

## Conclusion

Was Tokugawa society in the first half of the nineteenth century a model of Malthusian misery resulting from the positive check of mortality on population growth? Or was it a model of Malthusian vice, with the draconian preventive checks of abortion and infanticide keeping population numbers down and so providing a basis for economic growth? Does it in fact make a difference? Abortion and infanticide are hardly happy alternatives to epidemic and famine, and it is not difficult to find evidence of exploitation in either case. Nonetheless, a society that consciously limits population growth by abortion and infanticide—taking the dirty work on itself, as it were, rather than leaving it to nature—is undeniably different from a society that does not. It is hardly likely that the difference is insignificant.

The quantitative methods used in recent years to address such questions take agricultural commodity prices as indicators of food supply and look for statistical relationships between short-term fluctuations in prices, birth rates, and death rates. Rising death rates following a rise in prices, and falling death rates following a fall in prices, suggest the operation of a positive check. Falling birth rates following a rise in prices, and rising birth rates following a fall in prices, indicate a preventive check.

By this standard, we have found what appears to be powerful evidence of a preventive check, and this in turn tends to support the newer, progressive development view of late Tokugawa society. We have seen, however, that the estimated birth rate series might in fact be influenced by fluctuations in natural infant mortality (infant mortality exclusive of infanticide). Thus the observed correlation between prices and birth rates might really be a correlation between prices and (natural) infant mortality rates. This would indicate the operation of a positive check, which would be consistent with the older view of a society straining against the limits of subsistence. We are inclined against this possibility, on the grounds of the similarity of our results to those for many European countries, whose birth rate series are (probably) not subject to the same problems as those for Japan, but this is clearly not decisive.

It is perhaps worth noting, not just in self-defense, but for a realistic appreciation of the difficulty, that the prospects for resolving this particular statistical dilemma are poor. Resolution depends on knowing annual infant mortality rates during the Tokugawa era, and on this matter the *shumon cho* registers, the principal contemporary sources, are necessarily silent because they record only surviving children.<sup>42</sup> There are of course other possibilities, including the *kakocho* death registers and the *kainin-kakiagecho* pregnancy registers, but it is nonetheless our expectation that estimates of annual fluctuations in infant mortality rates will be difficult to come by.<sup>42</sup>

A more profound puzzle, and one probably more subject to eventual solution, is the smallness of the effects in question. This is not the place to enter into a discussion of the level of birth rates in late Tokugawa, but a figure in the low 30s is likely to be better than a figure in the low 40s.<sup>43</sup> We have found a very systematic response of birth rates to rice prices, but the typical effect is a change of some five per cent in the birth rate. This would bring a value of 32.0 births per thousand women, say, up to 33.6 per thousand or down to 30.4 per thousand. But if changing rice prices explain why the birth rate moves up and down by a few points in the low 30s range, what explains why it is in the low 30s rather than in the low 40s? Natural infant mortality cannot explain this level effect, and a truly extraordinary incidence of abortion and infanticide would be required to account for it. Late and non-marriage are more likely candidates, but the indications here are inconsistent.~ And if the preventive check of marriage operated to keep fertility low and population within the limits of subsistence, why was the check represented by the rice price-birth rate relation necessary?

However these matters turn out, we have conclusive evidence of a correlation between short-term fluctuations in rice prices and fertility. Uemura's results for Japan as a whole have been confirmed by our analysis of data for 13 provinces spread throughout the country. Saga stands out

clearly as an exception, but for the remaining 12 prefectures, we find that a rise (fall) of 10 per cent in rice prices in one year tends to be followed by a fall (rise) of about 1.2 per cent in fertility in the following year, with strong statistical significance.

These results bear remarkable similarities to those for the nine European cases assembled by Galloway.<sup>45</sup> The magnitude of the fluctuations in the Japanese rice price series is somewhat smaller than for the European series, the magnitude of the crude birth rate fluctuations somewhat greater. The estimated effects of prices on birth rates are congruent, being somewhat stronger for Japan than for Europe.~

An important ancillary conclusion concerns the accuracy of both the Iwahashi price series and the 1886 age data. The rice price series are based on contemporary local records, the birth rate series on the 1886 age distributions. Since there is no conceivable way in which errors in these two series could be correlated, the errors tend to obscure any relationship between them. The clarity with which the relationship is observed thus testifies to the accuracy of both series. This is particularly significant for the age data, where the fluctuations are much smaller, because the Meiji data have been so little regarded by Japanese demographers. That we should be able to discern a correlation involving movements of only a few percentage points in these numbers indicates age reporting far more accurate than we would otherwise have had any reason to expect. Hayami's characterization of these data as "a hitherto undiscovered Treasure Island awaiting exploitation" ~ is fully supported.<sup>48</sup>

It has been several decades now since quantitative approaches began to make an appearance in studies of Tokugawa society, and the results have perhaps not always met early hopes and expectations. Totman has observed acutely that "numbers measure outcomes but can only impute intent."<sup>49</sup> Imputing intent at the societal level is problematic by any means, however, and the challenge of good quantitative work is precisely to find the particular quantities that make the inference compelling. The coming decades promise a veritable explosion of new quantitative data on Tokugawa society. Though these data have certain inherent defects by conventional demographic standards, they are in other ways enormously more valuable, and the richly textured empirical work of Skinner gives a sense of how they may be exploited.<sup>50</sup> We think exciting times lie ahead, and with respect to the difficulties of making quantitative studies speak to the major issues, we suggest that, as Robert Frost once put it, "the only way out is through."

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38. Hanley and Yamamura, *Economic and Demographic Change*. Chapter 9 and *passim*.

39. Gosta Carlsson, "Nineteenth-century fertility oscillations," *Population Studies*, Vol. 24 (1970), pp. 413—22. Once the argument is understood, the conclusion is immediate from Figure 2, p. 417.

40. The distribution of intervals between marriage and first birth in Tokugawa Japan may be exceptionally concentrated because of a tendency to record marriages only upon the conception of a child, but this would not effect the smoothing effect of higher order births.

41. On the shumon cho registers, see Hanley and Yamamura. *Economic and Demographic Change*. *passim*; Smith, Nakahara, Chapter 2; and L. L. Cornell and Hayami Akira, "The Shumon Aratame Cho: Japan's Population Registers," *Journal of Family History*, Vol. II, No.4(1986), pp. 311—28.

42. On the kakocho death registers, see Arne Kalland and Jon Pederson, "Famine and Population in Fukuoka Domain During the Tokugawa Era," *Journal of Japanese Studies*, Vol. 10. No. 1 (1984), pp. 31—72, and Ann Bowman Janetta, *Epidemics and Mortality in Early Modern Japan* (Princeton: Princeton University Press, 1987). On the kainin-kakiagecho pregnancy registers see Kito, *Nihon nisennen nojinkoshi*.

43. The median values of our estimated crude birth rate series for the 80-year period 1807-86 typically give values of 31 or 32 per thousand. For other indications see Hanley and Yamamura, *Economic and Demographic Change*, Chapter 8, and Smith, Nakahara, Chapter 5.

44. Hanley and Yamamura, *Economic and Demographic Change*, present evidence of massive fertility

impact of marriage patterns, Chapter 9 and *passim*. Studies of other areas have shown little evidence at least of non-marriage, however. See Laurel L. Cornell, "Why Are There No Spinsters in Japan'?" *Journal of Family History*, Vol. 9, No. 4 (1984), pp. 326—39. Contemporary census data on marital status leave no doubt that marriage was virtually universal among females during the last several decades of the nineteenth century, as shown in Griffith Feeney and Yasuhiko Saito, "Progression to First Marriage in Japan: 1870—1980," NUPRI Research Paper Series No. 24 (Tokyo: Nihon University Population Research Institute, 1985), pp. 2—5.

45. Galloway, "Basic Patterns." 30 *Journal of Japanese Studies*.

46. *Ibid.*, Table 1, lower panel. The comparison may be made using the coefficient of variation (standard deviation divided by mean) of the detrended series. The median value for Galloway's nine European grain price series is 0.23; the median value for the 13 Iwahashi rice price series is 0.18. The median value of Galloway's nine crude birth rates series is 0.044; the median for our 13 crude birth rate series is 0.053. The median value of the tag one coefficients for Galloway's nine cases (his Appendix Table I) is 0.079; the median of the 13 lag one coefficients in Table 7 is 0.120.

47. Hayami, "Population Changes," p. 284.

48. It should perhaps be pointed out that these remarks apply only to the accuracy of age reporting. Underenumeration of the population is another matter. While underenumeration may vary from one age to the next, it will change very little from one single year to the next, and hence leave year-to-year fluctuations unaffected.

49. Totman, "Win, Lose, or Draw?" p.462.

50. Skinner, "Infanticide and Reproductive Strategies." *passim*.