Historically Increasing Marriage Delay in a Foraging Population: Tests of Ecological Hypotheses

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Abstract

Lamalera is a subsistence fishing and whaling village in southeast Indonesia. Compared to other foraging populations Lamalera exhibits several peculiar demographic features, most strikingly an extremely late age at first marriage. In 2006 the average age of marriage for resident married females was 27.0 years; for males 28.3 years. Other features include high rates of celibacy, emigration, and children entering the clergy, producing an overall demographic pattern remarkably similar to that observed in early modern Europe. Using historical demographic data from local parish registers, it is shown that age at marriage has been increasing throughout the 20th Century. Three hypotheses derived human behavioral ecology are presented as possible explanations for this delay: human capital investment, brideprice inflation, and ecological constraints. None of these hypotheses individually appears satisfactorily to explain marriage delay in Lamalera, though it may be possible that several are acting together to produce the observed delays.

Introduction

Under most circumstances natural selection favors earlier ages at first reproduction. There are two key reasons for this. First, under any selection regime extrinsic rates of mortality are expected to be positive. This means that for any delay of reproduction there is some probability that the organism will not survive to reproduce at the future time (Borgerhoff Mulder, 1992). Second, in a growing population, earlier reproduction results in a greater proportional genetic contribution to the next generation. Thus, in order for natural selection to favor delayed reproduction, the cost of those delays must be offset by future gains in survivorship or reproduction (Charnov, 1993). This life history tradeoff underlies the timing of the cessation of growth and commencement of the reproductive stage. For human females, there is a third reason: the reproductive lifespan is curtailed by menopause. Any delays in reproduction reduce this reproductive lifespan thereby reducing maximal fertility.

Delay of reproduction past the age of sexual maturation is rare in most species. In humans it is typically associated with three circumstances. First, delayed marriage is characteristic of developed labor market economies that have undergone a demographic transition (Kaplan, 1994, 1996). Second, bride price regimes can result in delay of marriage when bride price is substantial (Borgerhoff Mulder, 1988; 1992). Third, delayed marriage is common in agricultural societies where all available land has been claimed and estates have been subdivided among heirs down to the minimal size necessary to support a household (Low, 1991; Scott and Duncan, 1999; Strassmann and Clarke, 1998; Voland et al, 1991).

The goal of this paper is to test these hypotheses as possible explanations for marriage delay in the village of Lamalera, Indonesia. Although the people of Lamalera subsist primarily

through marine foraging, they display an age at marriage remarkably late compared to other foraging populations. In some respects, Lamaleran demography more closely resembles that of agricultural populations in early modern Europe at the beginning of the demographic transition. It may be that similar pressures lead to delay of reproduction in both settings.

Field Site

Lamalera is a fishing and whaling community located in Nusa Tenggara Timur province of southeast Indonesia. In 2006, the resident population numbered 1227 individuals in 317 households. The local economy is one based around subsistence maritime foraging. There is little agriculture; instead fish and whale meat is traded with agriculturalists from the interior of the island. With the exception of a couple dozen school teachers and a few administrative posts, there is no wage employment in Lamalera. However, wage employment is available in the regional centers of Lewoleba and Larantuka, and circular migration is an important feature of Lamaleran demography.

Lamalera's experience with formal education goes back well over a century. Beginning with the first mission visit in 1886, children from Lamalera returned with priests to be schooled in the city of Larantuka. By 1913 a mission school was established in Lamalera, the first on the island, training primarily schoolteachers, carpenters, and catechists (Barnes, 1986). By 1967 a second elementary school and a Catholic junior high school had been built. Today, many of the brightest junior high school graduates continue their studies at the high school in Lewoleba (the largest city on the island) or at the more prestigious minor seminary at Hokeng, Flores.

As the civil administration and economy of the surrounding region grew during the 20th Century, Lamalerans benefited greatly from their history of education. Barnes (1996) reports that Lamalera and just one other village provided most of the schoolteachers for the regency when the school system was first being developed. Likewise, Lamaleran carpenters are regularly able to contract work on government development projects in the province. The more prestigious professions produced by Lamalera include "a university professor, a university lecturer in Japanese and South-East Asian languages, a medical doctor, a general, a publisher, as well as priests, nuns, newspapermen, businessmen, members of the state assembly, government clerks, and many schoolteachers." (Barnes, 1996:26)

Marriage in Lamalera normatively follows a pattern called asymmetric marriage alliance, or circulating connubium. This system places exogamous patrilineal clans in permanent wifegiving or wife-taking relationships with other clans, and is common throughout eastern Indonesia (van Wouden, 1968). However, it is unclear to what degree the traditional system constrains marriage. Barnes (1996) reports that in 1979 only 52% of marriages between local men and women conformed to the expected pattern; in 23% of cases the wife game from a clan classed as wife-taking, in 25% of cases the wife came from a clan in the same marriage class as the husband's clan. Data from 1999 found a similar pattern: only 47% of marriages were in the traditional direction, 26% were in the opposite direction, and 27% were within the same marriage class.

Marriage in Lamalera is accompanied by brideprice. Barnes reports that traditionally brideprice consisted of six elephant tusks, four to the bride's descent group and two to the bride's mother's descent group. The value of individual tusks was measured in units of *kesebõ* depending on the length of the tusk (as measured from the fingertips of an outstretched arm to various landmarks on the chest or opposite arm) and the circumference (as measured by the gap remaining between the thumb and forefinger of an encircling hand; Barnes 1996; Barnes and

Barnes 1989). Of the six tusks traditionally given, three were supposed to be valued at twenty *kesebõ* and the other three at seven to ten *kesebõ*. Few tusks remain in the village now and it is more common for money, livestock, or other goods to be substituted in exchange for tusks.

Within the past century, the system of bride price in Lamalera has been complicated by a shift towards neolocality, largely at the encouragement of the Catholic Church. Historically, residence in Lamalera was patrilocal. Under unusual circumstances, post-marital residence might be temporarily matrilocal in combination with bride service: citing Munro (1915), Barnes (1996) writes that in the past in the absence of brideprice the newlywed couple might occasionally live with the bride's parents until the brideprice had been paid. However, within the past century, the Catholic Church in Lamalera has encouraged changes in the system of residence from patrilocality. Bruno Pehl, a missionary in the village from 1951-1962, wrote:

For years I have pointed out before every marriage in an almost unmerciful way to both young and old that they are already Catholics in Lamalera and that therefore they must follow the 'Catholic' marriage regulations...bridewealth affairs must be changed into an affair of an orderly house for the young couple who are to marry. To express it more primitively: provision of bridewealth means Heathen Marriage, provision of a house means Catholic Marriage! (Pehl 1959: 88, as cited in Barnes 1996: 96)

Considering brideprice and extended family dwellings "heathen", the resident priests promoted the replacement of traditional brideprice with the construction of a new home for the bride and groom before the marriage took place. Despite the Church's intentions, provision of a house has not replaced brideprice but instead appears to have become an additional cost of marriage. Besides the additional cost, neolocality imposes its own constraints on marriage: the steep and rocky volcanic hillside on which the village is built limits the number of suitable building sites. This is further complicated by a system of land tenure that vests usufruct rights in clans. Thus, building costs, terrain, and land rights may all impose indirect obstacles to marriage.

Methods and Materials

The data presented in this paper come from two main sources. The first of these is genealogical interviews conducted with each household in Lamalera in 2006. Genealogies of village residents had been previously collected in 1999, and subsequently expanded using data from the church baptismal register. In 2006, residents were asked to confirm that the genealogical data on their household were correct, and to fill in any missing data. In most cases, genealogies for living residents are complete back to their grandparents' generation.

The second source of data used here are parish registers maintained by the local Roman Catholic Church. These consist of a baptismal register, a marriage register, and a death register. The baptismal register begins in 1886; the other two registers begin in the 1910's. A photocopy of the baptismal register was obtained in 1999, and during fieldwork in 2006 additional entries added to the register since 1999 were hand typed from the original manuscript in the parish office. Also during 2006, copies of the marriage and death registers were hand typed into a database from the original manuscripts. In 2008-2009, the remainder of the baptismal register was entered into the database from the photocopy obtained in 1999.

Results

Features of Lamaleran Demography

The most striking features of Lamaleran demography is an extraordinarily late age of marriage at marriage. Among ever-married residents of the village in 2006, the mean age at marriage for females was 27.0 years, and for males was 28.3 6 years. Of course delay of marriage need not indicate delay of reproduction. In the pre-Christian era sex between a man and a woman was sanctioned roughly from the time of engagement onwards (Barnes 1996). One way of investigating how well age at marriage marks onset of reproduction is to compare age at marriage to age at first birth. As presented in Figure 1, in 2006, 58.8% of ever-married women experienced their first birth more than nine months after the date of marriage. A further 19.6% experienced their first birth within the first nine months of marriage, suggesting that sexual activity commenced before marriage. The remaining 21.6% of women experienced their first birth before the date of marriage, age at marriage appears to be a reasonably good proxy for onset of reproduction for most individuals.

[Figure 1 about here.]

The effect of delayed marriage can also be observed in the age-specific fertility rate (ASFR). This rate was estimated using the available reproductive histories of resident Lamaleran women in 2006. Figure 2 presents the Lamaleran ASFR compared to that of Lamalera in 1997. As can be seen, peak fertility in Lamalera occurs in the early thirties, compared to the early to mid twenties for Indonesia as a whole, reflecting the delay of marriage and reproduction in Lamalera.

[Figure 2 about here.]

Finally, marriage delay in Lamalera is accompanied by high rates of celibacy. As shown in Figure 3, in 2006, 29% of women and 13% of men aged 30-39 were unmarried. The celibacy rate falls for men, with all resident men aged 50 or older being married. However, celibacy rates for women remain high throughout the lifespan, with roughly 1 in 5 women aged 60 or older having never married. In part, this can be attributed to a high female-biased sex ratio represented by the dotted line in Figure 3. In a monogamous community in which women outnumber men, it is inevitable that some women will remain unmarried. These high rates of celibacy are also reflected in the disproportionate numbers of Lamaleran youths who have joined the clergy: since roughly 1950, Lamalera has produced 19 priests, 2 bishops, and over 60 nuns.

[Figure 3 about here.]

This pattern of delayed marriage and high rates of celibacy is unusual in a foraging population. In some ways, Lamaleran demography more closely resembles that of agriculturalists in early modern Europe around the time of the demographic transition. Low (1991) reports that age at first marriage in seven parishes in nineteenth century Sweden followed what she calls the "European" pattern. Mean age at first marriage for women born between 1825-1896 ranged from 23.6 to 26.7 years across parishes; the corresponding range for men was 25.9 to 30.0 years. Celibacy rates for women in this sample ranged from19% to 58% across parishes. Strassmann and Clark (1998) report for rural Ireland that in 1936 the proportion of never-married men and women aged 25-34 years was 55% and 74%, respectively, and that in the cohort aged 45-54 years fully a third of men and a quarter of women had never married. This pattern was typical of

rural Ireland over much of the nineteenth and twentieth centuries. Scott and Duncan (1998), working with data from seventeenth and eighteenth century Penrith, in northern England, found a mean age of marriage for women of 25.3 years and for men of 27.5 years. Inheritance followed male primogeniture. The celibacy rate in Penrith was comparatively low (10%), with non-inheriting siblings typically choosing emigration over celibacy. Voland et al. (1991) analyzed historical parish record data from eighteenth and nineteenth Krumhörn, Germany. Although they do not present data on age at first marriage, Voland et al. do report marriage rates for the landholding class: 43.5% of sons and 69.95 of daughters married while 18.8% of sons and 7.5% of daughters remained celibate; the remainder emigrated.

Discussion

Human Capital Investment

Kaplan (1994, 1996) argued that humans are sensitive to the rate of return of continued investment in existing offspring. Under selection regimes characteristic of most of human evolution this rate of return diminished quickly such that investment was frequently shifted from investment in current offspring to investment in the next offspring, resulting in the pattern of relatively high fertility seen in most subsistence-level societies. However, Kaplan suggests that in modern skills based wage-labor economies the rate of return to investment in what he terms "embodied capital", especially education, is likely to be positive. This causes parents to favor high investment in fewer children and results in a demographic transition from high to low fertility, a state of maladaptive mismatch in which the historic relationship between wealth and fertility has been divorced.

Although Kaplan's arguments are primarily directed at parental investment in offspring, they can be equally applied to reproductively mature individuals' decisions to invest in themselves. In highly competitive skills-based economies where skill sets may take a decade or more to learn, adults may recognize an advantage to delaying their own reproduction in order to continue investing in their own embodied capital. Thus, individuals may delay marriage and reproduction well into their twenties, in order to obtain higher levels of education that command higher salaries. It is this pattern that is most likely responsible for the delayed ages of marriage seen in modern industrialized societies.

While the data are not available to directly test the hypothesis that marriage delays in Lamalera are due to human capital investment, we can indirectly address the problem by looking at patterns of migration. While education through junior high school is available in Lamalera, higher education must be obtained outside the village. Furthermore, wage labor opportunities that would benefit those with greater educations are also only available outside the village. Migration may reflect in part attempts by individuals to take advantage of these opportunities.

Figure 4 presents an age-sex pyramid of the resident population in 2006. There is a notable reduction in mass beginning around age 15 and lasting through about age 50. This gap is primarily due to out-migration. It also evident that this gap is more pronounced for males than females, reflecting both a sex bias in parental investment towards males (i.e. sons are more likely than daughters to be sent on to high school) and a greater likelihood of males to pursue wage labor opportunities outside the village.

While human capital investment may provide some incentive for those outside the village to delay marriage while they invest in education and career, it is unclear how this would have a similar effect within the village. For the most part those who stay behind are those who have not pursued further education or market opportunities. However, these opportunities have left their mark on Lamaleran demography in one pronounced way: migration appears to be the chief cause of the imbalance in the sex ratio among reproductively aged cohorts. A direct consequence of this imbalance in the sex ratio is the high rate of female celibacy.

[Figure 4 about here.]

Brideprice Inflation

In brideprice regimes, the time it takes to accumulate sufficient wealth to attract a bride may delay marriage. However, because younger women of higher reproductive value are usually in high demand, brideprice constraints usually fall more heavily on younger males. For example, Borgerhoff Mulder (1988) reports that among the Kipsigis, the modal age at first marriage for males is 23 years while for females the modal age is only 16. Where brideprice is found it is most commonly associated with polygyny and male biased sex ratios (van den Berghe, 1979) and agricultural regimes in which women contribute significantly to subsistence (Goody, 1976). In the former two cases this is because both polygyny and male biased sex ratios create a situation of intensified competition among men for brides. In effect, demand exceeds supply in the marriage market, driving up bride price. In the latter case, women's productive labor is an economic asset to the parents' household and so parents must be compensated for the loss of labor.

Recall that one aim of resident priests in Lamalera was to eradicate brideprice, and their preferred method was by instead encouraging the groom's family to instead spend the wealth on building a new house for the new couple. Anecdotally, this suggests that brideprice has been increasing. One indication that brideprice inflation is causing marriage delay would be an increase in age at marriage over time.

Using data from the church marriage register, it is possible to observe changes in the age at marriage throughout the 20th Century. Because individuals born in later cohorts may not have yet reached marriageable age, the analysis presented here uses only those individuals listed in the parish marriage register born before 1970. For comparison across cohorts, the average age of marriage of those marrying between age 15 and 30 was then calculated. Figure 5 shows that over the course of the 20th Century, the age of marriage has indeed increased for both males and females.

[Figure 5 about here.]

Although an increase in age of marriage over time would be consistent with brideprice inflation, it is not the only possible cause. One way to test for the effects of brideprice on the age of marriage is to compare the ages of marriage of males with previously sisters to that of males without previously married sisters. In brideprice regimes, the brideprice received for daughters can be used by a household to pay the marriage expenses of sons. Thus, if brideprice payment poses a substantial obstacle to marriage, men with previously married sisters may be able to marry sooner than those without such sisters.

A survival analysis comparing time-to-marriage of resident males with and without previously married sisters fails to support the hypothesis. The Kaplan-Meier survival curves are presented in Figure 6. If anything, having previously married sisters appears to delay marriage even later. It may be that the crossing survival curves (a violation of the proportional hazards model) produce the non-significance of the survival analysis, and that this effect—the opposite of that predicted—is significant over earlier ages.

Another feature of Lamaleran demography that seems inconsistent with the brideprice inflation hypothesis is that demand does not exceed supply. Indeed, the opposite is true: there are more unmarried women than there are men. If anything, this ought to lead to a decline in brideprice, as parents are willing to accept less to ensure their daughters marry rather than see them unwed. One might also ask why, if high brideprice were the primary cause of marriage delay, women delay marriage as well as men? Brideprice commonly drives up the age of marriage for males more then females (e.g. Borgerhoff Mulder 1988), and increases the relative difference in age between brides and grooms. When brideprice is high it may be that grooms are more inclined to take older brides whose parents are willing to accept lower brideprice.

Ecological Constraints

Humans are not the only species whose offspring sometimes delay reproduction and dispersal from their natal group. The phenomenon is seen in other species as well, notably in territorial songbirds. The common explanation for this phenomenon is called the Ecological Constraints hypothesis (Koenig and Mumme 1987): when available breeding territories are saturated, the best option may be to delay reproduction and remain on the natal territory for a season, in the hopes that a neighboring territory, or the natal territory, will become available. Others have stressed the benefits that accrue from philopatry (Stacey and Ligon 1991), including helping parents to raise siblings. Together, this combination of constraints and benefits form part of an evolutionary theory of family formation (Emlen 1994, 1995).

As noted above, within the past century the Catholic Church in Lamalera has encouraged the replacement of traditional bride price practice with the provision of a new home for the bride and groom. As mentioned in the previous section, one possible effect may have been to increase the effective bride price. However, another problem with this imposed neolocality is that terrain severely constrains new building sites and the most suitable areas are already saturated with houses. This is further complicated by the system of usufruct land rights. Sites suitable for new construction may be limited. Under such circumstances, it may be advantageous for a man to wait until an existing house becomes available (either his own parents or that of some other kinsman) rather than build a new structure.

If saturation of suitable building sites were a main cause of marriage delay in Lamalera, we might expect the effect to be unique to the village. Other neighboring villages in the parish, especially agricultural communities in the interior of the island, are not as constrained by geography as is Lamalera, nor are they as populous or densely settled. Earlier ages of marriage in surrounding villages compared to Lamalera would support the hypothesis that local ecological constraints are contributing to marriage delays in Lamalera.

A survival analysis shows no support for this hypothesis. Using data from the marriage register, individuals were coded as being from Lamalera or elsewhere based on the place of marriage. In order to include later-born cohorts, only marriages between ages 15 and 30 were included, and only those born before 1970 were used. The Kaplan-Meier survival curves presented in Figure 6 clearly show no significant differences in age at marriage between those married in Lamalera and those married in other villages within the same parish.

[Figure 6 about here.]

Conclusions

None of the three hypotheses considered here seems to adequately explain the pattern of delayed marriage seen in Lamalera. The embodied capital hypothesis seems consistent with the history of education in Lamalera, the developing market economy in the region, and Lamalerans' emigration behavior. Furthermore, the developing education system and labor markets might explain the increase in age of marriage seen throughout the past century. However, while this might explain delay of marriage among out migrated individuals it seems unlikely to explain the delays seen among current residents engaged in subsistence marine hunting and fishing. The brideprice hypothesis seems consistent with historical changes to brideprice in Lamalera, and increasing market participation by young men may be further driving brideprice inflation. However, while it may adequately explain why young men are delaying marriage it does not satisfactorily explain why young women similarly delay marriage. The female-biased sex ratio would also appear to work against any increase in brideprice. The habitat saturation hypothesis is consistent with several ecological and social characteristics of Lamalera, but appears unsupported by the available data.

It should be noted that these three hypotheses are not mutually exclusive, and it is possible that all the forces discussed are at work. Educational and wage opportunities, bride price, and habitat saturation may all be combining to induce Lamalerans to delay marriage. Answering the question conclusively, however, will require further research. More accurate information regarding emigrants' activities is necessary to decide if the majority of these individuals are investing in education or simply pursuing unskilled wage labor. Accurate data on amounts of bride price and house construction are needed to determine how much of an obstacle to marriage bride price really is. Finally, more information regarding the costs of building new homes and the patterns of inheritance of existing ones are needed before the habitat saturation hypothesis can be adequately addressed. Collecting the data needed to answer these questions is an aim of future research.

Figures



Figure 1. First birth relative to date of marriage, resident ever-married Lamaleran women (n = 199), 2006.



Figure 2. Female age-specific fertility rate for Indonesia (1997) and Lamalera (2006).



Figure 3. Percentage of never-married resident Lamaleran men and women by age in 2006, and the corresponding age-specific sex ratio (men as a proportion of the female population).



Figure 4. Age-sex structure of Lamalera, 2006. Note especially the effects of migration, ages 15 - 50, and the disproportionate effect on males.



Figure 5. Mean age of marriage of those marrying before age 30 by decade of birth. (Data from Lamalera parish marriage register.)



Figure 6. Time to marriage for Lamalera and surrounding villages, for individuals aged 15 to 30 at marriage, and born between 1890 and 1970. (Data from Lamalera parish marriage register.)

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