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TOO MANY MEN? SEX RATIOS AND WOMEN'S PARTNERING BEHAVIOR IN CHINA

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Abstract

The relative numbers of women and men are changing dramatically in China, but the consequences of these imbalanced sex ratios have received little attention. We merge data from the Chinese Health and Family Life Survey with community-level data from Chinese censuses to examine the relationship between cohort- and community-specific sex ratios and women's partnering behavior. Consistent with demographic-opportunity theory and sociocultural theory, we find that high sex ratios (indicating more men relative to women) are associated with an increased likelihood that women marry before age 25. However, high sex ratios are also associated with an increased likelihood that women engage in premarital and extramarital sexual relationships and have had more than one sexual partner, findings consistent with demographic-opportunity theory but inconsistent with sociocultural theory.

A demographic revolution of sorts has been occurring in the People's Republic of China. A longstanding cultural preference for sons over daughters and sharp reductions in fertility have converged with more proximate factors, including particularly the widespread availability of sex-selective abortion technology, to create a dramatic shortage of girls in China over recent decades (Banister 2004; Cai and Lavelly 2003; Goodkind 2004). China will experience an overabundance of adult males relative to adult females as these cohorts age (Poston and Glover 2005; Tuljapurkar, Li, and Feldman 1995). This imbalance in the numbers of adult males and females is anticipated by some observers to have profound and far-reaching consequences (Poston and Morrison 2005). Others have gone so far as to suggest that this surplus of Chinese males threatens U.S. national security and global political stability (Hudson and Den Boer 2002; 2004) and will contribute substantially to the spread of HIV and other sexually transmitted diseases (Tucker et al. 2005).

The focus of this paper is on somewhat less dire but nonetheless consequential repercussions of imbalanced sex ratios in China, namely, their implications for women's partnering behavior. Our conceptual framework is grounded in influential but still controversial theories linking imbalanced population sex ratios to women's marital timing and engagement in premarital, multiple-partner, and extramarital sexual intercourse. We test hypotheses derived from these theories using data from the Chinese Health and Family Life Survey (CHFLS), a large, nationally-representative survey of Chinese adults, and

information from three Chinese censuses describing the relative numbers of women and men in their local residential community.

Sex Ratios in China

Although China has long experienced a shortage of girls (Coale 1991; Coale and Banister 1994; Hull 1990), over recent decades this female deficit has become especially acute (Banister 2004). Abnormally masculine sex ratios at birth in China have been reported by many observers (e.g., Cai and Lavelly 2003; Gu and Roy 1995; Johansson and Nygren 1991; Lavelly 2001; Murphy 2003; Peng and Huang 1999; Secondi 2002; Yi et al. 1993; Yuan and Tu 2004). A normal range of the sex ratio at birth (number of boys per 100 girls) is between 103 and 107; however, China has been reporting increasingly high sex ratios over recent decades. The Chinese sex ratio at birth in 1982 was 107.6 -- only slightly outside the typical range (Yuan and Tu 2005). By 1990 the sex ratio at birth had risen to 111.3, and by 2001 it had increased to 118 (Poston and Glover 2005). At higher birth orders (three and above), the sex ratio at birth reached an astounding 159.4 in 2000 (Yuan and Tu 2004). This degree of imbalance in the numbers of boys and girls is likely unparalleled in contemporary societies (National Research Council 2005).

Several factors have converged to create these imbalances in the numbers of young Chinese boys and girls. Like many Asian societies, China has a long history of preferring sons over daughters (e.g., Lee and Campbell 1997; Lee and Feng 1999a; 1999b; Wolf and Gates 1998; Wolf and Huang 1980). What has made this longstanding son preference particularly important in shaping China's unusual sex ratios at birth in recent decades is a sharp decline in fertility coupled with widespread availability of sex-selective abortion technology. Neither formal government policies restricting sex-selective abortion nor acknowledgement of the ramifications of sex-selective abortion for a future marriage squeeze dissuade parents from selectively aborting female fetuses (Chu 2001). While other factors, such as comparatively high female infant and childhood mortality (Banister 2004), the selective under-reporting of female births (Banister 1991), and traditional and contemporary health states and practices (Oster 2005; Peng and Huang 1999) may also contribute to China's observed abnormal sex ratios at birth, most observers agree that the pervasive utilization of prenatal sex-selective technology and accompanying sex-selective abortion are the critical proximate factors accounting for China's "missing girls."

Of course, the effects of the most recent imbalances in the sex ratio at birth will not be felt fully at the national level for another decade or two. But examining how *current* age-graded and spatial variation in sex ratios is associated with women's marital and sexual behavior may provide clues as to how these effects will manifest themselves at the national level in future decades. There is currently substantial age-graded and sub-national geographic variation in adult sex ratios (Yi et al. 1993; Yuan and Tu 2005), thereby enabling an examination of how existing imbalances influence women's marital and sexual behavior. Banister (2004) finds very high sex ratios (between 125 and 138 in 2000) in the provinces of Anhui, Guangdong, Guangxi, Hainan, Henan, Hubei, Hunan, Jiangxi, and Shaanxi. Sex ratios are generally higher in rural areas than cities with towns falling in between (Banister 2004; Hull 1990). Some studies suggest higher sex ratios are also associated with economic development and gains in maternal education (Banister 2004; Gu and Roy 1995; Yi et al. 1993). Regional variation in the rigor with which family planning policies have been imposed has been documented as well (Gu et al. 2007), and this variation likely creates inter-community differences in the demand for sex-selective abortions. The substantial variation in the sex ratio at birth across provinces and among villages, towns, and cities, coupled with inter-area variation in sex-specific migration streams (He and Gober 2003), creates significant variation in adult sex ratios among the counties of China that are inhabited by the respondents to the CHFLS. Historical fluctuations in fertility, combined

with the traditional age differences between spouses, also contribute to sex ratio imbalances across birth cohorts (Porter 2006).

THEORY AND HYPOTHESES

Two broad theoretical approaches address the possible impact of imbalanced sex ratios on women's partnering behaviors. Demographic-opportunity theory emphasizes the impact of the sheer availability of potential sexual and marital partners on social and demographic behavior. This perspective holds that the actual or perceived opportunities to form romantic and sexual partnerships are largely a product of the social structure, defined as the "multidimensional space of different social positions among which a population is distributed" (Blau 1977:4). The opportunities to form marital and sexual relationships are determined primarily by the availability of potential partners in the local community (South and Lloyd 1992). Theoretically, residing in a community containing an abundance of members of the opposite sex increases the likelihood of finding an attractive sexual or marriage partner, thereby hastening the transition to first marriage and increasing the likelihood of premarital, extramarital, and multiple sexual encounters. In contrast, when few potential partners are available, the transition to marriage will be delayed (and perhaps foregone entirely) and sexual encounters will be less frequent.

Studies of the impact of imbalanced sex ratios on these partnering behaviors have generally focused on the U.S. Early studies tended to rely solely on aggregate data, while more recent analyses have taken individuals as the units of the analysis and linked individual behaviors with characteristics of the local neighborhood, community, or other spatially-delimited marriage market. By and large, both strands of research have identified mate availability as a salient influence on family formation behavior. Female marriage rates and propensities are higher in communities containing more eligible men (e.g., Angrist 2002; Fossett and Kiecolt 1993; Lichter et al. 1992; McLaughlin, Lichter, and Johnston 1993), although only a small proportion of the substantial racial (black-white) difference in women's marriage rates is accounted for by racial differences in marriage opportunities (Lichter, Le Clere, and McLaughlin 1991; Schoen and Kluegel 1988; South and Lloyd 1992). Similarly, men's marriage rates increase as the relative number of available women in the local geographic area increases (Lloyd and South 1996). The literature is less consistent regarding the influence of mate availability on the timing of first intercourse and youth sexual activity more generally (e.g., Billy, Brewster, and Grady 1994; Brewster 1994; Browning and Olinger-Wilbon 2003), although high sex ratios significantly increase women's risk of nonmarital childbearing (Billy and Moore 1992).

A different theoretical perspective on the impact of imbalanced sex ratios on partnering behaviors is perhaps best labeled a "sociocultural" approach. In contrast to the gender-neutral assumption of demographic-opportunity theory, sociocultural theories explicitly acknowledge gender differentials in responses to sex ratio imbalances. Guttentag and Secord's treatise, *Too Many Women? The Sex Ratio Question* (1983), is perhaps the most influential sociological statement from this perspective and it has served as a springboard for much of the empirical research in this area. The sociocultural approach builds from a fundamental premise of exchange theory, namely, that relationship quality and commitment are functions of attraction and dependency. Guttentag and Secord (1983) begin their argument by describing the effects of imbalanced sex ratios on *dyadic power* in interpersonal relationships between women and men. Members of the sex that is in short supply are less dependent on their partners because a greater number of alternative relationships are available to them. Should they become dissatisfied with their current partners, they can more easily form relationships with other members of the opposite sex. In contrast, members of the sex that is in relative oversupply are in a dependent position vis-à-

vis their opposite-sex partners because there are fewer members of the opposite sex with whom to form a relationship. Members of the sex in short supply, then, enjoy greater dyadic power than members of the sex in relative oversupply.

The extent to which dyadic power shapes gender-specific behavior is constrained by the distribution of structural power which resides with men in all but a handful of societies (Guttentag and Secord 1983). Women's ability to use dyadic power to gain freedom and independence is limited because men use their structural power to limit and modify women's potential use of dyadic power. Women and men may also respond differently to sex ratio imbalances because of different reproductive motivations and strategies. As suggested by evolutionary psychology (Buss 2003; Buss and Schmitt 1993; Feingold 1992; Stone, Shackelford, and Buss 2007), men may be expected to exploit sex ratio imbalances in their favor by maximizing the production of offspring. Men might also be expected to more vigilantly "guard" their mates against possible usurpers when sex ratio imbalances favor women. In contrast, women's ostensible greater concern with a mate's long-term commitment may render women less likely to take advantage of their dyadic power even when it exists.

Sociocultural theory posits several societal or community-level responses to imbalanced sex ratios. In high-sex-ratio contexts (i.e., populations or communities with a shortage of women) women will be greatly valued. Because of the relative scarcity of females, men will treat women with deference and respect (Guttentag and Secord 1983). Although women's dyadic power will theoretically be high in such contexts, men will use their own structural power to limit women's economic and sexual independence. Thus, women's traditional roles as mothers and homemakers will be adulated and encouraged. Women will marry at an early age. Because men lack the opportunity to form alternative romantic partnerships, divorce will be relatively infrequent. Premarital sexual encounters for women will be limited and women's extra-familial roles will be severely constrained.

A markedly different sex-role structure characterizes low sex-ratio populations. Here, the surplus of women and deficit of men will encourage promiscuity among men and discourage their commitment to monogamy (Guttentag and Secord 1983). Despite having few mates to choose from, the increased competition for these mates will encourage promiscuity among women as well. From the perspective of evolutionary psychology, promiscuous sexual behavior is a strategy women may employ to attract a mate under unfavorable sex ratio conditions (Pedersen 1991; Schmitt 2005; Stone, Shackelford, and Buss 2007). Fewer men and women will marry, and those that do will marry later in life. Women's traditional roles will not be highly valued since men enjoy a surfeit of alternatives to their current partner. Because many women will not be able to find a partner or, if they do, to rely on their partner to maintain existing relationships, more will turn to extrafamilial activities (Guttentag and Secord 1983). This social context will increase the incidence of premarital and extramarital sexual relations.

Tests of hypotheses derived from the "sociocultural" approach have tended to rely primarily (though not exclusively) on societal-level data. These hypotheses, too, have received considerable support. For example, South and Trent (1988) find in a cross-national study of 117 countries that the sex ratio is positively related to the percentage of women who are married, and inversely related to the nonmarital fertility ratio, the female literacy rate, and female labor force participation rate. South (1988) finds that some of these associations are moderated by women's level of economic independence—an indicator of their structural power. Also as anticipated by sociocultural arguments, divorce is less common in countries with high adult sex ratios (Barber 2003; Trent and South 1989), and countries with fewer men have higher rates of teen pregnancy (Barber 2000; 2001) and single parenthood (Barber

2004). Geographic areas characterized by low sex ratios exhibit more frequent violence against women, both cross-nationally (South and Messner 1987) and across sub-areas of the United States (Avakame 1999; O'Brien 1991).

Hypotheses

Taken together, demographic-opportunity and sociocultural perspectives—and accompanying empirical research—on the implications of imbalanced sex ratios imply several hypotheses regarding the possible impact of the local sex ratio on Chinese women's partnering behaviors. Although a communist worldview and recent economic developments may elevate women's status in China (Mickelson and Parish 2000), and while acknowledging the somewhat ambiguous trends in gender inequality over recent decades (Whyte 2000), China nonetheless remains a largely patriarchal society in which men presumably hold the bulk of "structural power" (Bian, Logan, and Shu 2000; Das Gupta and Shuzhuo 1999; Wolf 1985). Consequently, China would appear to be an appropriate setting for testing the sociocultural thesis as well as hypotheses derived from demographic-opportunity theory.

Both demographic-opportunity theory and the sociocultural argument predict that a high local sex ratio (number of men per 100 women) will hasten women's transition to marriage. However, with regard to sexual behavior, demographic-opportunity theory posits that women will be more likely to engage in premarital sexual intercourse when men are in greater supply, since these sex ratio imbalances signal a copious supply of potential sexual partners. While this effect may be partially tempered by the impact of the sex ratio on earlier marriage (thereby reducing the duration of exposure to premarital sex), demographic-opportunity theory nonetheless anticipates a positive association between the sex ratio and the likelihood of engaging in premarital intercourse. The sociocultural argument makes an opposite prediction. When women are in short supply (i.e., the sex ratio is high), men will use their structural power to limit women's sexual activity. Thus, while demographic-opportunity theory hypothesizes a positive association between the sex ratio and women's initiation of premarital sexual intercourse, the sociocultural argument suggests an inverse effect of the sex ratio on women's likelihood of having premarital sex.

Opposing hypotheses can also be derived from these two theoretical approaches regarding the likelihood of having multiple sexual partners and engaging in extramarital sex. Demographic-opportunity theory implies that women's likelihood of having multiple partners and of engaging in extramarital sex will be higher in communities containing relative large numbers of men; accordingly, the local sex ratio is hypothesized to be positively associated with women's number of sexual partners and risk of infidelity. In contrast, the sociocultural argument implies inverse associations between the sex ratio and women's engagement in multiple-partner and extramarital sex because men will use their structural power to constrain women's sexual behavior in the face of favorable demographic opportunities. Figure 1 summarizes the predicted effects of the sex ratio on these outcomes made by demographic-opportunity and sociocultural theory.

DATA AND METHODS

We test the hypotheses developed above using data from the Chinese Health and Family Life Survey (CHFLS), a large, nationally-representative (with the exception of Hong Kong and Tibet) survey of 3,821 Chinese adults ages 20 to 64 (Chinese Health and Family Life Survey 2006). The CHFLS data were collected between August 1999 and August 2000. The main focus of the CHFLS survey is on family-related and sexual behaviors and attitudes (Parish et al. 2003; 2004). The design of the CHFLS is based on the 1992 U.S. National Health and Social Life Survey (Laumann et al. 1994). The CHFLS computerized survey

includes demographic information about the respondents, including marital status and history, and sex life with current spouse or sexual partner.

For this analysis we select only female CHFLS respondents and examine the association between the sex ratio and marital timing and the likelihood of engaging in premarital, multiple-partner, and extramarital sexual intercourse. For the analysis of women's marital timing, we select never-married and once-married non-widowed women ages 24 to 44. Remarried and widowed women are excluded from these analyses because their age at first marriage cannot be determined. For the analyses of the likelihood of engaging in premarital sexual intercourse and number of different sexual partners, we select all women ages 20 to 44. And for the analysis of the likelihood of engaging in extramarital sexual intercourse, we select ever-married women ages 20 to 44.

To circumscribe marriage markets geographically, we have coded the county (*xian*) or county-equivalent, such as an urban district (*shixiaqu*), county-level city (*xianjishi*), or autonomous county (*zizhixian*), for each of the CHFLS respondents. For urban districts and county-level cities that are under prefecture-level cities, we use data for the entire prefecture-level city (*dijishi*). For county-level cities that are under the province and for non-city counties, we use data at the county level. These geographic approximations of "community" correspond closely to the approximations of marriage markets (e.g., metropolitan areas, labor market areas, or nonmetropolitan counties) used in U.S. research on the impact of imbalanced sex ratios (e.g., Lichter et al. 1992). In total, the CHFLS respondents in our sample are distributed across 37 such communities. We append information from the 1982, 1990, and 2000 Chinese censuses about the local sex ratio in these communities to the individual CHFLS records.

Dependent Variables

Four dependent variables are used in the analysis of women's marital and sexual behavior in China. Women's marital timing is measured by whether the respondent *married before age 25* (scored 1 if yes; 0 otherwise).¹ *Premarital sex* is a binary variable scored 1 if the respondent had engaged in premarital sex (based on reported ages at first intercourse and marriage) and zero otherwise. Because very few Chinese women report having more than two different sexual partners in their lifetime (Parish, Laumann, and Mojola 2007), *number of sexual partners* is measured by a binary variable scored positively for women who report having had two or more partners. *Extramarital sex* is a binary variable derived from questions asking respondents about the date of their marriage and the timing of various sexual experiences. This variable is scored 1 if the respondent ever engaged in sexual intercourse outside of marriage and zero otherwise. Although sensitive questions about sexual behavior are often plagued by substantial non-response, fewer than one percent of the CHFLS respondents refused to answer the items used to construct these measures.

Independent Variables

The primary independent variable for our analysis is the community-level sex ratio—the number of men per 100 women—estimated for each respondent when she was age 20. Because the selection of spouses, or sexual partners more generally, is further circumscribed by age, we assign to each female respondent a nine-year sex ratio with a two-year staggering of the numerator (number of males) and denominator (number of females) (Porter 2006). Thus, these ratios are the number of men ages 18 to 26 divided by the number of women

¹To protect the confidentiality of the CHFLS respondents, age at marriage is unfortunately reported only in broad categories, thus preventing a more discriminating dating of this event. The next youngest category is younger than age 20, but fewer than 3% of the sample (unweighted) married this young.

ages 16 to 24. We use data from the full-count 2000 China census (China Data Center 2004) and the one-percent samples from the 1982 and 1990 censuses (China Population and Information Research Center 2008) to estimate the value of this sex ratio for each respondent at age 20. Women in the same community are therefore assigned different values of the sex ratio depending on the year (1976 through 2000) in which they turned age 20. We use linear interpolation and extrapolation to make estimates for women who turned age 20 in a non-census year.²

Of course, these sex ratios are not likely to be measured completely without error. Sex differentials in census coverage would bias the observed sex ratios. High levels of migration—particularly rural-to-urban migration of unregistered migrants (those without local *hukou*)—may lead to census underenumeration. The censuses may miss seasonal migrants. However, for several reasons we believe that measurement error in these sex ratios will not be severe. First, evaluative studies find little evidence of a sex differential in undercount, at least for the 2000 census (Anderson 2004; Banister 2004; Goodkind 2004). Second, according to official Chinese policy, even unregistered inhabitants of a given area will be counted as residents of that area if they have lived there for at least six months. Consequently, only very short-term residents will be intentionally excluded from the census counts. Third, given our focus on the relative numbers of women and men, rather than the size of the total population, the observed sex ratios will be inaccurate only to the extent that there exists a sex differential in the undercount that also varies across the communities represented in the CHFLS. Even if a sex differential in census coverage exists, if it does not vary across the communities, then the observed effect of the sex ratio on the outcomes variables will not be affected.

In addition to the sex ratio, the models include as independent variables dummy variables for decadal *birth cohort* (1950s through 1970s, with 1950s serving as the reference category), the *highest level of education attained* (1 = never attended school, 2 = elementary school, 3 = junior high school, 4 = senior high school, 5 = junior college, 6 = university/graduate school), and a dummy variable for whether the respondent *resided in an urban area at age 14* (1 = yes). For this latter variable, respondents who grew up in a county-level city or larger are considered urban, while those who grew up in a village or town are considered rural.

Analytical strategy

A key challenge in attempting to infer causal effects of the sex ratio on women's partnering behavior is that the sex ratio may be at least partly determined by forces that might also influence these outcomes. The gender-biased parental interventions that create a surplus of boys and a deficit of girls are also likely to reflect a patriarchal system that devalues the contributions of women, and this devaluation of women may help shape some of the behaviors examined here. Hence, the observed sex ratios may be partly endogenous to the outcomes we examine. The main theories guiding our investigation imply that, whatever the proximate cause of imbalanced adult sex ratios (i.e., whether they stem from imbalanced sex ratios at birth in prior years, sex differentials in life course migration, or sex differentials in mortality), these adult sex ratios independently influence various dimensions of family life. We address this concern by estimating community fixed-effect logistic regression models (Allison 2005). Community fixed-effect models, estimated here using conditional logistic regression, relate within-community variation in the sex ratio to within-community variation

²A few communities could not be identified in the 1982 or 1990 censuses. For women in these communities, we substitute the age-specific sex ratio observed in the 2000 census. Substantive findings are unaffected by this substitution. Likely because of sampling variability in the 1982 and 1990 censuses, we observed some extreme values of the sex ratio in the smaller communities. To limit the influence of these extreme values, we bottom code the sex ratio at 80 and top code it at 120.

in the outcome variables. This strategy is possible because women residing in the same community are assigned different values of the sex ratio depending on the year (1976 through 2000) in which they turned age 20, and thus we observe varying levels of mate availability for women even within the same communities. These models estimate the effect of variation in the sex ratio across age groups while controlling for *all* potential confounders, such as a patriarchal cultural system that devalues women, that vary across the communities inhabited by the CHFLS respondents.³ We also estimated the models without community fixed effects, and we discuss the results of these analyses later in the paper.

RESULTS

Descriptive statistics (weighted) and sample descriptions for the dependent variables are shown in Table 1. About 78% of women in this sample married before age 25. About 12% of women in the sample reported having had premarital sexual intercourse. Between 6% and 7% of the sample report having had more than one sexual partner and having engaged in extramarital sex while married to either their current partner or a previous partner.

Descriptive statistics for the explanatory variables used in the analysis are shown in Table 2. Because the sample size varies across the outcome variables, these statistics are reported for the largest sample size, but the corresponding statistics for the other two samples are not appreciably different.

The mean sex ratio, averaged across communities and single-year birth cohorts, is 108.73, which is reasonably close to both the sex ratio at birth prior to 1990 and for the Chinese adult population in 2001. Thus, on average women tended to face a relative abundance of men in their local marriage market. About 14% of the sample members were born in the 1950s (and were thus ages 40 to 44 at the time of the CHFLS administration), 44% were born in the 1960s (and were thus ages 30–39 at the time of interview), and 42% were born in the 1970s (and were thus ages 20 to 29 at the time of interview). The mean education level (2.72) is between elementary school and junior high school. Fifteen percent of the women in the sample report residing in an urban area during childhood.

Results from logistic regression analyses are presented in Table 3. The four models shown here explore the impact of the sex ratio on the odds of marrying before age 25, of having had premarital sex, of having had two or more sexual partners, and of having engaged in extramarital sex. For all four outcomes, the coefficient for the sex ratio is positive, statistically significant (at least at a borderline level), and reasonably strong.

Model 1 shows that a one-unit difference in the sex ratio increases the odds that women marry before age 25 by 1.3%. Perhaps a more intuitive metric for assessing the magnitude of this effect is to use recent changes in the sex ratio at birth. As noted above, between 1982 and 2001 the sex ratio at birth increased by about 10 males per 100 females (from 108 to 118). A change of this magnitude in the young adult sex ratio would increase the odds that women will marry prior to age 25 by about 14% [$= (e^{[.013][10]} - 1) * 100$].

The coefficients for the birth cohort dummy variables show that women born in the 1960s and 1970s are significantly more likely to marry before age 25 than are women born in the 1950s (the reference category). This decline in age at marriage stems from the rarity of early

³One requirement of these community fixed-effect models is that we observe variation *within* communities on the outcome variables. For two of the outcome variables—marital age and premarital sex—we observe variation in all 37 communities. For number of sexual partners we observe variation in 35 communities and for extramarital sex we observe variation in 31 communities. Omitting respondents in communities in which we observe no variation on the outcome variables contributes to the differential sample sizes shown in Table 1.

marriage among the 1950s birth cohort—a result of Maoist-era social policy which enforced delayed marriage beginning in the 1970s (Wolf 1986; Zeng, Vaupel, and Yashin 1985). According to Coale (1989:834), after 1970 “local authorities began to refuse permission for women to marry before age 23 (age 25 in the cities).” Marriage restrictions were not relaxed until 1980 (Wolf 1986). Model 1 also shows that education is significantly and inversely related with the odds of marrying prior to age 25. Net of the effects of these characteristics, however, women who resided in an urban area at age 14 do not differ significantly in their marital timing from women who grew up in a rural area.

Model 2 of Table 3 shows that a one-unit difference in the sex ratio increases the odds that women will have engaged in premarital sex by 1.8%. Applying the simulation described above, an increase in the sex ratio of 10 males per 100 females would increase the odds that women will engage in premarital sex by about 20% ($= [(e^{[.018][10]}]-1) * 100$). We also find that women’s likelihood of engaging in premarital intercourse is significantly higher for the 1960 and 1970 birth cohorts than for the 1950s birth cohort, an indication of the liberalization of sexual practices in China over recent decades (Parish, Laumann, and Mojola 2007). Educational attainment is not significantly related to the risk of having sexual intercourse prior to marriage. However, women who resided in an urban area at age 14 are significantly more likely (at a borderline level) than their rural counterparts to have engaged in premarital sex.

Model 3 presents the analysis of number of sex partners. Only the coefficient for the sex ratio ($b = .021$) is significant at even a borderline level. A one-unit increase in the sex ratio increases the odds that, over their lifetime, women will have had intercourse with two or more partners by 2.1%. An increase in the sex ratio of 10 males per 100 females increases the odds that women will have had sex with more than one partner by about 23% ($= [(e^{[.021][10]}]-1) * 100$).

Finally, the logistic regression analysis of the likelihood of engaging in extramarital sex is presented in Model 4 of Table 3. A one-unit increase in the sex ratio increases the odds that women will have engaged in extramarital sex by over 3%, and a increase of 10 men per 100 women translates into a 35% increase in the odds of having extramarital sex ($= [(e^{[.030][10]}]-1) * 100$). Higher levels of education are also associated with an increased risk of engaging in extramarital sexual intercourse.⁴

Importantly, the observed effect of the sex ratio in all four models not only survives controls for cohort, education, and childhood residence, they also survive implicit controls for all characteristics of local communities. These community fixed-effect models thus rule out the possibility that some characteristic common to *all* women in a given community is accounting for these associations. Substantively, at least for these four outcomes, the observed effect of the sex ratio is more consistent with demographic-opportunity theory than with sociocultural arguments. The sheer availability of potential partners increases the likelihood that women will marry earlier in life and that they will engage in premarital, multiple-partner, and extramarital sexual intercourse.

Appendix Table 1 presents regression models analogous to those in Table 3 but estimated without community fixed effects. The impact of controlling for unobserved community characteristics, via the fixed-effect models, on the observed association between the sex ratio and women’s partnering behavior depends on the outcome being examined. For age at

⁴Cohort differences in extramarital sex and number of sexual partners are likely influenced by differences in the duration of exposure to these behaviors. Relative to the older cohorts, younger cohorts have had less time to engage in extramarital or multiple-partner sex. Cohort differences in duration of exposure may help explain the non-significant trends in these behaviors.

marriage (Appendix Table 1, Model 1), the non fixed-effect estimate of the sex ratio ($b = .017$) is about one-third larger than the fixed effect estimate ($b = .013$; Table 3, Model 1). This is likely the case because the unobserved community characteristics include such factors as pro-male bias, traditional gender roles, and patriarchal structures that are positively related to both the sex ratio and early marriage for women. Controlling for these characteristics reveals the initial (non fixed-effect) association to be partially spurious.

In contrast, for the other three outcomes--women's likelihood of engaging in premarital, multi-partner, and extramarital sex--the coefficients for the sex ratio are much smaller (and statistically non-significant) in the non fixed-effect models (Appendix Table 1) than in the fixed-effect models reported in Table 3. This is likely the case because the unobserved community characteristics mentioned above will tend to discourage women from engaging in these forms of sexual behavior. For example, in communities with traditional gender roles, women will be strongly dissuaded from engaging in nonmarital intercourse. Here, the unobserved community characteristics tend to suppress a causal effect of the sex ratio on these dimensions of women's partnering behavior. Importantly, then, the failure to control for possible confounders of the relationship between the sex ratio and various dimensions of women's partnering behavior could lead to either overestimates or underestimates of these effects.

DISCUSSION AND CONCLUSION

Dramatic changes are occurring in the relative numbers of women and men in China, but the consequences of these imbalanced sex ratios have received little attention. In this paper, we examine the implications of China's imbalanced sex ratios for women's partnering behaviors. We test hypotheses derived from two competing theoretical approaches – demographic-opportunity theory and sociocultural theory. To our knowledge, this is the first attempt to derive and test divergent hypotheses from these two perspectives. We find that sex ratios are associated with women's marital and sexual behavior in a manner consistent with demographic-opportunity theory, but not sociocultural theory. A numerical surplus of men hastens the transition to first marriage for women and increases the probability that women engage in premarital, multiple-partner, and extramarital sexual relationships. That these associations withstand controls for all possible community-based confounders strengthens our inference that these are indeed causal effects.

It is possible that our failure to find support for hypotheses derived from sociocultural theory reflects the inability of our test case to satisfy the scope conditions of the theory. Sociocultural theory and related perspectives assume universal and constant gendered power differentials as well as essentialist mate selection desires and strategies (Buss 1989; Buss and Schmidt 1993; Pinker 2002; Stone, Shackelford, and Buss 2007). Yet, China's economic development, modernization, and ideological liberalization may have altered traditional gender differences in “structural power” and men's attendant ability to control women's partnering behavior. As a result, perhaps the fundamental assumptions that form the scope conditions for sociocultural theory are only partially met in the case of China.

Moreover, the dynamics posited by sociocultural theory may partly offset the influence of demographic opportunity on women's partnering behavior. Perhaps the positive effects of a numerical abundance of men on women's likelihood of engaging in premarital, multi-partnered, and extramarital intercourse would be even stronger than we observe if the gendered sociocultural dynamics described by Guttentag and Secord (1983) were not operating. Such dynamics--if they exist--appear insufficiently strong to override completely the effects of demographic opportunity, but they may serve to temper the influence of mate availability on these behaviors.

We acknowledge several limitations to our analysis. For women who migrated into their community after age 20, it is not possible to measure definitively the sex ratio of the community that they lived in at age 20. The CHFLS does not include complete residential or migration histories of the respondents that would allow us to determine their community of residence—and thus the sex ratio these migrant women were exposed to—at age 20. However, the most likely impact of this measurement error would be to bias downward the coefficients for the sex ratio, making our estimates conservative. We are also unable to date precisely the life-course timing of the sexual behaviors that serve as dependent variables in the analysis because we do not know exactly when during their lives these women had premarital or extramarital sex. Coupled with the lack of data on their residential histories, this limitation prevents event-history analyses that would treat the sex ratio as a time-varying covariate. Because of data limitations we have not attempted to delimit the sex ratio by marital status, social class, ethnicity, or other relevant factors for assortative mating.

While the effects of the most recent imbalances in the sex ratio at birth will not be felt fully at the national level for another decade or two, our findings may provide clues as to how these effects will manifest themselves as these adult sex ratios become more and more distorted in future decades. Based on our results, the increasingly masculine sex ratio suggests that women will face an ever-growing availability of partners with whom to form marital and sexual relationships. Of course, the consequences of changes in the sex ratio need to be evaluated in the context of other sources of change in the Chinese family system. For example, while marriage for women in China is and has been “virtually universal” (Coale 1989:834), the average age at first marriage for Chinese women has been increasing among very young cohorts, likely due to changing attitudes and values along with the expansion of women’s educational opportunities and economic modernization. The increasing masculinization of China’s sex ratios may temper this increase in women’s age at marriage; that is, the increase in age at marriage in the future will not be as great as it might have been in the absence of imbalanced sex ratios.

Although less is known about premarital, multiple-partner, and extramarital sexual behavior in China, these behaviors, while continuing to be non-normative, appear to have increased over recent decades (Feng and Quanhe 1996; Parish, Laumann, and Mojola 2007). We might expect increases in these sexual behaviors to continue as the society moves toward being a less “ideologically controlled society” and family-related attitudes and behaviors become increasingly diverse (Sheng 2005:122). As our analyses indicate, premarital sexual encounters for Chinese women have increased over time, but are still relatively uncommon. Having sex with more than one partner and having extramarital sex are also rare (less than 7 percent for women ages 20–44). Our results suggest that as adult sex ratios become more male-dominated, rates of premarital, multiple-partner, and extramarital intercourse are apt to increase faster than they otherwise would have. That is, the increasingly masculine adult sex ratios may accelerate expected increases in women’s rates of premarital and extramarital sex.

Future research might profit by addressing more systematically the role of migration in the relationship between sex ratios and marriage behavior. Women in China can marry up the “spatial hierarchy” from poorer to more prosperous areas (Fan and Huang 1998; Lavelly 1991). Up until the late 1980s, most rural marriages involved short distance moves by wives and occurred close to their natal homes (Fan and Huang 1998; Tan and Short 2004). Long-distance migration for marriage appears to be a relatively new phenomenon, a reflection of market reform and uneven development. However, most women migrating long-distances for marriage continue to move to rural areas – presumably from one rural area to another – because permanent migration to urban areas is difficult and because peasant women are the least desirable of brides in urban areas (Davin 2005; Fan and Huang 1998; Tan and Short

2004). As data become available, future research should closely examine how the growing imbalances of men and women influence patterns of marriage migration. Future research might also consider whether the impacts of skewed sex ratios on women's partnering behavior vary by the causes of sex ratio imbalances. For example, sex ratio imbalances created by sex differentials in adult migration may affect sociodemographic outcomes differently than imbalanced sex ratios caused by abnormal sex ratios at birth or fertility fluctuations.

The implications of sex ratio imbalances for the changing status of women in China also merit attention. As Sen (1992; 2001) has argued, there are many dimensions to gender inequality and these dimensions may only partly overlap. Women's increased sexual activity outside of marriage in the face of a male surplus need not indicate greater female empowerment, nor does it necessarily portend improvements in other dimensions of women's status. Both imbalances in the numbers of women and men and the sociocultural forces that generate these imbalances (e.g., son preference) may influence various dimensions of women's status in quite diverse ways. How these factors shape additional aspects of Chinese women's behavior and well-being, including their socioeconomic attainment, awaits further study.

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<u>Theory</u>	<u>Outcome</u>			
	<u>Marriage</u>	<u>Premarital Sex</u>	<u>Multiple Partners</u>	<u>Extramarital Sex</u>
Demographic-Opportunity	+	+	+	+
Sociocultural	+	--	--	--

Note: + indicates a predicted positive association; -- indicates a predicted negative association.

Figure 1.
Predicted Effects of the Sex Ratio on Women's Partnering Behavior Derived from Demographic-Opportunity and Sociocultural Theory

Table 1

Descriptive Statistics and Sample Descriptions for Dependent Variables Used in Analysis of Women's Partnering Behavior: Chinese Health and Life Survey

Variable	Description	Sample	Percent	N
Marry before Age 25	Whether married before age 25 (1=yes)	Never-married and once-married non-widowed women ages 24–44	78.1	1,157
Premarital Sex	Whether ever engaged in sexual intercourse prior to or absent marriage (1=yes)	Women ages 20–44	12.4	1,369
2+ Partners	Whether ever engaged in sexual intercourse with 2 or more different partners (1=yes)	Women ages 20–44	6.5	1,300
Extramarital sex	Whether ever engaged in sexual intercourse outside of marriage (1=yes)	Ever-married women ages 20–44	6.0	1,032

Table 2

Descriptive Statistics for Explanatory Variables Used in Models of Women's Partnering Behavior: Chinese Health and Family Life Survey (N=1,369)

<u>Variable</u>	<u>Mean</u>	<u>S.D.</u>
Sex Ratio	108.73	11.42
Birth Cohort		
1950s	.14	.35
1960s	.44	.50
1970s	.42	.49
Education	2.72	1.00
Urban Residence at age 14	.15	.36

Note: Sex ratio is the estimated number of men ages 18 to 26 per 100 women ages 16 to 24 in the respondent's community when she was age 20.

Table 3
Logistic Regression Analysis of Women's Partnering Behavior with Community Fixed Effects: Chinese Health and Family Life Survey

Independent Variables	Dependent Variables											
	Model 1			Model 2			Model 3			Model 4		
	Marry before Age 25			Premarital Sex			2+ Partners			Extramarital Sex		
	b	Z	e ^s	b	Z	e ^s	b	Z	e ^s	b	Z	e ^s
Sex Ratio	.013 [†]	1.792	1.013	.018*	2.017	1.018	.021 [†]	1.761	1.021	.030*	2.134	1.030
Birth Cohort												
1950s												
1960s	.825**	4.753	2.281	.404 [†]	1.735	1.498	.442	1.626	1.555	-.142	-.435	.868
1970s	1.382**	6.485	3.983	.845**	3.575	2.328	-.416	-1.362	.660	-.533	-1.417	.587
Education	-.419**	-5.668	.658	.008	.094	1.008	.142	1.382	1.153	.324*	2.491	1.382
Urban Residence at age 14	.180	1.069	1.198	.316 [†]	1.812	1.372	.012	.052	1.012	.015	.049	1.015
Likelihood Ratio Chi-square		80.65			28.95			19.14			12.31	
DF		5			5			5			5	
N		1,157			1,369			1,300			1,032	

Notes: Sex ratio is the estimated number of men ages 18 to 26 per 100 women ages 16 to 24 in the respondent's community when she was age 20. All models include community fixed effects.

[†] $p < .10$

* $p < .05$

** $p < .01$ (two-tailed tests)

Appendix Table 1
Logistic Regression Analysis of Women's Partnering Behavior Without Community Fixed Effects: Chinese Health and Family Life Survey

Independent Variables	Dependent Variables											
	Model 1			Model 2			Model 3			Model 4		
	Marry before Age 25			Premarital Sex			2+ Partners			Extramarital Sex		
	b	Z	e ^s	b	Z	e ^s	b	Z	e ^s	b	Z	e ^s
Sex Ratio	.017**	2.833	1.017	.005	.714	1.005	.006	.667	1.006	.018	1.636	1.018
Birth Cohort												
1950s												
1960s	.788**	4.834	2.199	.349	1.558	1.417	.377	1.461	1.458	-.103	-.330	.902
1970s	1.266**	6.330	3.546	.831**	3.677	2.295	-.442	-1.498	.643	-.462	-1.249	.630
Education	-.430**	-6.143	.650	.036	.474	1.037	.135	1.392	1.144	.373**	3.008	1.453
Urban Residence at age 14	-.170	-1.181	.844	.388*	2.456	1.475	.133	.646	1.143	-.002	-.008	.998
Pseudo-R ²		.129			.036			.029			.032	
Likelihood Ratio Chi-square		113.94			31.55			18.63			13.91	
DF		5			5			5			5	
N		1,157			1,369			1,300			1,032	

Note: Sex ratio is the estimated number of men ages 18 to 26 per 100 women ages 16 to 24 in the respondent's community when she was age 20.

*
p < .10

*
p < .05

**
p < .01 (two-tailed tests)