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Does parental desire for both a son and a daughter influence the decision to have another child? Evidence from Australian census data

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What are little boys made of?
What are little boys made of?
Frogs and snails and puppy-dogs' tails
That's what little boys are made of
What are little girls made of?
What are little girls made of?
Sugar and spice and all things nice
That's what little girls are made of
Nineteenth-century nursery rhyme

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Abstract

This paper investigates Australian parents' desire for both a son and a daughter. In many traditional societies there is a preference for at least one son. In modern societies it is often found that parents want children of each sex. We consider whether, in Australia, sex composition of existing children is an important factor in parity progression, and whether parents have larger families than originally planned in order to have a family with a son and a daughter. Using census data from 1981, 1986, 1991, 1996 and 2001, women are linked with their co-resident children, allowing investigation of family sex composition and its changing impact over time on the propensity to have another child. We find that parents are much more likely to have a third and fourth birth if existing children are all of the same sex, indicating a strong desire for a child of the opposite sex. This increased propensity has added almost three per cent to the fertility of recent cohorts. The paper concludes with a discussion of the potential impact of sex selection technologies on fertility. This research is part of a larger project investigating the impact of sex composition of children on parity progression, using census data, survey data and qualitative interviews.

Introduction

Research around the world shows that parents in many countries hold strong preferences when it comes to the sex of their children. In countries such as India and China, sons are preferred for their practical and economic assistance, their capacity to inherit the family estate and maintain the family name, and their fulfillment of gender-specific religious functions (Graham, Larsen and Xu 1998; Arnold, Choe and Roy 1998). In Europe and English-speaking countries, studies generally find a parental preference for at least one son and one daughter (Freedman, Freedman and Whelpton 1960; Young 1977; McDougall, DeWit and Ebanks 1999; Hank and Kohler 2000; Pollard and Morgan 2002; Kippen, Gray and Evans 2005), although recent findings indicate an emerging bias towards daughters in some European regions (Jacobsen, Møller and Engholm 1999; Hank and Kohler 2000; Brockmann 2001).

This paper examines whether Australian parents have a preference for one child of each sex, and, if so, what impact this has had on the fertility of recent cohorts. We begin by discussing the differential value of sons and daughters to parents in developed countries and ways of testing for parental gender preference. The data, method and results of this study are then described. We conclude with a discussion of how new sex-selection technologies might impact on fertility in Australia and around the world.

The differential value of sons and daughters

A cross-country study conducted in the 1970s found that it was important to parents to have sons to carry on the family name, for old-age support and practical assistance, for the conduct of religious ceremonies and for the psychological satisfaction they provide while young, including companionship for the father. Daughters were valued for balancing the number of sons, for their practical assistance and behavioural and personality characteristics, and for providing companionship for the mother (Arnold et al 1975). Studies conducted in the new millennium in developed countries will probably find some of these reasons still apply, others are no longer important and new reasons have emerged.

Although gender roles are becoming increasingly similar in developed countries, gender differentiation still begins at birth—sometimes before birth if the sex of the expected child is known. Clothes, toys and names are chosen on the basis of the baby's sex, and whether the prospective child or newborn is a boy or a girl is usually the first

piece of information elicited by the child's parents, relatives and friends. It is simply accepted that boys and girls each bring a gendered quality to their family and the world at large.

Ways of testing for gender preference

Researchers over the past half century have employed a number of different methods to evaluate whether parents want children of a particular sex. Three of these methods are outlined below.

The existence of widespread sex-selective abortion is highly indicative of parental sex preference. In China, for example, strong preference for sons interacting with pressure to limit family size has resulted in highly skewed sex ratios at birth, with many more males born than females. A study of one rural Chinese county found that almost 50 per cent of pregnant women ascertained foetal sex. Of these, 90 per cent of those carrying a female foetus aborted if this was their second pregnancy and their first child was a girl (Junhong 2001).

Some surveys have asked respondents hypothetical questions on the preferred sex of an only child or firstborn child, or the ideal sex-composition of children. U.S. studies from the 1940s through to the present have consistently found a preference among both men and women for a firstborn or only son (Dinitz, Dynes and Clarke 1954; Williamson 1976; Wood and Bean 1977; Swetkis, Gilroy and Steinbacher 2002; Lyons 2003 in Jain et al 2005). However in the case of a hypothetical two-child family, most respondents preferred one child of each sex (Wood and Bean 1977; Sensibaugh and Yarub 1997).

The most common gender preference studies are those that analyse progression, or intended progression, to another birth based on the sex of existing children (see, for example, Freedman, Freedman and Whelpton 1960; Wood and Bean 1977; Young 1977; Sloane and Lee 1983; Jacobsen, Møller and Engholm 1999; Hank and Kohler 2000; Brockmann 2001; Hank and Andersson 2002; Pollard and Morgan 2002; Andersson, Hank, Rønsen and Vikat 2004). Parental preference can be inferred from the differential probability of progressing to another birth based on whether children already in the family are all sons, all daughters, or a mixture. The higher the probability of progression, the less likely it is that the desired sex composition has been achieved. For example, in Sweden, mothers of two boys or two girls are around 25 per cent more

likely to have a third child than are mothers with a son and a daughter, indicating a preference for one child of each sex. This difference has been constant over 40 years (Hank and Andersson 2002). A study of 17 European countries, which examined the actual transition to a third birth and the desire to have a third birth, found that in most of these countries there was a strong preference for at least one child of each sex but that parents in some countries also exhibited a preference for daughters over sons (Hank and Kohler 2000).

Data and method

The current study uses the last method outlined above. We calculate parity progression ratios (the probability of having x+1 children given x children) for selected cohorts of Australian women, and examine differentials in the propensity to have another child given the sex composition of existing children. Data for this research are derived from the 1981, 1986, 1991, 1996 and 2001 Australian Censuses of Population and Housing. For each census, Australian-resident women are matched to their children living in the same household using the 'relationship in the household' census variable, which describes the relationship of each person in the household to the household reference person. Available characteristics for each mother-and-children matching are age of mother and age and sex of each child.

We compare the total number of children matched to each single-year birth cohort of women with the number of children expected for each birth cohort given the relevant cohort's age-specific fertility rates up until the time of the census. This is done in order to determine what proportion of children are 'missing' from their mother's household, either because they had died or were resident elsewhere.[1] As expected, older women have a lower proportion of children resident with them, because these women's children are likely to be adults themselves who have left home.

We decided to focus on women aged 38 years at each census as these women have near-complete fertility (96–99 per cent) and a reasonably high proportion of resident children (83–90 per cent). For these women, we calculate parity distributions by sex order of children. These parity distributions are adjusted so that the aggregate parity distributions reflect the completed-fertility parity distributions for each cohort, calculated previously by Kippen (2003; 2004). Using these adjusted parity distributions

[1] An implicit assumption in this comparison is that female mortality and migration are independent of fertility and that the number of adoptions is negligible relative to the number of births.

we then calculate parity progression ratios up to the progression from third to fourth birth for each variant of family sex composition.

Results

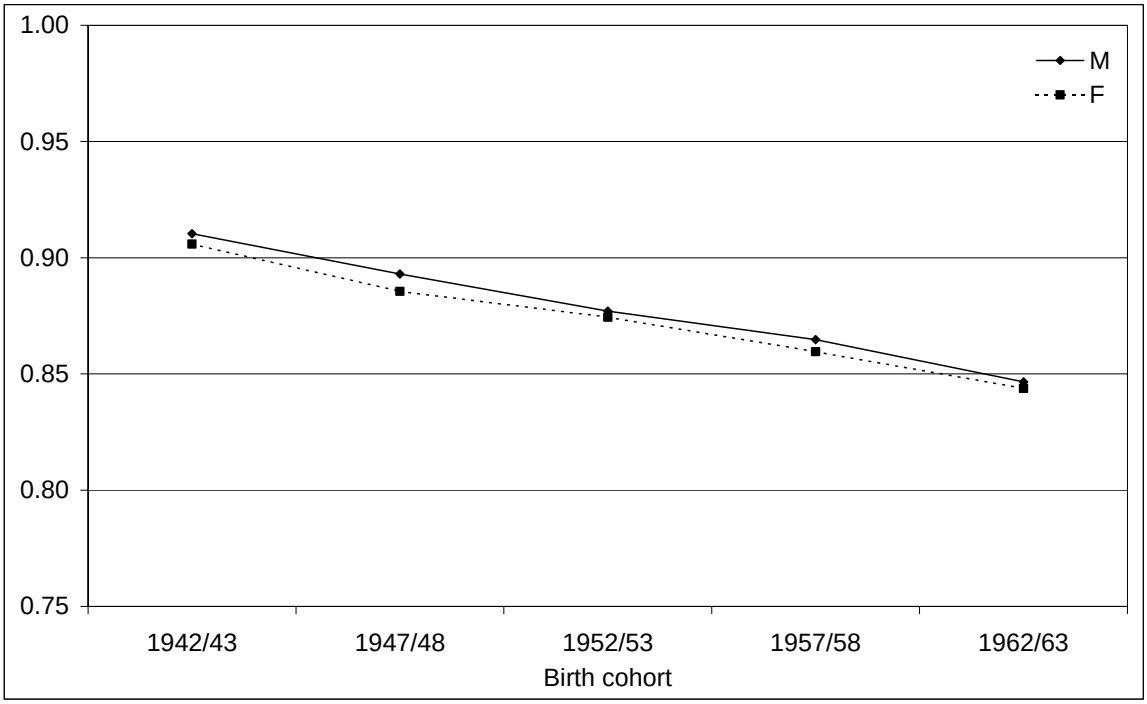
We consider the fertility of five cohorts of Australian women, aged 38 years at each census, who were born in 1942/43, 1947/48, 1952/53, 1957/58 and 1962/63. The completed fertility and parity distributions of each cohort are shown in Table 1. Fertility fell consistently across these cohorts, with the average number of births per woman around 20 per cent lower for women born in 1962/63 than for women born two decades earlier. This decline results from a marked increase in the proportion of women with no children and one child, balanced by a reduction in the number of families with four or more children.

Table 1. Completed fertility and parity distributions, Australian women born 1942/43–1962/63

	Birth cohort				
	1942/43	1947/48	1952/53	1957/58	1962/63
Completed fertility (average births per woman)	2.66	2.40	2.29	2.22	2.12
Completed parity distribution (no. of births)					
0	0.09	0.10	0.12	0.14	0.15
1	0.08	0.10	0.11	0.12	0.13
2	0.34	0.39	0.39	0.38	0.39
3	0.27	0.26	0.25	0.24	0.22
4+	0.21	0.15	0.13	0.13	0.11
Total	1.00	1.00	1.00	1.00	1.00

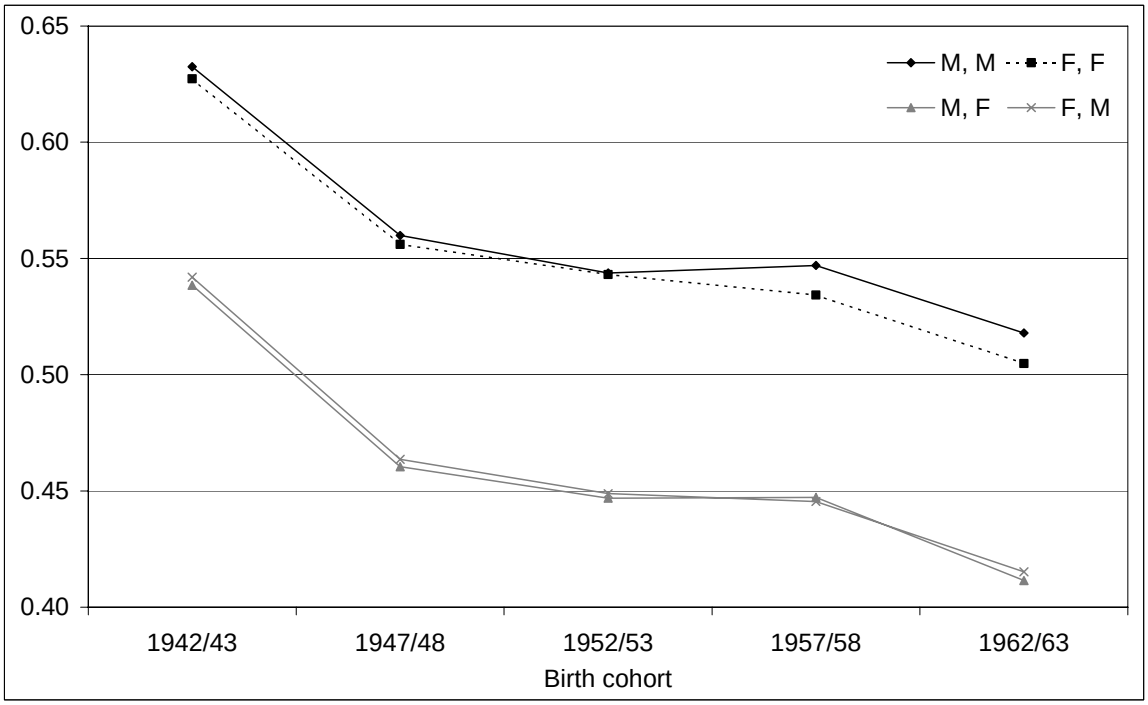
Parity progression ratios by sex of existing children are shown in Figures 1 to 3. The proportion of women who progressed from a first birth to a second birth has declined from 91 per cent for those born in 1942/43 to 83 per cent for those born in 1962/63 (Figure 1). The probability of having a second child is very slightly more likely if the first child is a son rather than a daughter, with a difference of around one half of a percentage point for each cohort. However the overwhelming conclusion is that there is virtually no difference between the progression to a second child based on sex of the first child, indicating that sons and daughters are equally desired in Australia.

Figure 1. Parity progression ratio, first to second birth, by sex of first child, Australian women born 1942/43–1962/63



Source: Appendix Table 1.

Figure 2. Parity progression ratio, second to third birth, by sex of first two children, Australian women born 1942/43–1962/63

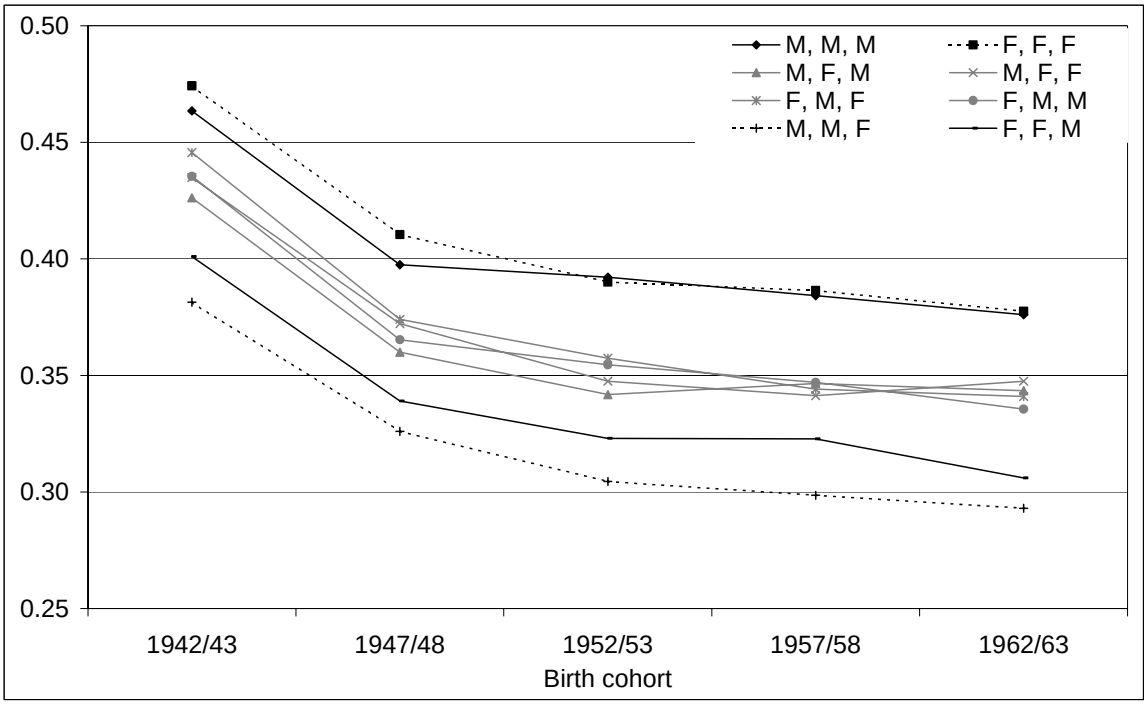


Source: Appendix Table 1.

Regarding progression from second to third birth, sex differences begin to emerge here between same-sex and mixed-sex children. Mothers with two girls or two boys are much more likely to have had a third child than are mothers with a son and a daughter (Figure 2). This strongly suggests that, in Australia, the desire is for at least one child of each sex rather than for a particular sex. However it appears that a weak daughter preference may be emerging. Mothers born from 1957/58 with two boys are slightly more likely to have a third child than are mothers of two girls. The main difference is between same-sex and mixed-sex families, with the differential growing stronger over time. Mothers born in 1942/43 are 17 per cent more likely to have had a third child if their first two are of the same sex than if they are of different sexes, rising to 24 per cent for mothers born in 1962/63.

In the progression from the third to the fourth child, again mothers with children of all one sex are the most likely to have a fourth child. Those least likely are mothers whose first two children are of the same sex and the third are of the opposite sex (Figure 3). Many of these are strongly influenced to have a third child to try for one of the missing sex. Once this is achieved they then stop having children.

Figure 3. Parity progression ratio, third to fourth birth, by sex of first three children, Australian women born 1942/43–1962/63



Source: Appendix Table 1.

This analysis is based on co-resident mothers and children at the time of each census, with calculated parity distributions adjusted to match true parity distributions for each cohort. Of concern is the fact that not all children are resident with their mothers. This may diminish actual differentials in the probability of progressing to another child based on sex of existing children, as missing children would tend to randomise the data. However we examined these differentials for the selected cohorts at younger ages (at which virtually all their children are co-resident) and found that they are relatively invariant across age from the late 20s to the late 30s. We therefore regard the results discussed above as reliable.

The title of this paper poses the following question: 'Does parental desire for both a son and a daughter influence the decision to have another child?' The answer to this is a resounding yes. Of the female cohorts studied here, those with two sons or two daughters are 17–24 per cent more likely to have had a third child than are those with one child of each sex. This differential is similar to that found in Sweden (Hank and Andersson 2002) and the United States (Pollard and Morgan 2002). Australian women with three sons or three daughters are 8–12 per cent more likely to have had a fourth child than are women with three children whose first two are of different sexes. The conclusion is that many Australian parents are willing to 'try again' in order to achieve a child of the missing sex.

The impact on cohort fertility of wanting one child of each sex

We now consider the impact on completed cohort fertility of this extra propensity to have a third or fourth child if children already in the family are all boys or all girls. To do this, we calculate what the fertility of each cohort would be if:

(1) the probability of progressing from second to third birth was, for all women, equal to that of women whose first two children were of different sexes; and

(2) the probability of progressing from third to fourth birth was, for all women, equal to that of women whose first two children were of different sexes.[2]

[2] For the progression from third to fourth birth, we consider only women with three children whose first two children were of different sexes. We exclude women whose first two children were of the same sex, and third was of the opposite sex. The reason for this is that these women have lower rates of progression to a fourth birth because many were influenced to have a third birth in order to achieve a child of the missing sex. If sex of child was not a factor in their decision to have another child, their probability of progressing from third to fourth birth would presumably be similar to those of women whose first two children were of different sexes.

Table 2 shows actual completed fertility of each cohort, and the hypothetical cohort fertility that would result if parents with all same-sex children did not 'try again' for a child of the other sex. For women born across these 20 years, the desire to have at least one child of each sex translates into an increase in completed cohort fertility of around 2.8 per cent. This has been relatively constant across the cohorts.

Table 2. Actual and hypothetical completed fertility, Australian women born 1942/43–1962/63

	Birth cohort				
	1942/43	1947/48	1952/53	1957/58	1962/63
Actual completed fertility	2.66	2.40	2.29	2.22	2.12
Hypothetical completed fertility	2.59	2.33	2.22	2.16	2.06
Absolute difference	0.07	0.07	0.06	0.06	0.06
Relative difference	2.7%	2.9%	2.8%	2.8%	2.8%

Future impact on fertility of wanting a son and a daughter

Pollard and Morgan (2002) posit that, in the future, the preference for children of both sexes will diminish as gender roles continue to become less distinct. This will act to lessen the impact of parental gender preference on fertility. Conversely, Wood and Bean (1977) point to the trend towards smaller families as resulting in a larger impact on fertility of parental gender preference. When most parents have large numbers of children regardless of their sex, there is a high probability that at least one son and one daughter will be achieved without trying. However when parents would prefer to have fewer children, the sex of the first two (or first three) children may be a major factor in the decision to have another child. Since the trends to less distinct gender roles and smaller families are concurrently taking place, the probable net effect on future fertility is difficult to assess (Kippen, Gray and Evans 2005).

However the above analysis suggests that future change in impact may be small. In Australia, the effect on fertility has been relatively invariant for the cohorts considered. Although these cohorts span only a short period of time—20 years—they have very different parity distributions and grew up under very different gender regimes. Almost half of women born in 1942/43 had three or more children, compared with one third of women born in 1962/63 (Table 1). Women born in 1942/43 were

likely to experience much more sharply delineated gender roles than were women born two decades later.

Sex-selection technology

For all these cohorts, one important factor has changed very little: the ability to control sex of children born. The development of sex-selection technology was predicted in the 1960s and 1970s (Wood and Bean 1977) with Kahn and Weiner (1967) asserting that the technology would be available by the end of the twentieth century. They were right. By the end of the twentieth century, three methods of relatively reliable prenatal sex selection had become available. These are sex-selective abortion, Preimplantation Genetic Diagnosis (PGD) and flow cytometric sperm separation. The last two were initially developed so that parents could avoid passing on genetic diseases associated with a particular sex—such as haemophilia—by only giving birth to children of the unaffected sex. However they have also been used by parents for non-medical reasons.

PGD is an extension of in vitro fertilisation (IVF). Soon after embryos are created, one or two cells are extracted and analysed to determine their sex. Only embryos of the desired sex are implanted. This method is highly reliable for determining the sex of potential babies, but carries problems inherent to the IVF process. Flow cytometric sperm separation involves sorting sperm into X-chromosome-rich and Y-chromosome-rich pools. The sorted sperm are then used in artificial insemination or IVF procedures. In the United States where this technology was developed, several hundred births have resulted from the use of sorted sperm. The proportion of those pregnancies which are of the desired sex is around 76 per cent for males and 91 per cent for females (Jain et al 2005). The ethics of sex selection are discussed in detail in Goodkind (1999), Savulescu (1999) and Robertson (2001).

Sex-selection technology in Australia

Sex-selective abortion is unlikely to be widely practised in Australia. Although data are sketchy, Federal-Government statistics indicate that 99 per cent of procedures that could include abortion are carried out within the first trimester of pregnancy (Health Insurance Commission 2004), before foetal sex can be ascertained. The vast majority of later-term abortions are carried out because of foetal abnormality.

Until recently, PGD was offered at at least three IVF clinics in Australia to parents who wished to choose the sex of their next child for non-medical reasons.

Several hundred couples had utilised this service at a cost of around AUD13,000. However, in September 2004, the Australian Government's National Health and Medical Research Council released updated ethical guidelines for the clinical practice of assisted reproductive technology. These guidelines state that 'sex selection (by whatever means) must not be undertaken except to reduce the risk of transmission of a serious genetic condition' because 'entry to life should not be conditional upon a child being a particular sex' (NHMRC 2004: 39). These guidelines were implemented in early 2005. As a result, sex selection through PGD is no longer available in Australia except to avoid genetic disease associated with a particular sex.

As far as we are aware, flow cytometric sperm separation has never been made available in Australia. It is unlikely to be allowed under the new NHMRC guidelines.

Future impact on fertility of sex-selection technologies

As has been noted in China and India, the widespread availability of sex-selection technology (in this case, sex-selective abortion), can have a profound impact on the number and sex ratio of births. It is unknown what the take-up rate would be if these, and future-developed, technologies became widely and reliably available at an affordable price in countries such as Australia. A recent study of women presenting to a United-States clinic for infertility care found that 41 per cent would select the sex of their next child if it could be done at no added cost (Jain et al 2005). However this sample may be biased towards those who are willing to use technology for reproductive purposes.

If sex-selection technology came into common use, it would probably act to significantly reduce fertility. Parents would be able to precisely select the sex composition of their family without having to 'try again' with a 50/50 chance of getting it right. As shown above, the extra propensity to have a third and fourth child if existing children are all of the same sex added almost three per cent to the fertility of recent Australian cohorts. However the impact of gender preference may be much greater. Some parents may have a second child because they wish for a son and a daughter, rather than two children per se. Additionally, there is strong anecdotal evidence that some parents strongly prefer sons over daughters, and vice versa. In general, these preferences balance out and so are masked in the parity progression ratios calculated above.

In countries such as Australia, the widespread use of sex-selection technologies is unlikely to significantly impact the sex ratio at birth in the short term, given that it appears sons and daughters are desired in roughly equal measure. However parental preferences for the sex of their children can change quickly. For example, in 1982, of Japanese wives who wanted one child, 52 per cent expressed a preference for a son. However, only ten years later, 76 per cent of wives who wanted an only child said that they would prefer a daughter (Atoh et al 1993).

Also of concern are potential changes in the sex ratio of firstborn children, given that most surveys find that parents would prefer a firstborn son if given the choice. Concern about bias to firstborn sons has been expressed since at least the 1970s because of particular characteristics that may predominate in firstborn children (Williamson 1976). Some studies show that firstborns, on average, are more intelligent and higher achieving than later born siblings and are over-represented amongst political leaders (Belmont and Marolla 1973; Sputa and Paulson 1995; Steinberg 2001). If the proportion of firstborns who are male increases, this may lead to 'a nation of little sisters' (in Belkin 1999).

Conclusion

This study finds that Australian mothers with two or three children of the same sex are much more likely to have another child than are mothers with two or three children of both sexes. For cohorts born 1942/43–1962/63, the added propensity to have a third or fourth child to gain a child of the missing sex has added almost three per cent to completed cohort fertility. The future advent of readily available sex-selection technology may act to decrease fertility, as parents gain control over the sex of each child added to their family.

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Appendix Table 1. Parity progression ratios by sex of existing children, Australian women born 1942/43–1962/63

To first birth	**0.91**	**0.90**	**0.88**	**0.86**	**0.85**
First to second birth	**0.91**	**0.89**	**0.88**	**0.86**	**0.85**
M	0.91	0.89	0.88	0.86	0.85
F	0.91	0.89	0.87	0.86	0.84
Second to third birth	**0.59**	**0.51**	**0.50**	**0.49**	**0.46**
M, M	0.63	0.56	0.54	0.55	0.52
F, F	0.63	0.56	0.54	0.53	0.50
M, F	0.54	0.46	0.45	0.45	0.41
F, M	0.54	0.46	0.45	0.45	0.42
Third to fourth birth	**0.43**	**0.37**	**0.35**	**0.35**	**0.34**
M, M, M	0.46	0.40	0.39	0.38	0.38
F, F, F	0.47	0.41	0.39	0.39	0.38
M, F, M	0.43	0.36	0.34	0.35	0.34
M, F, F	0.43	0.37	0.35	0.34	0.35
F, M, F	0.45	0.37	0.36	0.34	0.34
F, M, M	0.44	0.37	0.35	0.35	0.34
M, M, F	0.38	0.33	0.30	0.30	0.29
F, F, M	0.40	0.34	0.32	0.32	0.31