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period when they gave birth, sex selection by ultrasound became common. Could the famine refugees have resorted to sex selection less readily than economic migrants? Then the sex ratio effect would be behavioral and not biological.

Although I have raised a number of questions about the internal and external validity of this study, I doubt that any of these possible distortions would matter enough to affect the outcome. The evidence in figure 9.5 is quite strong, and overall I actually find the evidence in this excellent study persuasive.

Reference

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Comment   Naohiro Ogawa

Almond, Edlund, Li, and Zhang have written an intellectually stimulating chapter, estimating the long-term effects of the 1959 to 1961 Chinese famine on those born during that time. By heavily drawing upon a micro-level data set derived from the 2000 China Census (1 percent sample), the authors have successfully shown a major impact of maternal malnutrition upon these cohorts: reduced sex ratio (males to females) at birth in two generations. In addition, they have found that famine survivors, compared with other intact birth cohorts, showed a higher probability of (a) suffering from an impaired literacy; (b) staying out of the workforce; (c) relying upon their family members as dependents; and (d) living in a smaller house.

In their quantitative analysis, Almond and his associates have utilized the following two measures of famine intensity: death rates and average month of birth. In the case of the former, data on the all-age death rate in twenty-nine out of thirty-one provinces was used as a base. The weighted average of the death rate in the province of birth for the duration of the fetal period was calculated for each individual, and this variable was labeled as wdr_{jt}. Then, by collapsing this weighted death rate by month of birth, the authors created another predictor, namely, awdr_{jt}, which represents a population-weighted national average for each month and year.

Because of the lack of relevant information representing the level of famine intensity facing each person's household or his or her community, the

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authors used the crude death rate for the province of his or her birth as a proxy. It should be emphasized, however, that this approximation by the province-level data could present a few statistical difficulties. First of all, the crude death rates are directly affected by age-structural transformations. It is easily conceivable that, owing to regional differences in fertility and mortality, the age structures differed not only between provinces but also between regions within each province to a pronounced extent. In addition, it is also presumable that the famine generated differential impacts upon various age groups in the sampled provinces. For these reasons the age-standardized death rates could be substantially different from the crude death rates employed in the present study. In other words, first, variations in the variable wdr_{jt} are likely to capture changes in various factors other than the incidence of death due to malnutrition. Second, many of China's provinces are quite vast, so that climatic and geographical variations within each province are likely to be considerable, which suggests a high probability that the intensity of malnutrition varied markedly within each province. Third, but not as crucial as the first two points, according to the study by Painter, Roseboom, and Bleker (2005), poor nutrition in early-to mid-pregnancy has the most deleterious effect on health. Following this finding, the authors could have introduced an additional statistical adjustment (e.g., heavy weights in the first half of the pregnancy period and lower weights in the second half) in computing the value of wdr_{jt}. Because of these statistical limitations to the values of wdr_{jt} (and awdr_{jt}), caution needs to be exercised in interpreting the computed results presented in this chapter.

This study also indicates that those who managed to survive the risks generated by the 1959 to 1961 famine showed a higher probability of being disadvantaged in terms of education, labor force participation, and wealth accumulation. However, it is plausible that a great proportion of the population belonging to these cohorts who were healthy and well-educated were able to enjoy the economic advantages of their small cohort size, particularly in the form of relative wages at the labor market, just as was the case of baby boomers and baby busters in some industrialized countries such as Japan (Martin and Ogawa 1988). It would be interesting to see if such positive cohort size effects on the majority of these special cohorts born during the period in question could be examined by expanding the scope of the data set the authors have compiled. If such positive cohort size effects proved to be present, the income disparity among the famine-stricken cohorts could be more serious than among cohorts free from the influence of the famine.

The nexus between maternal nutrition and the sex ratio at birth is still important in some parts of the contemporary world. A recent study on Ethiopia, undertaken by Mace and Eardley (2004), is a salient example. In the case of East Asia, judging from its recent serious food shortage, North Korea might be an interesting country for researchers to test the presence of such a linkage. Moreover, in twentieth century East Asia, not only China but

other countries as well could provide a number of interesting phenomena to be statistically researched, following a similar line of interest as that found in the study conducted by Almond and his group. In Japan, for instance, the problems of anorexia and bulimia have been serious over the past few decades. Attention should be drawn to the findings derived from one of the recent studies focusing on Norwegian women; this study has shown that maternal eating disorders may influence offspring's sex and that the direction of the effect may vary by eating disorder subtype (Bulik et al. 2008). To date, however, the impact of eating disorders on the sex ratio at birth still remains unexplored in Japan, although Japan's sex ratio at birth has been on a downward trend since 1966, the "year of fire horse."[1] The sex ratio at birth was 107.6 in 1966, but it declined slowly to 105.6 by 1985. Although the effect of the year of fire horse on the sex ratio at birth should have lasted for only one year or its adjacent years, the sex ratio continued decreasing while still remaining at a relatively high level for a long time. Since the mid-1980s, however, the ratio has been oscillating around 105.5—a level observed back in the 1950s. Furthermore, sex selection by ultrasound has never been a common practice in Japan. How, then, can we account for these changes in the sex ratio over time in postwar Japan? It is an academically interesting topic to be investigated by researchers. In any case, the study undertaken by Almond and his associates appears to provide an instructive base for developing proper analytical and statistical approaches to be applied to such future research in Japan.

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1. According to a long-standing Japanese superstition, a girl born in this particular year is destined to have an unhappy life and kill her husband if she marries. This (for girls) ominous year comes around every sixty years. For further analysis, see Hodge and Ogawa (1991).