

On the Short and Long Run Effects of Male-Biased Sex Ratios: Evidence from Convict Transportation to Australia

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Despite significant improvements in the last century, gender disparities persist. In the workplace, women continue to work less, earn less, and are less likely to reach positions of leadership. At home, women still do most of the housework and remain the primary caregivers. Gender disparities manifest themselves even more severely in regions where heavily male-biased sex ratios prevail, such as China and India where an estimated 80 million women are missing today. This chapter traces present-day gender roles back to the marriage market conditions that prevailed in the past and shows the impact of male-biased sex ratios. In particular, we show that the effects of male-biased sex ratios in 19th century Australia have persisted until today, well after sex ratios have reverted back to normal. A surplus of males in the past has shaped cultural attitudes towards gender roles, and still affects labour supply decisions, occupations, and marital satisfaction, but in ways that are not necessarily negative for –all– women.

Introduction

There are an estimated 100 million women missing in the world today, 80 million in China and India alone, due to sex-selective abortion and differential gender mortality (Hesketh and Xing 2006). An important question is how male-biased sex ratios will further affect female outcomes, and whether these effects will persist in the long run. Biased local sex ratios can have a variety of effects on marriage markets, relationship outcomes and on labour supply decisions (Becker 1973, 1974). These effects could persist in the long run, even after the imbalance itself is corrected. Indeed, as is shown repeatedly in this publication, behaviours shaped by short run factors can become practices that persist in the long run. For example, the Neolithic revolution and the use of plough cultivation still influence gender roles and female outcomes today (Alesina *et al.* 2011, 2013, Hansen *et al.* 2015).

Answering the question of how male-biased sex ratios will affect the relative welfare of men and women is very difficult. Male-biased sex ratios are generally the product of poorer opportunities for women (Qian 2008, Carranza 2014) and of cultural preferences for sons (Almond *et al.* 2013). The employment opportunities of women are limited in many economies that place a high premium on physical strength, for example because of specialisation in agriculture or other extractive industries (Chung and Das Gupta 2007). In other cases, where only sons are able to carry the family name (Hesketh and Xing 2006), or where there is a financial burden imposed by the payment of a dowry upon a daughter's marriage (Rao 1993), this can lead to cultural preferences for having a son. Be it driven by economic or cultural factors, a lower value placed upon having daughters can lead to sex-selective abortion and female infanticide (Qian 2008, Almond *et al.* 2013). In these contexts, it is impossible to know for certain whether worse female outcomes are the cause of male-biased sex ratios, or their consequence. The ideal natural experiment would consist of placing a larger number of men than women on an isolated island, with these men and women

being of a similar cultural background and operating in the same institutional environment, and then observe female outcomes from that point on.

Convict transportation to Australia and male-biased sex ratios

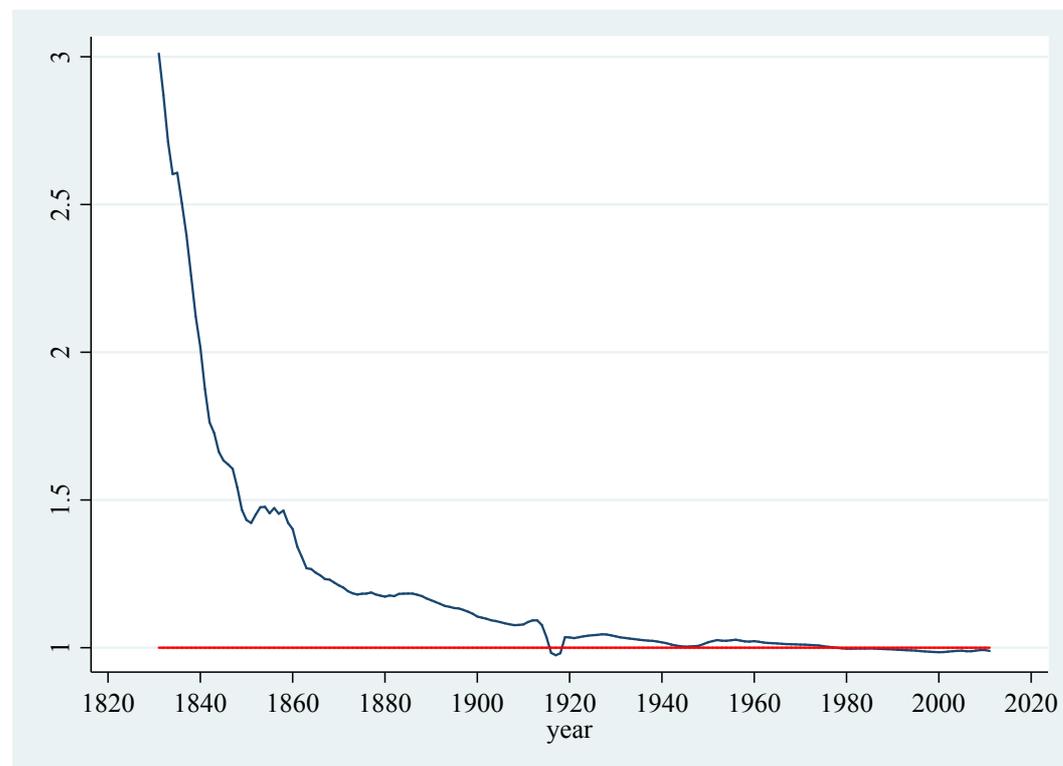
We exploit such a natural experiment in a series of recent papers (Grosjean and Khattar 2015, Grosjean and Brooks 2016).

In the late 18th and 19th centuries, the British policy of convict deportation to Australia resulted in heavily male-biased sex ratios. Men vastly outnumbered women among convicts. Between 1787 and 1868, 132,308 and 24,960 convict men and women were transported to Australia, more than five males for every female convict. This overall figure hides heterogeneity over time, with the initial waves of convicts even more male biased.

Convicts were not confined to prisons, but were allocated to work, first under government supervision, and then, as the number of free settlers and emancipists (ex-convicts) grew, under the direction of private employers. Convicts were generally freed after seven years.

Even among free migrants, men vastly outnumbered women, as it was mostly men who sought economic opportunities in Australia, which consisted chiefly of agriculture and, later, after the discovery of gold in the 1850s, mining. As a result of sustained convict transportation and male-biased free migration, male-biased sex ratios endured in Australia for more than a century, although less severely after the end of convict transportation, as illustrated in Figure 1.

Figure 1: Sex ratio in Australia: number of men to every woman, 1830-2011



Notes: This figure plots the number of men over the number of women in the whole population, that is to say: convicts, emancipists (ex-convicts), and free migrants, as well as people born in the colony. It does not include Aboriginal or Torres Strait Islanders, who were not counted in the Census until the 1960s. Only very rough estimates are available for these populations.

Source: Australian Bureau of Statistics.

We collect information on the historical sex ratio (number of men for every one woman), as well as other historical characteristics, such as total population and the structure of the economy, from the first Census taken in each of the six Australian states: the 1836 New South Wales Census (which also included what is now the Australian Capital Territory), the 1842 Tasmanian Census, the 1844 South Australian Census, the 1848 Western Australian Census, the 1854 Victorian Census, and the 1861 Queensland Census. Convicts were only present in New South Wales and Tasmania. We then match our historical data to present-day data from the 2011 Census and a nationally representative household survey (HILDA) in order to study the long run effects of male-biased sex ratios. In particular, we are interested in the effects of male-biased sex ratios on female labour supply in the labour market, time spent on household work and taking care of children, and on the nature of female occupations, as well as on how much leisure women enjoy, and marital and life satisfaction.

Prior to this work, digitised shapefiles on Australian historical Census boundaries did not exist. We collected electronic copies and digitised hard copies of maps from the National Library of Australia and from State Libraries in order to construct these boundaries and match historical counties to present-day boundaries.

The short run effects of male-biased sex ratios

We first study the short run effects of male-biased sex ratios. The limitations of our historical dataset restrict our focus on marriage rates and female labour force participation. In the presence of male-biased sex ratios, we find that women married more and reduced their labour supply. We also find that the quality of female occupations is negatively affected.

These results, contemporaneous to sex ratios, are in line with previous literature and the predictions of bargaining models of intra-household decision making (Grossbard-Schechtman 1984, Chiappori 1988, Chiappori *et al.* 2002), and with simple supply and demand models of the marriage market (Becker 1973, 1974). More interesting is to study whether the effects of male-biased sex ratios have persisted until today, even after sex ratios have reverted back to normal.

The long run effects of male-biased sex ratios

Today, 150 years after we measured the historical sex ratio, and even though sex ratios have long returned to parity, we find that people have more conservative attitudes towards women working and women still work fewer hours in counties that were more male-biased in the past. As a probable consequence of the reduction in

their labour supply and of the conservative attitudes held, women are still less likely to reach high-ranking occupations. However, we do not observe that women spend more time on household chores, or taking care of children. If anything, they spend less time. As a result, since they work less in the labour market but do not work more at home, women today consume more leisure in areas that were more heavily male-biased in the past.

In terms of magnitude, the long run effects of the historical sex ratio on attitudes towards gender roles is comparable, at the mean, to 30% of the effect of being a female versus a male.¹ Moreover, a one standard deviation increase in the historical sex ratio is associated with a 3.5% reduction in working hours supplied by females and a decrease in the share of women employed in high-ranking occupations by 0.13 standard deviations. Historical circumstances explain more than 3% of the variation in the share of women employed in high-ranking occupations that is left unexplained by traditional factors, even when accounting for the share of men employed in similar professions.

In Grosjean and Brooks (2016), we also study the long-term effects of male-biased sex ratios on the quality of relationships. We find that both men and women are more satisfied with their relationship in areas that were more male-biased in the past. In light of women experiencing more leisure, the result that women are more satisfied is perhaps not surprising. What is more surprising is that men also experience higher marital satisfaction. This result is surprising because it is in contrast, with the theoretical prediction is that scarcity of women will increase the bargaining position of women, but should reduce the bargaining position of men, so that we should observe a negative effect of men's welfare. An interpretation of this result is that because women have higher bargaining power, they are more selective and search for a better match, and, as an indirect effect, men also benefit from this better match quality. Other possible interpretations is that men directly benefit from having happier wives, or are more satisfied with a 'traditional' division of labour within the household and 'traditional' values. .

Conclusion

To the best of our knowledge, we are the first to document that sex ratios can leave a large and persistent imprint on labour supply decisions, occupations, and marital satisfaction, even long after sex ratios have returned to parity.

We want to emphasise that the outcome that women consume more leisure, but face limited opportunities in the workplace, may be welfare-improving for some – but not necessarily all – women.

Although our results may be specific to a certain technological context – work opportunities for women were very poor in 19th Century Australia – and although the average deviation from a balanced sex ratio that we study is larger than deviations observed today in the world, a noteworthy implication is that a temporary imbalance in the sex ratio can have significant consequences on society that endure well beyond the imbalance itself.

¹ The average historical sex ratio is 2 to 1. Women are 46% more likely to hold progressive attitudes compared to men.

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