

Socioeconomic Response by Age Group to the Australian Baby Bonus: A Multivariate Analysis of Birth Data from 2001-13

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Abstract

To deal with the demographic trends of declining fertility rates and ageing populations, many developed countries have implemented pronatalist policies designed to increase fertility rates. A key pronatalist policy introduced in Australia was the 'Baby Bonus' payment scheme announced in May 2004. Responding to a gap in the literature, this paper assesses changes in birth rates by age group and socioeconomic status after the introduction of the Baby Bonus, using national birth data for Australia from 2001-2013. Our results show that during the key years of the Baby Bonus policy, the overall birth rate for all socioeconomic groups in the 15-19 age group rose by 8.1%. Of particular note were the lowest two socioeconomic quintiles, for whom birth rates rose by 10% and 12% respectively.

1. Introduction

Many governments around the world have expressed concerns about declining fertility rates and ageing populations, because these changes are associated with future labour and revenue shortages, and can adversely affect long term economic prosperity. In an attempt to arrest these demographic trends many developed countries have implemented pronatalist policies intended to increase fertility rates. These attempts have been seen most recently in China, which has conditionally lifted its longstanding 'one-child' policy.

A key pronatalist policy introduced in Australia was the 'Baby Bonus' payment scheme announced in May 2004. The impact of the Baby Bonus on fertility in Australia deserves careful scrutiny and investigation. Using national birth data for Australia from 2001-2013, this paper aims to provide statistical evidence about the variability of this impact across different age groups and socioeconomic regions. In

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this study we aim to examine variability in the way different population subgroups appear to have responded to the policy. The main difference of our study lies in the use of official statistics from the Australian Bureau of Statistics (ABS) by age group and socioeconomic status over 13 years, thus it gives a comprehensive overview of changes in fertility rates on the national level. To date, other studies have investigated individual-specific associations between birth-rate and other factors using social survey data for a selected population, such as the Household, Income and Labour Dynamics in Australia (HILDA) Survey (Parr and Guest (2011) and Drago *et al* (2009)¹ or the data has been confined to a particular State (Lain *et al* 2009; Langridge *et al.* 2012).

2. Background: Australian Baby Bonus policy

On Australian Budget night 2004, the introduction of the Australian Baby Bonus was announced with then-Treasurer Costello (2004) famously quipping that Australian parents should consider having “one for mum, one for dad and one for the country”. The policy had been designed specifically to increase fertility levels and was structured as below.

- The introduction of the Australian Baby Bonus would be staged with increasing payments as follows:
 - o From 1 July 2004, a Baby Bonus of A\$3,000 would be paid for each child born.
 - o From 1 July 2006, a Baby Bonus of A\$4,000 would be paid for each child born.
 - o From 1 July 2008, a Baby Bonus of A\$5,000 would be paid for each child born.
- In 2008, it was announced that from 1 January 2009, a means test would apply to families with a combined income of A\$150,000 a year or more, making them ineligible to receive the Australian Baby Bonus.
- From 1 January 2011, families whose primary carer earned less than A\$150,000 became entitled to 18 weeks’ parental leave at the national minimum wage.
 - o The Paid Parental Leave scheme was designed to replace the Baby Bonus, however due to differences in eligibility criteria and tax treatment, some parents would have been better off under the old scheme. To avoid this situation, the Baby Bonus was still available and if a parent was eligible for both, they could choose which one to receive.
- From 1 March 2014, the Baby Bonus was abolished, instead giving recipients of Family Tax Benefit (FTB) Part A a smaller additional loading with the birth of a baby. FTB Part A is targeted towards parents earning lower or middle incomes.

The Baby Bonus was introduced in the context of the FTB, Australia’s primary form of assistance for families with children under the age of 16 years. The FTB was designed to compensate families for the costs of raising children, with higher rates of assistance to low income families. The FTB system comprises two parts: FTB Part A and FTB Part B. The amount of FTB-A that a family receives, depends on their annual income, and on the age and number of their children. FTB-B is more narrowly

¹ The HILDA survey is an annual household-based panel study which began in 2001.

targeted to families with only one income earner (including sole parents). As intended, the family assistance system in Australia has been important in reducing child poverty (Whiteford 2009; Whiteford & Adema 2007).

Australia has had a history of such payments: in 1912 the then-Prime Minister Andrew Fisher introduced the *Maternity Allowance Act* which was a one-off payment of £5 to all women who had given birth. In 1947, the Allowance was replaced by one-off payments that were means tested. In 1978, the payment scheme was replaced by other benefits (NMA 2016).

3. Theoretical context

The economic model predicts greater effects where pronatalist policies such as the Baby Bonus generate larger incentives (for example, for younger and lower income families). The demographic model predicts that the Baby Bonus would not have different effects among subgroups as the policy focused on short term, rather than longer term, arrangements such as enabling women to combine work and family.

The principal theoretical contributions in the economic model come from the rational choice school and in particular the work of micro-economist Gary Becker (Becker 1960; Becker 1981; Becker & Lewis 1973; Becker & Murphy 2003). Becker developed this framework seeking to explain why, in the nineteenth century, richer families had many children and poorer families fewer children – a trend that reversed in the twentieth century. Becker developed a rational way to reconcile these two facts in his theory of fertility. Becker saw a child as something that a family decides to have as a conscious decision, and in making such a decision families would trade off the costs of having a child against the benefits. Becker focused on the cost side, noting that children are very time-intensive and that it tends to be the mother's time involved in raising a child. Becker reasoned that the opportunity cost of a child was the price of the mother's time, or her wage rate. Becker theorised that women with high wages have very high values of time: as a result it is more costly for them to take time away from paid work to have children and therefore they tend to have fewer. In the nineteenth century women were not working and this mechanism of high-priced versus low-priced women was in reverse. Poorer women's time value was high in alternative activities, for example working on a farm, and they tended to have fewer children.

Becker theorised that as parents become wealthier they would want 'higher quality' children. As children are expensive to raise parents tend to have fewer, and family sizes fall with income independent of the woman's wage. Becker referred to this as the 'quantity-quality' trade-off. According to Becker, some families would rationally choose to have fewer children and spend more per child, rather than having many children and spending less (Becker & Lewis 1973).

There are additional theoretical insights from demography, including gender equity theory. Women's education levels and their capacity to compete with young men in the employment market have progressed rapidly since the 1970s across the developed world. Young women are able to compete almost equally with men in relation to education and employment for as long as they remain childless (McDonald 2006). From the 1970s, the Nordic-, French-, Dutch-, and English-speaking countries moved towards different models that supported the combination of work and family.

Social democratic countries did this mainly through the provision of services funded via the tax and transfer system. Liberal economies achieved the same aims through more market-oriented approaches including lower taxation, subsidised childcare, and income transfers. Reform has been much more difficult to achieve for women in the countries where complementarianism (where men and women are considered complementary to each other, having different and specialised roles) has remained strong, such as in Southern Europe and the German-speaking countries (McDonald 2006). This is also the case for women in the East Asian liberal economies, where an additional factor preventing reform has been the opposition of employers to allow reduced work hours. Further, in looking across the OECD, Castles (2003) found that the only aspects of family-friendly public policy associated with fertility outcomes are formal childcare provision, and the proportion of women reporting that they work flexible hours.

There also is an evolving body of literature suggesting that fertility may rebound at a certain level of socioeconomic development (Myrskylä *et al* 2009; Goldstein *et al* 2009; Furuoka 2009; Luci & Thvenon 2010; Day 2012). Myrskylä and colleagues (2009) suggested that as development continues, the demographic transition may go into reverse. They undertook a cross-country comparison of the Total Fertility Rate (TFR)² and the Human Development Index (HDI)³ in the years 1975 and 2005. In the 1970s, Canada had the highest HDI score of 0.89 out of the 107 countries examined. By 2005, HDI ratings had improved markedly, with two dozen of 240 countries having HDIs above 0.9. In 1975, a graph plotting fertility rates against HDIs showed a fall as HDI rose. By 2005, though, the line had a kink in it: above an HDI of approximately 0.9 it trended up producing a mirror 'J-shaped' curve. In many countries with very high levels of development (indices of around 0.95) fertility rates are now approaching two children per woman. Subsequent studies that have examined various socioeconomic dimensions have demonstrated an emerging positive correlation between fertility and a threshold level of socioeconomic development (Goldstein *et al* 2009; Furuoka 2009; Luci & Thvenon 2010; Day 2012). Goldstein *et al* (2009) and Luci and Thevenon (2010) found that temporal-effect-adjusted fertility rates appeared to have risen alongside GDP per capita in many developed countries.

4. Literature review

International studies

There has been debate in the literature as to whether pronatalist policies have caused increases in 'cohort fertility' (the fertility of all women of the same age over their lifetimes) or whether observed increases are merely changes in 'period fertility' (measured year to year) (Heard 2010). Demographers have asserted that observed increases in birth rates have often occurred because women have more opportunities for work, and this promotes delays in childbearing while not necessarily increasing the

² The TFR for any given year is the sum of age-specific fertility rates for that year. It is a hypothetical measure which represents the average number of babies each woman would give birth to during her lifetime if she experienced the current age-specific fertility rates at each age of her reproductive life.

³ The HDI, a measure used by the United Nations, has three components: life expectancy; average income per person; and level of education. Its maximum possible value is one.

total number of children they have. Any observed increases would thus be attributable to 'tempo effects' (increases in birth rate due to previously delayed childbearing, with that cohort of women responding to policy changes and ceasing the delay and causing the birth rate to spike). Such a response would likely lead to an observed increase in birth rates for women in their 30s and 40s.

Internationally, a considerable research effort has sought to evaluate the impact of attempts to stimulate fertility at a national level through fiscal policy. The results appear to be inconsistent, and this should not be surprising considering that the implications of financial incentives on fertility choices are complex and difficult to quantify. This is especially so when making cross-country comparisons, since policy, economic, and social contexts vary greatly (Gauthier 2007). In a literature review, Gauthier (2007) reported that although small positive effects on fertility attributable to policy initiatives had been found in a number of studies, no significant effect has been found in others. Moreover, Gauthier found that the effect of policies tended to be on the timing of births rather than on completed fertility in some studies. A follow-up paper by Gauthier and Thevenon (2011), suggested that although financial incentive policies were clearly associated with an effect on the timing of births, their impact on cohort completed fertility was less clear, and often underestimated, due to the difficulty in assessing the long term effects. Earlier studies had suggested that pronatalist policies could have a positive effect on fertility. For example, Milligan (2005) found the effects of a policy implemented in Quebec, Canada, that paid families up to C\$8000 for having a child, was associated with an increase in fertility of 25% for families entitled to the full benefit. There are studies that have shown that direct financial incentives can be effective, as they can assist with the direct costs of children, whereas policies that enable women to combine work with family reduce opportunity costs. Theory would suggest that opportunity costs of having children rise with a woman's wage, whereas the direct costs of children would be less responsive to rising wages. This means that as the wage rate rises, women will be more likely to favour the combination of work and childcare rather than direct financial incentives.

Australian studies

The Australian Baby Bonus scheme has received significant research attention. However, whether the policy led to a quantum increase in births remains contested. Some studies argue that the initial increase in births was a direct fertility response to the introduction of the policy. Sinclair *et al.* (2012) analysed 19 years of birth and macroeconomic data, beginning in 1990, and reported a significant increase in birth numbers ten months following the announcement of the Australian Baby Bonus. They further argued that this overall increase was sustained up to the end of the observed period (2009). A cumulative growth in birth numbers which commenced in January 2006, slowed in 2008 and 2009. Sinclair *et al.* suggested that the initial increase in births, identified in March 2005, was a direct fertility response to the introduction of the policy.

It has also been argued that the increase in births in the period following the 2004 introduction of the Australian Baby Bonus, at least until the 2008 peak, was more strongly influenced by other demographic and economic changes, with the

effect of the Australian Baby Bonus of minor importance. Parr and Guest (2011) analysed individual-level fertility using data from the HILDA survey focusing on the effects of changes to family benefits, macroeconomic variables, entitlements to family-friendly working conditions, and socioeconomic and demographic characteristics. They found that the effects of the Australian Baby Bonus and the Child Care Rebate were marginal, while the effects of education, income, occupation, marital status, age, and parity (the number of living children that a woman has had) were significant. Drago *et al.* (2009) also made use of the HILDA Survey to assess if the Australian Baby Bonus increased fertility intentions and thereby births, and whether the effects were temporary or sustained. They found that fertility intentions rose after the announcement of the Baby Bonus, and estimated that the birth rate rose modestly, between 0.7% and 3.2% as a result.

Research has also suggested that there may have been a heterogeneous response to the policy across sub-groups of the population. In a population-based study of NSW birth records from 1 January 1997 to 31 December 2006, Lain *et al.* (2009) reviewed changes in birth rates after the introduction of the Australian Baby Bonus in 2004, not only for the overall population, but for the sub-population within individual age, parity, socioeconomic and geographical groups. They found that in the first two years after the introduction of the Australian Baby Bonus, the greatest increase in birth rate was seen in teenagers. In another population-based study using NSW birth records Lain *et al.* (2010) assessed the impact of an increase in the number of births on maternity services in New South Wales following the 2004 introduction of the Australian Baby Bonus. They reported that compared with trends prior to the introduction of the Australian Baby Bonus, there were an estimated 11,283 extra singleton births each year in NSW hospitals by 2008, with significant increases in the number of deliveries performed in tertiary, urban and rural public hospitals. Langridge *et al.* (2012) examined Western Australian birth data from 2001–2008, and found that the greatest increase in births were among women residing in the highest socioeconomic areas who had the lowest general fertility rate in 2004 (21.5 births per 1000 women) but the highest in 2006 (38.1 births per 1000 women).

There was a need, prior to this study, to assess changes in birth rates by age group and socioeconomic status after the introduction of the Baby Bonus, using national birth data for Australia.

5. Data and methods

Responding to a gap in the literature, this paper assesses changes in birth rates by age group and socioeconomic status after the introduction of the Baby Bonus, using national birth data for Australia from 2001–2013. Women aged 15–49 years who gave birth in Australia from 1 January 2001 to 31 December 2013 were included in the study population. To assess changes in birth rates by age group and socioeconomic status, births were stratified by age group and socioeconomic status. Birth data (the numerator) and point estimates of population (used as the denominator for birth-rate calculations) were obtained from the ABS (2014).

The customised data set obtained from the ABS contained statistics on live births for Australia by state and territory, and sub-state region, based on calendar year of

registration. Registration of births is the responsibility of state and territory Registrars of Births, Deaths and Marriages, and is based on data provided on an information form completed by the parent(s) of the child. The customised dataset divided births by socioeconomic area as classified by the Socioeconomic Indexes for Areas (SEIFA). SEIFA is a product developed by the ABS that ranks areas in Australia according to relative socioeconomic advantage and disadvantage. SEIFA ranks and summarises aspects of the socioeconomic conditions of people living in certain areas. The four indices used to create SEIFA are the indices of Relative Socioeconomic Disadvantage, Relative Socioeconomic Advantage and Disadvantage, Economic Resources and Education and Occupation. Details can be found at the ABS website (www.abs.gov.au/websitedbs/censushome.nsf/home/seifa). SEIFA has a number of important policy and research purposes and has been used to help explain individual behaviour. For example, the *Longitudinal Study of Australian Children* used SEIFA to compare the academic skills of children in disadvantaged and advantaged neighbourhoods.

Although SEIFA has enabled the comparison of birth rates across advantage and disadvantaged regions, in this study there are a number of potential limitations in using SEIFA. It is not possible to look at the range of disadvantage for population subgroups included in the construction of the index. Further, within disadvantaged areas according to the SEIFA index there would likely be advantaged individuals, and vice versa in advantaged areas there would be disadvantaged individuals. These limitations notwithstanding, SEIFA represents an important tool for evidence-based policy making in Australia, and has supported research into some of Australia's major policy and social issues.

The births data is also limited by being unable to distinguish parity. Information on the number of previous children born to a mother is only collected in some Australian states, which means that development of a national dataset is not possible at this time.

Birth data were broken down according to local statistical areas (SA2s), which are medium-sized (an average population of 10,000 in each, but ranging from 3,000 to 25,000) communities that interact socially and economically. These are the smallest statistical areas for which ABS Census data for health and other vital statistics are available. Use of SA2 units allowed calculation of age band-specific birth rates per 1000 reproductive age (15 to 49 years) women, with individual five-year age band stratification. Each SA2 unit was classified according to SEIFA. In this paper we do not claim direct socioeconomic impact on birth rates; instead we use the SEIFA as a proxy to individuals' socioeconomic status and focus on investigating the change in birth rates in specific socioeconomic regions. For each SA2 region during the period 2001 to 2012 inclusive, the number of reproductive age women was determined and the number of births recorded to residents in the area extracted. Birth rates per 1000 population were calculated. In addition, a new variable period was defined as blocks of years of the various Baby Bonus schemes, as described in the 'Background: Australian Baby Bonus policy' section. We explored the association between age groups, socioeconomic status, and the various stages of the Baby Bonus scheme with birth rates using multivariate analysis (analysis of variance).

6. Results (including discussion)

We focused on examining whether or not the changes in the birth rates associated with changes in the Australian Baby Bonus schemes were consistent across the age groups and the socioeconomic regions. The analysis of variance (Table 1) shows statistically significant differences within age groups, within socioeconomic groups, and within the various stages of the Australian Baby Bonus scheme. Analysis also found statistically significant differences between age groups and socioeconomic status, between age groups and the various stages of the Australian Baby Bonus scheme, and between age groups, socioeconomic groups and the various stages of the Australian Baby Bonus scheme. Full reports of the analysis of variance, including the mean comparisons, standard errors and significance values, are available upon request from the authors.

Table 1 - Analysis of variance - Variate: log_birth

Source of variation	d.f.	s.s.	m.s.	v.r.	F pr.
Age	6	1.334E+03	2.223E+02	1.700E+05	<.001
SEIFA	4	4.192E+00	1.048E+00	801.51	<.001
period	6	2.822E+00	4.704E-01	359.73	<.001
Age.SEIFA	24	3.130E+01	1.304E+00	997.36	<.001
Age.period	36	4.205E+00	1.168E-01	89.32	<.001
SEIFA.period	24	9.804E-02	4.085E-03	3.12	<.001
Age.SEIFA.period	144	5.027E-01	3.491E-03	2.67	<.001

Figure 1 - Birth Rates from 2001 to 2013

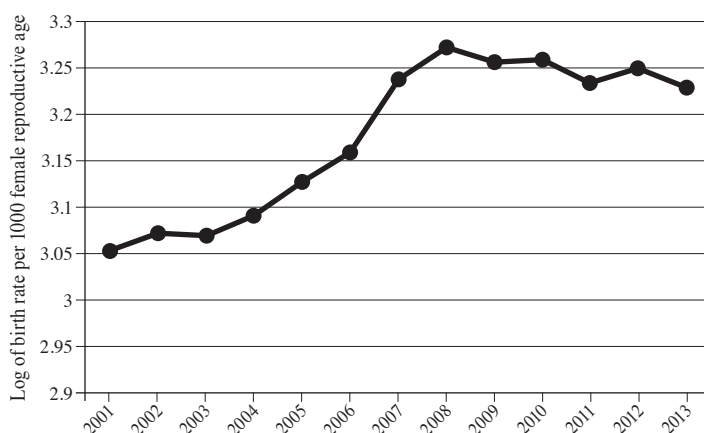


Figure 1 is a plot of the mean birth rates (on a logarithmic scale) from 2001 to 2013 and shows that the differences between the birth rates of the various Australian Baby Bonus schemes are statistically significant ($p < 0.001$). The 2009 family income means test is associated with a stabilisation of birth rates from 2009 to 2010, with a decrease observed after the introduction of the 2011 paid parental leave scheme. Figures 2 to 9 show the changes in the Australian TFR, and birth rates across age and socioeconomic status during the pre-, during, and wind-down phases of the Australian Baby Bonus scheme. Detailed statistics can be found in these tables and the calculations in Table 9.

Figure 2 - Australia's total fertility rate

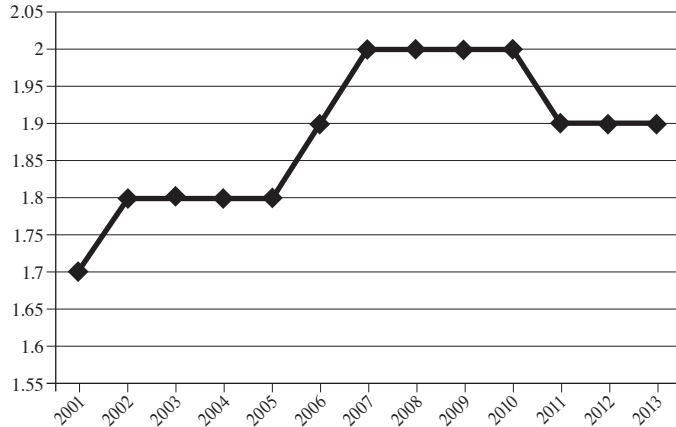


Figure 3 - Birth Rates 15-19 Age group, by SEIFA Quintile



Figure 4 - Birth Rates 20-24 Age group, by SEIFA Quintile

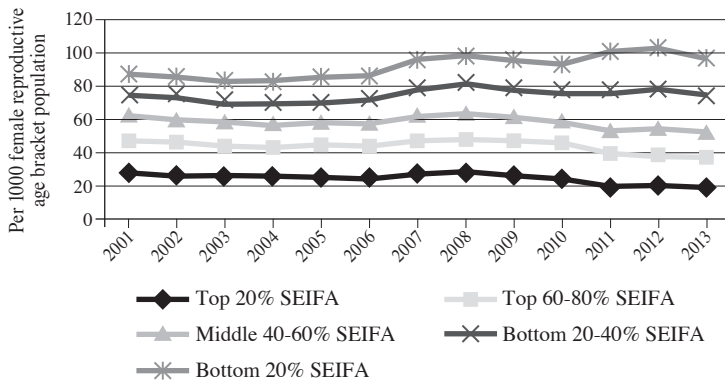


Figure 5 - Birth Rates 25-29 Age group, by SEIFA Quintile

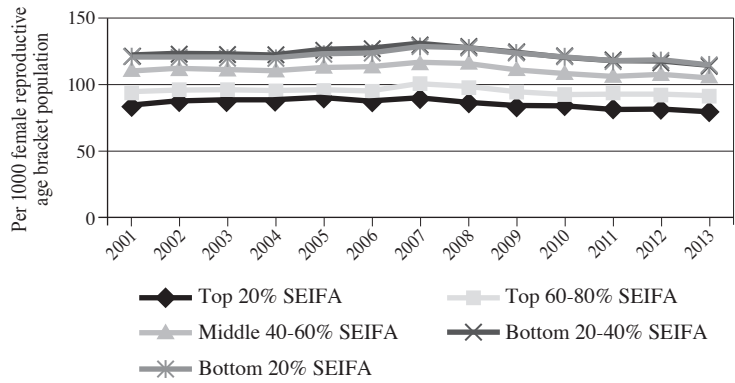


Figure 6 - Birth Rates 30-34 Age group, by SEIFA Quintile

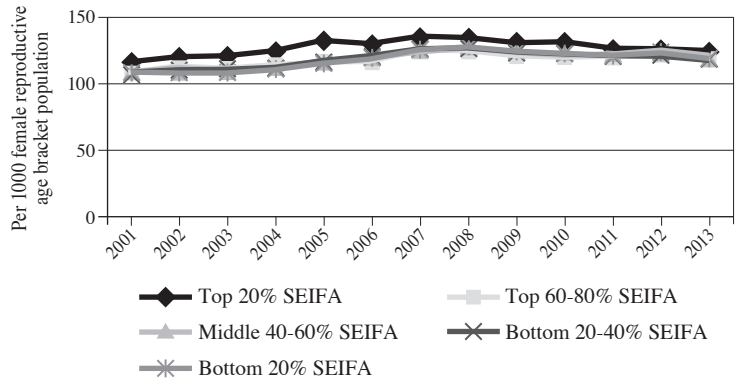


Figure 7 - Birth Rates 35-39 Age group, by SEIFA Quintile

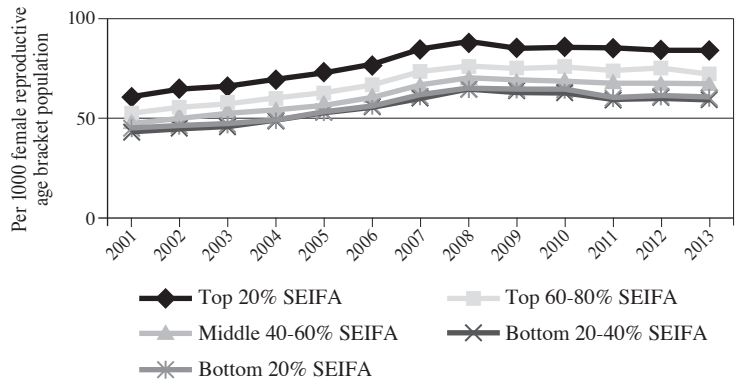


Figure 8 - Birth Rates 40-44 Age group, by SEIFA Quintile

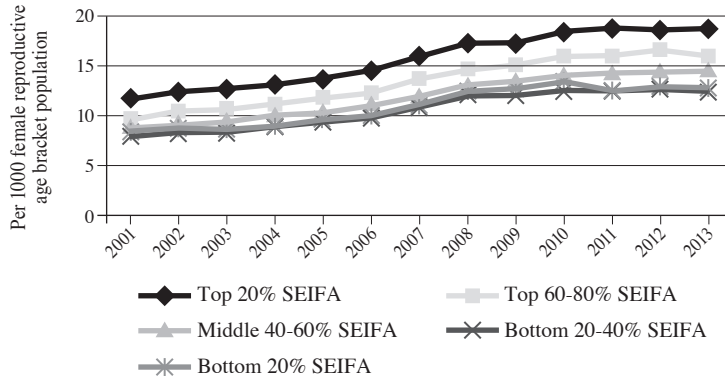


Figure 9 - Birth Rates 45-49 Agegroup, by SEIFA Quintile

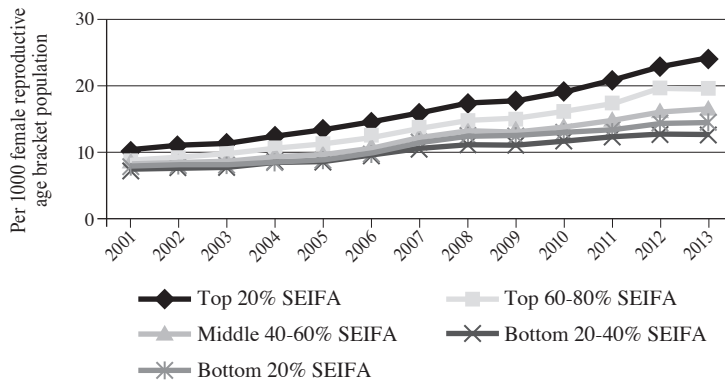


Table 2 - Birth Rates 15-19 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	7.03	7.01	6.56	6.57	6.54	6.53	7.12	7.37	6.96	6.69	5.18	5.03	4.73	-32.75
top 60-80% SEIFA	12.72	12.54	11.90	11.66	12.01	11.93	12.71	12.93	12.71	12.48	10.72	10.35	10.01	-21.30
middle 40-60% SEIFA	17.16	16.27	16.13	15.39	16.07	15.65	16.59	17.02	16.70	16.14	14.50	14.70	13.81	-19.51
bottom 20-40% SEIFA	21.45	20.96	19.90	19.55	19.72	20.38	21.79	22.71	22.12	21.74	21.60	21.82	20.63	-3.80
bottom 20% SEIFA	25.71	25.12	24.41	24.22	25.00	25.08	27.26	27.86	27.55	27.03	28.55	28.35	26.21	1.96
Total rate all SEIFA groups	16.65	16.20	15.60	15.28	15.64	15.64	16.80	17.28	16.90	16.51	15.72	15.64	14.66	-11.94

Table 3 - Birth Rates 20-24 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	26.50	26.51	24.97	24.87	24.65	24.59	26.68	27.39	25.90	24.66	19.32	19.18	18.88	-28.76
top 60-80% SEIFA	45.69	45.23	42.61	41.70	42.80	42.67	46.02	46.43	45.52	44.30	38.34	37.42	37.25	-18.47
middle 40-60% SEIFA	62.32	59.36	58.69	55.94	58.69	57.15	61.43	63.12	61.19	58.57	53.29	54.76	52.47	-15.80
bottom 20-40% SEIFA	74.44	73.07	69.44	68.80	69.36	71.24	77.62	80.76	77.17	75.60	75.79	77.88	74.72	0.38
bottom 20% SEIFA	87.56	85.87	83.16	83.52	85.83	86.26	95.98	98.74	95.82	93.50	101.00	102.74	96.64	10.37
Total rate all SEIFA groups	58.76	57.43	55.16	54.31	55.50	55.46	60.55	62.24	60.09	58.29	56.21	56.95	54.53	-7.19

Table 4 - Birth Rates 25-29 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	84.07	87.88	88.69	88.47	90.36	87.70	90.41	87.16	84.20	84.24	81.71	81.30	79.40	-5.55
top 60-80% SEIFA	93.72	96.41	96.78	96.20	96.79	95.37	100.10	98.43	94.04	92.03	92.60	92.66	90.68	-3.25
middle 40-60% SEIFA	110.29	112.85	112.08	111.05	113.39	113.92	117.21	115.77	111.34	108.67	106.62	107.78	104.53	-5.22
bottom 20-40% SEIFA	121.89	122.85	123.09	121.42	125.73	126.27	130.33	126.93	124.50	120.06	118.00	117.33	113.65	-6.76
bottom 20% SEIFA	120.27	120.39	120.42	120.21	123.59	124.40	129.05	128.65	124.55	120.97	119.08	119.25	114.83	-4.52
Total rate all SEIFA groups	105.18	107.15	107.22	106.46	108.84	108.31	112.17	110.19	106.52	104.16	102.68	102.78	99.79	-5.13

Table 5 - Birth Rates 30-34 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	116.62	120.77	121.57	125.10	131.53	130.95	136.52	134.35	130.63	132.25	126.29	127.00	125.06	7.23
top 60-80% SEIFA	108.01	110.81	110.74	113.25	116.08	117.77	125.19	125.85	121.29	120.77	121.87	123.51	121.62	12.60
middle 40-60% SEIFA	109.13	111.82	111.01	112.64	117.26	120.82	127.24	128.00	124.19	122.96	122.25	124.88	121.43	11.27
bottom 20-40% SEIFA	109.66	110.62	110.70	112.05	117.99	120.95	127.09	125.99	124.70	121.86	120.74	121.47	118.57	8.13
bottom 20% SEIFA	108.30	108.49	108.60	110.65	115.61	119.17	125.78	127.90	124.96	123.19	121.88	123.40	119.66	10.48
Total rate all SEIFA groups	110.44	112.70	112.74	115.01	119.91	122.04	128.48	128.52	125.15	124.29	122.68	124.15	121.40	9.92

Table 6 - Birth Rates 35-39 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	61.09	65.01	66.77	69.63	73.16	77.56	85.12	88.67	84.65	86.40	85.83	84.17	84.22	37.87
top 60-80% SEIFA	51.52	55.02	56.38	59.45	62.44	66.05	73.21	75.67	74.29	75.29	74.24	75.61	72.39	40.50
middle 40-60% SEIFA	47.98	49.38	51.41	53.98	55.87	60.46	66.21	69.36	68.49	68.52	67.94	67.62	67.32	40.31
bottom 20-40% SEIFA	43.74	45.42	46.21	49.59	52.60	55.46	60.89	64.83	62.95	62.61	60.26	60.32	59.99	37.15
bottom 20% SEIFA	45.85	47.11	47.20	48.70	53.14	56.29	62.16	66.06	64.49	64.95	60.24	61.70	60.43	31.80
Total rate														
all SEIFA groups	50.44	52.87	54.15	56.89	60.09	63.91	70.38	73.78	71.82	72.50	70.82	70.96	69.94	38.67

Table 7 - Birth Rates 40-44 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	11.66	12.45	12.77	13.23	13.84	14.58	16.02	17.42	17.32	18.61	18.90	18.81	18.82	61.38
top 60-80% SEIFA	9.75	10.44	10.71	11.31	11.84	12.38	13.81	14.70	15.14	16.03	16.20	16.62	16.05	64.59
middle 40-60% SEIFA	8.95	9.20	9.60	10.05	10.28	10.99	12.10	13.12	13.59	14.13	14.35	14.42	14.57	62.75
bottom 20-40% SEIFA	8.00	8.31	8.45	9.00	9.38	9.82	10.84	11.99	12.26	12.72	12.60	12.62	12.69	58.70
bottom 20% SEIFA	8.60	8.87	8.84	9.10	9.68	10.13	11.23	12.57	12.82	13.44	12.63	13.07	12.96	50.67
Total rate all SEIFA groups	9.48	9.95	10.19	10.67	11.14	11.74	12.98	14.15	14.42	15.22	15.21	15.39	15.29	61.34

Table 8 - Birth Rates 45-49 Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	% change 01-13
top 20% SEIFA	0.53	0.56	0.57	0.63	0.68	0.74	0.80	0.88	0.90	0.96	1.05	1.16	1.22	131.50
top 60-80% SEIFA	0.44	0.48	0.49	0.53	0.57	0.62	0.70	0.75	0.77	0.82	0.88	0.99	0.99	124.49
middle 40-60% SEIFA	0.41	0.42	0.44	0.47	0.48	0.53	0.61	0.66	0.67	0.69	0.74	0.81	0.84	102.91
bottom 20-40% SEIFA	0.38	0.39	0.40	0.44	0.45	0.49	0.53	0.55	0.56	0.59	0.61	0.64	0.64	71.28
bottom 20% SEIFA	0.41	0.42	0.42	0.43	0.46	0.51	0.59	0.62	0.63	0.65	0.67	0.72	0.73	79.12
Total rate all SEIFA groups	0.44	0.46	0.47	0.51	0.53	0.59	0.66	0.70	0.72	0.76	0.81	0.89	0.91	108.25

Table 9 - Birth Rates by Age Group (per 1000 female reproductive age group population), by SEIFA Quintile

	% change 01-04	% change 05-09	% change 10-13
15-19 Age Group			
top 20% SEIFA	-6.5	6.4	-29.4
top 60-80% SEIFA	-8.4	5.9	-19.8
middle 40-60% SEIFA	-10.3	3.9	-14.4
bottom 20-40% SEIFA	-8.8	12.1	-5.1
bottom 20% SEIFA	-5.8	10.2	-3.0
20-24 Age Group			
top 20% SEIFA	-6.1	5.1	-23.5
top 60-80% SEIFA	-8.7	6.3	-15.9
middle 40-60% SEIFA	-10.2	4.3	-10.4
bottom 20-40% SEIFA	-7.6	11.3	-1.2
bottom 20% SEIFA	-4.6	11.6	3.4
25-29 Age Group			
top 20% SEIFA	5.2	-6.8	-5.7
top 60-80% SEIFA	2.6	-2.8	-1.5
middle 40-60% SEIFA	0.7	-1.8	-3.8
bottom 20-40% SEIFA	-0.4	-1.0	-5.3
bottom 20% SEIFA	0.0	0.8	-5.1
30-34 Age Group			
top 20% SEIFA	7.3	-0.7	-5.4
top 60-80% SEIFA	4.8	4.5	0.7
middle 40-60% SEIFA	3.2	5.9	-1.2
bottom 20-40% SEIFA	2.2	5.7	-2.7
bottom 20% SEIFA	2.2	8.1	-2.9
35-39 Age Group			
top 20% SEIFA	14.0	15.7	-2.5
top 60-80% SEIFA	15.4	19.0	-3.9
middle 40-60% SEIFA	12.5	22.6	-1.7
bottom 20-40% SEIFA	13.4	19.7	-4.2
bottom 20% SEIFA	6.2	21.4	-7.0
40-44 Age Group			
top 20% SEIFA	13.5	25.2	1.1
top 60-80% SEIFA	16.0	27.8	0.1
middle 40-60% SEIFA	12.3	32.2	3.1
bottom 20-40% SEIFA	12.5	30.7	-0.2
bottom 20% SEIFA	5.8	32.4	-3.6
45-49 Age Group			
top 20% SEIFA	19.2	32.0	27.0
top 60-80% SEIFA	20.5	35.1	20.9
middle 40-60% SEIFA	13.3	40.0	21.9
bottom 20-40% SEIFA	17.3	24.4	9.0
bottom 20% SEIFA	6.8	35.9	11.5

These results show that birth rates in the different socioeconomic groups were not homogenous across different age groups ($p < 0.001$). For the younger women (in the age bands from 15 to 29 years), birth rates were higher in the lower socioeconomic groups. This relationship was reversed in the older age groups. The observed differences in birth rates between the different socioeconomic groups were not uniform, and were greater in younger segments of the population than older segments of the population, suggesting that the socioeconomic factors had greater influence on the birth rates for younger women.

With respect to differences between socioeconomic groups for the various stages of the Australian Baby Bonus scheme of particular note are the 15-19 and 20-24 year age groups. In the three years preceding the announcement of the new Australian Baby Bonus scheme and in the year of announcement (allowing for time lags in responses to the policy) the overall birth rate for all socioeconomic groups in the 15-19 year (teenage) group dropped by 8.2%. During the key years of the Australian Baby Bonus policy (2005-2009 inclusive) the overall birth rate for all socioeconomic groups in teenaged women rose by 8.1%. Of particular note were the bottom two socioeconomic status quintiles in which birth rates in the years preceding the Australian Baby Bonus had dropped by 5.8% and 8.8% respectively and then during the key years of the policy rose by 10% and 12% respectively. Similar patterns were seen in the 20-24 year age groups.

For women in the 15-19 year age group in the lowest SEIFA quintile, the birth rates remained stable after the introduction of the first Australian Baby Bonus scheme in 2004 and showed significant increases ($p = 0.012$) after the \$5000 incentive policy in 2008. There were no significant changes in birth rates 2009 when the family income test ($p = 0.643$) and paid parental leave scheme ($p = 0.881$) were introduced.

The 25-29 and 30-34 year age groups are the most common demographic for pregnancy (accounting for 61.3% of all births in Australia in 2004 and 60.4% in 2012). From 2001-2004, the overall birth rate in all socioeconomic groups in the 25-29 and 30-34 year age groups rose by 1.2% and 4.2% respectively. During the key years of the Australian Baby Bonus policy, overall birth rates dropped by 2.1% for the 25-29 year age group, and rose by 4.4% for the 30-34 year age group. These patterns were broadly consistent between socioeconomic groups.

Among women aged 35-39 years, there were similar trends across socioeconomic groups. Birth rates in this age group increased across all SEIFA quintiles and remained higher, although the increases seen in the key Australian Baby Bonus years were highest in the middle and lower two quintiles. From 2001-2004, the birth rates for the middle 40-60% SEIFA, bottom 20-40% SEIFA, and bottom 20% SEIFA rose by 12.5%, 13.4% and 6.2% respectively, whereas during the key years of the Australian Baby Bonus policy the groups' birth rates rose by 22.6%, 19.7%, and 21.4% respectively. In the wind-down period of the Australian Baby Bonus, birth rates tapered off in all socioeconomic groups of the 34-39 year age bracket. Similar patterns were found in the 40-44 and 45-49 year age brackets (although in the 45-49 age group the absolute rates were small). Birth rates did, however, remain higher in the Australian Baby Bonus wind-down period across all SEIFA quintiles.

For women in the 45-49 year age group in the lowest 20% SEIFA, there were

significant increases in birth rates ($p=0.001$) from 2005, a year after the introduction of the first \$3000 Australian Baby Bonus scheme. Increases in birth rates remained steady, even after 2009 when the family income test and paid parental leave scheme were introduced. This was in contrast to the other age groups, where introduction of the family income test and paid parental leave scheme appeared to have negative impacts on the birth rates.

7. Conclusion

Responding to a gap in the literature, this paper has assessed changes in birth rates by age group and socioeconomic status after the introduction of the Baby Bonus, using national birth data for Australia from 2001-2013. We find statistically significant differences within and between age groups, socioeconomic groups, and the various stages of the Australian Baby Bonus scheme. During the key years of the Baby Bonus policy, the overall birth rate for all socioeconomic groups in the 15-19 age group rose by 8.1%. Of particular note were the lowest two socioeconomic quintiles, for whom birth rates rose by 10% and 12% respectively.

The main strengths of our study lie in the use of a large national dataset which provides 13 years of birth data. Our results add weight to previous studies which show variability between subgroups in regions (Lain *et al.* 2009; 2010; Langridge 2012). Our results show this variability on a national scale.

In 2001 Australia's fertility reached a historic low of 1.73 babies per woman (ABS 3301.0). Since then, the TFR increased to a peak of 1.96 in 2008 before dropping back to 1.9 on the most recent data. We observed the strongest associations between the periods in which the policies were implemented and increased birth rates in the lowest socioeconomic quintiles of the 15-19 age group. This is a concern from a health policy outlook as pregnancy and birth outcomes in these groups are associated with a greater risk of adverse outcomes for both mothers and babies. This increase followed a decline in births in these groups in the years preceding the introduction of the policy.

That the policy appears to have had little association with birth rates in women aged 25 to 34 years – the age group to whom most babies are born – possibly adds weight to our findings of associations in the other age groups. There was also little variation between socioeconomic groups in this age group.

The impact of tempo effects on fertility in recent years is important to understanding the increases associated across all socioeconomic groups for the 35-39, 40-44 and 45-49 year age groups. These effects may have been underestimated by those concerned about low fertility rates seen around 2001, concerns that prompted the policy in the first place. Just as the postponement of childbearing contributed to long-term fertility decline, the end to this postponement may have boosted period fertility in the years of the study. Women in the older age groups may have been recuperating their delayed births. The increasing birth rates in all socioeconomic groups for older women may reflect a broader demographic trend towards women having babies at older ages in Australia.

In this article, we are not claiming a direct causation between the baby bonus policy and the variation in the birth rate, as we could not entirely account for other social and economic changes that occurred in Australia over the study period and that

may have affected birth rates. For example, there may have been an effect of prevailing rates of unemployment. Fertility decline slows over sustained periods of economic growth. The years following introduction of the Australian Baby Bonus and prior to the Global Financial Crisis was an environment characterised by high growth, low unemployment, and record terms of trade for Australia. Economic change may affect the tempo, rather than the quantum, of fertility. We also do not have data regarding the impact of the bonus on women's intentions, so we cannot draw conclusions as to whether the policy altered childbearing decisions, only that there is an association between the introduction of the policy and birth rates of the various maternal age and socioeconomic subgroups. We are unable to say whether these differences are causal or not but we can say that living in a disadvantaged area was associated with a spike in birth rates amongst younger age groups in the years after the introduction of the baby bonus in comparison to more advantaged areas. The impact of economic change over the period of the study warrants further investigation.

Over a similar period to this study, the National Centre for Social and Economic Modelling (NATSEM) looked at the costs of raising Australian children across all income groups. In 2002, NATSEM found that it cost a typical family A\$448,000 to raise two children from birth until they left home (Percival and Harding 2002). In 2007, NATSEM found that the cost had increased to A\$537,000 (Percival *et al* 2007). In 2013, NATSEM was reported that the cost of raising a family had increased to A\$812,000 (Phillips 2013). Due to methodological and data differences these numbers are not strictly comparable, however the authors concluded that costs had risen significantly: costs as well as prevailing economic conditions would also require consideration.

The varying associations between age group, socioeconomic status and the Baby Bonus scheme were as the economic model would have predicted: stronger associations where pronatalist policies such as the Baby Bonus generate larger incentives (for example, for younger and lower incomes families).

In terms of stimulating fertility into the future, demographers such as McDonald (2006, 2013) have consistently argued that comprehensive change is necessary to avert conflict between family and career goals for women. Cross-national research suggests that the availability of formal child care and of flexible working hours are the most important institutional factors supporting fertility (Castles 2003, McDonald 2006). The aim is to keep women attached to the labour market while enabling them to have the desired number of children. Economic analyses have drawn similar conclusions. For example, Day's (2013) analysis predicts that as an economy grows, overall fertility initially declines with rising skill intensity of the workforce and then may recover with rising wages of a skilled workforce suggesting that policies to support child rearing inputs raise fertility. The issues at play are more complex than a crude lump sum payment would suggest.

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