $\beta_1 < 0$.

The triple-differences strategy accounts for the same potential sources of bias as does the difference-in-differences strategy in equation (6). In addition, the inclusion of patrilocal by birth cohort fixed effects also accounts for differential time trends in education between traditionally patrilocal and non-patrilocal ethnic groups. If an alternative policy were to differentially affect the educational outcomes of traditionally patrilocal individuals, including patrilocal females in this regression differentiates out that effect.

Event Study Graphs

Finally, as for Indonesia, I plot event study graph analogues for the difference-in-differences regression equation (6). As in Indonesia, I use the two-step procedure to first estimate linear time trends and subtract them from the outcome variable. I then re-estimate the difference-in-differences regression but allow being traditionally patrilocal to have different effects by three-year cohort bins.

As before, this exercise provides evidence on whether the regression results are driven by differential time trends. If β_1 estimates the pension plan's differential effect on traditionally patrilocal males, we expect that being traditionally patrilocal will not have a differential effect on cohorts who were too old to be affected by the pension plan. If this is the case, it again helps rule out the possibility that the results are driven by reverse causality, where the government adopted pension plans in response to the decline of traditional patrilocality.

6.3 Results

Difference-in-Differences

The odd columns of Table 4 report the results of regression equation (6). The results from Ghana are consistent with the predictions of the model. The educational effect of the pension plan is concentrated on primary education, consistent with the fact that secondary schooling and university schooling are relatively rare (17 percent and 2 percent of the sample have completed secondary school and attended university respectively). Exposure to the pension plan differentially reduced primary completion by 3 percentage points for patrilocal males, and reduced the likelihood that a married male is observed living with his parents by 1.7 percentage points.

Triple-Difference

The even columns of Table 4 report the results of regression equation (7). The triple-differences effects for the educational outcomes are similar, though larger than in the difference-in-differences regressions. Relative primary schooling falls by 4 percentage points, and secondary schooling falls by 1 percentage point.[31]

Event Study Graphs

Figure 6 plots the event study graphs for equation (6) for primary completion and the practice of patrilocality. The event study graphs indicate that differential time trends are unlikely to be driving the results. Figure 6 shows that being born in later cohort had no significant effect

[31] The larger triple-differences effects are consistent with the possibility that the decline in human capital investment in males due to old age support motives had positive spillovers on females. This would occur if declining male education loosened households' budget constraints.

Table 4: The Effect of Social Security in Ghana on Educational Outcomes and the Practice of Patrilocality

	(1) **Primary** DD	(2) **Primary** Triple-D	(3) **Secondary** DD	(4) **Secondary** Triple-D	(5) **University** DD	(6) **University** Triple-D	(7) **Practices Patrilocality** DD
$I_e^{Patrilocal} \times I_c^{Part\_Treat}$	-0.029***		0.006		-0.002		-0.017**
	(0.009)		(0.006)		(0.003)		(0.007)
$I_e^{Patrilocal} \times I_c^{Part\_Treat} \times I_g^{Male}$		-0.039**		-0.009		-0.007***	
		(0.015)		(0.007)		(0.003)	
Ethnicity FE	Y	Y	Y	Y	Y	Y	Y
District by Birth Year FE	Y	Y	Y	Y	Y	Y	Y
Muslim by Birth Year FE	Y	Y	Y	Y	Y	Y	Y
Cultural Trait Interactions	Y	Y	Y	Y	Y	Y	Y
Differential Time Trends	Y	Y	Y	Y	Y	Y	Y
District by Birth Year by Gender FE	N	Y	N	Y	N	Y	N
Muslim by Gender	N	Y	N	Y	N	Y	N
Patrilocal by Gender	N	Y	N	Y	N	Y	N
Sample	Males	All	Males	All	Males	All	Males
Mean Dep. Var	0.623	0.523	0.165	0.127	0.022	0.016	0.112
Number of observations	195,629	419,570	195,629	419,570	195,629	419,570	136,422
Clusters	53	53	53	53	53	53	53
Adjusted R^2	0.241	0.260	0.050	0.058	0.010	0.009	0.078

This table reports difference-in-differences and triple-differences estimates of the effect of the 1972 institution of a social security program in Ghana. Difference-in-differences exploit the interaction between exposure to the plan in childhood ($I_c^{Part\_Treat}$ indicates an individual was younger than 12 when the plan was instituted) and whether an individual belongs to a patrilocal ethnic group. e denotes an ethnic group, c denotes a birth year, and g denotes a gender. The sample consists of individuals born between 1954 and 1975 in the Ghana 2000 census. The difference-in-differences only include males, and the triple-differences include both males and females. In the DD specification, the cultural trait interactions include ethnicity-level controls for the interaction between male-dominated agriculture and bride price with partial treatment (in DD). In the triple-D, they include ethnicity-level controls for the interaction between male-dominated agriculture and bride price and a gender-specific indicator variable, as well as the relevant double interactions. Time trend controls are a linear trend in birth year (normalized to 1954) interacted with an indicator variable for traditional patrilocality (and with a gender indicator variable in the triple-D). Standard errors are clustered at the ethnic group level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

on education or the transmission of patrilocality prior to the introduction of the pension plan. As in Indonesia, the timing of when the treatment effect appears in the event study graph also coincides with the timing of the pension plan.

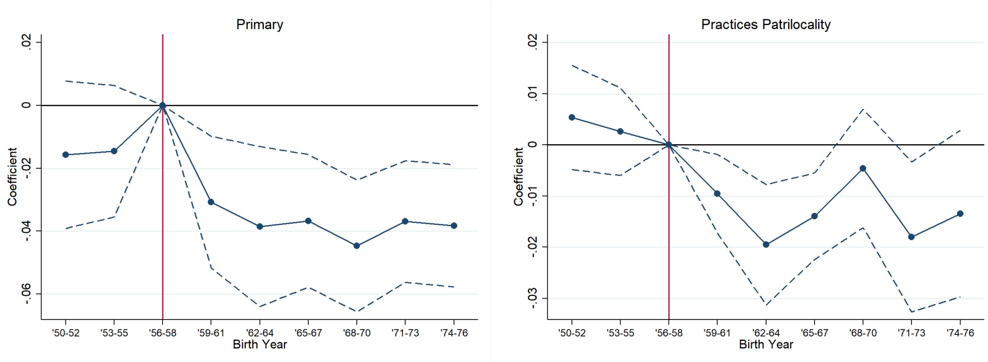
6.4 Robustness

In this section, I test whether the Ghana results are robust. First, I control for differential time trends more flexibly. Second, I show that different baseline levels of education among traditionally patrilocal ethnic groups do not drive the results.

Robustness to Flexible Time Trend Controls

To further verify whether the main treatment effects in the difference-in-differences and triple-differences regressions are driven by differential time trends for patrilocal males, I now control more flexibly for time trends. In the difference-in-differences regressions, I control for the interaction between third-degree polynomials in birth year and $I_e^{Patrilocal}$. In the triple-

Figure 6: Event Study Graphs for the Institution of Social Security in Ghana



These figures graph the coefficients for the interaction between belonging to a traditionally patrilocal ethnic group and being born in a 3 year cohort-group for completing primary school (left) and practicing patrilocality (right). Graphs were created following a two-step process where linear time trends were estimated first with equation (6) and then the coefficients of interest were estimated using the residual variation. Confidence intervals are at the 95 percent level.

differences regressions, I control for male by patrilocal fixed effects interacted with third degree polynomials in birth year. The first panel of Appendix Table A9 reports these estimates. The results are similar to those in Table 4.

Robustness to Baseline Education Controls

Patrilocality may lead to different baseline education levels between patrilocal and non-patrilocal males, which could itself lead individuals to respond differently to the pension plan. To account for this, I allow the pension plan to have different effects for more educated ethnic groups. I calculate the percent of males aged 55–65 who have completed primary school, secondary school, and attended university at the ethnicity level.[32] With the caveat that these are endogenous controls, I then include interactions between these controls and $I_c^{Part\_Treat}$ in equation (6). Similarly, I include double and triple interactions between these controls and $I_c^{Part\_Treat}$ and I_i^{Male} in equation (7). As the second panel of Appendix Table A9 shows, in both cases, including these controls has little effect on the point estimates.

7 Additional Results and Alternative Explanations

In this section, I report an additional finding that is consistent with the model and test for alternative explanations for the main results. I first provide evidence that educated individuals are more likely to practice matrilocality and patrilocality within traditionally patrilocal and matrilocal ethnic groups. This is counter-intuitive, as we typically expect more educated indi-

[32]Males aged 55–60 are too old to be included in the sample for whom I estimate the pension plan's effects.

viduals to be more likely to migrate. But it is consistent with the set-up of the model, in which it follows directly from the assumption that parents only want to transmit co-residence cultural traditions to children they educate. I then consider whether differential returns to education or gender bias could be driving the results. Finally, I provide evidence that the reduced practice of matrilocality does reduce old age support as traditionally matrilocal daughters who live apart from their parents are *not* more likely to send remittances.

Are Educated Children More Likely to Practice Matrilocality and Patrilocality?

I now test whether parents are more likely to transmit cultural customs of matrilocality and patrilocality to children whom they also educate. I examine whether educated matrilocal girls are more likely to practice matrilocality among traditionally matrilocal groups in Indonesia and educated boys are more likely to practice patrilocality among traditionally patrilocal ethnic groups in Ghana. Using a sample of married women from traditionally matrilocal ethnic groups aged 25-45 in Indonesia[33] and married men from traditionally patrilocal ethnic groups aged 25-45 in Ghana, I estimate

$$y_{icp} = \tau_0 + \tau_1 I_i^{Primary} + \tau_2 I_i^{Secondary} + \tau_3 I_i^{University} + \alpha_c + \alpha_p + \varepsilon_{icp},$$

where i denotes an individual, c denotes the individual's birth year, p denotes a province in Indonesia and a district in Ghana. Then, y_{icp} is an indicator variable equal to 1 if an Indonesian woman lives in the same household as her parents or a Ghanian man lives in the same household as his parents, and $I_i^{Primary}$ is an indicator variable equal to 1 if an individual has completed primary school, $I_i^{Secondary}$ is an indicator variable equal to 1 if an individual has completed secondary school, and $I_i^{University}$ is an indicator variable equal to 1 if an individual has attended university, α_c denote birth year fixed effects, and α_p denote province or district fixed effects.

Appendix Table A10 reports the results of these regressions for both Indonesia and Ghana. Even though the data sets post-date the policy change, there is a positive association between education and practicing the cultural tradition. The levels of education that are positively associated with the practice of the cultural customs (primary schooling in Ghana and secondary schooling and university attendance in Indonesia) correspond to the education levels for which individuals are most likely to be marginal in these two countries. In the 2000 Ghana census, only 62 percent of males between 25 and 45 have completed primary school (16 percent have completed secondary school). In the 2010 Indonesia census, 90 percent of women have com-

[33] I choose this age group so that the results will not be affected by selective mortality or by individuals who have not yet completed their education.

pleted primary school, and only 34 percent have completed secondary school.

Differential Returns to Education

A 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 the correlation that we observe between the gender gap and traditional customs. It is less clear that differential returns could explain the reductions of education and the practice of patrilocality and matrilocality due to the pension plan.

Without random or quasi-random variation in the amount of education an individual attains, I cannot directly estimate the returns to education for males in Ghana and females 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 attendance) and its interaction with matrilocality (in Indonesia) or patrilocality (in Ghana). Since formal sector workers report their wages in the 1995 Intercensal survey (but not the 2010 census), I use the 1995 Intercensal data for these regressions in Indonesia. This has the additional advantage of estimating the association between education and later-life outcomes closer to when the pension plan creation and expansion 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 A11 reports the results of this exercise. Column 1 shows that education is not more predictive of employment by traditionally matrilocal females relative to non-matrilocal females. Column 2 regresses log wages on the educational attainment measures and their interactions with matrilocality,[34] 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 of the wealth index,[35] 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 *negative* predictors of whether an individual is employed and household wealth.

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

[35]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. 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. In both cases, the units are standard deviations. For a discussion of this methodology, see Filmer and Pritchett (2001).

Altogether, in the hedonic regressions, there is little evidence that there are greater returns to education for matrilocal females or patrilocal males. These results may not be causal since, as the model shows, females with lower returns to education will be more likely to receive education in matrilocal ethnic groups relative to non-matrilocal ethnic groups. The same is true for males in patrilocal groups. Then, 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 A11, the estimated returns to education are significantly lower for matrilocal females and patrilocal males.

Traditions & Gender Biased Behavior

If traditionally matrilocal ethnic groups are generally more positively gender biased toward females, and vice versa for patrilocal groups, this could also explain the positive associations between matrilocality and female enrollment/patrilocality and male enrollment. As with differential returns to education, it is less clear that gender bias would lead to the pension plan's differential negative effects.

To test whether matrilocal ethnic groups are more biased toward females, I again draw upon the IFLS, which includes questions about decision-making in the household. I create indicator variables equal to 1 if a female respondent is coded as one of the decision-makers for decisions about her own clothes, large household purchases, and how much time she spends socializing respectively. For male respondents, the indicator variables are coded as 1 if a male respondent mentions his spouse as one of the key decision-makers for her clothes, large household purchases, and how much time she spends socializing. I then regress these outcomes on whether the respondent belongs to a matrilocal ethnic group, controlling for age, respondent gender, province, and survey-year fixed effects. Appendix Table A12 reports the results of these regressions. Overall, there is no strong positive relationship between traditional matrilocality and these proxies for gender bias.

Remittances & Old Age Support

So far, this paper assumes that a decline in the practices of matrilocality and patrilocality also leads to a reduction in old age support. However, traditionally matrilocal daughters could still provide their parents with more old age support than non-matrilocal daughters through remittances. If this were the case, the pension plan might not crowd out old age support even if it crowds out cohabitation. I use the IFLS data set, in which respondents report their support for parents who are *not* co-resident, to test whether matrilocality is associated with greater support of parents who live outside the household. In Appendix Table A13, I regress an indicator variable for whether daughters provide any financial support (columns 1 and 2), the log of the amount of financial support (3 and 4) conditional on providing financial support, and hours spent on chores for parents (5 and 6) on whether the adult daughter belongs to a matrilocal ethnic group, controlling for age, province, and survey-year fixed effects. Across all three measures, matrilocal daughters who do *not* live with their parents do not provide any more support than non-matrilocal daughters.

8 Conclusion

This paper provides novel evidence that cultural traditions evolve in response to new laws and policies. To establish whether policies can change cultural traditions, I study matrilocality and patrilocality, customs that determine which child lives with his or her parents after marriage. I show that pension plans reduce the practice of these customs. Moreover, since these customs incentivize educational investments in the targeted genders, pension plans also reduce these educational investments.

These results have several implications. First, they establish that policies can indeed change cultural traditions. While it may seem surprising that policies could cause cultural traditions that have persisted for centuries to change, modern pension plans and access to savings change the economic environment in new and important ways. Until modern times, there is little precedent for these changes to how individuals save for retirement or acquire old age support.

Second, these results speak to the importance of kinship traditions for determining economic outcomes, particularly in low-income countries. This paper helps bring kinship traditions into the economics literature by establishing the important role post-marriage residence traditions play in determining human capital investments.

Finally, this paper shows that pension plans had the unintended consequence of reducing human capital investments because they helped decouple old age support from parental investment in children. This finding highlights the importance of taking culture into account when considering the effects of policies.

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Appendix A: Mathematical Appendix

In this section, I prove the propositions in Section 3.

Proofs

Proof of Proposition 1.

Proof.
Existence of Neolocal Equilibrium. Consider the case where $I^f = I^m = 0$. Then, it is always individually rational for all parents to choose $i^f = i^m = 0$, since the returns to investing in the tradition are 0. Solving for when $U^p(1,0,0,0,\mathbf{0}) > U^p(0,0,0,0,\mathbf{0})$ shows that a daughter is educated in the neolocal equilibrium if $v^f \geq v^*_{neo}$, where $v^{f*}_{neo} = \frac{d_e}{\beta\gamma}$. Symmetrically, $v^{m*}_{neo} = \frac{d_e}{\beta\gamma}$.
Pure Gendered Equilibria. If $I^f > 0$ and $I^m = 0$ or $I^m > 0$ and $I^f = 0$, there will be a pure gendered equilibrium. Consider the matrilocal, pure gendered equilibrium, noting that everything will be symmetric for the patrilocal equilibrium. A parent will only choose $i^f = 1$ if she educates the child, and since $I^m = 0$, the parent always chooses $i^m = 0$. Then, parents choose $i^f = 1$ if $U^p(1,e^m,1,0,\mathbf{I}) \geq U^p(1,e^m,0,0,\mathbf{I})$. Re-arranging this relationship shows that parents choose $i^f = 1$ if

$$\beta g(1,I^f)\Big(\log(y_2+rp+\tau)-\log(y_2+rp)-\gamma d_\tau\Big) \geq d_i.$$

Since this relationship does not depend on v^f, if $I^f \neq 0$, the pay-offs to choosing $i^f = 1$ must be greater than the costs for all educated daughters. Therefore, $I^f = 1-F(v^*_{mat})$, where v^*_{mat} is the minimum returns to education a daughter needs to be educated in the matrilocal, gendered co-residence equilibrium. To solve for v^*_{mat}, consider when $U^p(1,e^m,1,0,\mathbf{I}) > U^p(0,e^m,0,0,\mathbf{I})$. Rearranging this relationship gives

$$v^*_{mat} = \frac{d_i+d_e}{\beta\gamma} + \frac{g(i,I)\Big(\log(y_2+rp)+\gamma d_\tau-\log(y_2+rp+\tau)\Big)}{\gamma}. \tag{8}$$

Then, a matrilocal gendered equilibrium exists if, and only if,

$$\beta g(1,I^*)\Big(\log(y_2+rp+\tau)-\log(y_2+rp)+\gamma d_\tau\Big) \geq d_i \tag{9}$$

and

$$1-F(v^*_{mat}) = I^{f*}.$$

Then the female education rate in the matrilocal equilibrium is $\alpha^f_{mat} = 1-F(v^*_{mat})$. The female education rate in the neolocal equilibrium is $1-F(v^*_{neo})$. So female education rates will be higher in the matrilocal, gendered equilibrium if $v^{f*}_{neo} > v^{f*}_{mat}$. Re-arranging equation (9) gives $\beta g(1,I^{f*})\Big(\log(y_2+rp+\tau)-\log(y_2+rp)\Big) \geq d_i+\gamma\beta d_\tau$. Substituting this into equation (8) and simplifying gives $v^*_{mat} \leq \frac{d_e}{\beta\gamma}$. Noting that the right-side of this equation is the same value as v^*_{neo}, this implies that $v^*_{mat} \leq v^*_{neo}$.

Since parents have quasilinear utility, the education problems of males and females are separable, and the male education problem is the same as in the neolocal equilibrium. Then, the gender gaps in education in the matrilocal and neolocal equilibria are given by

$$\alpha^f_{mat} - \alpha^m_{mat} = 1-F(v^{f*}_{mat}) - (1-F(v^{m*}_{neo}))$$
$$\alpha^f_{neo} - \alpha^m_{neo} = 1-F(v^{f*}_{neo}) - (1-F(v^{m*}_{neo}))$$

So, $\alpha^f_{mat} - \alpha^m_{mat} - (\alpha^f_{neo} - \alpha^m_{neo}) = F(v^{f*}(v_{neo})) - F(v^{f*}(v_{mat})) > 0$. The proof for the patrilocal equilibrium relative to the neolocal equilibrium is symmetric.

Mixed Gendered Equilibria. I now turn to the potential case where $I^f > 0$ and $I^m > 0$. Consider the matrilocal case where $I^f > I^m$ but note that everything is symmetric for the patrilocal case where $I^m > I^f$. The returns to transmitting i^k do not depend on v^k, so if $I^f > 0$ and $I^m > 0$, a parent must be willing to transmit the tradition for any child she educates if the constraint $i^m + i^f \leq 1$ is non-binding. If a parent only educates k, she will choose $i^k = 1$ and $i^{k'} = 0$. If a parent educates both children, she will transmit the tradition to f if $U^p(1,1,1,0,\mathbf{I}) > U^p(1,1,0,1,\mathbf{I})$. With a little algebra, this is the case if $g(1,I^f) > g(1,I^m)$, which is the case if $I^f > I^m$. Thus, if a parent educates both children, she chooses $i^f = 1$ in the matrilocal equilibrium. Then, v^{f*}_{mat} is given by solving for $U^p(1,e^m,i^f,0,\mathbf{I}) > U^p(0,e^m,0,i^m,\mathbf{I})$ since if $e^f = 1$, $i^m = 0$. This produces

$$v^{f*}_{mat} = \frac{d_i+d_e}{\beta\gamma} + \frac{g(1,1-F(v^{f*}_{mat}))\Big(\log(y_2+rp)+\gamma d_\tau - \log(y_2+rp+\tau)\Big)}{\gamma}, \tag{10}$$

where $\alpha^f_{mat} = 1-F(v^{f*}_{mat}) = I^f$.

Then, there is a probability α^{f*}_{mat} that $e^f = 1, i^f = 1, i^m = 0$ and a probability $1-\alpha^{f*}_{mat}$, $e^f = 0, i^f = 0$. If $e^f = 1$, $v^{m*}_{mat|e^f=1}$ is given by $U^p(1,1,1,0,\mathbf{I}) > U^p(1,0,1,0,\mathbf{I})$, which simplifies to $v^{m*}_{mat|e^f=1} = \frac{c_e}{\beta\gamma} = v^{m*}_{neo}$. If $e^f = 0$, $v^{m*}_{mat|e^f=0} = \frac{d_i+d_e}{\beta\gamma} + \frac{g(1,I^m)\Big(\log(y_2+rp)+\gamma d_\tau - \log(y_2+rp+\tau)\Big)}{\gamma}$, where

$I^m = (1-\alpha^{f*}_{mat})F(v^{m*}_{mat|e^f=0})$. So,

$$\begin{aligned}\alpha^m_{mat} =&(1-F(v^{f*}_{mat}))(1-F(v^{m*}_{neo}))\\&+F(v^{f*}_{mat})\left(1-F\left(\frac{d_i+d_e}{\beta\gamma}+\frac{g(1,I^m))F(v^{m*}_{mat})\Big(\log(y_2+rp)+\gamma d_\tau-\log(y_2+rp+\tau)\Big)}{\gamma}\right)\right),\end{aligned}$$

where $I^m = F(v^{f*}_{mat})\left(1-F\left(\frac{d_i+d_e}{\beta\gamma}+\frac{g(1,I^m))F(v^{m*}_{mat})\Big(\log(y_2+rp)+\gamma d_\tau-\log(y_2+rp+\tau)\Big)}{\gamma}\right)\right)$. Then, since $\alpha^f_{neo}=\alpha^m_{neo}$ and $\alpha^f_{mat}>\alpha^m_{mat}$, it follows that $\alpha^f_{mat}-\alpha^f_{neo}>\alpha^m_{mat}-\alpha^m_{neo}$ and re-arranging, this implies $\alpha^f_{mat}-\alpha^m_{mat}>\alpha^f_{neo}-\alpha^m_{neo}$.

Proof of Proposition 2.

Proof. Focus on a gendered equilibrium, where $I^k > I^{k\prime}$. Recall that the parent chooses $i^k=1$ if, and only if equation (9) is satisfied. The maximal value for the left-side is given by $g(1,I^k)=1$. So a parent will only choose $i^k=1$ if $\Big(\log(y_2+rp+\tau)-\log(y_2+rp)\Big)\geq d_i+\gamma\beta d_\tau$. Note that p does not affect the right-side of this relationship, but taking the derivative of the left-side shows that $\frac{\partial LHS}{\partial p}=\frac{r}{y_2+rp+\tau}-\frac{r}{y_2+p}<0$. Thus, the left-side is decreasing in p and as $p\to\infty$, the left-side goes to 0. This implies single-crossing between the left- and right-sides of the inequality. So, there must exist a p^H such that if $p>p^H$, the inequality is no longer satisfied, and all parents will choose $i^k=0$. If it is no longer incentive compatible to choose $i^k=1$, it will also no longer be incentive compatible to choose $i^{k\prime}=1$.

Proof of Proposition 3.

Proof. Again consider a gendered equilibrium, where $I^k > I^{k\prime}$. We again use the fact that parent will only choose $i^k=1$ if $\beta g(1,I^{k*})\Big(\log(y_2+rp+\tau)-\log(y_2+rp)\Big)\geq d_i+\gamma\beta d_\tau$. If λ individuals get a pension plan with $p>p^H$, the maximal value for the left-side is $g(1,(1-\lambda))$. Substituting this into the inequality, the gendered equilibrium only exists if $g(1,(1-\lambda))\Big(\log(y_2+rp+\tau)-\log(y_2+rp)\Big)\geq d_i+\gamma\beta d_\tau$. We see that the left-side is decreasing in λ with $\frac{\partial LHS}{\partial\lambda}=-g'(1,(1-\lambda))\Big(\log(y_2+rp+\tau)-\log(y_2+rp)\Big)<0$. When $\lambda\to 1$, the left-side is equal to 0 under the assumption that $g(1,0)=0$. The right-side does not depend on λ. So, there is single-crossing between the left- and right-sides at λ^*, and if $\lambda>\lambda^*$, the gendered equilibrium can no longer exist.

Appendix B: Cross-country Gender Gap Regressions

The model predicts that female education should be higher relative to male education in matrilocal societies and vice versa in patrilocal societies. This section tests whether this is the case in cross-country data. I combine country-level data on the percent of the population belonging to ethnic groups that traditionally practiced these customs 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."[36]

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

$$y_c = \beta_0 + \beta_1 income_c + \beta_2 income_c^2 + \gamma PerPatrilocal_c + \delta PerMatrilocal_c + \alpha_r + \varepsilon_c, \qquad (11)$$

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 log gdp per capita, $PerPatrilocal_c$ and $PerMatrilocal_c$ are the percent of a country's population that belong to historically patrilocal or matrilocal ethnic groups, and α_r is a continent fixed effect. Then, the coefficients of interest are γ and δ. Since a higher gender gap score indicates that women are better off relative to men, the model predicts that $\gamma < 0$ and $\delta > 0$.

Table A6 reports the estimates from these regressions. Column 1 estimates equation (11) for the aggregate score. The estimates from column 1 indicate that patrilocality is statistically significantly associated with worse gender gaps. Matrilocality is associated with better gender gaps with a coefficient of similar magnitude, although the relationship is not statistically significant.[37]

Notably, if the regression in column 1 did not include $PerPatrilocal_c$ and $PerMatrilocal_c$, the

[36] 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).

[37] The fact that the association between matrilocality and the global gender gap is statistically insignificant may in part be due to the fact that matrilocality is relatively rare. In 75 percent of the countries in the sample, the percent matrilocal variable is equal to 0.

adjusted R^2 would be 0.219, while in column 1, the adjusted R^2 is 0.257. Thus, the inclusion of controls for matrilocality and patrilocality 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 increases the overall gender gap score by 5 percent.

The remaining columns estimate equation (11) for the economics (column 2), education (column 3), health (column 4), and political scores (column 5). The large and significant effect of patrilocality on the overall gender gap in column 1 appears to be mainly 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. Moreover, matrilocality is associated with an even larger reduction in the education gap, although this relationship is not statistically significant. These findings are consistent with the idea that patrilocality and matrilocality will mainly affect gender gaps through differences in human capital investments.

Appendix Tables

Table A1: Association Between Matrilocality and Patrilocality and Other Traditional Practices for All Ethnic Groups in the *Ethnographic Atlas*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	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)		
Polygamy				0.133***					-0.063**	
				(0.036)					(0.031)	
Matrilineal					-0.500***					0.543***
					(0.036)					(0.029)
Region FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	1,135	1,235	934	1,208	1,220	1,135	1,235	934	1,208	1,220
Adjusted R^2	0.339	0.352	0.327	0.362	0.437	0.288	0.304	0.269	0.303	0.456

This table regresses indicator variables for practicing matrilocality or patrilocality on indicator variables for other ethnicity-level traditions. All regressions control for region (sub-continent) fixed effects. The data is drawn from Murdock's *Ethnographic Atlas*. Standard errors are heteroskedasticity robust. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Indonesia				**Ghana**	
			Indicator variable for matrilocal				**Indicator variable for patrilocal**	
Plow	-0.345***							
	(0.133)							
Bride Price		0.064				-0.071		
		(0.064)				(0.282)		
Male-Dominated Agriculture			0.210				0.542***	
			(0.207)				(0.213)	
Polygamy				-0.469***				
				(0.167)				
Matrilineal					0.967***			0.192
					(0.022)			(0.273)
Number of observations	20,638,004	20,729,400	20,419,559	20,720,062	20,729,400	1,603,351	1,347,921	1,597,917
Clusters	757	801	677	800	801	53	41	52
Adjusted R^2	0.231	0.022	0.048	0.317	0.287	0.001	0.208	0.284

This table regresses indicator variables for practicing matrilocality or patrilocality on indicator variables for other ethnicity-level traditions 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. To weight ethnic groups by their size, an observation is an individual in the 2010 Indonesia census or the 2000 Ghana census. The data is drawn from Murdock's *Ethnographic Atlas.* Standard errors are clustered at the ethnicity-level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A3: Summary Statistics for the Indonesia 2010 Census

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Matrilocal			Non-Matrilocal		Coef.	
	Mean	SD	N	Mean	SD	N	Prov. & Birth Year FE	SE
				Enrollment Sample: Children Aged 5-22				
Age	12.734	4.945	290,239	12.599	4.903	5,822,788		
Female	0.473	0.499	290,239	0.472	0.499	5,822,788	0.001	0.003
Enrolled	0.675	0.468	290,239	0.687	0.464	5,822,788	0.003	0.020
Father Primary	0.783	0.412	260,367	0.866	0.341	5,406,558	0.031	0.033
Mother Primary	0.783	0.412	283,327	0.851	0.356	5,667,905	0.063*	0.035
Father High Skilled	0.017	0.128	260,367	0.022	0.147	5,406,558	-0.002	0.004
Mother High Skilled	0.019	0.136	283,327	0.021	0.142	5,667,905	-0.002	0.004
Father in Agriculture	0.312	0.463	260,367	0.180	0.384	5,406,558	0.016	0.026
Mother in Agriculture	0.183	0.387	283,327	0.111	0.315	5,667,905	-0.023	0.024
Household Head Male	0.899	0.301	289,400	0.929	0.257	5,816,602	-0.014*	0.008
Muslim	0.865	0.341	290,192	0.871	0.335	5,820,514	0.232***	0.085
				Pension Sample: Females Born Between 1959 and 1985				
Age	36.289	7.678	213,506	36.244	7.664	4,454,682		
Branch Offices Per 1,000 Square Miles	0.103	0.209	213,506	0.681	1.468	4,454,682		
Primary	0.829	0.376	213,506	0.878	0.327	4,454,682	0.062**	0.031
Secondary	0.254	0.435	213,506	0.320	0.466	4,454,682	-0.039	0.056
University	0.043	0.204	213,506	0.056	0.230	4,454,682	-0.015	0.016
Muslim	0.890	0.312	213,474	0.879	0.326	4,451,916	0.221***	0.075

This table provides summary statistics for the two samples from the Indonesia 2010 census used in this paper. The first three columns give the mean, SD, and number of observations for individuals from traditionally matrilocal ethnic groups. The next three columns do the same for individuals from traditionally non-matrilocal ethnic groups. The final two columns report the coefficient on matrilocality and its standard error from a regression of the row name variable on an indicator variable for belonging to a traditionally matrilocal ethnic group, controlling for age and province fixed effects and ethnicity-level traits (traditional bride price, polygamy, plow use, and male-dominated agriculture). Because these regressions control for age and province fixed effects, coefficients for age and for branch offices per 1,000 square miles are not reported. The first panel is the set of children 5–22 of household heads. The second panel is the set of females born between 1959 and 1985. Standard errors are clustered at the ethnicity level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A4: Summary Statistics for Ghana 2000 Census

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Patrilocal			**Non-Patrilocal**		**Coef.**	
	Mean	**SD**	**N**	**Mean**	**SD**	**N**	**District & Birth Year FE**	**SE**
				Enrollment Sample: Children Aged 5-22				
Age	11.814	4.815	205,756	12.056	4.803	201,084		
Female	0.472	0.499	205,756	0.488	0.500	201,084	-0.005	0.003
Enrolled	0.527	0.499	205,756	0.670	0.470	201,084	-0.077***	0.021
Father Primary	0.366	0.482	163,057	0.671	0.470	142,063	-0.190***	0.047
Mother Primary	0.230	0.421	185,740	0.459	0.498	181,609	-0.164***	0.027
Father High Skilled	0.027	0.161	163,057	0.035	0.185	142,063	-0.009***	0.002
Mother High Skilled	0.016	0.125	185,740	0.026	0.158	181,609	-0.011***	0.002
Father in Agriculture	0.296	0.456	163,057	0.237	0.426	142,063	0.033***	0.005
Mother in Agriculture	0.265	0.441	185,740	0.235	0.424	181,609	0.027***	0.005
Head Male	0.755	0.430	205,094	0.660	0.474	200,957	0.078***	0.012
Muslim	0.165	0.371	205,756	0.083	0.276	201,084	0.022	0.068
				Pension Sample: Males Born Between 1954 and 1975				
Age	33.988	6.417	95,650	34.172	6.401	99,982		
Primary	0.515	0.500	95,650	0.726	0.446	99,982	-0.142***	0.029
Sec	0.149	0.356	95,650	0.180	0.384	99,982	-0.023**	0.009
Uni	0.019	0.136	95,650	0.025	0.157	99,982	-0.003***	0.001
Muslim	0.167	0.373	95,650	0.079	0.269	99,982	0.024	0.055

This table provides summary statistics for the two samples from the Ghana 2000 census used in this paper. The first three columns give the mean, SD, and number of observations for individuals from traditionally patrilocal ethnic groups. The next three columns do the same for individuals from traditionally non-patrilocal ethnic groups. The final two columns report the coefficient on patrilocality and its standard error from a regression of the row name variable on an indicator variable for belonging to a traditionally matrilocal ethnic group, controlling for age and district fixed effects and ethnicity-level traits (traditional bride price and male-dominated agriculture). Because these regressions control for age fixed effects, the coefficient for age is not reported. The first panel is the set of children 5–22 of household heads. The second panel is the set of males born between 1954 and 1975. Standard errors are clustered at the ethnicity level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A5: Association Between Traditional Matrilocality and Patrilocality and the Within-Household Gender Gap in Enrollment for Children Aged 5-18

	(1) **Baseline**	(2) **+SES Controls**	(3) **+Cultural Traits**	(4) **+Geography Controls**
			Indonesia	
$I_e^{Matrilocal} \times I_i^{Female}$	0.015***	0.013***	0.010	0.012*
	(0.005)	(0.005)	(0.007)	(0.006)
Dep. Var. Mean	0.773	0.778	0.778	0.778
Number of observations	5,218,460	4,765,650	4,765,650	4,765,650
Clusters	801	800	800	800
Adjusted R^2	0.436	0.434	0.434	0.434
			Ghana	
$I_e^{Patrilocal} \times I_i^{Male}$	0.011	0.005	0.007	0.009*
	(0.007)	(0.007)	(0.006)	(0.005)
Number of observations	299,006	239,294	239,294	239,294
Clusters	53	53	53	53
Adjusted R^2	0.510	0.530	0.530	0.530

This table reports difference-in-difference estimates of the association between the interaction between traditional matrilocality and female (Indonesia) and patrilocality and male (Ghana) enrollment for children of the household head aged 5-18 in the Indonesia 2010 Census and the Ghana 2000 Census. All regressions include household fixed effects and 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, whether the household head is male, and whether the individual is Muslim interacted with child gender. Column 3 adds indicator variables for whether a child belongs to an ethnicity with bride price custom, male-dominated agriculture, polygamy, and aboriginal plow use interacted with child gender. Column 4 adds province fixed effects (Indonesia) or district fixed effects (Ghana) interacted with child gender. Data on ethnic traits is drawn from the *Ethnographic Atlas*. Standard errors are clustered at the ethnicity level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A6: Patrilocality, Matrilocality, and the Cross-Country Gender Gap

	(1) **Score, 2013**	(2) **Economics Score**	(3) **Education Score**	(4) **Health Score**	(5) **Political Score**
Percent Population Patrilocal	-0.031**	-0.056*	-0.028**	-0.002	-0.037
	(0.014)	(0.029)	(0.013)	(0.002)	(0.032)
Percent Population Matrilocal	0.033	-0.031	0.054	0.002	0.107
	(0.042)	(0.062)	(0.034)	(0.003)	(0.124)
Continent FE	Y	Y	Y	Y	Y
GDP Per Capita Controls	Y	Y	Y	Y	Y
Mean Dep. Var.	0.683	0.643	0.948	0.971	0.173
Number of observations	122	122	122	122	122
Adjusted R^2	0.257	0.189	0.494	0.110	0.147

Each column reports the results from cross-country regressions of the 2013 World Economic Forum Gender Gap scores on the percentage of each country's population that belongs to ethnic groups that traditionally practice patrilocality and matrilocality according to the *Ethnographic Atlas*. Regressions control for log gdp per capita and log gdp per capita squared and continent fixed effects. The first column is the overall score, and 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 *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A7: Robustness of the Effect of the Introduction of Astek in Indonesia on Educational Outcomes and the Practice of Matrilocality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Primary		**Secondary**		**University**		**Practice of Matrilocality**	
	Panel A: Controls for Birth Province by Third-Degree Polynomial Differential Time Trends							
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p$	-0.027	-0.414**	-0.031	-0.303***	-0.037	-0.089*	0.005	-0.048
	(0.047)	(0.172)	(0.032)	(0.093)	(0.024)	(0.048)	(0.011)	(0.046)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p$	-0.086	-0.629**	-0.076*	-0.492***	-0.041	-0.216***	-0.045**	-0.276**
	(0.059)	(0.286)	(0.043)	(0.171)	(0.035)	(0.077)	(0.023)	(0.115)
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p^2$		0.055***		0.039***		0.007		0.008
		(0.021)		(0.012)		(0.006)		(0.006)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p^2$		0.077**		0.059***		0.024**		0.032**
		(0.035)		(0.022)		(0.010)		(0.014)
Additional Time Trend Controls	Y	Y	Y	Y	Y	Y	Y	Y
Mean Dep. Var	0.881	0.881	0.318	0.318	0.055	0.055	0.079	0.079
Number of observations	4,689,943	4,689,943	4,689,943	4,689,943	4,689,943	4,689,943	4,375,782	4,375,782
Clusters	810	810	810	810	810	810	809	809
Adjusted R^2	0.168	0.168	0.187	0.187	0.050	0.050	0.056	0.056
	Panel B: Controls for Differential Baseline Educational Levels							
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p$	-0.039**	-0.268***	-0.018	-0.225**	-0.030**	-0.057*	0.007	-0.050
	(0.017)	(0.077)	(0.022)	(0.092)	(0.014)	(0.034)	(0.015)	(0.047)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p$	-0.042**	-0.121	-0.051**	-0.356***	-0.017	-0.083	-0.019	-0.204*
	(0.017)	(0.095)	(0.023)	(0.129)	(0.026)	(0.054)	(0.025)	(0.108)
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p^2$		0.032***		0.028**		0.004		0.008
		(0.010)		(0.012)		(0.004)		(0.006)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p^2$		0.011		0.041**		0.009		0.025*
		(0.012)		(0.017)		(0.008)		(0.013)
Additional Baseline Edu. Controls	Y	Y	Y	Y	Y	Y	Y	Y
Mean Dep. Var	0.881	0.881	0.318	0.318	0.055	0.055	0.079	0.079
Number of observations	4,638,488	4,638,488	4,638,488	4,638,488	4,638,488	4,638,488	4,328,620	4,328,620
Clusters	674	674	674	674	674	674	673	673
Adjusted R^2	0.154	0.154	0.189	0.189	0.052	0.052	0.058	0.058

This table reports robustness checks for the triple-differences estimates of the effect of the 1977 institution of the Astek pension plan in Table 3. These regressions exploit the interaction between years exposed to the plan (partial treatment indicates a women was 6-12 when the pension plan was initiated and full treatment indicates that she was younger than 6), intensity of treatment (number of branches in the province per 1,000 square miles), and whether a woman belongs to a matrilocal ethnic group. e denotes an ethnic group, c denotes a birth year, and p denote's an individual's province of birth. The sample consists of women born between 1959 and 1985 in the 2010 Indonesia census. Panel A includes additional time trends controls for matrilocal by birth province specific third degree polynomials in the year an individual was born (normalized to 1959). Panel B includes controls for baseline female education prior to the pension reform. These controls consist of the ethnicity-level percent of women 55–65 in the Indonesia census who have completed primary and secondary school and attended university interacted with birth year fixed effects, birth province fixed effects, and triple interacted with $Intensity_p$ and $I_c^{Part\_Treat}$ and $I_c^{Full\_Treat}$ respectively. Standard errors are clustered at the ethnic group level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A8: Robustness of Non-Linear Effects of Astek to Controls for Prevalence of Matrilocality

	(1) **Primary**	(2) **Secondary**	(3) **University**	(4) **Practice of Matrilocality**
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p$	-0.453***	-0.139*	-0.024	-0.035
	(0.131)	(0.073)	(0.034)	(0.040)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p$	-0.682***	-0.318**	-0.094*	-0.183**
	(0.247)	(0.138)	(0.049)	(0.090)
$I_e^{Matrilocal} \times I_c^{Part\_Treat} \times Intensity_p^2$	0.055***	0.017*	-0.001	0.005
	(0.016)	(0.010)	(0.004)	(0.006)
$I_e^{Matrilocal} \times I_c^{Full\_Treat} \times Intensity_p^2$	0.079**	0.037**	0.010	0.021*
	(0.031)	(0.018)	(0.008)	(0.011)
Prevalence of Matrilocality Controls	Y	Y	Y	Y
Province by Matrilocal FE	Y	Y	Y	Y
Ethnicity FE	Y	Y	Y	Y
Province by Birth Year FE	Y	Y	Y	Y
Muslim by Province by Birth Year FE	Y	Y	Y	Y
Cultural Trait Interactions	Y	Y	Y	Y
Time Trend Controls	Y	Y	Y	Y
Mean Dep. Var	0.881	0.318	0.055	0.079
Number of observations	4,638,788	4,638,788	4,638,788	4,328,898
Clusters	704	704	704	702
Adjusted R^2	0.145	0.186	0.050	0.056

This table reports a robustness check for the triple-differences estimates of the non-linear effects of the 1977 institution of the Astek pension plan in Table 3. The regressions exploit the interaction between years exposed to the plan (partial treatment indicates a women was 6-12 when the pension plan was initiated and full treatment indicates that she was younger than 6), intensity of treatment (number of branches in the province per 1,000 square miles), and whether a woman belongs to a matrilocal ethnic group. *e* denotes an ethnic group, *c* denotes a birth year, and *p* denote's an individual's province of birth. The sample consists of women born between 1959 and 1985 in the 2010 Indonesia census. Regressions include the same controls as in Table 3, as well as interactions between $I_e^{Part\,Treat}$ and $I_e^{Full\,Treat}$, the ethnicity-level percent of traditionally matrilocal individuals 55–65 in the Indonesia census in a birth province, and $I_e^{Matrilocal}$. Standard errors are clustered at the ethnic group level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A9: Robustness of the Effect of Social Security in Ghana on Educational Outcomes and the Practice of Patrilocality

	(1) Primary DD	(2) Primary Triple-D	(3) Secondary DD	(4) Secondary Triple-D	(5) University DD	(6) University Triple-D	(7) Practices Patrilocality DD
	Panel A: Controls for Third-Degree Polynomial Differential Time Trends						
$I_e^{Patrilocal} \times I_c^{Part\_Treat}$	-0.031*		-0.008		-0.002		-0.019**
	(0.016)		(0.010)		(0.005)		(0.008)
$I_e^{Patrilocal} \times I_c^{Part\_Treat} \times I_e^{Male}$		-0.058*		-0.011		-0.006	
		(0.029)		(0.009)		(0.005)	
Sample	Males	All	Males	All	Males	All	Males
Mean Dep. Var	0.623	0.523	0.165	0.127	0.022	0.016	0.112
Number of observations	195,629	419,570	195,629	419,570	195,629	419,570	136,422
Clusters	53	53	53	53	53	53	53
Adjusted R^2	0.241	0.261	0.050	0.058	0.010	0.010	0.078
	Panel B: Controls for Differential Baseline Education Levels						
$I_e^{Patrilocal} \times I_c^{Part\_Treat}$	-0.026**		0.007		-0.001		-0.019***
	(0.011)		(0.006)		(0.003)		(0.007)
$I_e^{Patrilocal} \times I_c^{Part\_Treat} \times I_e^{Male}$		-0.037**		-0.010		-0.007***	
		(0.015)		(0.007)		(0.003)	
Sample	Males	All	Males	All	Males	All	Males
Mean Dep. Var	0.623	0.523	0.165	0.127	0.022	0.016	0.112
Number of observations	195,629	419,570	195,629	419,570	195,629	419,570	136,422
Clusters	53	53	53	53	53	53	53
Adjusted R^2	0.241	0.261	0.050	0.058	0.010	0.010	0.078

This table reports robustness tests for the difference-in-differences and triple-differences estimates of the effect of the 1972 institution of a social security program in Ghana in Table 4 and includes the same set of controls. Difference-in-differences exploit the interaction between exposure to the plan in childhood ($I_c^{Part\_Treat}$ indicates an individual was younger than 12 when the plan was instituted) and whether an individual belongs to a patrilocal ethnic group. e denotes an ethnic group and c denotes a birth year. The sample consists of individuals born between 1954 and 1975 in the Ghana 2000 census. The difference-in-differences only includes males, and the triple-differences includes both males and females. Cultural trait interactions include ethnicity-level controls for the interaction between male-dominated agriculture and bride price with partial treatment (in DD) and with partial treatment and a gender-specific indicator variable and the relevant double interactions (in the triple-D). In Panel A, time trend controls are a third-degree polynomial in birth year (normalized to 1954) interacted with an indicator variable for patrilocal (and with a gender fixed effects in the triple-D), while in Panel B, it is a linear control interacted with $I_c^{Part\_Treat}$ (as in Table 4). Panel B includes controls for the percent of patrilocal males who have completed primary school, completed secondary school, or attended university at the patrilocal by district-level interacted with $I_c^{Part\_Treat}$. Standard errors are clustered at the ethnic group level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A10: The Association Between Education and the Practice of Matrilocality and Patrilocality

	(1)	(2)	(3)	(4)
	Indonesia		**Ghana**	
	Dep var: Practice Matrilocality		**Dep var: Practice Patrilocality**	
$I_i^{Primary}$	-0.005	-0.005	0.010*	0.009*
	(0.005)	(0.005)	(0.005)	(0.005)
$I_i^{Secondary}$	0.060***	0.062***	-0.015	-0.015
	(0.003)	(0.003)	(0.010)	(0.010)
$I_i^{University}$	0.074***	0.073***	0.007	0.007
	(0.006)	(0.006)	(0.008)	(0.008)
Geographic FE	Y	Y	Y	Y
Age FE	Y	Y	Y	Y
Cultural Trait Controls	N	Y	N	Y
Muslim Control	N	Y	N	Y
Mean Dep. Var.	0.106	0.106	0.141	0.141
Number of observations	157,464	157,439	69,735	69,735
Clusters	137	137	31	31
Adjusted R^2	0.058	0.059	0.084	0.085

This table reports the association between the practices of matrilocality and patrilocality (measured as a married woman or man respectively living in the same household as his or her parents). The sample for Indonesia (columns 1 and 2), is married women aged 25–45 belonging to matrilocal ethnic groups in the Indonesia 2010 Census. The sample for Ghana (columns 3 and 4), is married men aged 25–45 belonging to patrilocal ethnic groups in the Ghana 2000 Census. Geographic fixed effects are province fixed effects in Indonesia and district fixed effects in Ghana. Cultural trait controls consist of ethnicity-level indicator variables for bride price traditions, traditional plow use, polygamy, and male-dominated agriculture. *i* denotes an individual in the census data. Standard errors are clustered at the ethnicity-level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A11: Association Between Education and Long-Term Outcomes in Indonesia and Ghana

	(1)	(2)	(3)	(4)	(5)
		Indonesia		**Ghana**	
	Employed	**Log(wage)**	**Wealth Index**	**Employed**	**Wealth Index**
$I_e^{Tradition} \times I_e^{Primary}$	-0.027	-0.053	-0.027	-0.033***	-0.072***
	(0.026)	(0.054)	(0.090)	(0.007)	(0.023)
$I_e^{Tradition} \times I_e^{Secondary}$	0.046**	0.121	-0.128	-0.027***	-0.057**
	(0.019)	(0.076)	(0.156)	(0.006)	(0.027)
$I_e^{Tradition} \times I_e^{College}$	0.009	0.016	-0.294***	0.022	-0.065
	(0.027)	(0.029)	(0.077)	(0.015)	(0.053)
$I_e^{Primary}$	-0.051***	0.313***	0.796***	0.032***	-0.101***
	(0.007)	(0.014)	(0.049)	(0.005)	(0.010)
$I_e^{Secondary}$	0.062***	0.830***	1.176***	-0.097***	0.056**
	(0.014)	(0.025)	(0.032)	(0.004)	(0.022)
$I_e^{College}$	0.144***	0.206***	0.490***	-0.035***	0.234***
	(0.020)	(0.019)	(0.027)	(0.008)	(0.027)
Sample	Females	Females	Females	Males	Males
F-statistic	2.16	1.29	16.41	9.00	8.37
Dep. Var Mean	0.539	11.560	-0.043	0.846	-0.188
Ethnicity Controls	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y
Muslim Control	Y	Y	Y	Y	Y
Number of observations	84,498	12,421	84,488	216,781	215,140
Clusters	120	78	120	54	54
Adjusted R^2	0.075	0.473	0.307	0.057	0.282

This table estimates the association between education and labor market outcomes and wealth for traditionally matrilocal and non-matrilocal females aged 25-45 in the 1995 Indonesia Intercensal Survey and traditionally patrilocal and non-patrilocal males aged 25-45 in the 2000 Ghana Census. $I_e^{Tradition}$ 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. 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. For a discussion of this methodology, see Filmer and Pritchett (2001). Standard errors are clustered at the ethnicity level. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A12: Traditional Matrilocality and Gender Bias in the Indonesia Family Life Survey

	(1)	(2)	(3)	(4)	(5)	(6)
	Female Makes Decision About:					
	Her Clothes		**Large HH Purchases**		**Her Time Socializing**	
$I_e^{Matrilocal}$	-0.040	0.019	-0.031	0.038	-0.049**	0.032
	(0.018)	(0.041)	(0.019)	(0.027)	(0.012)	(0.021)
	[0.190]	[0.616]	[0.520]	[0.238]	[0.002]	[0.158]
Ethnicity Controls	N	Y	N	Y	N	Y
Muslim Control	N	Y	N	Y	N	Y
Gender FE	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Survey Year FE	Y	Y	Y	Y	Y	Y
Dep. Var Mean	0.880	0.880	0.778	0.778	0.848	0.848
Number of observations	19,343	19,336	19,343	19,336	19,343	19,336
Clusters	20	20	20	20	20	20
Adjusted R^2	0.056	0.057	0.059	0.060	0.044	0.044

This table reports the association between traditional matrilocality and measures of gender bias towards females in rounds 3 and 4 of the Indonesia Family Life Survey. The outcome variable for columns 1 and 2 is an indicator variable for a female is listed as making decisions about her clothing. The outcome in columns 3 and 4 is an indicator variable for whether a female is listed as one of the decision-makers about large household purchases, and the outcome in columns 5 and 6 is an indicator variable for whether a female is a decision-maker about how much time she spends socializing. The sample is restricted to respondents aged 25–45. Ethnicity controls consist of controls for bride price traditions, traditional plow use, polygamy, and male-dominated agriculture. Standard errors are clustered at the ethnicity-level. Because of the relatively small number of clusters in the IFLS, p-values from a wild bootstrap procedure appear in square brackets. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively.

Table A13: Traditional Matrilocality and Old Age Support for Non-Resident Parents in the Indonesia Family Life Survey

	(1)	(2)	(3)	(4)	(5)	(6)
	Any Financial Support		**Log(Financial Support)**		**Hours Spent on Chores**	
$I_e^{Matrilocal}$	-0.055*	-0.088	-0.263	-0.555	-0.012**	-0.024
	(0.022)	(0.072)	(0.141)	(0.332)	(0.006)	(0.015)
	[0.066]	[0.501]	[0.224]	[0.136]	[0.046]	[0.192]
Ethnicity Controls	N	Y	N	Y	N	Y
Muslim Control	N	Y	N	Y	N	Y
Age FE	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
Survey Year FE	Y	Y	Y	Y	Y	Y
Dep. Var Mean	0.287	0.287	12.509	12.510	0.006	0.006
Number of observations	4,769	4,765	1,368	1,366	4,769	4,765
Clusters	25	25	23	23	25	25
Adjusted R^2	0.036	0.039	0.092	0.093	0.076	0.076

This table reports the association between traditional matrilocality and married daughters' aged 25–45 support for parents who do not live with them in rounds 3 and 4 of the Indonesia Family Life Survey. The outcome variable for columns 1 and 2 is an indicator variable for a daughter provides parents with any financial support. The outcome in columns 3 and 4 is the log amount of financial support provided by daughters, and the outcome in columns 5 and 6 is the number of hours spent on chores for parents. Standard errors are clustered at the ethnicity-level. Because of the relatively small number of clusters in the IFLS, p-values from a wild bootstrap procedure appear in square brackets. *, **, and *** denote 10 percent, 5 percent, and 1 percent statistical significance respectively based on the wild bootstrapped p-values.