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Son-biased sex ratios in 2010 US Census and 2011–2013 US natality data☆

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ABSTRACT

If gender bias is receding, demographic manifestations of son preference should also tend to decrease. The sex composition of US children provides a key barometer of gender preference. In the 2010 US Population Census, Chinese and Asian-Indian families are more likely to have a son after a daughter, consistent with previous research. Korean-American families, by contrast, do not show this same pattern, paralleling recent declines in sex selection observed for South Korea. Non-Hispanic White families have sex ratios within the range of the biologically norm regardless of the sex composition of previous children. We corroborate the 2010 Census data with 2011–2013 birth certificate microdata, which likewise show elevated sex ratios for Chinese and Asian Indians at higher birth orders.

1. Introduction

Six states adopted bans on sex selective abortion 2012–2014 (Rebouche, 2015). Debate over state laws and the federal Prenatal Non-Discrimination Act routinely references Almond and Edlund (2008). We update Almond and Edlund (2008) with the universe of 2010 US Census records, yielding 41 times the sample size of Asian-Americans as in Almond and Edlund (2008). To our knowledge, our analysis is the first Special Tabulation of the 2010 microdata by academic researchers and the largest population census ever analyzed to consider the sex composition of children (Yi et al. (1993) analyzed a 10% China Census sample and Almond and Edlund (2008) a 5% sample of the 2000 US Census).

The 2010 Population Census provides 309 million responses to ten "short form" questions, including race, ethnicity, sex, age, and family relationship in 116 million Census households. We focus on the subset of husband-wife households with young "biological" children as of the Census enumeration date: April 1, 2010. We define Asian-American families as those where both parents are of Chinese, Korean, or Asian-Indian race (please see data appendix for additional details).

We also consider subsequent data on sex ratios at birth available from the universe of birth certificate records, as collected by the National Center for Health Statistics.

2. Results

Among Chinese, Korean, or Asian Indian families in the 2010 Census, the sex ratio of the first child was 1.05, rising to 1.08, 1.30, and 1.44 for the second, third, and fourth child if there was no older brother. Sibling sex ratios were closer to the biological norm of 1.04–1.06 in Asian American families who already had at least one previous male child. These sex ratios follow the same basic pattern described by Almond and Edlund (2008). The magnitudes in Almond and Edlund (2008) were larger at second and third parity: 1.17 and 1.51 (respectively) if there was no previous son (fourth children were not considered for 2000 due to small sample sizes). Because of the 5% sample size for 2000, estimates are less precise: 95% confidence intervals run 1.09–1.25 and 1.21–1.89 for the second and third child, respectively.

For the subgroup of Chinese and Asian-Indian families, both show a tendency to sex-select boys. Among 149,345 Chinese-American families, the sex ratio of the first child was 1.06, rising to 1.08, 1.33, and 1.65 for the second, third, and fourth child if there was no older brother (see Fig. 1, purple bars). Among 257,085 Indian-American families, the sex ratio of the first child was 1.04, rising to 1.08, 1.43, and 1.39 for the second, third, and fourth child if

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there was no older brother (Fig. 2). By departing from the norm of 1.04–1.06, both groups show a tendency of high sex ratios in the absence of a previous daughter, consistent with the pattern documented in the 2000 US Census. Consistent with US census Bureau practice, we do not report confidence intervals for the universal 2010 data because our analysis of them is descriptive and does not invoke unobserved potential outcomes that arise conceptually when considering causal effects in universal data (Abadie, Athey, Imbens, and Wooldridge, 2014) (The confidence intervals reported in Almond and Edlund, 2008 are appropriate giveaan their analysis of a 5% random sample.)

White sex ratios, by contrast, do not increase following daughters (see Fig. 3), but instead reveal a slight tendency to repeat sex (Renkonen et al. (1962); Almond and Edlund (2008)), which has been interpreted as an underlying biological tendency, albeit modest. The tendency to repeat girls is somewhat stronger than the tendency to repeat boys.

Among 62,210 Korean-American families, the tendency for boys to follow girls is absent. The sex ratio among second Korean children is 1.04 after a first daughter and 1.07 after a son (see Fig. 4). For the third child, the sex ratio after two daughters falls to 1.02, and rises to 1.08 after two sons, with the sex ratio after a gender mix falling in between. This pattern appears to be similar to the "biological" one exhibited among US Whites, who likewise tend to repeat child sex (Renkonen et al., 1962).

The pattern for Korean Americans is perhaps surprising given earlier findings of sex selection in South Korea (Park and Cho, 1995) and Almond and Edlund (2008), albeit aggregated across Korean, Chinese, and Asian Indian subgroups for the US. To consider Koreans separately, we reanalyze the 2000 Census data and replicate Almond and Edlund (2008)'s estimates for the group "Asian Americans". Next, we separate Korean-Americans, finding a 1.07 sex ratio for the first child, which increases to 1.12 and 1.46 for the second and third child, respectively (absent a previous son). However, these 2000 sex ratios are based on 548 records for the second birth following girl and just 69 records for the third birth following two girls, and thus cannot be distinguished statistically from normal sex ratios. The "normal" sex ratios we find for Koreans in 2010 are based on 18,960 records (second children after a girl) and 1775 records (third children born after two girls).

The divergent pattern among Koreans in 2010 thus contributes to an attenuation of the "overall" sex selection pattern relative to 2000 (Korean-Americans account for roughly 14% of Korean-, Asian-Indian-, and Chinese-American children in our 2010 Census data). That said, the qualitative pattern among Chinese, Korean, and Asian Indians persists in 2010: heightened sex ratios in the absence of a previous son.

More recent data from all US birth certificate records likewise reveal higher sex ratios at higher parities among Asian Americans. Natality microdata are produced by the National Vital Statistics System of the National Center for Health Statistics and are derived from birth certificates filed with each US State and the District of Columbia. (These data are publicly available at: http://www.nber.org/data/vital-statistics-natality-data.html.) For 2011–2013, there were 288,669 singleton births to Chinese, Korean, and Asian Indian parents (unfortunately, siblings are not matched in the natality data so sibling sex composition goes unobserved). Nevertheless, these data are preferred; administrative measures of the sex ratio that readily inform whether the "net" effects of sex preference are pro-male. In these data, the first two live births had sex ratios of 1.06–1.08, climbing to 1.15 and 1.16 for the third and fourth births, respectively. The net male bias is similar (though more recent than) the 2010 Census. For example, the *unconditional* third child sex ratio in the 2010 Census among Chinese, Korean, and Asian Indians was 1.14 (cf. 1.15 in the natality data). While sex selective abortions are not reported in the birth certificate data, 1.4% of Asian births 2011–2013 reported using assisted reproductive technology (ART) to achieve the pregnancy.s These ART births yielded a sex ratio of 1.13 among Chinese, Korean, and Asian Indians, compared to 1.0% ART use for non-Hispanic Whites, yielding a normal sex ratio of 1.04. Dropping multiple births yields a similar pattern: the sex ratio among Chinese, Korean, and Asian Indian singleton deliveries that report ART use is 1.16 *versus* 1.06 for non-Hispanic Whites.

3. Discussion

We find that some Chinese and Asian Indians in the US appear to pursue sex-selection of boys, consistent with Almond and Edlund (2008). Koreans, by contrast, show a sibling sex composition more similar to Whites in 2010. Likewise, sex ratios have fallen in South Korea due to "normative changes across society" (Chung and Das Gupta, 2007). To the extent that this development is mirrored by the sibling sex composition of Korean-American children in 2010, this serves to attenuate the sex composition pattern among Asian Americans. That said, Korean-American sex ratios appear elevated for the first birth: 1.08 in 2010 Census.

Turning to US public policy, six states adopted bans on sex selective abortion in 2012–2014 (Rebouche, 2015). Unfortunately, the Census data do not report mechanisms of sex selection. Advances in noninvasive prenatal testing (Morain et al., 2013) will allow earlier sex determination at modest cost and potentially without knowledge of the physician. Distinguishing between sanctioned *versus* unsanctioned private motivations for abortion is difficult absent a "more intrusive state mechanism for assessing truthfulness" (Rebouche, 2015). Pre-implantation sex-selection technologies allow sex choice without abortion. Invoking sex selection to justify US abortion bans, while politically convenient, skirts the underlying causes of son preference.

We close by discussing data accessibility. The Census Special Tabulation Program enables researchers to query the underlying "short form" microdata with the assistance of Census Bureau staff (without which this analysis would not have been possible). Agencies of the federal government are the primary users of the Special Tabulation program. External researchers can access these data indirectly for a fee, but the process can be laborious and uptake is low. While the American Community Survey provides a much more detailed survey instrument, it samples just 1% of the US population in a given year. The fact we have found no academic publications using full 2010 microdata raises the question whether disseminating "short form" decennial datasets through an organization such as IPUMS at the University of Minnesota might enable additional research.

Data appendix

As of the April 1, 2010 enumeration date, the US Population was 308, 745, 538 persons living in 116,716,292 Households. 86,489,691 valid short form questionnaires were returned by mail, 1 with the balance of Households canvassed by the US Census Bureau (see http://www.census.gov/2010census/pdf/2010_Census_Mail_Response_Return_Rates_Assessment.pdf, accessed June 9, 2015). "Husband-wife" families accounted for 56,510,377 households, of whom 41.7% (30.0 million) had an "own" child under age 18.2 (see http://www.census.gov/prod/cen2010/cph-1-1.pdf, accessed June 9, 2015).

Definitions and sample restrictions

Geography: U.S. (not including Puerto Rico) Universe: The following criteria must be met –