

## MARRIAGE MARKET: FORMATION, SELECTION, AND POLICY EFFECTS<sup>‡</sup>

### Assortative Matching under Asymmetric Information: Evidence from Malawi<sup>†</sup>

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Asymmetric information is a key feature of the marriage market. People may conceal undesirable traits from their partners, including negative financial, temperamental, and health attributes (Becker 1981). Few studies have considered the effects of asymmetric information on assortative matching and marriage market outcomes.<sup>1</sup> In HIV-endemic settings, HIV risk—the prospect of HIV infection now or in the future—is an important but hidden partner trait. An HIV-positive spouse is less productive, requires extra medical care, and may transmit the infection (Chimbiri 2007). HIV remains asymptomatic for several years after infection, and risky traits such as promiscuity are difficult for others to observe.

Angelucci and Bennett (2017) study the impact of asymmetric information about HIV in

rural Malawi. We develop a model of assortative matching and marriage timing in which one attribute, health, is initially unobservable. The model suggests several correlations that may be present in equilibrium. Here we explain these patterns and provide supporting evidence with baseline data from the Tsogolo la Thanzi (TLT) Panel Study.

#### I. Theoretical Predictions

Angelucci and Bennett (2017) develop a simple two-period model of the marriage market with nontransferable utility. People have two binary traits, attractiveness and health. Attractiveness is observable in both periods but health only becomes visible to others in Period 2. While we conceive of health in terms of HIV risk, it could refer to any hidden trait that other marriage market participants learn about over time.

Our model leads to an equilibrium in which people positively assortatively match on the traits that are observable in each period. Unhealthy people universally prefer to marry early in order to capture the marital surplus in Period 1 and potentially to match with a healthy spouse. Healthy people who are impatient also marry in Period 1. However, healthy people who are patient delay marriage until Period 2 to avoid a health mismatch, which creates adverse selection in Period 1. Under additional assumptions, the model predicts healthy and unhealthy people have equally attractive spouses.

The model also predicts that among the healthy, attractive people may marry later than unattractive people if they have more to lose from an unhealthy match. Beautiful women, who marry wealthy husbands, face a larger drop in surplus if their husbands turn out to be HIV

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<sup>1</sup>Weiss and Willis (1997) study the impact of information revelation on divorce. Bergstrom and Bagnoli (1993) conjecture that asymmetric information about the earnings potential of young men contributes to the marital age gap.

positive. The incentive for a healthy person to wait also rises with HIV prevalence. Among the healthy, attractive people may also marry later if HIV prevalence is higher for attractive people.

The model incorporates two assumptions that we can validate. (i) *Marital surplus increases with own attractiveness and partner attractiveness.* This assumption is essential for positive assortative matching on attractiveness. (ii) *Marital surplus increases with own health and partner health.* This assumption is required for positive assortative matching on health in Period 2. Since we lack data on partner health, we only assess the prediction related to own health below.

The model also leads to four testable predictions. (iii) *Partner attractiveness increases with own attractiveness.* The model predicts positive assortative matching on attractiveness. (iv) *Partner attractiveness is uncorrelated with own HIV risk.* Under assumptions that Angelucci and Bennett (2017) describe further, asymmetric information about health does not interfere with matching on attractiveness. (v) *The age at marriage increases with own health.* Due to asymmetric information, some healthy people delay marriage to avoid a mismatch. (vi) *For healthy people, the age at marriage increases with own attractiveness.* The incentive to delay marriage under asymmetric information is greatest for attractive people, who lose the most surplus from a health mismatch.

## II. Context and Data

We test these predictions in a sample of young women from Balaka, Malawi. Matrilineal kinship is common and marriage payments are rare in this setting (Berge et al. 2014). Polygamy occurs infrequently. Individual partners, rather than their parents or community leaders, make marriage decisions (Kaler 2001).

HIV risk is an important but hidden partner attribute. HIV is primarily spread through unprotected heterosexual sex. Due to social norms that discourage condom use within marriage, spouses are particularly exposed to HIV from one another (Tavory and Swindler 2009). The disease remains asymptomatic for several years after infection. More generally, partners may hide their propensity for risky behavior that could lead to HIV infection. Angelucci and Bennett (2017) provide evidence that people are

better informed of their own HIV status than of the status of their partners.

The Tsogolo la Thanzi (TLT) Panel Study is an eight-wave longitudinal study from 2009 to 2011. The study includes 1,507 women aged 15 to 25. For this analysis, we use the baseline wave and limit the sample to 592 respondents who were married at baseline. The survey records the age at first marriage, the husband's education level, and the number of living children. We rely on surveyor scores of the physical attractiveness of respondents and divide at the median to create "attractive" and "unattractive" subsamples. Primary school completion is an indicator of the attractiveness of husbands. This variable almost always reflects completed schooling since the median husband age is 26. Empirical studies validate the delineation of attractiveness into beauty for women and earnings potential for men (Hitsch, Hortaçsu, and Ariely 2010; Chiappori, Oreffice, and Quintana-Domeque 2012). Ten percent of married respondents are HIV positive according to tests offered in the baseline and subsequent waves.<sup>2</sup>

An indicator of HIV risk encompasses both current infection and risky sexual behavior that could lead to future infection. A respondent qualifies as "low risk" if she is HIV negative and (i) has  $\leq 2$  lifetime partners; (ii) has  $\leq 1$  partner in the past year; (iii) has  $\leq 10$  percent subjective infection risk; (iv) does not have multiple partners for money; and (v) has never taken antiretroviral therapy. We chose these thresholds to isolate the riskiest quartile of respondents by each measure. Boileau et al. (2009) link several of these factors with subsequent HIV infection and marital disruption. Fifty-two percent of married respondents are "low risk" according to this definition. Dividing the sample by HIV risk rather than HIV status increases statistical power since relatively few people are HIV positive.

The number of children per year of marriage is a proxy for marital surplus. Fertility is a primary aspect of household productivity that reflects the extent of complementarity between the inputs of spouses (Becker 1973). Childrearing also entails upfront costs and future benefits that depend in

<sup>2</sup>The research team randomized the timing and frequency of HIV testing across respondents. The deferred testing of some participants is a minor source of measurement error because HIV seroconversion occurs infrequently (Attia et al. 2009).

part on the longevity of the partnership. Couples may base fertility decisions on their expectations of future marital surplus. We normalize fertility by marriage duration to avoid comparing people with different windows for conception.

### III. Correlations

Table 1 provides evidence of assortative matching under asymmetric information. The table shows the age at first marriage, an indicator for husband's primary school completion, and the number of children per year of marriage. Panel A divides the sample by physical attractiveness and panel B divides the sample by HIV risk.<sup>3</sup> We use OLS regressions to compute heteroskedasticity-robust  $p$ -values for these comparisons.

- (i) *Marital surplus increases with own attractiveness and partner attractiveness.* Column 1 of panel A shows that attractive respondents have 0.06 more children per year of marriage than unattractive respondents ( $p = 0.02$ ). In addition, respondents whose husbands have finished primary school have 0.02 more children per year of marriage than respondents whose husbands have not finished school ( $p < 0.001$ , estimates available from the authors).<sup>4</sup>
- (ii) *Marital surplus increases with own health and partner health.* Column 1 of panel B shows that low-risk respondents have 0.07 more children per year of marriage than high-risk respondents ( $p < 0.001$ ).
- (iii) *Partner attractiveness increases with own attractiveness.* Column 2 of panel A shows that 57 percent of the husbands of attractive respondents have completed primary education, compared to 38 percent of the husbands of unattractive

<sup>3</sup>Estimates by HIV status closely resemble the estimates by HIV risk and are available from the authors.

<sup>4</sup>The model predicts that own health and partner health should be uncorrelated. Likewise, a corollary to item (ii) is that marital surplus is positively correlated with partner health. We lack a credible measure of partner HIV risk to test these claims.

TABLE 1—MARITAL OUTCOMES BY ATTRACTIVENESS AND HIV RISK

	Children/yr of marriage (1)	Husband primary education (2)	Age at first marriage (3)
<i>Panel A. By attractiveness</i>			
Attractive	0.44	0.57	17.7
Unattractive	0.38	0.38	17.1
$p$ -value	0.02	0.00	0.00
<i>Panel B. By HIV risk</i>			
Low risk	0.44	0.48	17.5
High risk	0.37	0.46	17.2
$p$ -value	0.00	0.60	0.05
Observations	592	592	592

respondents ( $p < 0.001$ ). This result is consistent with assortative matching in terms of these traits.

- (iv) *Partner attractiveness is uncorrelated with own health.* In our model, people positively assortatively match on attractiveness despite the inability to observe partner HIV risk. Column 2 of panel B shows that low-risk and high-risk respondents have husbands with similar and insignificantly different levels of schooling ( $p = 0.60$ ).
- (v) *The age at marriage increases with own health.* Our model predicts that asymmetric information leads some low-risk people to postpone marriage in order to prevent a mismatch. Column 3 of panel B shows that low-risk respondents marry an average of 0.3 years later than high-risk respondents ( $p = 0.05$ ). Similarly, low-risk respondents are 14 percentage points more likely to be married than high-risk respondents ( $p < 0.001$ , estimates available from the authors).
- (vi) *The age at marriage increases with own attractiveness among the healthy.* Attractive and healthy people have a stronger incentive to delay marriage than unattractive and healthy people. Column 3 of panel A shows that attractive

respondents marry 0.6 years later than unattractive respondents ( $p < 0.001$ ). Although this comparison is unconditional, a comparison in the low-risk subsample yields a similar result.

#### IV. Discussion

These correlations are consistent with matching under asymmetric information about HIV risk. Item (v) suggests that healthy people delay marriage to avoid a mismatch. This result complements Angelucci and Bennett's (2017) finding that an HIV testing intervention, which reveals partner types, accelerates marriage for low-risk people. Item (vi) suggests that among the healthy, attractive people delay marriage, which is also consistent with Angelucci and Bennett (2017). As correlations, these findings could reflect other channels that are not represented in our model.

Marriage markets throughout the world feature asymmetric information. People commonly choose partners without full knowledge of important partner attributes. Courtship is a time-consuming process that serves to reveal partner traits. Institutions and innovations that facilitate information provision among partners may influence the matching process and marriage timing. Becker (1981) notes that the invention of modern contraceptives has enabled partners to learn about sexual compatibility prior to marriage. Demographic phenomena such as migration and female labor force participation may also shape the marriage market by introducing additional uncertainty about partner quality. The costliness of divorce moderates the impact of asymmetric information by determining whether a mismatch is consequential. Marriage is primarily a social institution rather than a legal institution in Malawi. However, in other settings, legal reforms such as no-fault divorce that streamline marriage dissolution may accelerate marriage by reducing the need for lengthy courtship. More research into these topics is needed.

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