What Explains the Fall in Weekend Births?*

by

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Abstract

If births are unaffected by medical technology, then they should be uniformly distributed over the week. We document that nearly one-third of births that would have occurred on a weekend are 'moved' to a weekday. This proportion has grown significantly since 1960. Splicing together data from several sources, we construct long-run series of cesarean section and induction rates. The rise in these procedures appears to be closely linked to the shift of births off weekends.

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1 Introduction

One of the most noticeable trends in birth timing over recent decades has been the move away from weekend births. In the early twenty-first century, nearly one-third of US and Australian babies who would have been born on a Saturday or Sunday were 'moved' to a weekday. Yet little is known about the historical trends in this phenomenon, and the factors that drove it.

In this paper, we present new evidence on the factors that drove the shift off weekend births. Using data from Australia, we document for the first time the evolution of the shift away from weekend births. Combining figures from births registers and the electoral roll, we show that this process began in the 1960s, and accelerated rapidly around the early-1970s and the late-1990s.

Having documented the trend, we then set out to explore the role that two birth procedures – cesarean sections and inductions – played in shifting births off weekends. First, we explore the pattern of births across the week according to birth procedure. Second, we create new historical series on the prevalence of these birth procedures, and see how closely they relate to the shift off weekend births. We conclude that around four-fifths of the shift off weekend births can be explained by these two technologies alone.

2 Weekend Births – Historical Trends and Explanations

To analyze the historical trend in weekend births, we combine two data sources. From 1975-2003, we use a full tabulation of all Australian births by day. Prior to 1975, we are unable to obtain daily births data, so we instead use the largest possible population sample. This turned out to be the full electoral roll from Victoria, Australia's second-largest state (approximately one-quarter of Australians live in Victoria).[1] Using a tabulation of birthdates from the electoral roll, we code up the share of people in each

[1] The Australian Electoral Commission refused to provide us with a tabulation of birth dates from the national electoral roll. We also tabulated birth dates using an unconfidentialized version of the HILDA dataset, which gave similar long-run trends, though with more year-to-year volatility.

year who were born on a weekend.[2] By combining these two datasets (see Appendix 1 for details), we are able to track weekend birth patterns back to 1960, allowing us to identify the patterns over the period when cesarean section and induction rates first began to rise.

The solid line in Figure 1 shows the share of births that were moved off weekends in each calendar year. Taken together, the births data and population sample suggest that in 1960, few or no births were moved off weekends, but that by the early-2000s, 29 percent of weekend births were moved onto a weekday. Results are very similar if holidays are excluded.

What might explain this change? One possibility is that the increasing use of birth interventions (particularly cesarean section and induction procedures) made it easier for doctors and parents to choose the timing of births. We test this theory in two ways. First, we use recent hospitals data (for 2003-05) to look at the distribution of birth procedures across the week. Second, we construct long-run series of the prevalence of cesarean section and induction procedures, and see how these correlate with trends in weekend births.

To analyze births procedures, we use data collected from hospital records by the Australian Institute of Health and Welfare, spanning the period from 1 July 2003 to 31 March 2005. For vaginal, non-induced births, the distribution across the week is approximately uniform, but for births involving an induction and/or a cesarean section procedure, the distribution is strongly skewed away from weekends. According to the hospitals data, in 2003-05, 27 percent of all births were moved off weekends, but there are substantial differences across procedures. There were only 3 percent fewer vaginal non-induced births on weekends than a uniform distribution would predict. However, there were 50 percent fewer vaginal induced births on weekends than a uniform distribution would predict; and 54 percent fewer cesarean section non-induced births on weekends than a uniform distribution would predict. For births where induction was performed but the baby was eventually delivered by cesarean section, there were 42

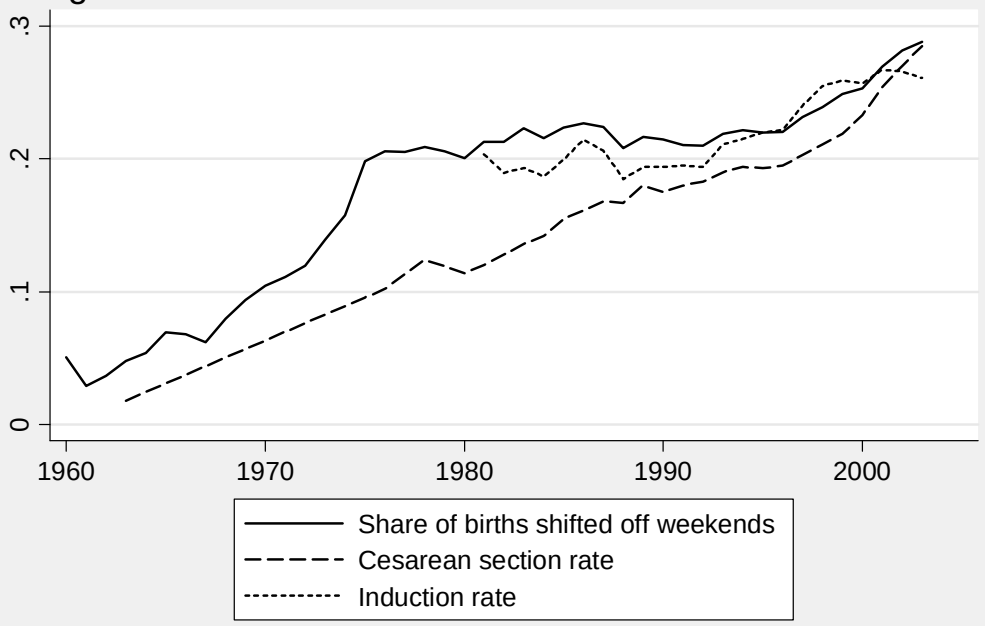
[2] There are two possible concerns about our use of the electoral roll dataset. The first is that weekend birth patterns may be different in Victoria and the rest of Australia. We discuss this issue in the text, and account for it in our empirical analysis. Another potential concern about using an adult sample to infer birth patterns is that differential mortality may affect the reliability of the data. However, the infant mortality rate is sufficiently low (2 percent in 1960; 0.9 percent in 1988) that any weekend/weekday mortality differences could have only had a tiny impact on the aggregate distribution of birthdates in the general population.

percent fewer of these procedures on weekends than a uniform distribution would predict (for full results, see Appendix Table 3). This indicates that there are only about half as many cesarean section and induction procedures performed on weekends than a uniform distribution would predict. The low frequency with which induction and cesarean section procedures are performed on weekends provides some evidence that these technologies might be responsible for the shift away from weekend births.

The second way that we can test whether birth technologies are responsible for the fall in weekend births is to plot the historical trends in the prevalence of these procedures. Since no long-run series on the prevalence of cesarean section and induction procedures is available, we construct it by combining national data for the period 1985 onwards with estimates for particular Australian states in previous years. Appendix 1 provides details on the derivation of these series.

Figure 1 plots the share of births that are moved off weekends. For 1975-2003, we use administrative births data, and for 1960-74, we use population data. Against this, we plot the share of births that were induced and the share of births that were delivered by cesarean section. The induction rate has risen from 20 percent in 1981 to 26 percent in 2003, while the cesarean section rate has risen from 2 percent in 1963 to 29 percent in 2003.

Figure 1: Birth Procedures and the Shift off Weekend Births



Note: All series include public holidays.

To formally test the relationship depicted in Figure 1, we regress the share of births shifted off weekends on the cesarean section rate and the induction rate. We estimate the relationship with each birth procedure separately, and then together. (Note that our sample is larger when we do not include the induction rate, which is only available from 1981 onwards.) Panel A of Table 1 shows the results in levels, while Panel B is estimated in first differences. Across the six specifications, we find a consistent pattern: the more prevalent the procedure, the more births are shifted off weekends. In our preferred specification (Panel B, column 3), we find that a 10 percentage point increase in the cesarean section rate shifts an additional 4 percent of births off weekends, while a 10 percentage point increase in the induction rate shifts an additional 7 percent of births off weekends. The R^2 in this specification is 0.8, suggesting that the rise in cesarean section and induction procedures can explain four-fifths of the shift away from weekend births.

Table 1: Technology and Birth Timing
Dependent variable: Share of births shifted off weekends (annual data)

	[1]	[2]	[3]
Panel A: Levels			
Cesarean section rate	0.873***		0.213
	[0.077]		[0.135]
Induction rate		0.712***	0.437***
		[0.128]	[0.148]
Observations	41	23	23
R^2	0.84	0.79	0.83
Panel B: First Differences			
Cesarean section rate	0.740***		0.715***
	[0.147]		[0.112]
Induction rate		0.524***	0.419***
		[0.119]	[0.068]
Observations	40	22	22
R^2	0.16	0.48	0.80

Note: Standard errors in brackets, corrected for heteroskedasticity and autocorrelation using the Newey-West procedure with 1 lag. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. R^2 is the centered R^2 statistic, obtained using Stata's *ivreg2* command (Baum, Schaffer and Stillman 2007).

3 Conclusion

The movement of births off weekends is one of the most significant changes in the timing of births in recent decades. In the early-1960s, virtually no births were moved off weekends. In the early-2000s, nearly one-third of births were moved off weekends. Using two different strategies, we show that this change was most likely due to the rise in cesarean section and induction rates. With recent data, we document that these procedures are significantly more likely to be performed on a weekday than on a weekend. Then, using historical data, we document a strong time series correlation between the share of births moved off weekends and the cesarean section/induction rate.

While significant attention has been given to the impact of cesarean sections and inductions on maternal and infant health, less research has looked at their effect on birth timing. Yet from a public health perspective, this impact may have been equally profound. In 1960, maternity wards – by necessity – were a 24/7 business. Now, by shifting one in three births off weekends, they operate in a manner that is closer to elective surgery wards. In Gans and Leigh (2008), we consider the implications of this

change for infant health. Additionally, it is quite conceivable that it has also affected the cost structure for hospitals, the occupational decisions of would-be obstetricians, and the duration of stays for new mothers.

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