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Prudence and Pressure

Reproduction and Human Agency in Europe and Asia, 1700–1900

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The MIT Press
Cambridge, Massachusetts
London, England

25. Several factors account for this discrepancy. While the aggregate statistics are the outcome of a combination of starting, spacing, and stopping behaviors, differences in age at marriage and the timing of the first birth are omitted from the multivariate analysis, which only includes women who had at least one previous birth. A previous study of the same population in Venice found that there were large differences by social group in both starting and stopping. Middle-class wives started their reproductive careers, on the average, 15 months later and stopped 18 months earlier than wives of day-laborers (Derosas 2002a). There were also large differences in spacing, but these were largely the consequences of differences in infant mortality, whose influence on fertility is controlled in our analysis.

26. Indirect support for this hypothesis comes from inclusion in the model of a dummy variable for known wet nurses. This covariate, which does not substantially change the results displayed in table 9.10, is associated with a statistically significant 15 percent higher risk of giving birth for known wet nurses. This would seem to be a contradictory finding, but it is actually a consequence of our procedure for identifying wet nurses. We can only identify wet nurses whose nurslings died. This subgroup of women had higher infant mortality, which would have reduced the effect of breast-feeding on birth intervals from nursing both foundlings and their own children.

10 Family, Household, and Reproduction in Northeastern Japan, 1716 to 1870

Noriko O. Tsuya and Satomi Kurosu

This chapter examines the patterns and correlates of reproduction in Shimomoriya and Niita, two farming villages in northeastern Japan in the eighteenth and nineteenth centuries. Drawing data from their annual population registers, we seek to explore the role of human agency in reproductive processes of married women in agrarian communities in early modern Japan in the contexts of their family, household, and local economic conditions. Existing studies found that marital fertility in preindustrial rural Japan varied by region and over time, but it was clearly lower than many, if not most, preindustrial European rural communities (e.g. Hayami 1973, 1992; Hayami and Kito 1989; Saito 1992a; Smith 1977: 47–58). This was due in part to under-registration of infant deaths in local population registers (see chapter 3 for details). Even taking this under-registration into account, however, the level of marital fertility in early modern Japan still seems to have been lower than in many parts of historical Europe. Among the major regions of preindustrial Japan, the northeast, in which the two farming villages of our study were located, had especially low marital fertility (Hayami and Kurosu 2001; Saito 1992a; Tomobe 1991).

A consensus emerging from accumulated evidence covering a wide variety of preindustrial Japanese villages is that the low level of marital fertility was due primarily to deliberate family control among peasants through the extensive use of infanticide and induced abortion (e.g., Hanley 1977; Hanley and Yamamura 1977; Hayami 1973; Kalland and Pedersen 1984; Kami 1991: 177–173; Kawaguchi 1998; Saito 1992a; Skinner 1987a, 1988; Smith 1977: 59–85).[1] Although a general agreement has not yet been reached as to whether family control was parity-specific or sex-selective (see chapter 6; also Saito 1992a), these studies agree that Japanese peasants limited their offspring not because of desperation stemming from poverty but primarily to improve their

standards of living. Put differently, family control among peasants in Tokugawa Japan was likely a calculated behavior to maximize the utility of their families and households.

Using micro-level data drawn from the local population registers in two northeastern farming villages covering the 154 years from 1716 to 1870, this chapter examines how and under what household and community contexts couples built their families by conducting two sets of analyses: a descriptive analysis of reproductive and family-building patterns, and a multivariate analysis of covariates of marital reproduction. Specifically, we first offer an overview of population trends, economic development, and family and household systems in early modern Japan, which sets the chapter in the larger regional and historical contexts. We next estimate basic measures of nuptiality and fertility in the two villages, and compare them with those of other Tokugawa Japanese villages for which comparable data are available. We then conduct discrete-time event-history analyses that relate the probability of giving a marital birth (to be exact, having a recorded marital birth) to individual demographic, socioeconomic, household, and community characteristics. The chapter concludes with a summary of findings and discussion of their implications.

Tokugawa Japan, which began in 1603 and ended in 1868, was a society with enormous local differences in demographic patterns, economic development, and social customs (Cornell and Hayami 1986; Hayami and Kurosu 2001; Kurosu, Tsuya, and Hamano 1999; Saito 1998). Given the relative scarcity of analytically rigorous empirical studies on reproductive behavior covering different parts of preindustrial Japan, a conclusive account for the Tokugawa reproductive regime is far from complete. In this chapter we seek to provide systematic evidence to further our understanding of the characteristics and nature of reproduction in rural communities in preindustrial northeastern Japan. By this means we seek to shed the light on the family, household, and local socioeconomic contexts in which human agency influenced reproductive processes in the Japanese past.

Background

Population Trends and Their Demographic Factors

One of the major issues long pursued by researchers on early modern Japan is the explanation of population stagnation in the latter half of the Tokugawa era (Hayami 1973, 1986; Saito 1992a). In clear contrast to the first half of the era (the early 1600s to the 1720s) in which the population grew dramatically, there was little increase from the 1720s to the 1840s. This "stagnation" of the nation's population, however, masked large regional differentials: the population on the northeast was on the decline whereas the population in the center was largely stable and that on the southwest increased (Hayami 2001: 39–65; Hayami and Kurosu 2001). Only after the 1840s did the populations in all regions increase simultaneously until the end of the Tokugawa era.

Prewar generations of economic and population historians attributed the lack of population growth during the 1720s to the 1840s to Malthusian positive checks, especially to crisis mortality caused by widespread famines and epidemics (Honjo 1927, 1930; Takahashi 1936; see also Saito 1992a). Since then, however, empirical studies based on local population registers revealed that the overall level of mortality in the latter half of Tokugawa Japan was not particularly high for a preindustrial population (Hayami 1973, 1992, 2001; Saito 1992a; Smith 1977: 47–58). Given this relatively low mortality, population stagnation came to be attributed mainly to low fertility, especially to low levels of reproduction within marriage, which, studies argued, was achieved primarily through the widespread use of infanticide and induced abortion (Hanley 1977; Hanley and Yamamura 1977: 226–266; Hayami 1973; Kalland and Pedersen 1984; Kito 1978; Saito 1992a; Skinner 1987a, 1988; Smith 1977: 59–85).

Among the major regions of Tokugawa Japan, the northeast seems to fit especially well the portrayal of a regime of low marital reproduction achieved by extensive family control. Marriage was early and universal in the northeast, compared to the central and southwestern regions where marriage was later and the level of marital reproduction tended to be higher (Hayami 1992; Hayami and Kurosu 2001; Saito 1992a; Tsuya 2001). According to Tomobe (1991), who estimated the Coale–Trussell indexes for northeastern and central Tokugawa Japan using family reconstitutions of sixteen rural communities, the values of m was 0.41 and that of M was 0.58 for the northeast while the corresponding values for the center were 0.19 and 0.81.[2] This finding suggests that while the level of marital fertility in the northeastern region was low (roughly 60 percent of the standard natural fertility schedule) even in the absence of parity-specific control, the practice of family limitation resulted in a very low level of marital reproduction. On the other hand, family limitation was more limited in the central region,

and the level of marital reproduction was also higher. As we will show later in this chapter, the level of marital reproduction was indeed very low in the two northeastern villages in our study, and family control in the form of infanticide seems to have been practiced extensively.

Economic Development and Proto-Industrialization

Although there were periodic outbreaks of nationwide and local famines and crop failures in preindustrial Japan (Saito 2002),[3] a growing body of evidence shows that the overall standard of living improved in most parts of the country in the eighteenth and nineteenth centuries (Hanley and Yamamura 1971, 1977: 69–90; Hayami 2003: 114–159; Smith 1958). At the same time, however, there existed large regional variations in economic development, which resulted largely from differences in natural and topographical conditions. The weather in the northeastern region tends to be much colder than in the central and southwestern regions, and many parts of the northeast have considerable snowfall in the winter. By contrast, the central and southwestern regions enjoyed a warmer and more favorable climate for agriculture. Consequently the northeast experienced the least economic development and had the lowest living standards (Hayami and Kurosu 2001; Saito 1992a).

Commercial farming and proto-industrialization spread rapidly in Japan during the latter part of the Tokugawa period, although there were considerable regional differences in tempo and degree. The northeast was probably the least developed in terms of commercial farming (Smith 1959: 68–72), and the overall level of proto-industrialization in the region was much more limited. Officially, the development of proto-industry was discouraged by the Nihonmatsu domain authorities, which governed Shimomoriya and Niita, our study villages, during the eighteenth century. Only after the great Tenmei famine in the late 1780s, which devastated the northeastern region as a whole, did the domain government adopt a new policy to upgrade agricultural technologies and increase rice production. In the 1790s the government then started encouraging specialized local production of cash crops, resulting in the development of such proto-industries as sake brewing, papermaking, and cotton and silk textiles from the 1800s onward (Nagata, Kurosu, and Hayami 1998). After the Tempo famine in the 1830s, the region experienced improvements in environmental conditions as indicated by a drastic decline in the occurrence of famines and

crop failures. At the same time the rigid social structure and stratification system of Tokugawa Japan became increasingly slack, leading to the period called *bakumatsu*, the last years of the Tokugawa regime.

Family System, Household Structure, and Family Farming

The ideal and prevalent family form in rural communities in early modern Japan was the patrilineal stem family, in which a son (most commonly, an eldest son) continued to live with his parents after marriage, bringing his bride into his parents' home (Aruga 1943; Otake 1982; Saito 1998). On a broader scale, Nakane (1967) identified three types of succession as regional variants of the Japanese stem family system: areas characterized by eldest son succession, areas characterized by youngest son succession, and those with succession regardless of birth order. According to Nakane, northeastern Japan is strongly characterized by eldest son succession. Other studies have also classified stem family orientations in preindustrial Japan as the northeastern type (*tohoku-gata*) and conjugal orientations as the southwestern type (*seinan-gata*) (Naito 1973; Takei 1971). The two villages analyzed by this study clearly belong to the former.

Inheritance of family property under the stem family system was, in principle, impartible and belonged to the child who continued to live with the parents after marriage. When families had large landholdings, however, partition of family property was possible, and other siblings, typically males, could receive part of the land and form branch households. Although it was typically the eldest son who assumed headship in the region of our study, succession by an elder daughter is also reported to have been practiced, even when her younger brothers were alive (Maeda 1976; Narimatsu 1992: 170–182). When no biological son was alive, families often adopted a male heir as either an adopted son or as the husband of their daughter. Given the low level of reproduction prevalent in the northeastern region, sons were often adopted and sons-in-law were recruited to maintain the family line (Kurosu 1998; Okada and Kurosu 1998). Households in preindustrial Japan, especially in the northeast, therefore consisted typically of one married couple, their children, and the parents of the husband. In the course of the family life cycle, nuclear households appeared when parents of the head died before a child married and brought his/her spouse into the household. Only rarely did married siblings of the household head co-reside under one roof. Such arrangements were

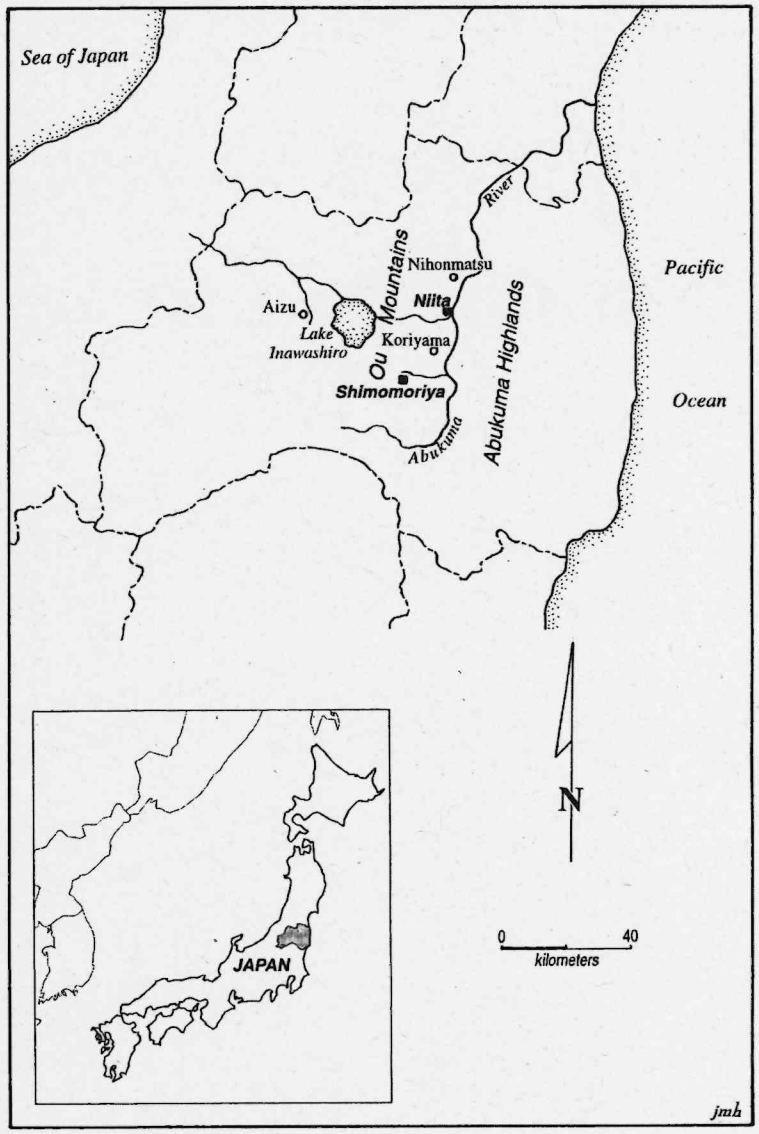
often temporary, when married siblings lived with the head before forming their own branch household.

Although there were considerable regional variations, marriage in Tokugawa Japan differed from historical Europe in two important ways. First, marriage was generally universal and early (Kurosu, Tsuya, and Hamano 1999). The northeastern region is known as a region characterized by very early and universal marriage with a large majority of men and women marrying by the mid-twenties (Hayami and Kurosu 2001). Second, marital disruption and remarriage were common. The northeastern region is especially characterized by frequent divorces and quick remarriages. For example, only 27 percent of first marriages were completed in our two northeastern study villages, whereas the corresponding proportion in a central and a southwestern village was roughly one half (Kurosu, Tsuya, and Hamano 1999). Women in our two northeastern villages who experienced marital disruption also remarried quickly: around 70 percent of women whose first marriages were dissolved by divorce or the death of a spouse remarried within five years after the dissolution if they survived or remained in the villages that long. This suggests that the fertility-inhibiting effects of frequent marital disruption were probably limited because, while marriage was brittle, remarriage was easy and quick.

The Communities and Data

Shimomoriya and Niita

Our study is based on data drawn from the annual population registers in Shimomoriya and Niita, two farming villages in the present Fukushima prefecture (see map 10.1). During the Tokugawa period both villages belonged to the Nihonmatsu domain located in the southeastern part of the northeastern region traditionally known as Ou. Situated at the foot of the Ou mountain range, Shimomoriya was susceptible to cold summers and poor harvests resulting from chilly gusts off the mountains (Narimatsu 1985: 1–3). Because it was located in a hilly area with severe winter weather, most of its agricultural land was not fertile and unfit to grow cash crops such as mulberry trees. Niita was situated on a plain between the capital town of Nihonmatsu and the growing market town of Koriyama, two major population centers in the domain at that time (Narimatsu 1992: 4–6). Although located north of Shimomoriya, Niita enjoyed milder winter weather and a



Map 10.1
Locations of Shimomoriya and Niita in northeastern Japan

better climate for agriculture. Lying on the banks of the Gohyaku River, however, the village was vulnerable to frequent floods.

Despite somewhat different topographical conditions both villages were almost totally agricultural, and the villagers' livelihood depended largely on rice agriculture, supplemented by a number of dry crops (Nagata, Kurosu, and Hayami 1998). Because of the underdeveloped and non-mechanized agricultural technologies at that time (Sato 1990; Smith 1959: 87–107), the northeastern region was the northernmost boundary of rice cultivation and could only grow a single crop per year.[4] These circumstances often put villagers at the mercy of fluctuations in agricultural output, driving their living standards near subsistence levels when crops failed.

According to its population registers, Shimomoriya was a relatively small village whose population in 1716 was 419. The population was relatively stable during the first 35 years for which the records are available until it started to decline at around the time of the Horeki famine in the mid-1750s. Devastated by the Tenmei famine in the 1780s, it further dwindled to 286 in 1786. Although the population was restored somewhat from 1790 to 1830, it again took a dramatic downturn during the Tempo famine in the late 1830s, reaching a low point of 238 in 1840. While the population increased gradually to 328 in 1869, it did not recover the 1716 level.

Niita was a larger village with a population of 538 in 1720. Its population was stable, like Shimomoriya, for the first 50 years until it began to decline in 1770. Owing mainly to a long spell of bad weather culminating in the Tenmei famine in the mid-1780s, Niita's population decreased from 530 in 1770 to 430 in 1786, a decline of 19 percent in a mere 15 years. After fluctuating from 420 to 450 during 1786 to 1803, the population declined again in the early 1800s. Growth resumed gradually after it reached an all-time low of 367 in 1820. Niita's population was not as seriously affected as Shimomoriya by the Tempo famine in the 1830s, recovering and surpassing the 1720 level by the late 1860s.

In summary, the populations of both villages were in overall decline, except for the first few decades of the available registration records and the last few decades in which they showed an upturn. Especially large net population losses occurred during times of major famines in the mid-1780s and the late 1830s. Although the evidence is by no means definitive, this implies that the populations of the two villages were affected seriously by economic hardships triggered by widespread crop failures.

Sources and Study Data

This chapter uses data drawn from the local population registers called *ninbetsu-aratame-cho* (NAC). In both Shimomoriya and Niita the NAC was enumerated annually at the beginning of the third lunar month. Surviving NAC registers in the two villages cover a period of a little over 150 years in the eighteenth and nineteenth centuries: 1716 to 1869 for Shimomoriya, and 1720 to 1870 for Niita. During these years there are only a small number of years missing: nine for Shimomoriya and five for Niita, respectively.[5] Thus nearly unbroken records exist for the latter half of the Tokugawa era. Since our preliminary analysis showed that the format and contents of NAC records are the same in both villages, we pooled the records from the two villages together.

In addition to providing continuous information over long periods of time, the population registers in these villages have other advantages. The registers were compiled on the principle of current domicile; thus the records are all de facto. Registers compiled in this manner give far more exact demographic information than registers based on the principle of legal domicile, although the latter de jure principle seems to have been used far more frequently (Cornell and Hayami 1986).

The NAC registers in the two villages also give the dates (month and year) of major demographic events such as birth and death, except for infants who died before the first enumeration after birth. The dates of occurrence of these events were not usually given in Tokugawa population registers (Saito 1992b; Smith 1977: 19). Exits from the registers due to unknown reasons are moreover extremely rare. Such mysterious disappearances comprise merely 0.6 percent (19 cases) of all exits during the 154 years covered by Shimomoriya's registers and only 0.3 percent (13 cases) of all exits during the 151 years recorded in Niita's registers.

Despite these strengths the NAC records have shortcomings, the most serious of which is the under-registration of infant deaths as mentioned above. Not all births and infant deaths were recorded in the registers—only those who survived from birth to the subsequent registration were entered. Consequently infants who died before the first registration after birth were not recorded. Put differently, the "births"

examined in this study are not actual births but infants who survived at least until the first enumeration. Hence we do not examine fertility in the usual sense but reproduction net of mortality of infants who died before the registration due to natural and man-made causes (for more details, see chapter 3). We need to keep in our mind the nature of our birth information when we interpret the results of our analyses.

This study focuses on marital reproduction of women aged 10 to 49, although we also estimate, when appropriate, general fertility measures. The 857 women aged 10 to 49 who appeared in the NAC registers of Shimomoriya were matched to 1,055 recorded births (527 male births and 528 female births, 4 recorded births were unmatched). In Niita 1,270 women aged 10 to 49 appeared in the NAC registers and were matched to 1,565 births (819 male births and 746 female births, 8 recorded births remain unmatched). Altogether, 2,127 women aged 10 to 49 appeared in the NAC registers in the two villages, and 2,620 births (1,346 male births and 1,274 female births) were recorded and matched to their mothers.

Whenever possible, we measure age as the number of years since a woman's first appearance in the NAC register that followed her birth. Thus in this study "age" is derived from appearances in the registers (NAC age), which indicates the number of years (annual registrations) each individual lived after birth until her exit from observation. Our earlier studies (Tsuya and Kurosu 2000a, 2004a) discuss the procedures used to construct the machine-readable data files for the analyses presented in this chapter. For women who migrated into the study area or were born before the start of the registers, their NAC age is estimated based on the ages listed in the registers.[6]

Descriptive Analysis

Levels and Patterns of Nuptiality

Because reproduction took place mostly within marital unions, marriage patterns strongly affected the level and pattern of reproduction.[7] Here we first look at the age patterns of marriage of women and men in the two villages. Figure 10.1 presents the percentage never-married by sex and age in 1716 to 1870, computed using person-years recorded in the NAC registers.[8] As shown in the figure, female marriage was very early and universal: around 40 percent of women aged 15 were never married; the proportion decreased to 7 percent at age 19, and

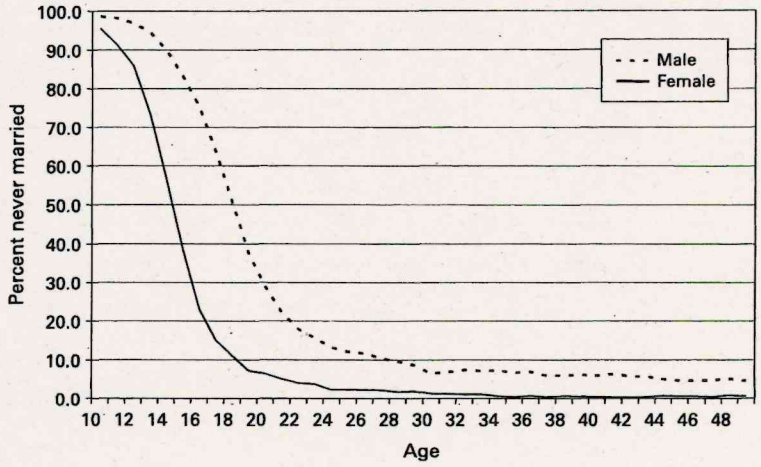


Figure 10.1
Proportion never-married by sex and age in Shimomoriya and Niita, 1716 to 1870

then to mere 4 percent at age 20 to 24. Men married somewhat later than women, but male marriage was also early and universal. While the proportion never-married was around 62 percent for men aged 15 to 19, it decreased to 20 percent at age 20 to 24, and then to 10 percent at age 25 to 29. The proportions never-married among women and men at age 45 to 49 were less than 1 and 5 percent, respectively. The prevalence of very early marriages in the two villages is also indicated by the singulate mean age at marriage (SMAM).[9] As shown in table 10.1, the SMAM was 15.3 among women and 19.5 among men for the entire time under consideration (1716–1870), but first marriage was increasingly delayed for both sexes over time. The SMAM increased among women from 13.2 between 1716 and 1759 to 17.2 between 1840 and 1870, and among men from 18.2 in the first period to 22.7 in the last period.

In addition to early and universal marriage, another notable feature of marriage in the two villages is a high prevalence of divorce. The proportion divorced exceeds the proportion widowed at all age groups until women reach their early forties and men reach their late forties. Nonetheless, since many divorced women (and men) remarried relatively quickly (Kurosu, Tsuya, and Hamano 1999), the fertility-inhibiting effect of divorce was small, especially for women in the peak reproductive ages

Table 10.1
Singulate mean age at marriage by sex and period in Shimomoriya and Niita, 1716 to 1870

Period	Female	Male
1716–1870	15.3	19.5
1716–59	13.2	18.2
1760–99	15.5	20.4
1800–39	16.6	20.1
1840–70	17.2	22.7

Notes: Singulate mean age at marriage is estimated based on the marital-status composition of women and men under age 50, excluding "marital status unknown." "Never married" is defined as persons (1) whose marriages were not recorded in the *ninbetsu-aratame-cho* (NAC), (2) whose spouse and/or children were not registered in the NAC, and (3) who were not in-migrating servants. "Marital status unknown" includes (1) in-migrating servants whose marital statuses were unknown, or (2) persons whose marriages were not observed nor had spouse but had a child/children when they first appeared in the NAC.

Levels and Patterns of Fertility

We next look at the levels and age patterns of general fertility and marital fertility in the two villages. Table 10.2 presents the total fertility rates (TFR) and two sets of the total marital fertility rates (TMFR), one based on the rates for women aged 20 to 49 and the other based on the rates for women aged 15 to 49, for all births and separately by period for male and female births. These measures were all computed based on woman-years recorded in the NAC registers. The table shows that the level of general fertility in the two villages was very low for a pre-industrial rural population. The TFR for the entire period of 1716 to 1870 was 3.0 children per woman. We cannot compare this TFR with those in other Tokugawa villages because almost all fertility measures available for those villages describe marital fertility. Nonetheless, if we take into consideration the under-registration of infant deaths (estimated to be roughly 10–18 percent, see chapter 3), the TFR of three children per woman is equivalent to the TFR for Japan in the early 1950s (National Institute of Population and Social Security Research 2008: 50).

The TFR for the period 1760 to 1799 is clearly lower than the rates for the other three periods. The great Tenmei famine in the 1780s, which devastated northeastern Japan, would have been partially responsible for this low fertility in 1760 to 1799, although fertility did not drop notably at the times of other large-scale famines, such as the Kyoho

Table 10.2
Total fertility rate and total marital fertility rate for all births and separately for male and female births by period in Shimomoriya and Niita, 1716 to 1870

Period	TFR (15–49)	TMFR (20–49)	TMFR (15–49)
All births			
1716–59	3.04	2.63	3.32
1760–99	2.62	2.44	3.16
1800–39	3.06	3.05	3.90
1840–70	3.49	3.36	4.26
1716–1870	2.99	2.77	3.54
Male births			
1716–59	1.58	1.39	1.74
1760–99	1.41	1.33	1.68
1800–39	1.58	1.62	2.00
1840–70	1.65	1.59	2.03
1716–1870	1.54	1.46	1.82
Female births			
1716–59	1.45	1.39	1.74
1760–99	1.21	1.11	1.48
1800–39	1.48	1.43	1.90
1840–70	1.84	1.70	2.23
1716–1870	1.45	1.32	1.72
Woman-years (15–49)			
1716–59	8,368	6,066	7,341
1760–99	7,784	5,393	6,237
1800–39	6,601	4,285	4,994
1840–70	4,094	2,802	3,235
1716–1870	26,847	18,546	21,807

famine in the 1730s and the Tempo famine in the 1830s. By contrast, the TFR is clearly higher for the period of 1840 to 1870. The sizes of the village populations increased in the 1840s to 1860s, as we saw above, and this fertility increase is thought to have been responsible, at least in part, for the net population gain in the two villages.

Finally, fertility differentials by sex of child are not distinctive, although the rates for male births are higher than those for female births for all periods under consideration, except for the period of 1840 to 1870 when the rate for female births surpassed that for male births. While both male and female birth rates went up in the last three decades of the Tokugawa era, the tempo of increase was much more rapid in female rates than in male rates. Overall, boys seem to have

Table 10.3
Age-specific and total marital fertility rates in selected Tokugawa Japanese villages

Village and period	15–19	20–24	25–29	30–34	35–39	40–44	45–49	TMFR[b]
Nomo, 1802–1821[a]	560	381	298	250	215	130	25	6.50
Kandoshinden, after 1800	377	425	281	215	180	110	13	6.12
Nishijo, 1773–1835	257	319	285	251	201	97	26	5.90
Yokouchi, before 1701	163	306	286	213	211	131	22	5.85
1701–1750	134	220	192	186	117	57	21	3.97
1751–1800	150	164	181	129	93	62	8	3.19
After 1800	245	211	185	162	74	34	9	3.38
Nakahara, 1717–1830[c]	171	261	244	240	176	97	27	5.23

Sources: For Nomo, Tsuya (2001); for Kandoshinden and Nishijo, Hayami (1992: 147, 217); for Yokouchi, Hayami (1973: 218); and for Nakahara, Smith (1977: 60).
[a] Periods refer to birth cohorts of women.
[b] Sum of marital fertility rates for ages 20 to 49 (or Japanese ages 21–50).
[c] Smith inflated his rates by 25 percent, based on the estimation that around 20 percent of births were unrecorded because of the omission of unregistered infants. However, as the other figures were not inflated, Smith's figures were adjusted accordingly to make all figures comparable.

been somewhat preferred to girls as the male birth rate exceeded the female birth rate by around 10 percent (except for 1840–1870). Still, since the excess in male fertility does not greatly exceed the usual range of sex ratios at birth, we do not see any clear sign of sex-selective infanticide nor son/daughter preferences from these measures.

The main features that we found for general fertility are even more distinctive for marital fertility (see table 10.3). The overall level of marital fertility in the two villages is extremely low, compared not only to European historical populations but also to other preindustrial Japanese villages. The TMFR of 2.8 for women age 20 to 49 is much lower in the two villages than in other Tokugawa Japanese villages for which we have comparable data. For example, in Yokouchi, where deliberate fertility control is argued to have been widely practiced after 1750 (Hayami 1973: 217–220), the TMFR is in the range of 3.2 to 3.4.

Turning to age patterns of fertility, we can see from figure 10.2 that the fertility rate peaks at age 20 to 24 and starts dropping precipitously at age 35 to 39. This implies a relatively early start of family building as well as some deliberate parity-specific control. As shown in figure 10.3, the marital fertility rate also drops at age 35 to 39 and continues to decrease at higher ages, again indicating some degree of family limitation

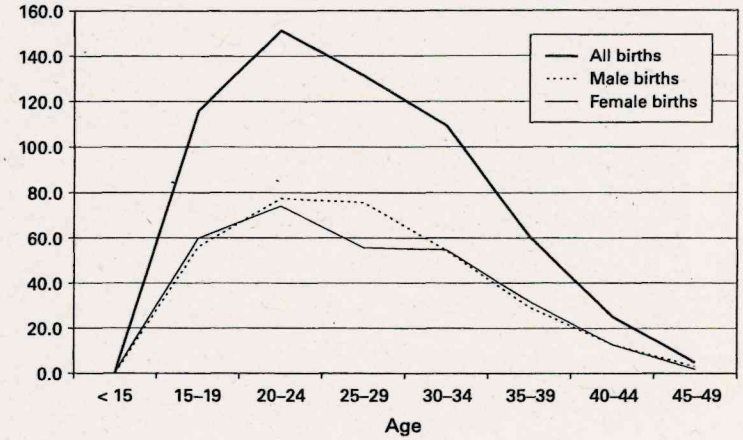


Figure 10.2
Age-specific fertility rates for all recorded births and separately for male and female recorded births in Shimomoriya and Niita, 1716 to 1870

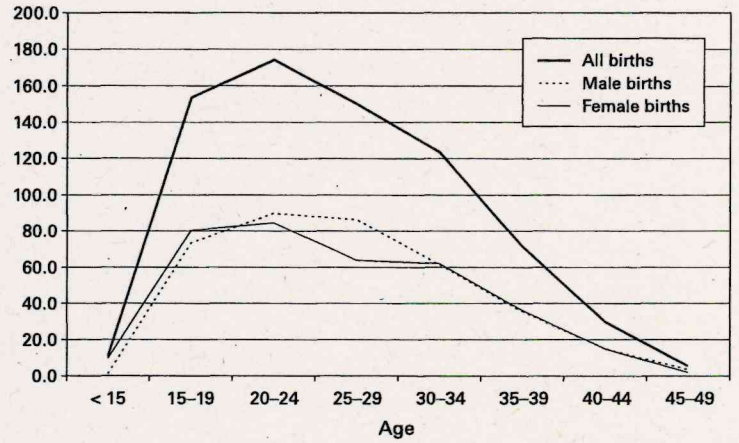


Figure 10.3
Age-specific marital fertility rates for all recorded births and separately for male and female recorded births in Shimomoriya and Niita, 1716 to 1870

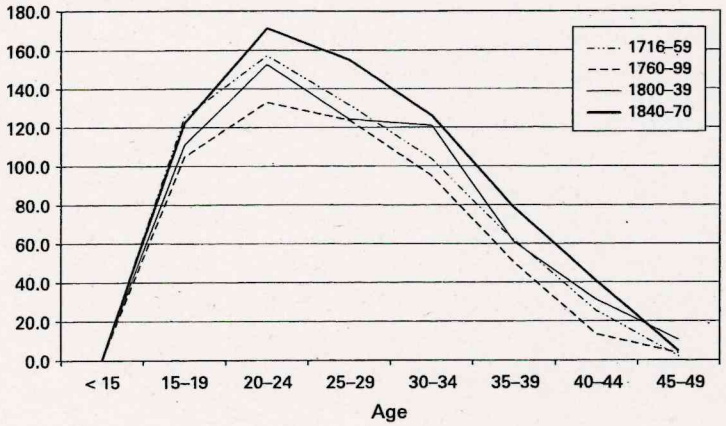


Figure 10.4
Age-specific fertility rates for all recorded births by period in Shimomoriya and Niita, 1716 to 1870

in the two villages. Although the overall age pattern of fertility holds over time, there are also some temporal differentials in the age shapes of general fertility and marital fertility as can be seen in figures 10.4 and 10.5. Declines at older ages are especially distinctive for the period 1760 to 1799, while they are least noticeable from 1840 to 1870.

We can quantify changes in the degree of family limitation and confirm the low level of marital fertility in the two villages with the Coale–Trussell indexes. As shown in table 10.4, the value of m was 0.38 and that of M was 0.33 for the entire period under consideration. This indicates that a moderate degree of family limitation was practiced in these villages and that the level of marital fertility was indeed very low, only one-third of the natural fertility standard. Furthermore these indexes change over time, especially in the prevalence of family limitation. The value of m jumps from 0.38 between 1716 and 1759 to 0.79 between 1760 and 1799, and then drops to roughly 0.2 in 1800 and afterward. This suggests that family limitation was practiced extensively in the two villages from 1760 to 1799 but waned quickly in the nineteenth century. The value of M remains at around 0.32 from 1716 to 1799, increases slightly to 0.34 in 1800 to 1839, and further to 0.38 in 1840 to 1870. Thus the level of marital fertility in the two villages was, in general, low throughout the period under consideration and increased only moderately in the nineteenth century. These findings suggest the

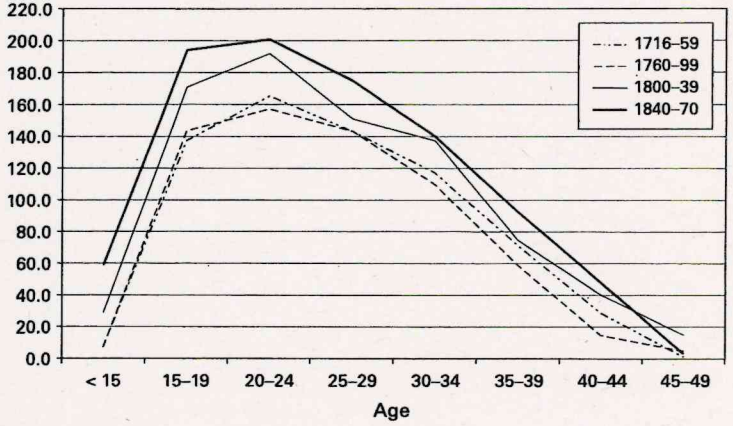


Figure 10.5
Age-specific marital fertility rates for all recorded births by period in Shimomoriya and Niita, 1716 to 1870

Table 10.4
Coale–Trussell indexes of marital fertility by period in Shimomoriya and Niita, 1716 to 1870

Period	m	M
1716–1870	0.379	0.334
1716–59	0.385	0.322
1760–99	0.786	0.323
1800–39	0.206	0.342
1840–70	0.184	0.382

prevalence of strong family control in our two villages, which resulted not only from parity-specific efforts but also from behavior not related to family limitation, such as birth spacing and spousal separation by labor migration.

Family Building and Infanticide

The age patterns of marital fertility and the estimated values of m and M suggest that deliberate family control was widely practiced in Shimomoriya and Niita. In this section we explore mechanisms of family control among married couples by examining sex ratios of

Table 10.5
Sex ratio of recorded births (males per 100 females) by number and sex of surviving children in Shimomoriya and Niita, 1716 to 1870

Number of surviving daughters	Number of surviving sons			All	Male births
	None	One	Two+		
None	90.7	96.5	94.2	92.6	750
One	124.9	129.7	103.0	124.2	411
Two or more	204.7	126.7	(122.2)	167.1	137
All	106.1	108.4	99.1	106.1	1,298
Female births	755	357	111	1,223	2,521

Notes: Figures are based on births to currently married women at risk of giving birth. The figure in parentheses is based on fewer than 30 births.

recorded births by number and gender mix of surviving offspring. Table 10.5 presents sex ratios of recorded marital births (male births per 100 female births) by number and sex composition of surviving children.[10] The overall sex ratio of observed births was 106 boys per 100 girls, which is in the normal range of 104 to 107 (Shryock and Siegel 1976: 109). When we look at sex ratios of births by sex composition of surviving children, however, we can clearly see signs of sex- and parity-selective infanticide. When couples had no surviving children, they were much more likely to have a girl than a boy as their first recorded child, implying the practice of male infanticide on first births.[11] The very low sex ratios (well below 100) of recorded births among couples without a surviving daughter also indicate that couples preferred to have at least one girl, even if she was not their first child.

Once couples had a girl (often as their first recorded child), however, boys seem to have been favored much more strongly than girls. Only when couples had two or more surviving sons (and such couples were a small minority—only 4 percent) did the sex ratio of recorded births return to normal levels. Especially notable are dramatic increases in the sex ratios of recorded births among couples with no surviving son. As the number of surviving daughters increased from none to one, and from one to two or more, the sex ratio of recorded births jumps from 91 to 125 and then to 205. This means that couples without a surviving son but with two or more daughters were around two times more likely to register a boy than a girl, if they had another child. Altogether these findings clearly indicate the widespread and sophisticated use of sex-selective and parity-specific infanticide, aiming to achieve a relatively small family size with a sex-balanced (and possibly sex-ordered) offspring set.

These findings suggest that the most desired family-building pattern among couples in the two villages was to have first a daughter and then two sons. Previous studies have explained the preference for one girl and two boys (*ichi hime, ni taro*) among Tokugawa peasant couples in the following way (e.g., Kami 1991: 171–172; Ota 1991). Given the limited resources available to families and households in Tokugawa villages, peasants needed to minimize the number of children while assuring continuity of the family line. Since infant and child mortality were high, two sons were ideal as a couple needed to have an heir and a spare. The preference for a daughter (especially having a daughter first) resulted from the desire for offspring balanced by sex, which is supposed to have prevailed in Tokugawa society (Ota 1991). Studies also argue that a daughter could help the mother by tending to her younger sibling(s) as a babysitter and a caregiver (Hanley and Yamamura 1975; Skinner 1987a). In addition Skinner (1988) points out that the girl-boy(s) sequence served the interests of the father (and the mother), who had married at a young age, by reducing the potential for intergenerational power conflicts between the father as household head and his eldest son as heir presumptive.

In reality, however, this ideal minimum of one girl and two boys was often unattained because of frequent marital dissolution, spousal separation due to temporary labor migration, and considerable infant and child mortality. Less than 30 percent of all first marriages recorded in the NAC registers of the two villages remained intact until wives reached age 50 (Kurosu, Tsuya, and Hamano 1999). Out-migration for labor-related reasons was, in general, high, especially among men: around 77 percent of all male migration in and out of the two villages was for service (Tsuya 2000).[12] In contrast to farming villages in central Japan, where a majority of labor migrants were young unmarried persons (Hayami 1973), a majority of service migrants in our two villages were currently married men and women (Nagata 2001; Tsuya 2000). Although the level of mortality in Shimomoriya and Niita was not particularly high for a preindustrial population, only around 60 percent of male births are estimated to have survived to age 10 (Tsuya and Kurosu 2004a).[13] Consequently couples who realized the ideal offspring set—one daughter and two sons—were a lucky minority, comprising only 6 percent of all married women recorded in the population registers of the two villages.

Multivariate Analysis

Variables

Discrete-time event-history analysis of marital reproduction is used to show the effects of a woman's characteristics and circumstances on the probability of having a recorded marital birth in the next year from age 10 to 49.[14] Although the number of women who had a birth recorded before age 15 was very small, we include females aged 10 to 14 in the analysis because of the prevalence of very early marriages in the two villages. Because of sex differentials in infant mortality as well as widespread sex-selective infanticide, we also differentiate births by sex.

For the event-history analysis of marital reproduction, we define women "at risk of having a recorded birth within marriage" as those who were alive and present in the village throughout the index year, and had a husband at the beginning of the previous year.[15] Put differently, we exclude women who died during the index year and those who did not have a husband at the beginning of the previous year. We also restrict our analysis to years for which an immediately succeeding register is available, since it is impossible to attribute an event (a recorded marital birth) to a specific year if a register is missing. In addition to the analysis of all birth intervals we conducted separate analyses on intervals from marriage to first birth and intervals after first birth. When necessary, we show and discuss the results of these separate analyses. In this chapter, however, we present mostly the results of the analysis of all intervals. Only a small number of covariates had significant effects on the interval between marriage and first birth, and the significant covariates for intervals after first birth closely corresponded to the covariates that affected all intervals.

Although a large number of possible covariates are available, we present the results of the most parsimonious models to facilitate clearer interpretation of the results and to avoid repetition. Three covariates (local rice price, household landholding, and a dichotomy indicating whether a woman was in first marriage or remarriage) are always kept in the model for theoretical reasons. Our event-history analysis model has four general groups of covariates: demographic variables, variables related to a woman's current marriage, family and household contexts, and socioeconomic factors.

Demographic characteristics consist of four covariates: women's current age, interval under consideration is after marriage or first birth, time since most recent marriage/birth, and women's age at first birth. The second group of covariates, characteristics of the woman's current marriage, consists of spousal age difference and a dichotomy indicating whether the current marriage is a first marriage or remarriage. The woman's family and household contexts are measured by five covariates: size and sex composition of surviving children, presence of married children, presence of parents, the woman's household relationships, and migration status. All family and household relational variables are specified relative to the index woman. Socioeconomic factors consist of household landholding, local rice prices, time period, and village of residence.

In addition we examine the effects of two bio-demographic factors: the number of children ever observed and the survival of the preceding child. Because of the small household sizes prevalent in the two villages, the number of children ever observed is strongly correlated with variables pertaining to family formation—age at first birth, size and sex composition of surviving children, and presence of married children. We therefore conducted a separate analysis, replacing these family-building variables with the number of children ever observed. We show those results separately, since including the second variable (survival of preceding child and time since the last birth) limits the analysis to women who had at least one birth. Table 10.6 presents the definitions and descriptive statistics of the covariates used in our multivariate analysis. Because the general conceptual framework and specifications of these variables are given in chapter 3, we explain these measures in a summary fashion and give detailed explanations only when covariates are specified differently in this chapter.

Women's current age is a continuous variable between 10 and 49, rather than the five-year age categories used in the standard comparative models because we did not see any threshold in its effect. Since our earlier study found that the effect of a woman's age was curvilinear (Tsuya and Kurosu 1999), we also include the square of current age. Time (in years) since the most recent marriage or birth is included to capture the duration of exposure to risk of conception within marriage. We must include duration of exposure because the discrete-time event-history model employed here does not have a built-in baseline hazard like the Cox proportional hazards model (see chapter 3). To capture the possible curvilinearity in this effect, the square of this variable is also included. The woman's age at first birth is specified as a categorical

Table 10.6
Means and standard deviations for the covariates used in the event-history analysis of marital reproduction in Shimomoriya and Niita, 1716 to 1870

Variable	Mean	Standard deviation
Women's current age	30.296	10.176
Women's age squared	1,021.387	638.407
Interval after marriage	0.259	0.438
Years since preceding marriage/birth	5.663	5.375
Years since marriage/birth squared	60.966	122.662
Woman's age at first birth (refs. 18–19)		
Less than 15	0.014	0.118
15–17	0.242	0.428
20–24	0.298	0.457
25 and above	0.099	0.300
No data	0.109	0.311
Age difference between spouses		
Husband same age or 1–5 years older than wife (ref.)		
Wife is older than husband	0.043	0.203
Husband is older by 6+ years	0.434	0.496
Remarriage	0.140	0.347
Sex composition of surviving children		
At least one son and one daughter alive (ref.)		
No children alive	0.287	0.452
No son, only daughter(s) alive	0.198	0.398
No daughter, only son(s) alive	0.220	0.414
Married child(ren) present	0.200	0.400
Presence of parents		
No parents present (ref.)		
Both parents	0.376	0.484
Only father	0.088	0.283
Only mother	0.147	0.354
Nonkin/servant to household head	0.039	0.194
In-migrated within last 3 years	0.091	0.287
Number of children ever observed (ref. 2)		
Zero	0.260	0.438
One	0.211	0.408
Three	0.164	0.371
Four or more	0.140	0.347
Previous child dead†	0.522	0.500

Table 10.6
(continued)

Variable	Mean	Standard deviation
Household landholding (in *koku*)	12.448	8.086
Log of raw rice price lagged by 1 year	−0.247	0.295
Time period		
1716–59 (ref.)		
1760–99	0.283	0.450
1800–39	0.226	0.418
1840–70	0.144	0.351
Village (Shimomoriya = 1)	0.431	0.495

Note: † indicates restricted to women years in which they had at least one recorded marital birth.

variable because the effect of this covariate is presumed to be nonlinear, and also because ages at first birth are not available from the NAC registers for a considerable number of women.[16] The covariate consists of six categories: under age 15, 15 to 17, 18 to 19, 20 to 24, 25 and higher, and unknown.

Turning to characteristics of a woman's current marriage, age difference between spouses is divided into three categories: wife is older than husband; husband is same age or older by 1 to 5 years; and husband is older by 6 or more years. The model also includes a dichotomous variable indicating whether a woman was in a first marriage or remarriage. Since the disruption of marriages was common in the two villages, it is necessary to control for the effect of marital dissolution.

Size and sex composition of surviving children consists of four categories: no child alive; no son, only daughter(s) alive; no daughter, only son(s) alive; and at least one son and one daughter alive. As shown above, it is highly likely that couples in the two villages practiced sex-selective and parity-specific infanticide. Using this covariate, we further explore the effect of the sex composition of surviving children in a multivariate context and ask whether the effect differs according to the sex of the next birth.

The presence of married children in the household is included to examine whether a child who was ready to assume (or had already assumed) the household headship influenced the likelihood of having a recorded marital birth. Since securing the succession and continuing the family line were two of the major objectives of marriage and the family in Tokugawa agrarian communities, the start of family building

by the next generation is thought to have deterred women from having another child. Couples could have stopped sleeping together once their children were married and presented them the prospect of becoming grandparents. Our earlier study found that the mean age at last recorded birth for women in completed marriages was exceptionally early in the two villages, around 33 years old (Tsuya and Kurosu 1999). We suspected that this early curtailment of reproduction might have been due to local customs that discouraged sexual relations among couples who were grandparents.

The presence of the senior generation is included because evidence from other Tokugawa villages (Skinner 1988) showed that the presence of mother/mother-in-law had a positive fertility effect, suggesting help from the senior generation in child care. The variable has four categories: both parents present, only father present, only mother present, and no parent present.[17] Our analysis also accounts for the effects of a woman's relationship to the household head because reproductive decisions would have been influenced by the position that each woman occupied within her household. In our model the woman's household relationship is a dichotomy indicating whether she was kin or nonkin of the household head.[18] Women's migration status is also a dichotomy, indicating whether a woman had migrated into one of the two villages within the last three years.

Household landholding (*mochidaka* in *koku*) indicates the expected yield of land owned by household.[19] This variable is included to index the socioeconomic status of the household and the economic resources available to its members. Previous studies on other preindustrial farming villages in central and eastern Japan found that household economic resources and wealth, as measured by landholding, were associated positively with marital reproduction (Hayami 1980; Kurosu 2003; Skinner 1987a). The local rice price is also included to measure the effect of short-term economic stress, since reproductive behavior is expected to respond to local economic conditions. The practice of deliberate family control could also have been influenced by local economic conditions, although many existing studies on other Tokugawa Japanese villages suggest that fertility control was not limited to times of economic hardships (Hanley 1977; Hanley and Yamamura 1977: 226–266; Saito 1992a; Skinner 1987a, 1988; Smith 1977: 59–85). This study uses the log of raw rice prices in the local market of Aizu, which are time-lagged by one year.[20] Our earlier study on mortality in our two study villages examined the effects of different rice price series,

using different specifications (Tsuya and Kurosu 2000a). That study found that short-term variations in local economic conditions were best measured by raw prices in the local market. Here we use the logged raw price to facilitate comparisons with other populations. The one-year time lag is introduced because local economic conditions at the time of conception are thought to have had a stronger effect on reproduction than conditions in the year of the child's recorded birth.

We saw in the previous section that there were considerable differences across time in marital fertility in the two villages. Our model includes dummy variables for 1760 to 1799, 1800 to 1839, and 1840 to 1870 with the earliest period 1716 to 1759 as the reference category to account for these differentials. Because the data from two different villages are pooled in our analysis, a dichotomous variable is also included to control for possible fertility variations between the two communities.

Finally, we include two bio-demographic factors: the number of children ever observed and survival status of previous child. The number of children ever observed consists of five categories: zero, one, two, three, and four or more. Since marital fertility was extremely low in the two villages, we had to group women with four or more observed births into one category. Survival status of previous child is measured by a dichotomous variable indicating whether the previous child was dead.[21] This covariate is included to measure the child-replacement effect (Knodel 1982, 1988; see also chapter 3) because couples who lost their previous child through natural death would attempt to "replace" the child by having another birth.

Results

Table 10.7 presents the results of the event-history analysis of the probability of a recorded marital birth of either sex for women aged 10 to 49, and also separately for births of sons and daughters. As expected, the relationship between women's age and the probability of a recorded marital birth is highly significant and curvilinear (reverse J-shape), and this relationship holds for both male and female births. Compared to intervals after the first birth, intervals from marriage to first birth show a significantly higher level of marital reproduction. In our two villages the likelihood of progression from marriage to first birth among all women was around 2.2 to 2.3 times higher than the progression probability from first to later births among women with at least

Table 10.7
Estimated effects (relative risks) of selected individual, household, and community characteristics on the likelihood of a recorded birth in the next year by sex of birth for currently married women aged 10 to 49 in Shimomoriya and Niita, 1716 to 1870

	All births		Male births		Female births	
Variable	Risk	*p*-Value	Risk	*p*-Value	Risk	*p*-Value
Women's current age	1.767	0.000	1.713	0.000	1.716	0.000
Women's age squared	0.990	0.000	0.991	0.000	0.991	0.000
Interval after marriage	2.345	0.000	2.205	0.001	2.296	0.000
Years since preceding marriage/birth	1.386	0.000	1.483	0.000	1.269	0.000
Years since marriage/birth squared	0.977	0.000	0.973	0.000	0.983	0.000
Women's age at first birth[a]						
Less than 15	1.069	0.777	1.014	0.973	1.129	0.425
15–17	1.277	0.000	1.145	0.119	1.392	0.000
18–19	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
20–24	0.587	0.000	0.628	0.000	0.592	0.000
25 and above	0.327	0.000	0.339	0.000	0.384	0.000
Current marriage is remarriage	0.990	0.912	1.030	0.797	0.977	0.829
Age difference between spouses						
Wife is older than husband	1.175	0.175	1.261	0.226	1.047	0.770
Husband is older by 0–5 years	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Husband is older by 6+ years	0.991	0.066	0.889	0.097	0.940	0.399
Sex composition of surviving children						
No children alive	5.231	0.000	3.827	0.000	6.020	0.000
No son, only daughter(s) alive	2.609	0.000	2.670	0.000	2.274	0.000
No daughter, only son(s) alive	2.472	0.000	2.087	0.000	2.706	0.000
At least one son and one daughter alive	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Married child(ren) present	0.742	0.009	0.675	0.010	0.840	0.252
Presence of parents						
Both parents	1.061	0.397	0.968	0.709	1.159	0.114
Only father	1.137	0.205	0.997	0.986	1.281	0.045
Only mother	1.250	0.006	1.117	0.288	1.365	0.004
No parents present	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Nonkin/servant	0.351	0.000	0.393	0.000	0.326	0.000
In-migrated within last 3 years	1.293	0.002	1.491	0.001	1.111	0.380
Household landholding (in *koku*)	1.003	0.440	1.005	0.329	1.001	0.918
Log rice price lagged by 1 year	1.094	0.256	1.168	0.153	1.014	0.900

Table 10.7
(continued)

	All births		Male births		Female births	
Variable	Risk	*p*-Value	Risk	*p*-Value	Risk	*p*-Value
Time period						
1716–59	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
1760–99	0.972	0.651	1.006	0.948	0.942	0.531
1800–39	1.254	0.001	1.241	0.028	1.254	0.012
1840–70	1.428	0.000	1.242	0.055	1.600	0.000
Village (Shimomoriya = 1)	0.899	0.034	0.814	0.004	1.009	0.890
Log likelihood	−5,132.97		−3,370.56		−3,242.40	
Wald chi-squared	896.07		470.00		556.86	
(Degree of freedom)	(27)		(27)		(27)	
Probability > chi-squared	0.000		0.000		0.000	
Number of births	1,982		1,016		966	
Number of observations	16,688		16,688		16,688	

Notes: Unit of observation is a married woman-year recorded in the population register. Estimation of standard errors takes the effects of contribution of more than one observation from same women into account by Huber's formula.
[a] The category of woman's age at first birth unknown is (2,161 observations are) dropped because no women of that category had a recorded marital birth.

one birth. The effect of duration of exposure to risk of conception, as measured by years since most recent marriage/birth, is also found to be highly significant and curvilinear (convex with the highest likelihood around five years after the preceding marriage/birth). This suggests that the interval from marriage to first birth and subsequent birth intervals tended to be long—around five years on average—in the two villages.

The relationship between reproduction and age at first birth is also curvilinear. The probability of having a recorded marital birth was highest for women at age 15 to 17, and decreased at higher ages. If we exclude a very small group (1.4 percent) of women whose ages at first birth were below 15, the effect of a woman's age at first birth was, in general, negative: women who started family building in their twenties had a lower likelihood of a marital birth than women who began their family formation in their upper teens. It may be that the early-starters were more inclined to have a larger family than those who started late, or women whose first birth was over age 24 could have been a select group with lower fecundity. Given that a large majority of women

began their reproductive career in their late teens and early twenties, these late-starters could have been those who failed to marry and have a child at "suitable ages" because they were physically or mentally frail.

Although not significant at the conventional level of 5 percent, the age difference between spouses also affected the probability of marital reproduction. Compared with women whose husbands were at the same age or older by 1 to 5 years, women with husbands 6 or more years older were somewhat less likely to have a recorded birth, especially a male birth. We interpret this finding as suggesting the negative physiological effect of a husband's older age on a couples' reproduction. If the age difference between spouses indexed the conjugal power relationship, a large age difference (i.e., stronger power for husbands) would have been associated with a higher likelihood of a recorded marital birth. This in turn implies that women who had a stronger position relative to their husbands resulting from a relatively small age difference (or being older than their husbands) would have favored a smaller family. But the result is in the opposite direction.

Despite the relatively high likelihood of marital disruption, the probability of reproduction did not differ between first marriage and remarriages. There seem to be two possible explanations for this. First, marital disruption might not have mattered much when couples practiced strong family control. Second, although marital dissolution was frequent, it tended to be followed quickly by remarriage. The negative fertility effect of marital disruption would therefore have been minimal.

The factor with the strongest and most significant effect was the number and sex composition of surviving children. Relative to women who had at least one surviving son and one surviving daughter, women without any surviving child or only children of the same sex were much more likely to have a recorded birth. Somewhat stronger preferences for sons over daughters can also be seen in the higher likelihood of having a recorded birth (of either sex) for women with only daughters than that for women with only sons. The difference is small, however, suggesting that son preference was not strong. We can also confirm, in the multivariate context, the preference for having a daughter first. When women did not have any living children, they were much more likely to have a recorded female birth than a male birth. Even when women had a living son, they seem to have tried to have a girl, as shown by a considerably larger risk for a female birth than for a male birth among women with sons only. Once couples had a girl, however, they were more likely to opt for a boy than for a girl, as shown by a larger risk for a male birth than for a female birth among women with only daughters. Altogether these findings clearly suggest the prevalence of well-calculated family control behavior among couples opting for a sex-balanced offspring set with sons slightly more favored than daughters.

The presence of married children in household significantly reduced the probability of having a male birth recorded. Since securing the family line was one of the ultimate purposes of marriage and the family in Tokugawa agrarian communities, this implies that reproduction was no longer valued after succession of the family line became certain. This result also offers an explanation for the exceptionally early curtailment of family building in the two villages.

The presence of parents mattered too. In particular, the presence of a mother/mother-in-law without a father/father-in-law significantly increased the likelihood of a recorded female birth. This implies that co-resident mothers/mothers-in-law helped women to keep and care for a baby girl. Since the likelihood of a recorded female birth increases significantly in the presence of a mother (without a father) while there is no effect on male births, the senior female generation in a household might have enabled women to avoid the infanticide of a female baby by giving them material and moral support.

Women who were servants or not kin of the household head were much less likely than kin of the head to have a recorded birth of either sex. This is expected, as these women lacked the resources and power needed to have and keep a baby. Childbearing must have been inconvenient and socially inappropriate for female servants or women who were nonkin of the household head, even if they were married.

Compared with women who had resided in the villages for at least three years, women who had recently migrated were much more likely to have a male birth, but not a female birth. Newly migrated women, many of whom moved into the villages because of marriage, would have been more motivated to produce a male heir to secure their position and status in the new environment, their household of marriage as well as in the community.

Net of the other covariates in the model, household landholding did not significantly affect marital reproduction in the two villages. This suggests that women practiced strong family control no matter whether they lived in a wealthy household or in a poor one. The effect of

landholding becomes significant and positive at the 10 percent level, however, when years since preceding marriage/birth (the duration of exposure) is dropped from the model and the number of kin in the household is added (results not shown). The effect of landholding is insignificant when the exposure variable is included because landholding is positively correlated with years since marriage/last birth, which strongly affect marital reproduction. Landholding is correlated with the duration of exposure because wealthy women in the two villages were less likely to experience marital disruption, especially divorce, and also less likely to experience spousal separation due to their husbands' service migration.[22] In other words, wealthier women would have been more likely to have a recorded birth than poorer ones if we did not take into account differences in their duration of exposure.

Variations in local rice prices did not significantly influence marital reproduction. This does not necessarily mean that local economic conditions did not affect marital reproduction. Rather, we interpret this finding as evidence that family control (through infanticide and abortion) was not limited to times of economic and environmental hardship, as previous studies have argued (Hanley 1977; Hanley and Yamamura 1977: 226–266; Saito 1992a; Skinner 1987a, 1988; Smith 1977: 59–85).

We can also see significant temporal differentials in the probability of marital reproduction. Compared to the earliest period of 1716 to 1759, the probability of a recorded birth becomes increasingly higher in the nineteenth century. Increases in the likelihood of having a recorded female birth were especially significant and steady after 1799.

We next look at the effect of the number of children ever observed in a multivariate context. As shown in table 10.8, compared to women with two observed births, women with zero or one observed birth have a significantly lower likelihood of a recorded marital birth. Further the likelihood of a birth is different between women with at least one birth recorded and those without any recorded birth. Women with no observed birth were more likely to have a female birth than a male birth, but after registering one birth, the likelihoods of male and female births were about the same. This confirms that couples would have practiced male-selective infanticide to begin their families with a daughter.

Although there was no significant difference between women with two and those with three recorded births, women with four or more

Table 10.8
Estimated effects (relative risks) of selected individual, household, and community characteristics on the likelihood of a recorded birth in the next year by sex of birth for currently married women aged 10 to 49 in Shimomoriya and Niita, 1716 to 1870

	All births		Male births		Female births	
Variable	Risk	*p*-Value	Risk	*p*-Value	Risk	*p*-Value
Number of children ever observed						
Zero	1.250	0.026	1.008	0.955	1.549	0.000
One	1.328	0.000	1.257	0.018	1.360	0.002
Two	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Three	1.028	0.744	1.059	0.632	0.993	0.957
Four or more	1.308	0.012	1.294	0.100	1.305	0.087
Women's current age	1.371	0.000	1.380	0.000	1.344	0.000
Women's age squared	0.993	0.000	0.993	0.000	0.994	0.000
Years since preceding marriage/birth	1.507	0.000	1.607	0.000	1.374	0.000
Years since marriage/birth squared	0.974	0.000	0.969	0.000	0.979	0.000
Current marriage is remarriage	1.054	0.493	1.090	0.403	1.025	0.806
Age difference between spouses						
Wife is older than husband	1.065	0.627	1.203	0.330	0.924	0.635
Husband is older by 0–5 years	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Husband is older by 6+ years	0.951	0.293	0.930	0.270	0.977	0.737
Presence of parents						
Both parents	1.013	0.827	0.948	0.506	1.085	0.325
Only father	1.007	0.936	0.916	0.510	1.114	0.368
Only mother	1.090	0.249	1.013	0.893	1.170	0.136
No parents	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Nonkin or servant	0.319	0.000	0.359	0.000	0.296	0.000
In-migrated within last 3 years	1.444	0.000	1.646	0.000	1.237	0.075
Household landholding (in *koku*)	1.004	0.291	1.006	0.281	1.002	0.696
Log rice price lagged by 1 year	1.003	0.968	1.076	0.499	0.929	0.514
Time period						
1716–59	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
1760–99	0.963	0.550	1.005	0.954	0.922	0.388
1800–39	1.198	0.007	1.188	0.076	1.198	0.046
1840–70	1.315	0.001	1.161	0.175	1.461	0.000

Table 10.8
(continued)

Variable	All births		Male births		Female births	
	Risk	*p*-Value	Risk	*p*-Value	Risk	*p*-Value
Village (Shimomoriya = 1)	0.947	0.263	0.865	0.034	1.044	0.510
Log likelihood	−5,654.29		−3,593.06		−3,508.41	
Wald chi-squared	557.61		316.45		321.64	
(Degree of freedom)	(22)		(22)		(22)	
Probability > chi-squared	0.000		0.000		0.000	
Number of births	1,982		1,016		966	
Number of observations	18,849		18,849		18,849	

Notes: Unit of observation is a married woman year recorded in the local population (NAC) register. Estimation of standard errors takes the effects of contribution of more than one observation from same women into account by Huber's formula.

births were somewhat *more* likely to have another recorded birth. In view of the prevalence of small families and the evidence of female-selective infanticide among women with one or two surviving daughters (see table 10.5), women with four or more recorded births were probably those who practiced relatively little family control. Put differently, marital reproduction in the two villages was heterogeneous with a majority of women practicing strong sex- and order-selective family control and a minority with relatively little control.

Finally, we look at the effects of the survival status of the preceding child, restricting the analysis to women who had at least one recorded birth. As shown in table 10.9, compared to women whose preceding child was alive, women whose preceding child died were approximately 30 percent more likely to have a recorded birth of either sex. This finding clearly indicates that the death of a child (who did not die by natural causes or infanticide shortly after birth) resulted in a much higher likelihood of a subsequent birth.[23] This in turn implies the strong child-replacement effect caused by the death of a previous child in the two villages.[24]

Conclusion

Marriages in our northeastern farming villages of Shimomoriya and Niita were very early and universal for both women and men. Fertility, especially marital fertility, was very low in these villages. The low level

Table 10.9
Estimated effects (relative risks) of individual, household, and community characteristics on the likelihood of a recorded birth in the next year by sex of birth for currently married women aged 10 to 49 with one or more previous children in Shimomoriya and Niita, 1716 to 1870

Variable	All births		Male births		Female births	
	Risk	*p*-Value	Risk	*p*-Value	Risk	*p*-Value
Preceding child dead	1.282	0.000	1.278	0.000	1.266	0.000
Women's current age	1.378	0.000	1.320	0.000	1.430	0.000
Women's age squared	0.993	0.000	0.994	0.000	0.993	0.000
Years since preceding marriage/birth	1.699	0.000	1.762	0.000	1.564	0.000
Years since marriage/birth squared	0.966	0.000	0.964	0.000	0.971	0.000
Number of children ever observed						
One	1.345	0.000	1.215	0.061	1.457	0.001
Two	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Three	1.013	0.884	1.074	0.562	0.945	0.670
Four or more	1.282	0.031	1.343	0.074	1.195	0.281
Current marriage is remarriage	1.114	0.228	1.256	0.040	0.967	0.788
Age difference between spouses						
Wife is older than husband	1.211	0.186	1.357	0.140	1.049	0.807
Husband is older by 0–5 years	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
Husband is older by 6+ years	0.867	0.020	0.853	0.051	0.893	0.190
In-migrated within last 3 years	1.312	0.089	1.363	0.191	1.241	0.342
Household landholding (in *koku*)	0.998	0.658	0.999	0.910	0.997	0.580
Log rice price lagged by 1 year	0.979	0.824	1.121	0.360	0.833	0.206
Time period						
1716–59	1.000	(ref.)	1.000	(ref.)	1.000	(ref.)
1760–99	0.878	0.108	0.949	0.625	0.810	0.083
1800–39	1.151	0.116	1.106	0.420	1.191	0.132
1840–70	1.245	0.037	1.139	0.352	1.347	0.036
Village (Shimomoriya = 1)	0.804	0.000	0.804	0.007	0.820	0.017
Log likelihood	−3,885.57		−2,536.02		−2,334.42	
Wald chi-squared	470.47		270.76		284.33	
(Degrees of freedom)	(18)		(18)		(18)	
Probability > chi-squared	0.000		0.000		0.000	
Number of births	1,347		719		628	
Number of observations	13,974		13,974		13,974	

Notes: Unit of observation is a married woman year recorded in the local population (NAC) register. Estimation of standard errors takes the effects of contribution of more than one observation from same women into account by Huber's formula.

of marital fertility resulted in part from moderate parity-specific control (stopping) but also from very long birth intervals due probably to such factors as spacing and spousal separations. These findings suggest active human agency in reproductive processes in the two northeastern Japanese villages, namely the prevalence of deliberate family control, both parity specific and independent of ultimate family size.

Our analysis of the sex ratio of births by number and sex composition of surviving children further revealed how human agency shaped reproductive patterns through the widespread and sophisticated use of sex- and parity-specific infanticide to achieve a relatively small family size with a sex-balanced (and possibly a sex-ordered) offspring set. Couples seem to have preferred to have a daughter as their first child. Once they had a girl, however, they opted to have a boy or two. If they did not have a son after having two (or more) daughters, they were highly likely to have a son as their next child. However, the proportion of couples who had achieved this ideal offspring set was small (around 6 percent) because of frequency of marital dissolution, temporary spousal separation due to labor migration, and infant and child deaths. The results of our multivariate analysis also confirmed the overwhelming and complex effects of number and sex composition of surviving children on marital reproduction. These strong family-controlling effects account, at least in part, for very low marital reproduction in the two villages.

The negative effect of the presence of married children shows yet another way that human agency affected reproduction. This is probably the major reason for the unusually early stopping of reproduction in these two farming villages. The need to have a child for the continuation of the family line was greatly diminished, if not completely gone, once a child was married. On the other hand, the strong enhancing effect of previous child's death on women's subsequent reproduction again suggests the active role of human agency in reproductive processes. When couples lost their child through natural death, they clearly sought to compensate the dead child by having another child quickly.

The lack of significant effects of landholding and local rice price variations implies that couples in wealthy and poor households alike practiced strong family control not only in bad times but also in good times. Although the reasons for family control would have been different according to local economic conditions, such control was clearly not limited to bad times.

The significant effects of a woman's household relationship and her migration status show that her position and resources within the household and in the community affected reproduction, thus affirming again the role of human agency. Nonkin and servants were much less likely to have a recorded marital birth than women who were kin of the household head. On the other hand, women who had recently migrated into the village were more likely to have a recorded birth, especially a male birth. Reproduction therefore served to solidify a woman's status within the household and in the community.

A large majority of couples in our two northeastern Japanese villages practiced strong family control to maintain the standard of living of their families and households. They tightly controlled the number and sex composition of their offspring as well as the pace of family building. By limiting their family size and spacing their children, they attempted to minimize the economic burden of a large number of dependent children. At the same time, by controlling the sex balance, sex order, and birth timing of their offspring, they sought to maximize the prospect of household succession and continuation of the family line while trying to increase the well-being of their surviving offspring. Our study revealed the complex and intricate nature of reproductive patterns and mechanisms in preindustrial farming villages in the Japanese past.

Notes

We thank Akira Hayami and Saeko Narimatsu for making the original records available, Mikako Sawayama for providing information on child care practices in Tokugawa Japan, and Yoshihiko Ono and Hideki Nakazato for their assistance at the earlier stages of constructing the data file.

1. The term "family limitation" refers to one type of family control, namely parity-dependent control of marital fertility, while the term "family control" refers to all forms of marital fertility control, including birth spacing and spousal separation.

2. The parameter m indicates the degree of parity-specific (more correctly, age-specific) control of marital fertility, and M, a scale factor, measures the level of marital fertility relative to the "standard" derived from the natural fertility schedule (Coale and Trussell 1974, 1978a, 1978b).

3. Japan experienced a number of famines and crop failures in the eighteenth and nineteenth centuries (Saito 2002). Of these, the Kyoho (1732–1733), Tenmei (1783–1787), and Tempo (1836–1838) famines, named after imperial reign years, are known as the three major famines in the Tokugawa era. The Tenmei famine had especially devastating effects on the northeastern region. The region also experienced a smaller but nevertheless serious famine in 1755 known as the Horeki famine.

4. According to Smith (1959: 87–107), Japanese agriculture underwent notable technological changes between 1600 and 1850. However, these changes were not mechanical or hardly the results of innovations. Rather, they mostly resulted from the spread of known agricultural techniques.

5. The years for which NAC records are missing are 1720, 1729, 1846, 1850, 1858, and 1864–1867 for Shimomoriya; they are 1742, 1758, 1796, and 1857–1858 for Niita.

6. Age listed in the registers is based on the traditional Japanese method of counting age. As in the rest of East Asia, it regards a child as age 1 at birth and adds an additional year on each New Year's Day thereafter. Consequently, if counted by the traditional Japanese method, most newborns, if they survived, appear in population registers at the age of 2 *sai*. If population registration was conducted on each New Year's Day, traditional Japanese age (in *sai*) minus 1 equals to their NAC age. For women whose births were not recorded in the registers, NAC age was estimated by adjusting the timing of registration, since the registration was conducted at the beginning of the third lunar month in the two villages.

7. In Shimomoriya and Niita, recorded births born out of wedlock were extremely rare, less than 1 percent of observed births (Tsuya and Kurosu 1998).

8. Unlike marriages in Western parish registers, marriages in the Tokugawa Japanese population registers were not necessarily recorded as the events occurred. Rather, marriages in the Japanese registers were recognized when changes in marital and household relationships of household members were annotated. For details, see Kurosu, Tsuya, and Hamano (1999).

9. We employ a less conservative definition of first marriage than usual: if marriages were observed for the first time for individuals who first appeared in the registers under age 50 with no spouse and no children, they were considered as "first" marriages.

10. "Surviving" children are defined as offspring of an index woman who were alive and co-residing in the woman's household, or children whose deaths were not recorded in the register at the beginning of the year even if they were not living with their mothers. This definition may have resulted in an undercount (omission) of older children (especially daughters) who emigrated from the village permanently (due mainly to marriage), because once a child's legal domicile was removed from the village, there was no way to trace their survival status. However, since we are looking at women in reproductive ages and women in the two villages stopped childbearing at relatively young ages, the frequency of such omissions is thought to be low.

11. Other explanations, such as sex-selective child neglect, are also possible. Further, because male infants tend to be physiologically more vulnerable than female infants, boys could have suffered a much higher fatality rate than girls especially under the care of young and inexperienced mothers.

12. Service (*hoko*) refers to all forms of contract labor lasting any duration of time longer than six months. Short-term employment or daily wage labor was not included in service (Nagata 2001; Tsuya 2000).

13. Based on life tables assuming that the male infant mortality rate was 0.2, approximately 57 percent of male births are estimated to have survived to age 10 in the two villages.

14. We use a series of generalized linear models based on binomial distributions with the complementary log-log link function to obtain results comparable to continuous-time

15. The one-year time lag for the husband is due to the assumption that given the gestation period of approximately nine months, a woman can be at risk of giving birth as long as her husband was present at the previous enumeration.

16. We also tested using a woman's age at first marriage as a covariate in the model. However, this covariate was highly correlated with woman's age at first birth, and the latter was found to be more significant. Our model therefore employs age at first birth, rather than age at first marriage.

17. We also tested the effects of household structure. Given the relatively small household sizes and simple household structures (either nuclear or stem households) prevalent in the two villages, however, this variable is strongly correlated with the presence of parents in the household. We tested these two covariates separately and decided to employ the presence of parents, since this covariate was statistically more powerful and theoretically more interesting.

18. We also estimated the model by dividing this covariate into six categories: household head, head's wife, stem kin, spouse of stem kin, non–stem kin, and nonkin or servant. When all birth intervals were pooled, however, our analysis showed that there was no significant statistical difference in the likelihood of a birth by women's household relationships, except between women with kinship to the head and nonkin/servants.

19. One *koku* equals approximately five bushels.

20. Aizu domain was adjacent to Nihonmatsu domain, and the domain capital of Aizu was just 40 kilometers to the west of the domain capital of Nihonmatsu. Since the rice price series in Nihonmatsu are not available, we use rice prices in Aizu.

21. We specify this variable as a dichotomy, by grouping all previous child deaths as one category regardless of time since last birth. This grouping was necessary because previous child dead and time since last birth being less than two years, which consisted only 6 percent of women's married reproductive years, was strongly correlated with a number of variables in the model, namely years since preceding birth, the number of children ever observed, and women's migration status.

22. For the negative effect of landholding on the probability of divorce, see Kurosu (2004a). For the negative effect of landholding on men's service migration, see Tsuya (2000).

23. Almost all children whose births and deaths were recorded in population registers are thought to have died of natural causes. Infanticide in Tokugawa Japan was practiced almost exclusively on newborn babies, who were killed immediately after birth. Thus victims of infanticide were never recorded in the registers. For details, see chapter 6.

24. We also tried to specify this covariate differently as a composite variable consisted of (1) preceding child dead, (2) previous child alive and less than two years since previous birth, and (3) preceding child alive and two or more years since last birth. The result showed that compared to women whose preceding child was dead, women with a surviving child born within last two years were much less likely to have a recorded birth of either sex. Women whose preceding child was alive but more than two years old were also somewhat less likely to have a birth (especially a female birth) recorded, but the effect was smaller and less significant. These findings suggest the fertility-inhibiting effect of breast-feeding.