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Born (Again) on the First of July: Another Experiment in Birth Timing

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Abstract

In an earlier paper (Gans and Leigh, 2006a), we analysed the effect of the introduction of the $3,000 "Baby Bonus" for children born on or after July 1, 2004. We demonstrated that parents behaved strategically in order to receive this benefit, with over 1000 births being "moved" so as to ensure that their parents were eligible for the Baby Bonus. On July 1, 2006, the payment was increased by $834. In this paper, we analyse births in 2006, and find that again, a large number of births were moved. We estimate that over 600 births were moved from June 2006 to July 2006, with unknown and potentially adverse health consequences.

JEL Codes: H31, J13
Keywords: introduction effect, timing of births, policy distortion

* We are grateful to Philip Clarke for comments on an earlier draft. All errors are ours.

A leading obstetrician has called on the Federal Government to bring forward the date of the rise in the baby bonus to reduce the risk of women delaying birth to secure the extra money.

The director of Women's and Children's Health Services at the Royal Prince Alfred Hospital, Dr Andrew Child, has approached the Government with his concerns.

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists has also approached the Government, expressing its concern that mothers and babies could be put at risk by delaying births to cash in on the bonus.

The baby bonus is due to increase from $3166 to $4000 next Saturday.

- *Sun Herald, June 25, 2006*

I. Introduction

People respond to economic incentives even with regard to decisions that potentially have health consequences. We documented this in Gans and Leigh (2006a) where we analysed the introduction by the Australian government of a $3,000 Maternity Payment, commonly referred to as a 'Baby Bonus' to each family of a new born child. That policy was announced on the 11th May, 2004, to apply to all babies born on or after 1st July, 2004. Thus, a household with a child born at 11:59pm on the June 30, 2004, would receive no payment while one with a child born at 12:01am on the July 1, 2004, and thereafter would receive $3,000. Consequently, there were strong economic incentives for parents to delay births to take advantage of the government payment.

We demonstrated that the effect of introducing the baby bonus was dramatic. Over 1,000 births were shifted from June to July with the greatest number of births shifted within a two week window. Indeed, through the period for which we have daily births data (1975-2006), the 1st July, 2004, had the most number of births on a single day with 1005 born that day compared to just 500 the day before. July 2nd, 2004 had the 7th highest number of births.

Daily births data has now become available for the period up until December 2006. This included some revisions to the 2004 but, more importantly, covers a period whereby the baby bonus payment was again significantly changed on a single day. The following table[1] has the updated payments and the dates upon which they apply.

Dates	Maternity Payment	Increment
30th June, 2004 and before	$0	
1st July, 2004 – 19th September, 2004	$3,000	$3,000
20th September, 2004 – 19th March, 2005	$3,042	$42
20th March, 2005 – 19th September, 2005	$3,079	$37
20th September, 2005 – 19th March, 2006	$3,119	$40
20th March, 2006 – 30th June, 2006	$3,166	$47
1st July, 2006 – 19th September, 2006	$4,000	$834
20th September, 2006 – 19th March, 2007	$4,100	$100
20th March, 2007 – 19th September, 2007	$4,133	$33
20th September, 2007 – 19th March, 2008	$4,187	$54

While most revisions are relatively small (< 2.5%), on the 1st July, 2006, the payment increased by $834 or 26.3%. While this increment was not as significant as the initial introduction of the bonus, it still represents a non-trivial amount of money; equivalent to three-quarters of a week's post-tax[2] income for a median household. Indeed, for some recipients the value of the increment may be even more significant (e.g., it is four weeks' unemployment benefits).[3] Finally, a similar order of magnitude increase is planned for the 1st July, 2008 when the payment rises to $5,000. For these reasons, we believed it would be instructive to analyse the 2006 increment to see whether it had an impact on birth timing in June and July 2006.

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[1] Source: http://www.familyassist.gov.au/Internet/FAO/fao1.nsf/content/historical_rates-maternity_payment.htm
[2] Maternity payments are not subject to taxation.
[3] http://www.facs.gov.au/guides_acts/ssg/ssguide-5/ssguide-5.2/ssguide-5.2.1/ssguide-5.2.1.20.html

In theory, the impact of the 2006 jump would be expected to be less than the 2004 introduction effect. Birth timing is a negotiation between the parents and their physician[4] and so physician preferences and demands will moderate parental wishes. Consequently, a reduction in the parental incentive would see a reduced impact on negotiated birth timing. Second, delayed pregnancy likely imposes costs on the parents themselves. Hence, a reduced financial incentive mitigates their desire for such delay. However, the precise magnitude of the reduced financial incentive is unknown.

In analysing the 2006 increment, we find that a substantial effect, relative to the payment increment, more dramatic than that in 2004. Our best estimate is that *687 births were moved from June 2006 to July 2006*; representing about 7 percent of births. Of these, about two-thirds were moved from the last week of June 2006 to the first week of July 2006. Using our two experiments (2004 and 2006), this implies that the elasticity of birth timing with respect to parental payments is significantly higher at lower dollar amounts and tapers off at higher payments; that is, a 260% increase in the financial incentive caused a 69% increase in births delayed.[5]

Nonetheless, there are two issues that complicate comparisons between 2004 and 2006. First, the government's stated objective in introducing the baby bonus was to encourage more babies. This implies a belief on their part that such financial payments would raise fertility. The July 2004 'introduction effect' could not have been driven by the timing of conceptions, since the policy was only announced in May 2004. However, the July 2006 increase was publicly known more than nine months before it came into effect. Consequently, it is possible that parents timed their conceptions to take advantage of the payment. If this

[4] Gans and Leigh (2006b) estimate that this negotiation is somewhat one-sided with doctors having three times the bargaining power of their patients in birth timing decisions.

[5] Of course, as noted in Gans and Leigh (2006a), the current payment replaced a previous scheme and so it may not be the case that the increment was $3,000 but something lower. However, the total budgetary costs of the old scheme were only one-third as large as the new scheme; so for the typical new parent, the July 2004 policy change represented a substantially bigger increment than the July 2006 policy change.

were the case, one might expect some difference in births between June 2006 and July 2006. But since birth timing is inherently imprecise, it is unlikely that an effect that was purely driven by conceptions would cause the birth rate to be very different in the last week of June and the first week of July. (On this point, see Dickert-Conlin and Chandra, 1999.)

Another point to be made is that both our previous study (Gans and Leigh 2006a) and this one are concerned only with the timing of births from one month to another. Our results do not shed any light on the broader question of whether the Baby Bonus affected overall fertility.

Second, while there was publicity surrounding the introduction of the baby bonus in 2004, there was some publicity over the increment to that bonus in 2006 (as indicated by the quote opening this paper). This included an explicit discussion of birth timing issues in early June 2006 when our first paper was released (on June 18, 2006). However, that public discussion could have had two effects: it might have raised parents' awareness of the increase, but it might also have increased doctor and hospital resistance to such pressures. As a consequence, the 2006 experiment cannot be considered as clean an experiment on financial impacts on birth timing as the 2004 one.

The remainder of this paper outlines our methodology and results. Also, given that the new births data contained revisions of the 2004 data, we re-estimate the results in Gans and Leigh (2006a) by way of an update. Those revisions indicate that the introduction effect was, if anything, stronger than we had previously estimated.

II. Results

We begin by graphically showing our results. Note that 1st July 2006 was a Saturday. Weekends are historically times when birth rates are lower (Gans and Leigh, 2006b).

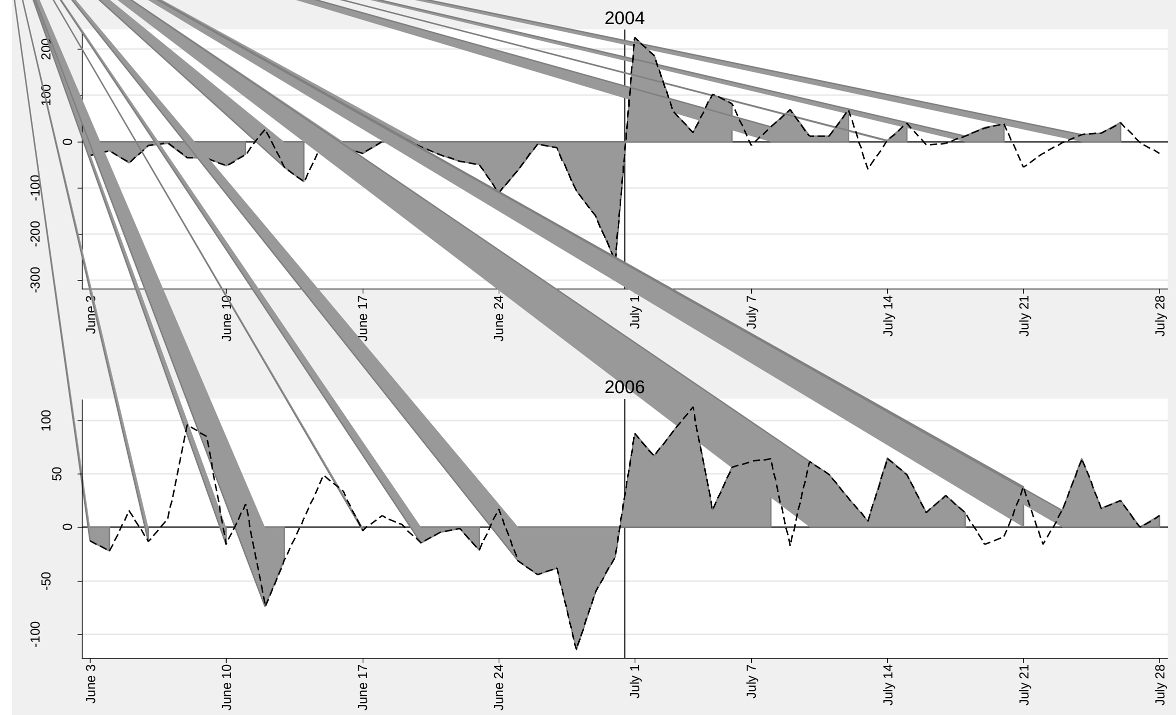
Consequently, without adjusting for the day of the week, it is not possible to depict the full impact of the increment to the baby bonus.

To purge the day of the week effect, we regress the number of births on a vector of dummies for each day of the week, interacted with the year. This effectively accounts for a weekly cycle, and allows that cycle to differ from one year to the next. For each date, we then estimate how the actual number of births differs from the number of births that might have been expected. For example, the number plotted for Saturday July 1, 2006 shows the difference between the number of babies born on all Saturdays in 2006, and the number born on Saturday July 1, 2006.[6] This adjusted series is shown in Panel B of Figure 1. Both 2004 and 2006 saw a marked drop in births in late-June, and a spike in births in early-July. To show this is not merely a seasonal effect we also estimate the same model for 2005 (a year in which the Baby Bonus did not change on July 1), and find no effects (see Appendix Figure 1).

An intuitive way of looking at the data is simply to calculate the number of births in the last seven days of June and the first seven days of July (this effectively averages out the day of week effect). In 2004, 3978 babies were born in the last week of June, and 5367 in the first week of July. In 2006, 4603 babies were born in the last week of June, and 5394 in the first week of July.

[6] Formally, Figure 1 shows the residuals from the regression $Births=a+DOW*YEAR+QB+\varepsilon$, where DOW, YEAR and QB are indicator variables for the day of week, year, and the Queen's Birthday holiday respectively. In estimating the regression, we omit June-July 2004 and June-July 2006, so as not to attenuate the Baby Bonus effect.

Figure 1: The Introduction Effect in 2004 and 2006



Shading shows days of unusually low births in June and unusually high births in July

To formally test the effect of the Baby Bonus on the number of births, we use daily birth counts for 1975-2006, and estimate the regression:

$$Births_i = I_i^{BabyBonus,2004} + I_i^{BabyBonus,2006} + I_i^{DayOfWeek} + I_i^{DayOfYear} + I_i^{Year} + \varepsilon_i \qquad (1)$$

where *Births* is the number of children recorded as having been born on day *i*, and the indicator variables denote babies that were newly eligibility for the Baby Bonus (born in July 2004), newly eligible for a $4,000 Baby Bonus (born in July 2006), the day of the week (e.g., Monday, Tuesday), the day of the year (e.g., day number 182 is June 30, day number 183 is July 1), and the calendar year. (Note that because we are interested only in increments, both the Baby Bonus dummies are set to zero in 2005.) We estimate the regression both with the dependent variable as the number of births, and the log of the number of births.

To see the effect of the Baby Bonus on the timing of births, we progressively widen the window of analysis. The first column of Table 1 restricts the sample to the last 7 days of

June and the first 7 days of July, the second column to the last 14 days of June and the first 14 days of July, and so on. In Table 1, we present data using the number of births as the dependent variable. In Table 2, we show results using log(births) as the dependent variable (which allows the coefficients to approximately be estimated as percentage effects).

Our original results were based on births registered on or before December 31, 2004. Due to a lag in birth registrations, some 2004 births had not been registered by that date. We have now obtained data on births registered by December 31, 2006, and thus our results for 2004 are similar, but not identical.[7]

For 2006, our results show a substantial Baby Bonus effect. Our best estimate is that 687 births were moved from June 2006 to July 2006, or about 7 percent of births. Of these, about two-thirds were moved from the last week of June 2006 to the first week of July 2006. The narrowness of this window suggests that it is very unlikely that our results are driven by the timing of conceptions.[8]

[7] For example, based on births registered by the end of 2004, the number of babies born on July 1, 2004 was 978. But including births registered by the end of 2006, the number of babies born on July 1, 2004 was 1005. The results in Table 1 show that using updated birth registrations does not substantially alter the results. Our previous estimate of the number of births moved from June 2004 to July 2004 was 1089. Our new estimate is 1167.

[8] We also tested for changes in births around the smaller increments in the Baby Bonus (on March 20 and September 20), but found no consistent pattern.

Table 1: Birth Effects
Dependent variable is number of births

	(1)	(2)	(3)	(4)
Window	**±7 days**	**±14 days**	**±21 days**	**±28 days**
Panel A: Based on 2004 birth registrations				
Baby Bonus 2004	206.527***	128.155***	98.294***	77.782***
	[38.970]	[25.884]	[20.809]	[16.841]
Observations	420	840	1260	1680
R-squared	0.93	0.92	0.9	0.9
Total number of births shifted in 2004	*723*	*897*	*1032*	*1089*
Panel B: Updated to 2006				
Baby Bonus 2004	209.157***	130.488***	101.030***	83.340***
	[40.843]	[26.626]	[20.069]	[15.941]
Baby Bonus 2006	123.729***	87.988***	66.411***	49.055***
	[21.090]	[16.940]	[14.152]	[13.445]
Observations	448	896	1344	1792
R-squared	0.93	0.92	0.92	0.91
Total number of births shifted in 2004	*732*	*913*	*1061*	*1167*
Total number of births shifted in 2006	*433*	*616*	*697*	*687*

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All specifications include day of year, day of week, and year fixed effects. *Window* denotes the number of days before and after the start of July. For example, the ±7 day window covers the last seven days of June and the first seven days of July. *Total number of births shifted* is half the Baby Bonus coefficient, multiplied by the number of days in the window that fall on July 1 or later. Note that Panel B also includes an indicator variable for the Queen's Birthday holiday (this makes no substantive difference to our results).

Table 2: Birth Effects
Dependent variable is ln(number of births)

	(1)	(2)	(3)	(4)
Window	**±7 days**	**±14 days**	**±21 days**	**±28 days**
Panel A: Based on 2004 birth registrations				
Baby Bonus 2004	0.302***	0.187***	0.146***	0.117***
	[0.053]	[0.037]	[0.031]	[0.026]
Observations	420	840	1260	1680
R-squared	0.94	0.93	0.91	0.91
Panel B: Updated to 2006				
Baby Bonus 2004	0.298***	0.186***	0.146***	0.123***
	[0.054]	[0.037]	[0.029]	[0.023]
Baby Bonus 2006	0.176***	0.123***	0.095***	0.072***
	[0.027]	[0.024]	[0.020]	[0.019]
Observations	448	896	1344	1792
R-squared	0.94	0.93	0.92	0.92

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All specifications include day of year, day of week, and year fixed effects. *Window* denotes the number of days before and after the start of July. For example, the ±7 day window covers the last seven days of June and the first seven days of July. *Total number of births shifted* is half the Baby Bonus coefficient, multiplied by the number of days in the window that fall on July 1 or later. Note that Panel B also includes an indicator variable for the Queen's Birthday holiday (this makes no substantive difference to our results).

Although our study cannot speak directly to the health effects of delaying births, it seems likely that decisions to delay births for non-medical reasons can only have adverse health consequences for babies and parents. While babies born pre-term and/or underweight are less likely to be healthy, the same is also true of babies born too late and/or overweight. Strong evidence on this point comes from Thorngren-Jerneck and Herbst (2001), who analysed data from over 1 million births in Sweden in the 1980s and 1990s. As their outcome measure, they used the child's Apgar score (a five-item measure of skin color, heart rate, reflex irritability, muscle tone, and respiration, which ranges from 0 to 10). Apgar scores below 7 are regarded as being low, and Thorngren-Jerneck and Herbst plotted the relationship between low Apgar scores and birthweight, and between low Apgar scores and gestation length. Figure 2 (taken from Thorngren-Jerneck and Herbst 2001) demonstrates a clear U-shaped relationship for both variables. This suggests that exogenous increases in gestational age or birth weight may well have adverse health consequences.

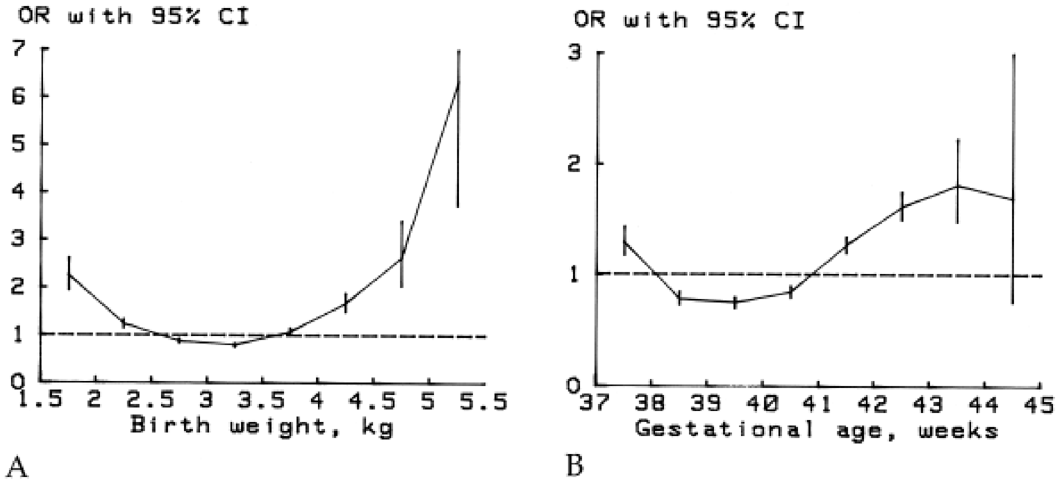


Figure 2: Child Health, Birth Weight and Gestational Age
Chart shows the Odds ratio (OR) for a low Apgar score (below 7), plotted against birth weight (A) and gestational age (B).
Source: Thorngren-Jerneck and Herbst (2001)

III. Policy Implications

In terms of long-term planning, obstetrics has distinct advantages over other fields of health. Planning on intakes proceeds months in advance and maternity wards do not have to deal with outbreaks or large scale emergencies. While births follow a cyclical pattern across the week, and a seasonal cycle over the year, these movements are themselves predictable.[9]

The financial interventions by the Australian government both in introducing a baby bonus and increasing it have had the effect of disrupting normal maternity hospital operations. The consequences of this are unknown. However, it is precisely because of that that governments need to take care in not creating conditions that introduce disruptions.

When the bonus was introduced in 2004, there was some evidence that parents timed births for financial reasons (Dickert-Conlin and Chandra, 1999); but it was generally fair to

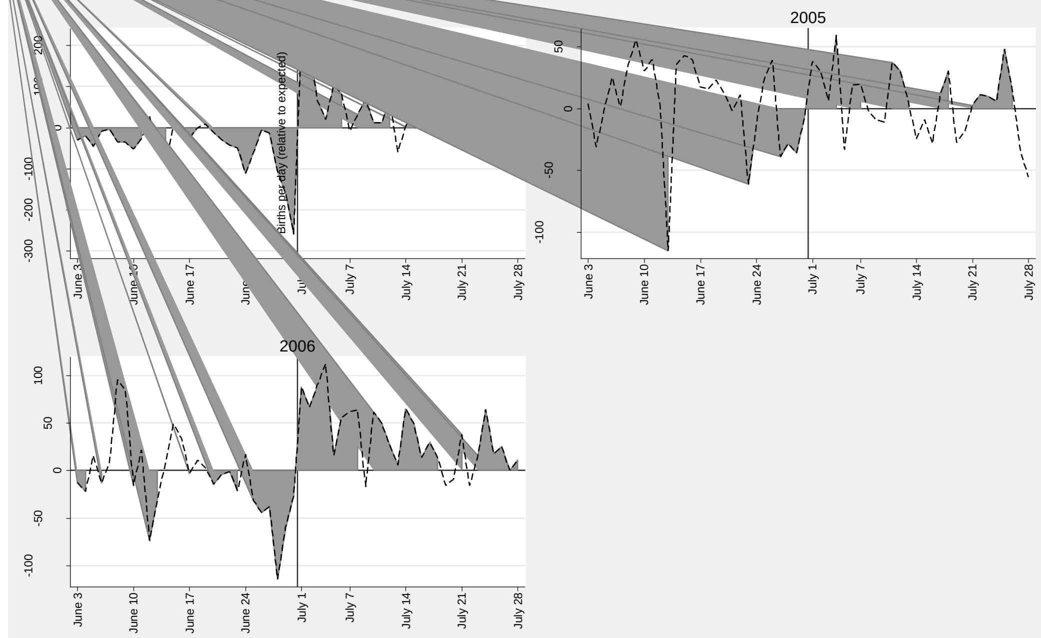
[9] In Australia, the typical weekly cycle sees births peaking from Tuesday to Thursday, and dipping on Saturday/Sunday, while the typical annual cycle sees births peaking in April and September/October, and dipping in December/January.

say that the potential for disruption was unclear. The same lack of knowledge could not be said to have existed in 2006. Yet the Australian government continued with a large increase in the bonus. This paper has demonstrated that this decision was not innocuous and, indeed, resulted in disruption of a large magnitude in June and July 2006. In our view, it is likely that this was probably due mostly to the timing of planned cesarean section and inducement procedures. But even if part of the effect was the result of fertility changes, the impact on maternity hospitals was the same: a sudden change in government financial incentives caused a 'lumpy' pattern in births.

The baby bonus is due to receive another large increment on the 1st July, 2008.[10] This paper reinforces our earlier work that the government should consider a far more gradual increase in maternity payments if it wishes to raise the payment to $5,000 in 2008.

[10] Births are typically much higher on weekdays than weekends. In 2004, July 1 fell on a Wednesday, already a busy day in maternity wards. This explains why July 1, 2004 had the highest number of births in 32 years. In 2006, July 1 fell on a Saturday, which led to an unusually busy Saturday, but not an all-time peak. In 2008, July 1 will fall on a Tuesday: raising the possibility of severe congestion in maternity wards if the Baby Bonus is suddenly increased on that date.

Appendix Figure 1: Including 2005 as a Placebo



Shading shows days of unusually low births in June and unusually high births in July

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