The Emotional Nucleation Hypothesis

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Abstract

Caldwell's emotional nucleation hypothesis is not simply an understudied prediction it is an important alternative to other theories of fertility decline because it offers a clear explanation of why many couples might choose to have small numbers of children once any childbearing at all is no longer economically rational. After years of design and testing to construct setting specific measures of husband-wife emotional bond appropriate for general population research, followed by integration of those measures in a long term panel study, we have the empirical tools to provide a test of this hypothesis. This paper presents that test. We use long term, multilevel community and family panel data to demonstrate that the variance in levels of husband-wife emotional bond are significantly associated with their subsequent behavior to limit childbearing independent of other key factors. The paper discusses the wide ranging implications of this intriguing new result.

INTRODUCTION

Though research on fertility decline has been a leading preoccupation among demographers for nearly a century (Thompson 1929), and scores of studies have poured empirical evidence on the topic, many fundamental hypotheses about fertility decline remain untested. John Caldwell's wide ranging theory of intergenerational wealth flows provides an excellent example. At the heart of Caldwell's theory is the idea that extended families transition to nuclear families, in part through a process of "emotional nucleation," in which individuals' emotional bonds to their spouse grows stronger relative to their emotional ties to parents, siblings, and other relatives. This shift toward stronger emotional ties to spouses then shifts individuals' motivations from the pursuit of many children in support of the larger family goals to the pursuit of few children in support of their emotional ties to their spouse (Caldwell 1982). The emotional nucleation hypothesis forms an essential ingredient to motivate a transition from unlimited childbearing to limited childbearing. It is an especially powerful explanation for change over time in societies initially characterized by strong emotional ties to natal kin rather than the conjugal bond, such as the many parts of South Asia that Caldwell studied extensively (Caldwell 1982; Caldwell et al. 1988). In this paper we use measures from newly available panel data to test Caldwell's emotional nucleation hypothesis in just the sort of South Asian setting in which he predicted this factor would motivate fertility decline.

As with many of Caldwell's hypotheses, suitable measurement has proved a formidable obstacle to empirical testing. In this case, at a minimum, the test demands measures of variation across married couples in their level of emotional bond linked to a subsequent record of their fertility behaviors. Measurement of the emotional bond is not well defined or simple to execute. In fact, the lack of standardized measures of emotional variation in the general population is undoubtedly a key reason that population-based social sciences have given little empirical attention to the emotional basis for behavior (Massey 2002). The study we report here is the product of several years of ethnographic, focus group, survey design, and pilot study research to devise a general population measure of the emotional bond—sometimes termed "love"— between husbands and wives for a specific South Asian setting: Nepal.

By integrating this measure into the Chitwan Valley Family Study (CVFS) in rural Nepal we are able to describe the observed empirical relationship between variations in the husband-wife emotional bond and their subsequent childbearing behavior. This specific panel study is

ideal for the task because it was designed to measure community, family, and individual influences on childbearing behavior and it features multilevel, comprehensive baseline measurement combined with a detailed record of childbearing behaviors spanning more than ten years after the baseline. This tool allows us to establish the hypothesized time order between measures of emotional bond and behaviors to limit childbearing and to control for a broad range of key determinants of fertility limitation that could produce a spurious relationship between measures of the emotional bond and childbearing behaviors. Also important, this unique panel study features measures of other subjective phenomena that may co-vary with variations in the emotional bond, including spousal communication and spousal conflict. By adding measures of these factors to the test we are able to examine the extent to which variation in the emotional bond has an independent influence on subsequent fertility behavior. Together these empirical resources provide an unprecedented examination of the emotional nucleation hypothesis.

THEORETICAL FRAMEWORK

Though our objective is to test a single hypothesis, the complexity of empirical research on the behavioral consequences of emotional variation requires specific theoretical guidance to formulate an appropriate empirical test. The framework we propose is simple, but it establishes three crucial steps: (1) conceptualization of the specific emotional dimension we investigate; (2) consideration of the mechanisms likely to link that emotional dimension to the specific subsequent behavior we investigate; and (3) consideration of the known determinants of the behavior to be studied that may also shape the emotional dimension being studied. This third step is crucial because without randomization of emotional states—a research tool likely to remain unavailable to general population research for the foreseeable future—all observational studies must address the potential that observed associations with emotional states are the spurious product of other strong associations. In the framework presented below we address each of these elements in order.

Conceptualizing the Husband-wife Emotional Bond

Research on the husband-wife relationship identifies many different dimensions, but the dimension of positive emotional bond—or love—is commonly deemed one of the important elements of marriage. Research on marriages in the Western European past often treats the

emotional bond as a prerequisite and the singular core defining feature of marriage, around which social institutions like church and state build other dimensions of marriage (Goode 1959; Hamon and Ingoldsby 2003; Hart 2007; Khandelwal 2009; Patico 2010; Thornton et al. 2007). The literature on Western marriage not only sometimes identifies love as unique to Western marriage (Coontz 2005; Goode 1959; Khandelwal 2009; Thornton and Lin 1994) but it also sometimes characterizes non-western arranged marriage as loveless, empty, patriarchal, and without choice (Khandelwal 2009; Pasupathi 2002; Patico 2010).

Recent critics of the ethnocentric characterization of arranged marriage recognize "love" in general and "husband-wife bond" in particular as universal psychological phenomenon. These scholars see the loveless characterization of arranged marriage as "discourse of exaggerated difference" that incorrectly renders romance unique to Western modernity (Khandelwal 2009; Pasupathi 2002). These scholars' conclusions are consistent with the Hindu philosophy of arranged marriage that dominates the central parts of South Asia. Hinduism defines marriage as the union of two individuals for life, so that they can pursue *dharma* (duty), *artha* (possessions), *kama* (physical desires, sexual pleasure), and *moksa* (ultimate spiritual release) together (Ramachandran 2010; Vatsyayana 2009). In fact, Hinduism often glorifies the idea of love between the sexes. This is evident from the amazing variety of mythical love stories that abound in the Sanskrit literature. In Hinduism love consists of four components: *kama* (pleasurable, sexual love), *prema* (elevated love), *karuna* (compassion and mercy), and *bhakti* (devotion) (Ramachandran 2010; Vatsyayana 2009). *Kamasutra* is one of the oldest texts on human sexual behavior, written by Vatsyayana around the 4th century AD, and provides substantial evidence of the glorification of love and sex in Hinduism (Vatsyayana 2009).

Although Hinduism glorifies love between sexes, it conflicts with the Western notion of love in one important way. Although the Western notion of love sees romantic love spring out of individual's desire and attraction and often consider this a prerequisite for marriage, Hinduism professes that the bond between husband and wife (love) begins after the marriage and grows between the two spouses with years of collaborative life struggle (Fuller and Narasimhan 2008; Goode 1959; Medora 2003; Pasupathi 2002). In the Hindu belief system, marriages are made in heaven and celebrated on the earth. In this philosophy, arranged marriage is explicitly designed to enhance the growth of the emotional bond between husband and wife, or to *grow* love.

In this investigation we follow the key foundational schema of universality of love (not limited to those situations understood as modern, individualistic, or capitalistic) with cultural variability (Patico 2010). As in many other societies, Nepali society has a long history of cultural practices, music, folklore, poetry, and literature that glorifies the emotional bond between marriageable youth or between husbands and wives (Bennett 1976; Fricke 1986; Macfarlane 1976; Matthews 1989; Pasupathi 2002).

Ethnographic research from Nepal and the Nepali speaking population in India provides verifies the local cultural construction, meaning, and centrality of love or husband-wife bonding (Ahearn 2001; Allendorf 2009; Fricke 1986; Macfarlane 1976; Pasupathi 2002). In her recent narrative of marital relationships Allendorf (2009) asserts that "people conceive of love between a husband and wife as a powerful emotion, felt inside heart and mind (_man)[1]_" (Allendorf 2009: 136). These ethnographies also highlight cultural variability within Hinduism—specifically, the ethnic variations at the intersection between culture, social change, and love (Ahearn 2001) or expressions of love (Bennett 1976; Fricke 1986; Macfarlane 1976). In *Invitations to Love,* Ahearn (2001) presents detailed accounts of love in daily social interactions in Nepal. Ahearn (2001) not only investigated the meaning and centrality of love but also vividly illustrated how recent dramatic changes characterizing Nepali society—especially the Western education in schools, have shaped this emotional phenomenon. It is clear that variation in the strength of the emotional bond between husbands and wives is part of daily life for married couples in Nepal.

Mechanisms Linking Emotional Bond to Limiting Childbearing

Husband-wife relationships are multidimensional, including facets such as love and affection, communication, and conflict. Caldwell (1982) argues that a closer emotional bond between husband and wife—or "emotional nucleation" of the family—results in contraceptive use to limit childbearing because this emotional bond helps to reverse intergenerational wealth flows so that young couples are more likely to spend on their children than on their parents (Caldwell 1982; Degler 1980). He argues that close emotional connections between husband and wife change the way they view childbearing and childrearing, from an obligation to a larger kin network to an expression of their love and affection for each other. As childbearing and childrearing become an expression of conjugal love and affection, couples invest more time and

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[1] *Man* – a Nepali word that represent both the heart and mind and do not direct translation in English.

resources into their children and begin trading low investments in many children for high investments in a small number of children (Caldwell 1982). Thus Caldwell's argument is that this key emotional change promotes what economists have described as the "Quality-Quantity" tradeoff in childbearing and childrearing (Becker 1991; Easterlin and Crimmins 1985; Willis 1973). Though both views of the transition help us understand why couples adopt contraception to limit their family size across a broad range of the population, Caldwell's emotional nucleation hypothesis has the advantage of explaining why couples continue to have any children at all. That is, even when having *no children* at all is economically rational, the emotional nucleation hypothesis predicts couples will still consider childbearing and childrearing as an expression of their love and affection (Caldwell 1982).

This provocative theoretical idea has proven difficult to test empirically because there are so few sources of measures of the emotional bond between husbands and wives, particularly from populations in the midst of dramatic family and fertility transitions. Thus, a key objective of this study is to add culturally appropriate, setting-specific measures of the emotional bond between husbands and wives to comprehensive models of contraceptive use and test Caldwell's hypothesis.

However, consideration of the full multidimensional breadth of husband-wife relationships reveals other dimensions which may also influence fertility. Communication between husbands and wives is likely to directly affect contraception and childbearing behavior. This is because close communication between sexual partners is needed to use contraception effectively and achieve childbearing intentions (Link 2011; Satayavada and Adamchak 2000; Sharan and Valente 2002). Couples who have higher levels of communication are more likely to discuss issues of contraceptive use and desired number of children (Salway 1994). Studies of husband-wife communication demonstrate that communication between spouses can have dramatic effects on contraceptive use (Lasee and Becker 1997; Salway 1994; Sharan and Valente 2002; Stone and Ingham 2001). This hypothesis is important to our understanding of the consequences of the emotional bond between husband and wife because the two are likely to co-vary. That is, more positive emotional bonds are likely to produce greater communication and greater communication may also produce more positive emotional bonds (Ahearn 2001; Allendorf 2009; Gottman 1979).

Conflict and disagreement is another dimension of the husband-wife relationship likely to influence childbearing. Of course high marital conflict that leads to divorce reduces fertility by terminating sexual relationships thereby removing couples from exposure to risk of childbearing (Bongaarts 1982). However, a number of studies show that even among couples who are currently married, pregnancies are less likely to take place when the marriage is characterized by a high level of conflict or instability (Lillard and Waite 1993; Peters 1986; Thornton 1978). High levels of conflict within marriage are associated with high levels of marital instability (Amato and Rogers 1997; Kitson 1992). Husband-wife conflict may also affect childbearing because the couple is less interested in engaging in mutual activities, including both sexual and childrearing activities. As a result of these mechanisms, high conflict marriages may produce lower overall fertility and higher rates of fertility limitation. On the other hand, high levels of conflict are likely to leave couples less able to use contraception effectively, much like poor communication reduces effective contraceptive use. Either way, because positive emotional bonds and conflict are likely to co-vary, albeit inversely, it is crucial to consider husband-wife conflict in evaluating the consequences of the husband-wife emotional bond.

In the Nepalese setting, the relationship between marital dynamics and fertility is complicated by the reciprocal influences of fertility on relationship dynamics. Absence of childbearing, sometimes because a spouse is unable to conceive, is known to produce higher levels of conflict and lower levels of satisfaction within marriages in Nepal (Bennett 1983; Stone 1978). Thus, any empirical investigation into the influence of marital relationship dynamics on fertility must give explicit empirical attention to the possible reciprocal effects of fertility on marital relationship dynamics. As a result, detailed time-ordered measures of both marital relationship and childbearing are crucial.

Factors Known to Influence Childbearing Behavior which May also Shape the Emotional Bond

Of course, fertility transition has been such an important element of social change that many social scientists have focused on these phenomena to understand change and variation in fertility processes worldwide. Scholars have identified many individual-level factors that influence fertility such as education, employment, exposure to media, religion, and individuals' orientations about family or family formation processes (Blossfeld and Huinink 1991; Brien and Lillarad 1994; Caldwell 1982; Chesnais 1992; Cleland and Wilson 1987; Freedman 1979, 1987;

Lesthaeghe 1983; Lesthaeghe and Wilson 1986; Notestein 1953; Rindfuss et al. 1988; Thornton 2001, 2005). These also include family and household-level factors such as parents' education, work, exposure to media, and fertility behavior (Axinn and Yabiku 2001; Barber 2000; Caldwell 1982; Caldwell et al. 1983, 1988). Finally, these factors also include various dimensions of social context, such as the spread of non-family services (Axinn and Yabiku 2001; Thornton and Lin 1994), mass education (Axinn and Barber 2001; Cochrane 1979), family planning policy (Entwisle and Mason 1985) and family planning programs (Brauner-Otto et al. 2007; Entwisle et al. 1997; Knodel 1987). This body of literature has produced numerous insights regarding the factors affecting dimensions of fertility behavior, especially couples' use of contraceptives to limit their childbearing.

However, studies have also demonstrated the important influence of change and variation in individuals' community context and non-family experiences on marital processes, including the quality of the husband-wife relationship (Allendorf and Ghimire 2011; Ghimire et al. 2006; Hoelter et al. 2004; Thornton and Lin 1994; Yabiku 2004, 2005, 2006). Thus, failure to consider the exogenous consequences of community, family, and individual experience for both the husband-wife relationship and childbearing behavior could easily produce the observation of spurious a relationship between husband-wife relationship and childbearing behavior.

Our effort to test the emotional nucleation hypothesis in rural Nepal is advantaged for two crucial reasons: (1) we are able to use measurement from the Chitwan Valley Family Study (CVFS) which was explicitly designed to estimate consequences of community, family, and individual experiences on childbearing behavior; and (2) there are dozens of completed studies using CVFS data which document the community, family, and individual factors which are observed to affect marriage and childbearing in this specific study population (Axinn and Barber 2001; Axinn and Yabiku 2001; Barber and Axinn 2004; Barber et al. 2002; Brauner-Otto 2011, 2012; Brauner-Otto et al. 2007). Drawing on those studies we are able to use the specific measures documented in previous research to shape couple's subsequent contraceptive use to limit childbearing. The measures themselves span the domains of health services, education, media exposure, social welfare groups, travel, parents, children, spouses, ethnic groups, religion, and beliefs (Axinn and Barber 2001; Axinn and Yabiku 2001; Barber and Axinn 2004; Barber et al. 2002; Brauner-Otto 2011, 2012; Brauner-Otto et al. 2007; Yabiku 2004, 2005, 2006). To organize this broad range of factors into our empirical models, we rely heavily on the life-course

approach, and begin with those factors determined earliest in life, adding factors from later in life as we build our test of the emotional nucleation hypothesis (Axinn and Yabiku 2001; Elder 1994, 1985, 1983).

Finally, although demographic research on fertility processes has historically focused exclusively on women, recent research giving equal attention to men and women demonstrates important gender differences in these processes (Allendorf 2006; Axinn 1992; Barber 2001; Ghimire and Axinn 2006; Malhotra 1991; Mason and Smith 2000; Morgan and Niraula 1995; Sorenson 1989). Following that research, we also to take advantage of the unique CVFS of individual-level measures, collected independently from both the husband and wife, to include the effects of husband's and wife's experiences on the couple's childbearing behavior.

DATA AND METHODS

This study used data from the Chitwan Valley Family Study (CVFS). The CVFS features substantial mixed method, multilevel measurement of couples and childbearing (Axinn and Pearce 2006). It is based on a systematic probability sample of 171 neighborhoods in South Central Nepal. In these neighborhoods, all individuals aged 15-59 and their spouses were interviewed in 1996 (N= 5,271, response rate = 97%). A structured survey interview provided measures of individuals' values, attitudes and marital relationship and a Life History Calendar (LHC) provided rich retrospective measurement of the timing of individual life events, including marital events. The LHC method provides more accurate retrospective measurement of life events than alternatives (Axinn et al. 1999; Belli 1998; Freedman et al. 1988).

In February of 1997, the CVFS launched a monthly prospective study of contraceptive use for all eligible individuals in the baseline study. Ninety-five percent of respondents who were interviewed in 1996 participated in a monthly contraceptive use survey through 2008 (144 months).[2] We focused on the 526 married women aged 15-44 in 1996 who had never used any contraceptive methods prior to February 1997. We limited the sample to married women because in this setting premarital sex is rare and never married women are extremely unlikely to use contraceptive methods (Acharya and Bennett 1981; Axinn 1992; Ban et al. 2012; Caltabiano and Castiglioni 2008; Maitra 2011; Ministry of Health and Population et al. 2012; Tuladhar 1987, 1989). The CVFS includes measures of these women's family, households, and neighborhoods.

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[2] Individuals who moved out of the study area were tracked and interviewed throughout this period.

Measures

Husband-wife Emotional Bond. Although emotions are expressed and shared, the internal nature of the husband-wife emotional bond makes it especially difficult to measure. We took this challenge seriously and invested substantial effort in constructing culturally appropriate, context specific measures of values, attitudes, and emotions (Ahearn 2001; Allendorf 2009).

To construct these measures, we applied a mixed method approach in an iterative process through a series of steps (Axinn and Pearce 2006). First, we used unstructured interviews and direct observations focused on marital relationships to investigate multi-dimensional aspects of the husband-wife emotional bond in the local setting. Several investigators, including the authors, spent hundreds of mornings, afternoons and evenings with people in Chitwan in their backyards, farms, and nearby markets observing rituals and related activities, attending public meetings and engaging in casual discussions. These informal meetings gave us a baseline understanding of how these complex feelings are often expressed and communicated—an understanding that agrees with subsequent ethnographic research in other parts of Nepal (Ahearn 2001).

Second, the insights from this unstructured investigation were used to create multiple structured survey measures of emotional bonds between husbands and wives. Using these initial measures, we conducted over 100 cognitive interviews and dozens of focus group interviews over more than a year with systematically selected sections of the study population to create these potential measures. Results from these interviews were used to eliminate some of these survey measures and revise others.

Third, these measures were then pretested several times sequentially among four different samples of 100 married individuals, with each sample selected to represent the study sample. The pretests were conducted by an experienced local research staff that is diverse in terms of gender and religious/ethnic/racial group. Once again, the results from these pretests were used to eliminate measures and to revise the strongest of the measures.

Fourth, and finally, the final versions of survey measures of husband-wife emotional bond were then administered to a pilot sample. The pilot data allowed us to assess the measurement properties of these survey items. The results of this pilot study were then used as

the basis for choosing a small set of standardized survey measures included in the 1996 interviews with married couples.

Because of the significant potential for husbands and wives to influence each other's responses, we also made special effort to maintain independence in their reporting. We sent multiple interviewers to each household for separate, simultaneous husband and wife interviews to ensure independent responses.

Although there are over half a dozen Nepali words/phrases that people use, the word "Maya" (a type of love) was the most commonly used term to communicate the husband-wife emotional bond. We used this same Nepali word in our interviews to measure the intensity of the emotional bond between husband and wife. In the individual interview, respondents were asked: "How much do you love ("maya") your (husband/wife)? Very much, some, a little, or not at all?" For statistical analyses, we code the responses "very much" as 3, "some" as 2, and "little" or "not at all" as 1. This item is similar in scope to the global items often employed to measure the positive aspect of marital quality (Gottman 1998; Gottman and Notarius 2002; Norton 1983).

Contraceptive Use. We focused on behavior aimed at limiting childbearing by studying the *first use of any contraception*, operationalized as the timing of the transition from never having used any contraceptive methods to ever having used any contraception. Both husbands and wives were asked: "Did you, your (husband/wife), or your partner ever use any kind of contraceptives or any method for delaying or avoiding pregnancy?" A "yes" response was coded as 1, and 0 if otherwise. We coded a time-varying, dichotomous variable equal to 0 for all months the couple did not use any contraceptive methods, and 1 for the first month the couple used any contraception. This variable was used to estimate the hazard of first contraceptive use to avoid or delay childbearing. As shown in Table 1, 62% of married couples began using contraceptives to avoid pregnancy during the observation period. Table 1 presents descriptive statistics for all measures used in these analyses. The distributions refer to the respondent's last person-month contributed to the analysis; for couples who used any contraceptive methods this is the first month they used the method, for couples who did not use any contraceptive methods this is the final month (month 144) of data collection.

Table 1. Definition, means, SD, minimum, maximum values of measures used in the analysis of hazard of first contraceptive use among married women ages 15-44 in 1996 from western Chitwan, Nepal (N=526)

MEASURES[a]	LABELS	MEAN	SD	MIN	MAX
A. Husband-wife emotional bond					
("maya")	A little or not at all=1, Some=2, Very much=3	2.03	0.68	1	3
B. Contraceptive Use:					
First use of any contraception	No=0, Yes=1	0.62	0.49	0	1
C. Marital Relationships:					
Spousal disagreement	Seldom or never=1, Sometimes=2, Frequently=3,	1.17	0.46	1	3
Spousal violence (beaten)	No=0, Yes=1	0.12	0.32	0	1
Spousal communication (discuss contraception)	Never=1, Sometimes=2, Often=3	1.60	0.59	1	3
D. Family Experiences:					
Length of marriage	Year of marriage	9.43	8.16	0	32
Participation in spouse choice	Parents only=1, Parents mostly=2, both equally=3 Respondent mostly=4, Respondent only=5	1.95	1.60	1	5
Number of children born	Number	2.20	2.11	0	10
Has at least one son	No=0, Yes=1	0.57	0.50	0	1
Age of oldest child	Age in year	8.51	7.13	0	29
E. Nonfamily Experiences:					
Schooling	Years	4.49	5.33	0	21
Spouse's schooling	Years	7.54	6.04	0	25
Media exposure	None=0, One of the three=1, Two of the Three=2 , All three(radio, TV and movie)=3	2.59	0.75	0	3
Spouse's media exposure	None=0, One of the three=1, Two of the Three=2 , All three(radio, TV and movie)=3	2.81	0.55	0	3
Ever traveled outside of Nepal	No=0, Yes=1	0.05	0.22	0	1
Ever a member of a group	No=0, Yes=1	0.08	0.26	0	1
Oldest child goes to school	No=0, Yes=1	0.39	0.49	0	1
F. Community Context:					
Exposure to nonfamily services in childhood[b]	None= 0, All five=5	3.59	1.53	0	5
School within 5-minute walk	No=0, Yes=1	0.49	0.50	0	1
Health service within 5-minute walk	No=0, Yes=1	0.24	0.50	0	1
G. Parental Experiences:					
Either parent ever went to school	None=0, Either one=1, Both=2	0.37	0.59	0	2
Either parent ever used contraception	No=0, Yes=1	0.29	0.45	0	1
Either parent ever saw movie	No=0, Yes=1	0.45	0.50	0	1
Mother's children	Number of children	5.99	2.54	1	19
H. Age (Birth Cohort):					
15-24 (1972-1981)	No=0, Yes=1	0.47	0.50	0	1
25-34 (1962-1971)	No=0, Yes=1	0.34	0.47	0	1
35-44 (1952-1961)	No=0, Yes=1	0.19	0.39	0	1
I. Ethnicity:					
Brahmin/Chhetri	No=0, Yes=1	0.38	0.49	0	1
Dalit	No=0, Yes=1	0.11	0.31	0	1
Hill Janajati (Indigenous)	No=0, Yes=1	0.18	0.39	0	1
Newar	No=0, Yes=1	0.05	0.22	0	1
Terai Janajati(Indegineous)	No=0, Yes=1	0.28	0.45	0	1

[a]These English descriptions of measures are not the actual Nepalese words used in survey interviews.

[b]Sum of school, health service, employment center, market and bus service within a one-hour walk from the respondent's place of residence during her childhood (before age 12).

Multiple Dimensions of Marital Relationships. Although the focus of our study is on the emotional bond between husbands and wives, we also investigated three other dimensions of marital relationships. Specifically, we used measures of *spousal disagreement*, *spousal violence*, and *spousal communication* because they may co-vary with the emotional bond and may also have independent consequences for fertility limiting behaviors. These measures were created using the same rigorous process described above—the numerically coded versions are displayed in Table 1. (See Table 1, Section C.)

Family Experiences. A number of prior family experiences likely shape the subsequent husband-wife emotional bond and contraceptive use. We included the following measures of family experiences in our analyses: *length of marriage* (marital duration), *participation in spouse choice* (marital arrangement), *number of children born*, whether or not the respondent *has at least one son*, and the *age of the oldest child*. (See Table 1, Section D.)

Nonfamily Experiences. Likewise, many prior nonfamily experiences may also likely shape both the husband-wife emotional bond and contraceptive use. We explicitly considered both husbands' and wives' prior nonfamily experiences: *schooling*, *spouse's schooling*, *media exposure*, *spouse's media exposure*, if the wife *ever traveled outside of Nepal*, was *ever a member of a group*, and whether or not the couple's *oldest child goes to school*. (See Table 1, Section E.)

Community Context. Both theory and empirical evidence demonstrate the potential of characteristics of the community to shape childbearing behavior. We built directly on substantial empirical research on this specific study site to add key measures of these community effects to our models (Axinn and Yabiku 2001; Brauner-Otto et al. 2007). These include measures of *exposure to schools*, *health services*, *employment centers*, *markets*, and *bus services* within a one-hour walk from the respondent's place of residence during childhood (before age 12). Following previously published research (Axinn and Yabiku 2001) we summed these five measures to create a scale with values ranging from 0-5.

In addition to measures of childhood community context, we included measures of two of the most influential aspects of contemporary community context—access to school and health service (Axinn and Barber 2001; Brauner-Otto et al. 2007). These measures come from the CVFS Neighborhood History Calendar data, which recorded the walking time (in minutes) to the nearest of each of these services (Axinn et al. 1997). (See Table 1, Section F.)

        Parental Experiences. Because parental experiences may also shape both children's marital relationships and their contraceptive use, we also include measures of these in our multivariate models, including whether or not *either parent ever went to school*, *either parent ever used contraception*, *either parent ever saw a movie*, and *mother's total number of children*. (See Table 1, Section G.)

        Age (Birth Cohort). We also include a measure for the respondent's birth cohort, which is coded in three categories: cohort 1 born between 1972-1981, cohort 2 born between 1962-1971, and cohort 3 born between 1952-1961.

        Ethnicity.   Though Nepalese society is ethnically complex, scholars often categorize ethnicity into five major groups for analytical purposes: Brahmin/Chhetri (high caste Hindus), Dalit (low caste Hindus), Hill Janajati (Hill Tibeto-burmese), Newar, and Terai Janajati (Terai Tibeto-burmese) (Bista 1972; Blaikie et al. 1980; Fricke 1986; Guneratne 1994; Gurung 1980; Macfarlane 1976). We have adopted the same categories for this analysis.

Analytical Strategy

        The breadth of the CVFS data allowed us to simultaneously estimate the effects of multiple dimensions of the marital relationship on contraceptive use. First, we estimated the total effects of emotional bond between husband and wife, controlling for other known determinants of contraceptive use: prior family experiences, nonfamily experiences, community context (childhood and contemporary), parental experiences, age (birth corhort), and ethnicity. Second, we added measures of other dimensions of the marital relationship such as spousal disagreement, spousal violence, and spousal communication, individually. Finally, we included all four types of measures of husband-wife relationship in a single model to estimate the independent effect of emotional bond between husband and wife.

        We used event history methods to model the risk of adopting contraceptive methods. Because the data are precise to the month, we used discrete-time methods to estimate these models (Allison 1984; Petersen 1991). Person-months of exposure were the unit of analysis.[3]

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[3] Although it may appear that the discrete-time method of creating multiple person-months for each individual inflates the sample size resulting in artificially deflated standard errors, this is not the case (Allison 1982, 1984; Petersen 1986, 1991). In fact, the estimated standard errors are consistent estimators of the true standard errors (Allison 1982: 82).

To estimate the discrete-time hazard models, we used logistic regression of the form:

$$\ln(\frac{p}{1-p}) = a + \sum (\beta_k)(X_k),$$

where *p* is the yearly probability of using any contraceptive method, *p/1-p* is the odds of using any contraceptive method, *a* is a constant term, β_k represents the effects parameters of the explanatory variables, and X_k represents the explanatory variables in the model. This approach to the estimation of the discrete time hazard model is described in detail elsewhere (Allison 1982, 1984; Petersen 1986, 1991). The results presented in the tables below have all been calculated using SAS *GLIMMIX* and therefore properly specify the multilevel nature of the data. Estimating multilevel, discrete-time hazard models requires three major assumptions regarding the model: conditional independence, noninformative covariates, and coarsening at random. For a full description of these assumptions and the application of these techniques to these data from Nepal see Barber et al. 2000.

RESULTS

Husband-wife Emotional Bond

In Models 1 – 3 of Table 2, we present estimates of the associations between the strength of a woman's emotional bond to her husband and her subsequent contraceptive use. We transformed the raw coefficients by exponentiating them; the coefficients presented in the table are estimates of the multiplicative effects on the odds of using contraceptives in any one-month interval. A coefficient of 1.00 represents no effect; a coefficient greater than 1.00 represents a positive effect; and a coefficient less than 1.00 represents a negative effect on the odds of contraceptive use. Because the frequency of events in any time interval is quite small, the odds of transition from never having used any contraceptive method to having used a contraceptive method are very similar to the rate of contraceptive use (Brauner-Otto et al. 2007) and we discuss our results in terms of rates.

Table 2. Multilevel discrete-time hazard model estimates of effect of husband-wife emotional bond ("maya") on hazard of first contraceptive use among married women ages 15-44 in 1996 (N=526)

MEASURES	1	2	3
Husband-wife emotional bond ("maya")	1.29**	1.29**	1.30*
	(2.90)	(2.56)	(2.21)
Family Experiences:			
Length of marriage		0.89**	0.99
		(-4.58)	(-0.31)
Participation in spouse choice		1.01	0.99
		(0.17)	(-0.28)
Number of children born		1.46**	1.71**
		(5.92)	(5.74)
Has at least one son		1.76**	1.79**
		(3.4)	(2.96)
Age of oldest child			0.79**
			(-4.23)
Nonfamily Experiences:			
Years of schooling		0.99	1.01
		(-0.72)	(0.42)
Spouse's years of schooling		0.99	0.97
		(0.58)	(-1.32)
Media exposure		1.25*	1.19
		(1.93)	(1.27)
Spouse's media exposure		1.22	1.30
		(1.40)	(1.52)
Ever traveled outside of Nepal		1.31	1.34
		(0.91)	(0.84)
Ever a member of a group		1.16	1.10
		(0.56)	(0.27)
Oldest child goes to school			1.94**
			(3.22)
Community Context:			
Exposure to nonfamily services in childhood[a]	1.04	1.06	1.06
	(0.93)	(0.98)	(0.85)
School within 5-minute walk		0.79	0.45
		(-1.06)	(-2.75)
Health service within 5-minute walk		1.33	1.01
		(1.17)	(0.02)
Parental Experiences:			
Either parent ever went to school	0.85	0.90	0.94
	(-1.46)	(-0.88)	(-0.37)
Either parent ever used contraception	1.02	1.26	1.05
	(0.16)	(1.52)	(0.25)
Number of mother's children	1.01	1.03	1.04
	(0.39)	(1.01)	(1.06)

Age (Birth Cohort):[b]

15-24 (1972-1981)	14.21**	9.87**	8.46**
	(7.76)	(4.76)	(4.15)
25-34 (1962-1971)	7.94**	6.21**	5.28**
	(6.08)	(4.46)	(3.72)

Ethnicity:[c]

Dalit	1.16	1.47	1.86*
	(0.67)	(1.46)	(1.74)
Hill Janajati (Indigenous)	1.41*	1.63*	1.34
	(1.77)	(1.93)	(0.85)
Newar	0.80	0.92	0.89
	(-0.71)	(-0.24)	(-0.27)
Terai Janajati (Indigenous)	1.13	0.90	0.68
	(0.6)	(-0.39)	(-1.28)
Time	1.01*	1.02**	1.02**
	(1.75)	(2.92)	(3.01)
Time(sq)	0.99**	0.99**	0.99**
	(-2.87)	(-3.30)	(-2.85)
Intercept	0.99**	0.99**	0.99**
	(-16.10)	(-9.97)	(-8.28)
Person months	29702	25287	18524
Deviance	3262	2829	1951

Note: *$P<.05$, **$P<.01$; all probabilities are one-tailed. Odds ratios are reported on the first line, with Z statistics in parentheses on the second line. All models were estimated using multivariate logistic regression.
[a] Sum of school, health service, employment center, market and bus service within a one hour walk from the respondent's place of residence during childhood (before age 12).
[b] Born 1952-1961 (age 35-44 Cohort 4) as reference group.
[c] Brahmin/Chhetri (High Caste Hindus) as reference group.

Model 1 in Table 2 shows the association of a positive emotional bond between a husband and wife with the subsequent rate of any contraceptive use, controlling for childhood community context (exposure to nonfamily services in childhood), parental experiences, birth cohort, and ethnicity. We find that this positive emotional bond has a strong positive statistically significant effect on the rate of using contraceptives. The odds multiplier of 1.29 for husband-wife emotional bond suggests that a 1-point increase toward a more positive emotional bond on a three-point scale increases the rate of contraceptive use by 29%. Because we include controls for childhood community context, parental experiences, birth cohort, and ethnicity, the observed association of this positive emotional bond with contraceptive use is net of these factors known

to affect contraceptive use (Axinn and Yabiku 2001; Brauner-Otto et al. 2007). In general, all of the controls performed as expected. As demonstrated in previous analyses of these same measures, change across birth cohorts has a strong effect; younger cohorts use contraceptives at much higher rates than the oldest cohort (Axinn and Yabiku 2001; Brauner-Otto et al. 2007). Likewise, the duration of the hazard—parameterized in a quadric functional form[4]—has a strong, statistically significant effect on the rate of contraceptive use. These results are consistent with previously published work from this study setting (Axinn and Barber 2001; Axinn and Yabiku 2001; Barber and Axinn 2004; Brauner-Otto et al. 2007).

Model 2 of Table 2 shows the association now adding measures of other experiences known to have an important influence on both the spousal relationship and contraceptive use to the model (Axinn and Barber 2001; Axinn and Yabiku 2001; Brauner-Otto et.al. 2007; Hoelter et al. 2004). These include a wide array of both familial experiences (length of marriage, participation in spouse choice, number of children, and having a son) and nonfamily experiences (schooling, media exposure, travel outside Nepal, group membership), and community context (childhood and contemporary). As shown in Model 2, even controlling for this wide range of familial and nonfamily experiences, the estimated association between the husband-wife emotional bond and contraceptive use remains the same as in Model 1.

Note that the effects of other factors known to affect contraceptive use are estimated as expected. For example, the odds multiplier of 1.46 for number of children born by 1996 suggests that each additional child increases the rate of contraceptive use by 46%, an effect similar to that reported in previous studies from this setting (Axinn and Yabiku 2001; Barber and Axinn 2004; Brauner-Otto et al. 2007). Likewise, having at least one son and media exposure each have a strong positive effect on the rate of contraceptive use, consistent with the effect reported in previous studies (Axinn and Yabiku 2001; Barber and Axinn 2004).

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[4] Although we have parameterized the duration of hazard as a quadric, we also tested other functional forms, including a log function, a linear function, and a series of six-month increment dummies. The results vary only slightly across various functional forms. We chose the quadric functional form of the hazard duration because it provided the strongest overall model fit. This is also consistent with the previously published models of contraceptive use from this study setting (Axinn and Yabiku 2001; Brauner-Otto et al. 2007).

Finally, we add one more complex factor to our models. In Nepal, children's education is not only a strong determinant of parents' subsequent contraceptive use to limit childbearing (Axinn 1992), because many parents have little or no education, it can also be parents' first exposure to the high costs of formal education in schools. Previous research has identified the first time a couple's oldest child attends school as a strong determinant of their subsequent contraceptive use to limit childbearing (Axinn and Barber 2001). In Model 3 of Table 2, we add a measure of the oldest child attending school. Again, despite the strong positive effects of the oldest child's schooling on parents' rate of contraceptive use to limit childbearing, the effect of the husband-wife emotional bond remains large and statistically significant.

Effects of Positive Emotional Bond Independent of Other Spousal Relationship Measures

Table 3 displays our estimates of the effects of a positive emotional bond between a husband and wife on contraceptive use independent of other spousal relationship factors. Because emotional bond between husband and wife is likely to influence or be influenced by other spousal relationship factors such as spousal disagreement, spousal violence, and spousal communication, each may have independent or interrelated influences on the rate of contraceptive use. Moreover, as both the husband-wife emotional bond and other spousal relationship factors may co-occur, it is difficult to empirically adjudicate the independent effects of each. The models displayed in Table 2, and described above, reflect the upper bound for the total effects of the husband-wife emotional bond, entirely ignoring the other spousal relationship factors (spousal disagreement, spousal violence, and spousal communication). To establish the lower bound for the total effects of the husband-wife emotional bond and other spousal relationship measures, we now estimate a set of models including the measure of husband-wife emotional bond and each measure of other spousal relationship factors first individually in separate models and finally, combined together in a single model. Table 3 displays the results from models of contraceptive use with both the measures of multiple dimensions of the spousal relationship.

Table 3. Multilevel discrete-time hazard model estimates of effect of spousal relationships on hazard of first contraceptive use among married women ages 15-44 in 1996 (N=526)

MEASURES	1	2	3	4	5
Husband-wife emotional bond ("maya")	1.30*	1.30*	1.31*	1.30*	1.31*
	(2.21)	(2.21)	(2.24)	(2.17)	(2.20)
Marital Relationship:					
Spousal disagreement		0.96			1.08
		(-0.27)			(0.44)
Spousal violence (beaten)			0.59*		0.60*
			(-2.15)		(-1.94)
Spousal communication (discuss contraception)				1.37**	1.35*
				(2.35)	(2.21)
Family Experiences:					
Length of marriage	0.99	0.98	0.99	0.97	0.98
	(-0.31)	(0.33)	(-0.22)	(-0.56)	(-0.44)
Participation in spouse choice	0.99	0.99	0.99	0.99	0.99
	(-0.28)	(-0.29)	(-0.3)	(-0.28)	(-0.28)
Number of children born	1.71**	1.71**	1.76**	1.68**	1.74**
	(5.74)	(5.75)	(5.86)	(5.30)	(5.47)
Has at least one son	1.79**	1.80**	1.82**	1.74**	1.75**
	(2.96)	(2.97)	(3.01)	(2.77)	(2.76)
Age of oldest child	0.79**	0.79**	0.77**	0.79**	0.78**
	(-4.23)	(-4.22)	(-4.49)	(-3.91)	(-4.18)
Nonfamily Experiences:					
Years of schooling	1.01	1.01	1.01	1.01	1.01
	(0.42)	(0.39)	(0.42)	(0.46)	(0.50)
Spouse's years of schooling	0.97	0.97	0.97	0.97	0.97
	(-1.32)	(-1.34)	(-1.69)	(-1.38)	(-1.66)
Media exposure	1.19	1.20	1.20	1.15	1.15
	(1.27)	(1.29)	(1.27)	(0.97)	(0.95)
Spouse's media exposure	1.30	1.31	1.24	1.23	1.16
	(1.52)	(1.54)	(1.23)	(1.14)	(0.8)
Ever traveled outside of Nepal	1.34	1.36	1.35	1.27	1.26
	(0.84)	(0.87)	(0.86)	(0.67)	(0.65)
Ever a member of a group	1.10	1.10	1.06	0.80	0.77
	(0.27)	(0.28)	(0.16)	(-0.61)	(-0.7)
Oldest child goes to school	1.94**	1.93**	2.07**	1.93**	2.09**
	(3.22)	(3.2)	(3.47)	(3.08)	(3.36)
Community Context:					
Exposure to nonfamily services in childhood[a]	1.06	1.06	1.05	1.06	1.05
	(0.85)	(0.86)	(0.64)	(0.82)	(0.63)
School within 5-minute walk	0.45**	0.45**	0.44**	0.48**	0.47**
	(-2.75)	(-2.76)	(-2.79)	(-2.74)	(-2.71)
Health service within 5-minute walk	1.01	1.01	1.05	1.22	1.24
	(0.02)	(0.03)	(0.14)	(0.65)	(0.68)

Parental Experiences:

Either parent ever went to school	0.94	0.95	0.94	0.93	0.93
	(-0.37)	(-0.37)	(-0.42)	(-0.44)	(-0.48)
Either parent ever used contraception	1.05	1.04	1.07	1.08	1.10
	(0.25)	(0.23)	(0.34)	(0.41)	(0.52)
Number of mother's children	1.04	1.04	1.04	1.03	1.03
	(1.06)	(1.09)	(1.21)	(0.73)	(0.79)
Age (Birth Cohort):[b]					
15-24 (1972-1981)	8.46**	8.45**	8.06**	9.27**	8.98**
	(4.15)	(4.14)	(4.01)	(3.83)	(3.74)
25-34 (1962-1971)	5.28**	5.34**	5.12**	6.26**	6.03**
	(3.72)	(3.73)	(3.63)	(3.50)	(3.41)
Ethnicity:[c]					
Dalit	1.86*	1.85*	1.82*	2.08*	2.06*
	(1.74)	(1.72)	(1.67)	(2.1)	(2.05)
Hill Janajati (Indigenous)	1.34	1.33	1.24	1.32	1.27
	(0.85)	(0.82)	(0.62)	(0.81)	(0.68)
Newar	0.89	0.88	0.80	0.74	0.71
	(-0.27)	(-0.3)	(-0.51)	(-0.67)	(-0.78)
Terai Janajati (Indigenous)	0.68	0.67	0.63	0.72	0.69
	(-1.28)	(-1.29)	(-1.48)	(-1.10)	(-1.25)
Time	1.02**	1.02**	1.02**	1.02**	1.02**
	(3.01)	(3.01)	(3.11)	(2.66)	(2.83)
Time(sq)	0.99**	0.99**	0.99**	0.99**	0.99**
	(-2.85)	(-2.85)	(-2.89)	(-2.6)	(-2.69)
Intercept	0.99**	0.99**	0.99**	0.99**	0.99**
	(-8.28)	(-8.25)	(-7.92)	(-8.21)	(-7.95)
Person months	18524	18524	18524	18072	18072
Deviance	1951	1951	1947	1942	1935

Note: *$P<.05$, **$P<.01$; all probabilities are one-tailed. Odds ratios are reported on the first line, with Z statistics in parentheses on the second line. All models were estimated using multivariate logistic regression.
[a]Sum of school, health service, employment center, market and bus service within one hour walk from the respondent's place of residence during childhood (before age 12).
[b]Born 1952-1961 (age 35-44) as reference group.
[c]Brahmin/Chhetri (High Caste Hindus) as reference group.

In general, adding measures of other dimensions of the spousal relationship to the model leads to almost no change in the effects of the husband-wife emotional bond. First, the odds multipliers for husband-wife emotional bond remained in the range of 1.30 – 1.31 in all models, suggesting that the observed association between our measure of the emotional bond and

contraceptive use is independent of disagreements, violence, and communication. Second, the odds multiplier of 0.59 for spousal violence in Model 3 suggests that violence between spouses has strong negative statistically significant association with the rate of subsequent contraceptive use. Moreover, the effect of spousal violence is independent of the effect of the husband-wife emotional bond. Third, in Model 4, the odds multiplier of 1.37 for spousal communication about contraceptive use suggests that spousal communication has a strong, positive, statistically significant effect on the rate of contraceptive use. This result is as expected and has been documented in prior research on Nepal (Link 2011).

In Model 5, when we include the measure of husband-wife emotional bond and measures of all three other spousal relationship factors in a single model we see no change in the positive effect of the husband-wife emotional bond. In this final model we do observe a small reduction in both the negative effect of spousal violence and the positive effect of spousal communication. The odds multiplier for spousal violence increased from 0.59 (Model 3) to 0.60 (Model 5) suggesting a small reduction in the negative effects of spousal violence. Likewise, the odds multiplier for spousal communication decreased from 1.37 (Model 4) to 1.35 (Model 5), again suggesting a small reduction in the positive effect of spousal communication. These small reductions in the effect of spousal violence and communication suggest that only a small fraction of the effect of spousal violence and communication may work through the husband-wife emotional bond – the majority of the association between each dimension of the spousal relationship and the subsequent rate of contraceptive use independent of the other dimensions.

As discussed above, because multiple dimensions of spousal relationships co-occur, it is particularly difficult to adjudicate the role each may pay play mediating effects of other dimensions. This is not our substantive aim. But we are concerned with the extent to which these other co-occurring dimensions of the spousal relationship may explain the association between husband-wife emotional bond and contraceptive use. By estimating the association of the husband-wife emotional bond with contraceptive use both with and without measures of these other dimensions of spousal relationships in our model (Model 1 of Table 3 compared to Model 5 of Table 3) we are able to estimate both an upper and lower bound for the association of the husband-wife emotional bond with the rate of contraceptive use. However, there is virtually no change in observed associations between the husband-wife emotional bond and subsequent contraceptive use when we add measures of disagreements, violence, and communication to the model. Thus we conclude these other potentially co-occurring dimensions of the spousal relationship do not explain the observed association between the husband-wife emotional bond and contraceptive use.

DISCUSSION

Nearly a century of demographic research on the process of fertility decline has tested hundreds of hypotheses and provided empirical evidence for dozens of factors promoting the transition from high fertility and no use of birth control to widespread birth control and low fertility (Axinn and Yabiku 2001; Bulatoa and Lee 1983; Cleland and Hobcraft 1985; Coale and Watkins 1986; Davis 1955; Easterlin and Crimmins 1985; Freedman 1979; Freedman et al. 1988; Knodel 1987; Notestein 1953; Thompson 1929). In spite of fertility transition's lofty status as one of the most sustained areas of empirical investigation ever mounted in the social sciences, many fundamental hypotheses about fertility decline remain untested. Caldwell's wide ranging theory of intergenerational wealth flows—and in particular his "emotional nucleation hypothesis—provides an excellent example. In this hypothesis Caldwell (1982) argues that extended families transition to nuclear families, in part through a process of "emotional nucleation," in which an individual's emotional bonds to their spouse grow stronger relative to their emotional ties to parents, siblings, and other relatives. This shift toward stronger emotional ties to spouses then shifts individuals' motivations from the pursuit of many children in support of the larger family goals to the pursuit of few children in support of their emotional ties to their spouse (Caldwell 1982). If true, this "emotional nucleation" would not only motivate a transition from unlimited childbearing to limited childbearing, but it would also explain why some couples continue to have children even when having children is no longer economically advantageous.

Unfortunately, the measurement demands of an empirical test of this intriguing hypothesis are daunting. Random assignment to emotional states is not within our means now, and may never be. Observational studies of variations in emotional states linked to records of childbearing behaviors are not only rare but without longitudinal designs and extraordinary measurement, and the likelihood of observing a spurious correlation between an observed emotional state and childbearing behavior is high. Of course we cannot eliminate this possibility. However, using the Chitwan Valley Family Study (CVFS)—a 15-year panel study of communities, families, couples, and individuals that was specifically designed to study this fertility transition—we have a rare opportunity to gain some empirical insight into the possibility of an "emotional nucleation" mechanism. It is only in a context like Nepal, with historical extended family living and low emotional ties between husbands and wives, that one might expect to observe the emotional nucleation effect (Caldwell 1982; Caldwell et al. 1988; Ghimire

et al. 2006). As demonstrated in the analysis reported above, this rare opportunity does yield evidence that the husband-wife emotional bond shapes the subsequent use of contraceptives to limit childbearing.

Of course this investigation is predicated on adequate measurement of variations across couples in the levels of the husband-wife emotional bond. Such measurement is a significant challenge. We make no claim to provide perfect measurement, but acknowledging that all measures suffer from measurement error (Biemer et al., 1991; Groves 1987; 1989; Groves et al. 2009) we do claim that the survey measure we use captures variations across couples. The measure itself is the product of years of ethnographic, cognitive, and survey research on the husband-wife emotional bond in the context of rural Nepal. It uses highly context-specific, language- and religion-appropriate words to ask couples to report on the emotional dimensions of their relationship. Simultaneous interviewing of husbands, wives, and other family members is used to provide privacy while these topics are discussed. Empirically it correlates with reports of other dimensions of the relationship exactly as expected. Most important, it provides us with a means to begin research on the consequences of this emotional dimension of the relationship on couples' decisions to stop having children. Of course this area of research can only benefit from greater scientific efforts to produce improved measures of husband-wife emotional bonds. We argue that the important results we document here should serve as motivation for substantial new efforts to construct such measures.

There are also the dozens of factors shown to shape contraceptive use to limit childbearing in previous research, most of which may also shape variations in the husband-wife emotional bond. Again, the CVFS provides us with an unusual tool. Because it features more than a decade of effort to measure all the community, family, and individual factors shaping a couple's decision to use contraception to limit their fertility, it provides one of the most comprehensive sources of measures available (Axinn and Pearce 2006; Axinn, Barber, and Ghimire 1997; Axinn, Pearce, and Ghimire 1999). Equally useful, there are now dozens of publications documenting the specific measures from the CVFS that shape marital and childbearing experiences in Nepal (see perl.psc.isr.umich.edu for a comprehensive list). This is important because it gives us the means to identify a comprehensive set of controls for prior experiences likely to shape both marital relationships and contraceptive use. In this analysis we are able to introduce these controls sequentially and demonstrate our estimate of the

consequences the husband-wife emotional bond does not change. This emotional dimension of the marital relationship has an empirically independent association with couples' subsequent use of contraception to limit childbearing.

Finally, there are other dimensions of the husband-wife relationship likely to co-vary with the emotional bond but with the potential for independent influences on contraceptive use to limit childbearing. We investigate husband-wife conflict and husband-wife communication as two of the most likely to shape subsequence contraceptive use to limit childbearing. Our results show greater conflict is associated with reduced contraceptive use and greater communication is associated with increased contraceptive use. Most important though, adding measures of these other dimensions of the husband-wife relationship to our models also produces no change in our estimate of the consequences of variations in the husband-wife emotional bond for couples' subsequent use of contraception to limit childbearing. The "emotional nucleation" association we observe appears to be independent of these other observed dimensions of husband-wife relationships.

Together these results provide the strongest evidence to date that variations in husband-wife emotional bonds are associated with subsequent childbearing behavior just as Caldwell predicted (1982). This interesting finding not only lends credibility to Caldwell's intergenerational wealth flows framework, it also has the potential to extend economic theories of the "quality-quantity" trade off to explain why even when children are clearly a high cost, many couples continue to have them. Of course many other factors in our models remain strongly associated with fertility limitation even when this emotional dimension is included. It is unlikely that the emotional dimension is strong enough to "explain" fertility decline by itself. The idea that many forces are working simultaneously to produce fertility decline is much more plausible (Axinn and Yabiku 2001; Freedman 1979). However, it is also possible that this emotional dimension operates independently of these many other forces.

Stepping back from the narrower question of the emotional nucleation hypothesis per se, the results also point toward the need for an even broader view of demographic research that includes empirical attention to emotions. In recent years several leading demographers have argued that closer engagement with the psychology of interpersonal relationships and emotions will yield a more comprehensive understanding of demographic behaviors (Basu 2006; Hobcraft 2006; Massey 2002). There are both theoretical and empirical reasons to agree (Massey 2002).

We add to those here, not only reminding those studying fertility of Caldwell's powerful hypothesis, but also providing empirical evidence that is consistent with that hypothesis. Certainly as we move forward to study change and variation in couples' decisions to have children or avoid having children, this emotional dimension deserves greater scientific attention. But even as we investigate the full range of demographic topics that include decisions such as educational enrollment, job choice, geographic moves, or health behaviors, we join these demographers in arguing that emotional dimensions of behavioral choices deserve our theoretical and empirical attention.

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