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CENSORSHIP, FAMILY PLANNING, AND THE HISTORICAL FERTILITY TRANSITION

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ABSTRACT

The historical fertility transition is one of the most important events in economic history. This study provides new evidence on the role of information and social norms in this transition. We begin by documenting a causal relationship between the public release of information on the morality of engaging in family planning that resulted from the famous Bradlaugh-Besant trial of 1877 and Britain's subsequent fertility decline. We then show that the release of this information had nearly simultaneous effects among British-origin populations abroad, in Canada, South Africa, Australia and the United States. These findings highlight the importance of information and changing social norms in the historical fertility transition, as well as the role that cultural and linguistic ties played in transmitting these changes around the world.

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1 Introduction

The fertility transition stands alongside the Industrial Revolution as a key turning point on the road to modern economic growth. While the Industrial Revolution began a period of sustained technological progress, early gains in output were largely offset by rapid population growth, limiting the rise in per-capita income. Only with the onset of the fertility transition did population growth begin to slow, paving the way for the sustained increases in real wages that characterize modern economic growth.[1] This paper improves our understanding of this pivotal event.

Given the importance of the historical fertility transition, it is not surprising that a large body of work examines the underlying causes of this change. In the 1970s, work by the European Fertility Project sought to document and understand the fertility transition in Europe. One result of this effort was Ansley Coale's "Ready, Willing and Able" model, which suggested that three conditions must be satisfied for a fertility transition to take place.[2] First, as Coale argued, people must be ready, meaning that fertility control must be "within the calculus of conscious choice" (van de Kaa, 2004). Second, they must be willing, in the sense that the costs and benefits of raising children provide incentives to reduce fertility. Third, people must be able to reduce fertility, for example by having an understanding of and access to contraceptive methods for reducing fertility.

In recent years, economists have focused primarily on the "willing" condition. Motivated by theoretical work such as Becker & Lewis (1973) and Galor & Weil (1999, 2000), many studies have examined how fertility responds to factors such as an increased desire to invest in human capital and changing opportunity costs of female time.[3] Less attention has been paid to the "ready" and "able" conditions, in

[1] Allen (2001).

[2] See Coale (1973) and van de Kaa (2004).

[3] Empirical studies on the quality-quantity trade-off include Bleakley & Lange (2009), Aaronson *et al.* (2014), and Hansen *et al.* (2018) on the U.S., Fernihough (2017) on Ireland, Diebolt *et al.* (2016) on France, Becker *et al.* (2010, 2012) on Prussia, and Klemp & Weisdorf (Forthcoming) on England. Another active area focuses on the role of female education and labor force opportunities, which may increase the cost of raising children. Work on this topic includes Schultz (1985), Crafts (1989), Galor & Weil (1996), Jensen (2012), Becker *et al.* (2013), Diebolt & Perrin (2013) and Murphy (2015). Some have also examined the impact of mortality (Kalemli-Ozcan *et al.*, 2000; Ager *et al.*, 2018) and industrialization (Wanamaker, 2012; Franck & Galor, 2015). Additionally, there are a number of studies evaluating a range of potential determinants of the historical fertility transition in different settings. These include two studies on Sweden, Dribe (2008) and Bengtsson & Dribe

part because of the difficulty in generating quantitative evidence (Guinnane, 2011).[4]

While existing studies provide convincing evidence that economic incentives influence family size, some historical fertility patterns remain difficult to explain based purely on changes in the costs and benefits of having children. For example, as illustrated in Figure 1, the onset of Britain's fertility transition occurred rapidly, starting in 1877.[5] The sharp change in the number of births in England & Wales is striking and, as we show in Appendix Figure 8, the decline occurred simultaneously across all regions of the country and in both rural and urban areas. Both the sharpness of this change and its appearance across locations with a wide range of socioeconomic conditions are difficult to reconcile with purely economic drivers. An additional mystery appears when Britain is compared to France, which was less developed than Britain in terms of industrialization and economic growth, but where fertility began to fall many decades earlier (Guinnane, 2011).

This study offers an explanation that helps reconcile these patterns with standard models of the historical fertility transition. In particular, we argue that changing societal norms about family planning can explain the rapid slowdown in births observed in England & Wales starting in 1877. Put another way, we provide empirical support for the "ready" condition being necessary for a fertility transition to occur, as first hypothesized by Coale (1973).

We show that the sharp regime change in British fertility can be traced to one event, the famous Bradlaugh-Besant trial of 1877, and that the impact of this trial reached far beyond British shores.[6] This trial was initiated by Charles Bradlaugh and Annie Besant, two secularist and free-thought activists who published a book by Charles Knowlton with the intent of being arrested and triggering a test of existing censorship laws. Knowlton's book argued in favor of the moral right to engage in family planning and provided rudimentary information about contraceptive tech-

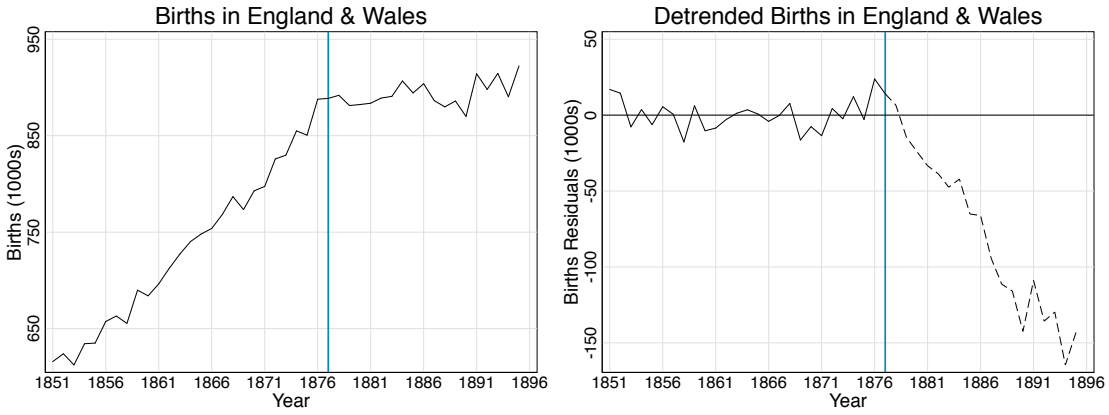
(2014), as well as work on Bavaria (Brown & Guinnane, 2002).

[4]Cultural conditions received substantial attention in the work of the European Fertility Project (Knodel & van de Walle, 1986).

[5]We plot births rather than birth rates because population is only accurately observed in census years. Appendix Figure 7 plots birth rates using a simple linear interpolation of population and shows a similar sharp and steady decline starting in 1877.

[6]Previous researchers, including Elderton (1914), Glass (1967), Himes (1970), McLaren (1978), Teitelbaum (1984) and Szreter (1996) have speculated that the trial may explain the relationship observed in Figure 1. However, support for this connection is based entirely on the timing of the event.

Figure 1: Births in England & Wales, 1851-1895



Births data were transcribed from annual reports of the Registrar General. The left-hand panel plots a simple time series of all births in England & Wales. The right-hand panel plots residuals from a regression that fits a linear trend between 1851 and 1877. The solid line corresponds to the observations that were in the regression while the dashed line corresponds to out of sample predictions. The vertical line at 1877 corresponds to the year of the Bradlaugh-Besant trial.

niques. The trial was widely covered in the press and this, together with Bradlaugh and Besant's victory, started a national conversation on family planning and led to a surge in sales of books and pamphlets on family planning and contraception. A systematic review of notable historical events occurring around the same time shows that there were no other widely-reported events that might have been behind the results we document.

Our argument relies on two separate but mutually-reinforcing arms of analysis. The first focuses on England & Wales, where the trial took place, while the second part of the analysis looks abroad, at the simultaneous fertility slowdowns among Anglophone populations outside of the U.K., in British colonies such as Canada, South Africa and Australia as well as among first and second-generation British immigrants in the United States.

England & Wales is the natural starting point for our analysis. To find variation in exposure to the information released by the Bradlaugh-Besant trial, we search through a rich archive of historical newspapers and identify articles about the trial. We identified over one thousand relevant articles published in the year that the trial took place. For each article we observe the place of publication, which allows us

to generate a local measure of exposure based on the number of articles published within a given geographic radius. With this measure in hand, we adopt a differences-in-differences framework that compares fertility patterns in areas with more vs. less exposure to coverage of the trial.

Our baseline results indicate that fertility declined more rapidly after 1877 in locations with greater newspaper coverage of the Bradlaugh-Besant trial. To ease concerns about endogeneity, we include a rich set of variables reflecting factors commonly thought to have played a role in the historical fertility transition. We also conduct a variety of placebo tests in the pre-trial period to help rule out competing hypotheses. In addition, we analyze individual-level micro-data from the 1881 Census to examine the key dimension of fertility adjustment. This analysis provides evidence that ending fertility earlier was a key margin of adjustment, though we also find evidence consistent with an increase in mothers' age at the time of their first birth. These results suggest that exposure to the Bradlaugh-Besant trial rapidly and substantially altered fertility patterns in England & Wales.

In the second part of our analysis we consider the impact of these events among Anglophone populations outside of the U.K. This provides additional evidence isolating the importance of information and changing social norms in the historical fertility transition, as well as the role played by cultural and linguistic ties in transmitting this influence around the world. Our main analysis in this section focuses on Canada, which provides an ideal setting to consider these effects. Canada was the closest large colony to Britain, with strong cultural ties. However, there were also substantial Francophone parts of the country with very little cultural or linguistic connection to Britain. Our analysis exploits this difference. We begin by providing evidence that the Bradlaugh-Besant trial and its aftermath was covered by Canadian English-language newspapers but largely ignored by the French-language press. Next, we construct a panel to study changes in fertility in the years just before and after the trial, in locations with stronger vs. weaker cultural and linguistic ties to Britain.

Our results show a substantial slowdown in fertility in Canadian counties with strong cultural and linguistic ties to Britain, relative to those (Francophone) areas with weaker ties, in the years just after 1877. This pattern is robust to including a rich set of control variables, and even holds when focusing only on variation within the province of Quebec. We also analyze microdata from the 1881 Canadian Census,

where it is possible to separately identify British-origin and French-origin households. This analysis shows that, even within the same location, British-origin families experienced a relative fertility decline just after 1877. Moreover, the margins of fertility adjustment are very similar to those observed in England & Wales.

We then briefly consider the impact of the trial in other British colonies. In South Africa, we compare fertility patterns among the British-origin population to those among the Dutch-origin Afrikaners. As in Canada, we find evidence of a relative fertility decline in locations where the population had stronger links back to Britain. We also document that fertility declined in Australia in the decade after the trial.

In the U.S., we use census microdata to compare changes in fertility patterns among the British-origin immigrant population to patterns among other European immigrant groups around the time of the trial. We find evidence that British immigrants in the U.S. reduced fertility following the trial, mainly by reducing births at higher parities, exactly the same mechanism observed in both England & Wales and Canada. While this pattern appears for both first and second-generation immigrants, effects are stronger for first-generation immigrant families.

Together, the two arms of our analysis provide convincing evidence that the information released by the Bradlaugh-Besant trial had an important effect on the fertility transition in both Britain and among more distant Anglophone populations. These results help explain both the surprising rapidity of the reduction in fertility as well as the fact that it is observable in locations with widely varying economic conditions.

One argument against the importance of information in the historical fertility transition is that evidence suggests that the main contraceptive techniques, abstinence and withdrawal, do not appear to have changed substantially during the period of the transition.[7] To reconcile this existing evidence with our results, we conducted a careful review of the literature surrounding the Bradlaugh-Besant trial. This assessment revealed that the main debate during the trial, and the vast majority of the literature related to the trial, was not focused on specific contraceptive techniques. Rather, the central debate was over the very idea that couples should have a right, or even a responsibility, to choose their family size. As Woods (1987) writes, "The very question of 'how many children should we have?' was new to most Victorians." The idea that family size should be a conscious choice, which we take for granted

[7]See Guinnane (2011) and Szreter (1996) Ch. 8.

today, was highly controversial in Victorian society. Annie Besant wrote in 1877 that, "Many people, perfectly good-hearted, but somewhat narrow-minded, object strongly to the idea of conjugal prudence, and regard scientific checks to population as 'a violation of nature's laws, and a frustration of nature's ends."' Moreover, the specific contraceptive information released during the trial was rudimentary and in several cases turned out to be dead wrong.[8] Thus, it seems that the dissemination of the idea that family size should be part of "the calculus of conscious choice," rather than the information about specific contraceptive techniques, is the main mechanism behind our results.

The patterns we document appear to be well-described by models of social norms, which we briefly review in Section 2. This literature emphasizes the central role that self-enforcing beliefs play in maintaining social norms and allowing them to persist over long periods, even when they work against individual self-interest. When behavior is dependent on norms preserved by beliefs, focal events that cause a coordinated change in beliefs can lead to rapid changes in behavior. These theoretical predictions can help explain why the Bradlaugh-Besant trial was able to generate such a rapid and substantial change in fertility behavior.

Our findings offer a new twist relative to existing empirical evidence on culture and norms. Most work on this topic emphasizes the persistent effects of culture (e.g., Nunn & Wantchekon (2011), Alesina *et al.* (2013), Fernandez & Fogli (2009)). Our results show that cultural and linguistic ties can also be an agent of change, transmitting new norms rapidly around the world. In emphasizing the role of social norms, our study builds upon recent work by Spolaore & Wacziarg (2016) and Blanc & Wacziarg (2019), which argue that culture and social norms played an important part in the historical fertility transition.[9] We view our work as complementary to these studies, with our results providing further evidence of the important role played by cultural factors. However, our study provides more direct and well-identified evidence on the role of information in this process and the role that cultural ties played in

[8]For example, Besant argued strongly against the idea that breastfeeding reduced the chances of conception, which today we know is true. Information on the timing of the most fertile period of the menstrual cycle was also wildly inaccurate.

[9]Spolaore & Wacziarg (2016) argue that the idea of fertility restriction arose in France and then diffused first to locations with stronger cultural ties to France. They test this idea using a cross-country approach. Blanc & Wacziarg (2019) examine over 150 years of fertility patterns for the French village of Saint-Germain-d'Anxure and find little evidence to support the idea that fertility declines followed changes in economic incentives.

the diffusion of this information. Our findings also explain the surprisingly rapid transitions experienced in Britain and its colonies, an important feature that has not been addressed in previous work.

Our results also relate to work on the importance of contraception, such as Bailey (2010). An important difference between our study and modern studies in this area is that we document the role of family planning information in a historical setting without access to modern birth control techniques. Our results suggest that disseminating ideas related to the morality of family planning may be just as important as releasing more practical contraceptive information, and that such ideas may lead to substantial effects even when modern contraceptive technologies are unavailable.[10]

The literature on the historical fertility transition is immense and as a result there are some important topics that we will not directly address. For example, many studies have examined the extent to which fertility reductions appeared first among elite segments of society (see Dribe *et al.* (2017) for a review of this literature). While understanding this patterns is important, the changes revealed by Figure 1 are far too large to be driven solely or even mainly by the upper classes, so we set this issue aside. We also abstract from patterns observed in other European countries, though it is worth noting that, with the exception of Scotland, other parts of Europe do not show a sharp break in fertility patterns around 1877 similar to the one we observe in England & Wales.[11]

The remainder of the paper is organized as follows. We begin with a brief discussion of relevant theoretical work. We then introduce the empirical setting and discuss the Bradlaugh-Besant trial. Our analysis of fertility in England and Wales is presented in Section 4 followed by our analysis of fertility in Canada in Section 5. Section 6 provides evidence for South Africa and Australia while Section 7 studies the behavior of British immigrants in the United States. Section 8 concludes.

[10]These results are consistent with Leahy (2014), which shows that early laws banning abortion affected fertility rates in the nineteenth-century United States.

[11]See Appendix 9.1.

2 Theoretical foundation

There is now an extensive theoretical literature modeling social norms (or cultural beliefs) and how they affect economic outcomes. These models offer a useful framework for thinking about the empirical patterns that we document. In this section we briefly review the key features of existing theories of social norms.

In a recent review, Young (2015) defines social norms as "patterns of behavior that are self-enforcing within a group: Everyone conforms, everyone is expected to conform, and everyone wants to conform when they expect everyone else to conform." Norms are often sustained through coordinated social pressure, such as the stigmatization of those who do not obey them. The existing literature suggests these enforcement mechanisms are powerful enough to sustain behaviors that run counter to individual self-interest.[12] In the case of fertility, social norms may sustain higher levels of fertility than families would prefer, with those who failed to have many children stigmatized as "barren" or "impotent."

One of the pioneers of work on social norms and cultural beliefs, particularly in a historical setting, was Avner Grief. Grief applied theories of social norms to understand the institutions that supported early trade in the Mediterranean (Greif, 1994, 2006). More recently, theories of social norms have been applied to understand fertility patterns, in studies such as Munshi & Myaux (2006), Fernandez & Fogli (2009), Spolaore & Wacziarg (2016) and de Silva & Tenreyro (2018).

Existing work on social norms highlights several features that are important for understanding our results. First, there is ample evidence that social norms and cultural beliefs tend to be persistent (see, e.g., Nunn & Wantchekon (2011), Alesina *et al.* (2013)). This persistence is important for our story because it can help explain why the high fertility levels established in Britain before the Industrial Revolution were sustained long after shifting economic forces provided an incentive to lower fertility levels (as suggested by the large literature following Galor & Weil (2000)).

Another feature of theories of social norms is that, "Social norms, usually persistent, can unravel quickly when new public information arrives" (Bursztyn *et al.*,

[12]Examples include the persistence of foot-binding in some societies, the stigmatization of "acting white" in African-American communities examined by Austen-Smith & Fryer Jr (2005), or recent evidence on how norms limit female labor force participation in Saudi Arabia (Bursztyn *et al.*, 2018).

2017). This is because models of social norms typically feature multiple equilibria sustained by coordinated beliefs. This can lead to rapid change either because beliefs reach a tipping point, or because of the occurrence of a shock resulting in a coordinated change in beliefs. The evidence we present suggests that the Bradlaugh-Besant trial may have acted as just such a shock to beliefs.

Recent evidence from other contexts shows that it is plausible that single events that are widely covered in the press can have such effects. For example, Alsan & Wanamaker (2018) shows that the disclosure of the Tuskegee Experiment in 1972 had important and long-lasting effects on mistrust of the medical system among African-American men. Another example is Bassi & Rasul (2017), which documents the substantial fertility impact of a visit by Pope John Paul II to Brazil in 1991.

To summarize, the features of social norms often lead to a model characterized by punctuated equilibria, where long periods of persistence are punctuated by short burst of rapid change. Such models appear to be a good fit for British fertility patterns during the period we study, which were characterized by persistently high levels of fertility followed by a rapid shift following the Bradlaugh-Besant trial. Similarly, a model featuring social norms can also help explain the surprisingly early fertility transition of France, where beliefs may have been affected by the French Revolution. Thus, we view social norms as a useful framework for understanding the patterns we document.

3 Setting: The Bradlaugh-Besant Trial

The impetus for the Bradlaugh-Besant trial was the 1875-76 publication of *The Fruits of Philosophy*, a book written by the American doctor Charles Knowlton in 1832. The book itself had been available in England since 1834 and was never challenged, perhaps because it always sold in small numbers. The 1856-76 edition, however, was challenged after a Bristol bookseller named Henry Cook allegedly added "obscene" pictures to the pamphlet (Ledbetter, 1976, p. 29). This prompted the prosecution of Cook and the publisher of the pamphlet, Charles Watts. The prosecutions might have gone unnoticed except that Watts was a friend of Charles Bradlaugh, a well-known secular activist and reformer. Bradlaugh, together with Annie Besant, another active secularist reformer, realized the case against Watts could be used to gain publicity

for their views on family planning while also testing the government's right to censor work of this kind. They decided to publish a new version of Knowltons' book, with some updated medical knowledge, and informed the magistrates and city police of the time and place of sale in order to prompt arrest and trial.

The trial attracted substantial public attention. A crowd of over 20,000 assembled for the first hearing at Guildhall in April, 1877 (Ledbetter, 1976). The main trial, at the Queen's Bench, began in June and lasted for five days. During the trial, Bradlaugh and Besant made a case for population control as a solution to poverty and argued against restrictions on access to contraceptive information.[13] Against them, the Solicitor-General argued[14],

> *Their notion is that the population should be limited, that it would be a desirable thing that conception should be prevented. I say that this is contrary both to the law of God and the law of man, and if they choose to circulate a document of this sort, which is intended to produce that result...I say that it is immoral...*

Ultimately, the jury found the pair guilty of publishing a book "calculated to deprave the public morals." They were fined £200 each and sentenced to six months imprisonment, though the verdict was reversed on a technicality in 1878. However, while the jury found Bradlaugh and Besant guilty, in his remarks during the trial the presiding Lord Chief Justice made sufficiently clear his disapproval of the prosecutor's decision to bring the case to trial in the first place. These remarks were broadly interpreted as allowing future publication of similar work.

The trial brought substantial attention to a subject which had long been taboo in Victorian society. *The People's Chronology*, which lists important events in each year, includes only the following entry under the population category for 1877: "The tabooed subject of contraception comes into the open at the Bradlaugh-Besant trial." Our review of other similar listings of key events turned up no similarly important events in 1877 or nearby years that could have plausibly influenced fertility to a similar extent. Historians are also convinced of the importance of the trial. Himes (1970) writes that (p. 240), "The social effects of the publicity attending this prosecution were nothing less than revolutionary."

[13] An account of the trial was published by Bradlaugh and Besant: fre (1877).
[14] Quoted from Manvell (1976), p. 147.

Widespread newspaper coverage of the trial played a crucial role in disseminating this message. As the *Exeter and Plymouth Gazette* reported (23 June, 1877), "Many journalists–with the Times at their head–have seen fit to reproduce long extracts from it in their reports of the trial...The moral ordure served up in the case of Mr. Bradlaugh and Mrs. Besant has been spread out upon the breakfast table of thousands of English families."[15] Coverage was found in national papers such as the conservative *Times* and more liberal *Daily Telegraph* as well as local papers throughout the country such as the *Exeter and Plymouth Gazette*, the *Leeds Mercury*, the *Blackburn Times*, the *Birmingham Daily Gazette* and the *Sussex Daily News* (Banks & Banks, 1954). Chandrasekhar (1981) writes that (p. 42), "At no time in British social history had the arguments in favor of a small family been presented so fully and freely...this was a remarkable turning point, for until this moment no regular newspaper would touch the subject."

Figure 2 offers a more comprehensive look at newspaper coverage. The lefthand panel plots the number of articles published in 1877 that mention each of the following keywords: "Bradlaugh or Besant", "Fruits of Philosophy", or "Population Question."[16] The timing of publications matches key moments of the trial. For instance, we see no mentions of any of these search terms prior to April of 1877, when Bradlaugh and Besant were arrested and the first hearing at Guildhall took place. We see a dip in publications in May and then the number of articles peaks in June, when the trial, conviction, and sentencing occurred. The relative increase in articles published in November matches a key hearing at Queen's Bench regarding Bradlaugh and Besant's attempt to appeal the conviction.

The right-hand panel plots, for these same keywords, the number of articles published on an annual basis from 1870 to 1890. From 1870 to 1876 there are effectively no articles published mentioning any of these terms. In 1877, however, there is a dramatic rise in articles mentioning these terms. There were nearly 1200 articles mentioning either Bradlaugh or Besant, roughly 800 articles mentioning "Fruits of Philosophy", and just under 300 articles mentioning the "Population Question". Mentions of all three terms remain elevated for several years.[17] The pattern we observe for "Pop-

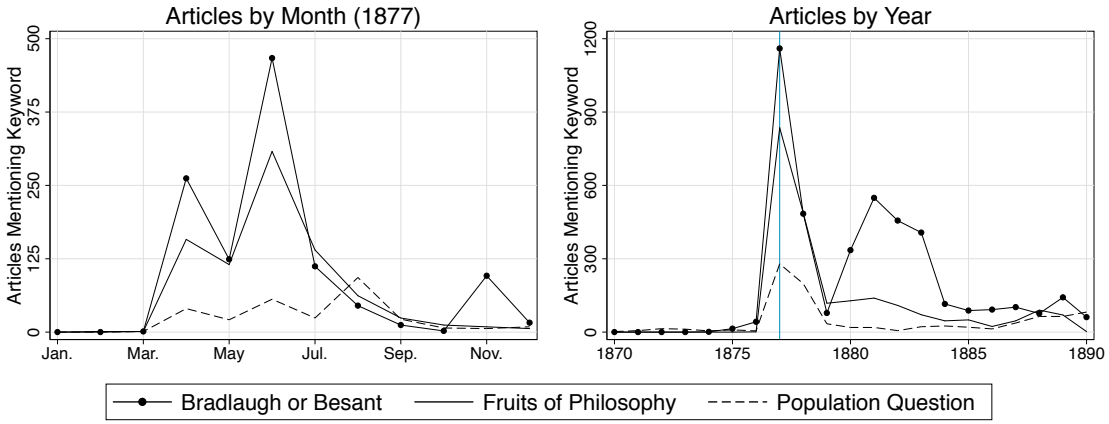
[15]Quoted from Banks & Banks (1954).

[16]The underlying data come from our own search of digitized articles from the British Library's holdings. We discuss this source in greater detail below. Note that these searches only include articles published in England & Wales.

[17]In 1878 Bradlaugh and Besant successfully overturned the ruling on appeal. From 1879 through

ulation Question" is particularly informative because this was one of several terms that the Victorians used to describe what today we would call the debate over family planning. That the use of this term tracks mentions of Bradlaugh and Besant so closely illustrates the extent to which the trial drove the broader debate over family planning. Overall the patterns in this graph provide support for the claim that the issue of family planning was not widely discussed before the trial and that the trial helped start an open conversation of this topic.

Figure 2: Published Articles Mentioning Various Keywords



Data obtained from author's own search of digitized articles published in England & Wales as made available from https://britishnewspaperarchive.co.uk.

The relatively high levels of literacy among married couples during this period (around 80%) and the large numbers of newspapers situated all around the country, meant that many people were probably exposed to the trial through this channel. In addition to reading newspapers, people were probably exposed to these ideas through conversations with others who read them.[18] Bradlaugh and Besant also gave several public lectures around the country.[19] Finally, there was the Malthusian League,

1890 we see consistent mentions of "Fruits of Philosophy" and the "Population Question", although the frequency is quite attenuated relative to 1877 and 1878 peaks. Mentions of Bradlaugh and Besant are a bit more volatile, reflecting other controversies that they would eventually get involved with. For instance, Bradlaugh's election to Parliament in 1880 resulted in a major controversy when he argued that he should not have to take the religious Oath of Allegiance.

[18]For example, Teitelbaum (1984) suggests that many working-class women may have been exposed to the ideas discussed in the trial through their work as servants in middle-class households.

[19]On 25 June, 1877, for example, the *Times* reported that, "Last night the new Hall of Science,

an organization dedicated to spreading family planning ideas, which was established following the trial.[20] The trial also generated an enormous increase in sales of books on family planning in England & Wales. This included Besant's book, *Law of Population*, which was published in 1877 and sold 175,000 copies by 1891.[21]

News about the trial spread rapidly outside of England, particularly in British colonies. In Section 5 we discuss the coverage of the trial in Canada. In Australia, a similar trial over the publication of Besant's *Law of Population* reached the Supreme Court of New South Wales in January of 1888. The presiding judge, Justice Windemeyer, drawing heavily on the statements of the judge in the original Bradlaugh-Besant trial, ruled that Besant's book was not obscene and thus its publication was not illegal. In the U.S., the trial was covered extensively in American newspapers from New York to Kansas to Hawaii. Four new U.S. editions of *Fruits of Philosophy* were released in the second half of the 1870s, by publishers in Boston, Chicago and Kentucky (Brodie, 1994). An American edition of Besant's book was published in New York in 1878 and second edition in 1886.

We have conducted a thorough review of both the books and the newspapers related to the trial to understand the nature of the debate that it generated. This revealed that there were two central issues at stake. The first issue, and the one that attracted the most attention, was the debate over whether married couples–and the literature in this period was always aimed at married couples–had a moral right to choose their family size. While the idea that couples should have such a right may sound obvious today, this point was controversial at the time. Many, like the Solicitor General quoted above, believed that such a choice was "contrary both to the law of God and the law of man." In response, the bulk of the family planning books and

Old Street, was densely crowded, it having been announced that Mr. Bradlaugh and Mrs. Besant were to deliver addresses. Of the 600 persons who filled the hall, one-third were women, many very young...In the streets were some 400 people who were unable to obtain admission. Copies of the Fruits of Philosophy were sold by the hundred, young women and lads purchasing largely" (quoted from Banks & Banks (1954)). Elderton (1914) documents visits by Bradlaugh and Besant as far afield as Leigh, near Manchester, where "well-attended meetings were held at which neo-Malthusian doctrines were advocated and tracts distributed."

[20] D'Arcy (1977) estimates that the League printed over 850,000 pamphlets from 1879-1889.

[21] Other similar works, such as Dr. H.A. Allbutt's *Wife's Handbook* appeared soon after, and demand increased for books, such as George Drysdale's *Elements of Social Science* and Robert Dale Owen's *Moral Physiology*, which attracted little attention before 1877. Himes (1970) estimates that (p. 251), "Probably not less than a million tracts...were sold in England between 1876 and 1891." This is substantial given that the population of the U.K in 1871 was just over 31 million.

pamphlets published during this period were dedicated to arguing that couples had a right, and even a responsibility, to choose.[22]

The second issue was whether specific contraceptive information could be provided at a cost that was affordable to the working class population. This was an important issue in the trial, but the literature spent far less attention on this topic, perhaps because reasonably effective methods, such as abstinence and withdrawal, were already well-known. The pamphlets published during and after the trial did recommend specific contraceptive procedures, but these were rudimentary and in several cases dead wrong.[23] Based on this review, it seems unlikely that the trial substantially improved available contraceptive technology, a conclusion that is consistent with existing work suggesting that the main methods remained unchanged during this period (see Guinnane (2011) and Szreter (1996) Ch. 8). Yet this does not mean that families did not have the ability to limit their fertility: an analysis by David & Sanderson (1986) shows that applying even rudimentary techniques such as withdrawal can lead to substantial reductions in family size.[24]

In order to quantify the content of the debate surrounding the trial we have transcribed a sample of just under 500 articles on the trial published in England & Wales in 1877 (about 40% of the full set of articles). An analysis of the content of these articles, in Appendix 9.2.2, shows that, beyond factual reporting on trial, the discussion in the newspapers was centered on the morality of fertility control. None of the articles included terms related directly to the technical aspects of contraception.

The debate over the morality of family planning is important for our story because it indicates that information may matter even when specific contraceptive techniques

[22] As an example, the first chapter of Knowlton's book aimed at, "Showing how desirable it is, both in a political and a social point of view, for mankind to be able to limit at will the number of their offspring." Besant's book, written just after the trial, was given the title *The Law of Population: Its Consequences and its Bearing Upon Human Conduct and Morals*. Moral questions of the correctness of family planning were central to the book, which dedicated three chapters to making an argument for the righteousness of family limitation.

[23] Knowlton's book describes the unreliability of withdrawal, clarifying common misconceptions about partial withdrawal. He advocates a syringe douching with a chemical compound, which he believed was more effective and less intrusive than other methods. Besant recommended the sponge and withdrawal. Besant also provided erroneous information about the safest times in the cycle for intercourse and argued that nursing had no effect on conception.

[24] Their baseline model predicts that a married couple taking no efforts to curb fertility could expect nine live births over the duration of their marriage. If the couple adopted a method of contraception with a 12.5% failure rate–a rate consistent with rudimentary nineteenth-century contraceptive techniques–their expected family size would fall to roughly three.

do not change. As Glass (1967) writes (p. 43), "Until the end of the War of 1914-18 the birth-control movement in England concentrated almost exclusively on spreading the *idea* of and reasons for family limitation."

4 Analysis of fertility in England & Wales

4.1 Quantifying Exposure to the Trial

To assess the impact of the trial on fertility, we construct a measure of exposure based on a search of extant newspaper articles for mentions of the Bradlaugh and Besant trial. As noted earlier, newspapers were only one way that people could be exposed to the trial, but historical sources suggest that newspapers played a central role in disseminating information about the trial within England & Wales (Banks & Banks, 1954). Studying newspapers is particularly advantageous since it allows us to track articles about the trial in a systematic way.

Our newspaper source is britishnewspaperarchive.co.uk, a partnership between the British Library and the UK genealogy service findmypast.com to digitize 40 million newspaper pages from the British Library's extensive collection. Each newspaper article is indexed by place and date of publication. Given the uniqueness of the names "Bradlaugh" and "Besant," we identify relevant articles as those published in England & Wales in 1877 where either of the two names appears in the text. There were 1,149 articles matching these criteria.

As shown in Figure 2, the timing of the published articles matches pivotal moments of trial, indicating that our keyword search is a good proxy for trial coverage. We have manually reviewed each article to ensure that we correctly identify articles related to the trial and manually classified each article into several categories (see Appendix Table 7). Roughly three quarters of the articles captured in our search were direct reporting on the trial. The remaining quarter of articles are either opinion pieces or tangential topics rather than explicit coverage of the ideas being discussed in the trial, but all of the articles identified in our search were related to the trial in some way. In our main analysis we measure exposure to the trial using all of the articles identified in our search, though in robustness checks we will explore alternative approaches.

Our measure of exposure to the trial is based on articles published in local papers.

This "provincial press" was highly influential during the second half of the nineteenth century, before the emergence of a national market dominated by London papers.[25] Provincial papers kept close track of events in London and beyond through their own reporters as well as telegraph services such as the Press Association (Williams, 2010, p. 117). We identify local articles using the place of publication reported in the newspaper data, which we match to registration districts, the smallest administrative unit with consistent birth and population data.[26] To reflect the fact that provincial papers usually served not just the town where they were published but also the surrounding area, we measure exposure to the trial in a district by tabulating the number of articles published in that district or other districts within a given geographic radius (usually 25km, though we explore alternatives). Appendix Figure 10 plots the spatial distribution of this measure.

Variation in this measure of exposure is driven by two forces. The first is pre-existing variation in access to newspaper networks while the second is variation in whether a specific paper decided to cover the trial. In the Appendix we show that both types of variation were important, though editorial decisions appear to be more important than the overall newspaper network. While one may worry about whether a newspaper's decision to cover the trial or access to newspapers more generally might have an independent effect on fertility, it is worth noting that the differences-in-differences framework we adopt helps alleviate some of these sorts of concerns.

4.2 Other Data for England & Wales

We study the impact of exposure to the trial on fertility outcomes using both aggregate district-level and individual-level outcome variables. Our first outcome variable is the district fertility rate. This is calculated using annual data on births, which

[25] In 1877, Gladstone said that "there was more political power in the provincial press than in the whole of the London press" (Williams, 2010, p. 8).

[26] While there are over 600 districts in England & Wales, many districts changed their boundaries at some point during our study period. We adjust for these changes by combining districts with boundary changes that shifted more than 200 residents. We also exclude the districts that comprise London because London differed from the rest of the country in a number of important ways. In particular, London was the location of the trial and also the center of the national press. As a result, newspaper articles may not be a good indicator of exposure. After these adjustments we are left with 430 consistent districts spanning 1851 to 1891.

we transcribed from reports from the Registrar General's Office for 1851 to 1895.[27] We combine the births data with population data from the Census to calculate birth rates relative to the fertile-aged female population. When calculating birth rates, we use three-year windows following each census. This helps smooth over some of the variation observed in annual births at the district level while also avoiding the need to use interpolated population denominators, though it also means our analysis is conducted at the decade level.[28]

We have also constructed a rich set of district-level control variables reflecting key factors thought to influence fertility behavior. These include controls for female and child labor-force participation, infant and overall mortality rates, population density, local industrial structure, religious affiliation, literacy at the time of marriage, etc. Further details on the data and construction are in Appendix 9.2.3.

We also present results obtained from individual-level census data from the 1881 census. This dataset, which was provided by the U.K. Data Archive, covers all families in England & Wales.[29] Because this census maintained the structure of the household, we can identify parents and all of their children that resided at home at the time of enumeration. Since we know the age of each child, we can use this to infer each family's fertility history. Of course, this approach has limitations, the most important of which is that we will not observe children who were born but died before the Census took place. As a result, variation across locations in infant mortality rates may affect our inferred fertility behavior. However, our difference-in-difference approach helps deal with these types of concerns.

The microdata will be particularly useful for looking at some of the mechanisms through which fertility adjustment occurred. In particular, these data allow us to look within families, to study whether couples were putting off childbirth, allowing more time between children, or ending fertility earlier. However, because the individual-level data also have some limitations relative to the aggregate birth statistics, we view

[27] There are data separating legitimate and illegitimate births starting in 1871. These show that the vast majority of births were within marriage and it is among those births that the change in fertility behavior observed in Figure 1 occurred. The quality of the birth registry data has been analyzed in several papers starting with Glass (1951). A review of these studies by Woods (2000) (Ch. 2) indicates that by the early 1860s the registration data was capturing 97-98% of all births and that registration was essentially complete by the mid-1870s.

[28] So, for example, the birth rate in each district in 1851 is calculated as the average annual number of births from 1851-53, divided by the number of fertile-aged women in the district in 1851.

[29] See Appendix 9.2.3 for details on the construction of this sample.

these two sources of data as complementary.

4.3 Analysis approach and main results

We begin this section with an analysis of birth rates at the district level. Specifically, we study whether districts with greater exposure to the trial, as measured using the newspaper data, experienced a relatively greater reduction in fertility after the trial. This analysis is conducted at the decade level, using fertility rates calculated around each census year (1851, 1861, etc.). The specification is,

$$\Delta ln(BR_{dt}) = \beta_0 + \beta_1 ARTICLES_d * TRIAL_t + X_{dt}\lambda + \phi_d + \eta_t + \epsilon_{dt} \qquad (1)$$

where BR_{dt} is a measure of the birth rate in district d during decade t and Δ is a difference operator. BR_{dt} is calculated using the total number of births in district d spanning the year of census enumeration, the year after enumeration, and two years after enumeration, and then dividing by the female population aged 15-45 in the census (as measured in the enumeration year).

The variable $ARTICLES_d$ captures district d's exposure to the trial. In our main analysis, we measure this as the number of articles published within a district or within other districts in a 25km band around the district center, though in robustness results we consider alternative distance windows.[30] We then divide districts into high-exposure ($ARTICLES_d = 1$) and low-exposure ($ARTICLES_d = 0$), where high-exposure districts are those exposed to above the median number of articles (six) mentioning Bradlaugh or Besant in 1877. Using a discrete exposure measure eases interpretation and helps account for the fact that there is likely measurement error in our exposure measure. The variable $TRIAL_t$ is an indicator for the decade during which the Bradlaugh-Besant trial took place, i.e. the change between 1871 and 1881. The variable ϕ_d represents a set of district fixed effects, which can be interpreted as district-specific time trends since our outcome variable is in changes. Our regressions also include decade fixed effects, denoted η_t. Finally, we adjust the

[30] Our district centers are typically the main town of the district, though in some very rural districts we instead use the geographic center.

standard errors by clustering at the district level.[31]

Our key identification assumption is that exposure to articles about the trial is not related to other factors that may cause a change in fertility patterns exactly in the decade of the trial. To help strengthen identification we have constructed a wide range of control variables reflecting the key factors thought to influence the demand for children. In our specification each of these controls is interacted with the post-trial indicator in order to allow them to have a time-varying impact on fertility.[32]

Table 1 presents our primary results for England & Wales. Column 1 offers a baseline estimate before we add our district-level fixed effects, which again can be interpreted as district-level linear trends. Note that what we are identifying is the difference in the change in birth rates after 1877 in high vs. low exposure districts. Low exposure districts may have also been exposed to the trial, but we expect their response to be weaker than in districts where the coverage was more widespread. Thus, the magnitude of our estimates will not reflect the full effect of treatment. Despite this we still observe a substantial effect: in Column 1, we find that high exposure districts saw their birth rates fall by roughly 2.5% more than low-exposure districts following the trial. In Column 2 we add our district-level fixed effects and the point estimate increases to roughly 3.5%.

To alleviate concerns that our results are being driven by changes in characteristics of the married population, Column 3 adds to our baseline specification the interaction between our trial decade indicator and each of the following district-level variables: the marriage rate from 1871-73, the share of marriages that took place at the Registrar's office (i.e., non-religious), the share of marriages that took place in a Catholic church (which also helps control for the Irish population in each location), the share where the bride or groom were minors, and the share where they were illiterate. The inclusion of these interactions slightly attenuates the results but the qualitative story is largely unaffected: places with more exposure to trial coverage saw large and statistically significant declines following the Bradlaugh-Besant trial.

[31] We have also tried correcting our standard errors to account for serial and spatial correlation at the 25km, 50km, and 100km level. These standard errors are generally 10-15% smaller than district-clustered standard errors, and so we stick with district clustering since it is more conservative.

[32] This is consistent with the methods to strengthen identification when using difference-in-difference estimation suggested by Jaeger *et al.* (2018) and Kahn-Lang & Lang (2018).

Table 1: Main results for England & Wales

DV is Decadal Change in ln(Avg. Birth Rates)					
	(1)	(2)	(3)	(4)	(5)
High News Exposure × Pre-Trial Decade					0.001
					(0.010)
High News Exposure × Trial Decade	-0.027***	-0.036***	-0.021***	-0.018**	-0.017**
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Period fixed effects	Yes	Yes	Yes	Yes	Yes
District fixed effects		Yes	Yes	Yes	Yes
Marriage X trial interactions			Yes	Yes	Yes
Other district X trial interactions				Yes	Yes
Within R-squared	0.500	0.594	0.618	0.628	0.669
Observations	1,720	1,720	1,720	1,720	1,720
No. districts	430	430	430	430	430

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions weighted by 1851 district population. The trial decade is the 1871-1881 change while the pre-trial decade is the 1861-1871 change. Birth rates are 3-year forward looking averages (i.e., centered on the year after enumeration). "High News Exposure" districts are those where the number of articles published on the Bradlaugh-Besant trial within a 25km band is above the median. The "Marriage X trial interactions" specification adds interactions between our trial decade indicator and each of the following district-level marriage variables: the marriage rate from 1871-73, share of marriages spanning 1871-75 that took place at the Registrar's Office (which we interpret as non-religious), share of marriages that took place in a Catholic church, share of 1871-1875 marriages that were first time marriages, the share where the bride and groom were minors, and share of marriages where the bride and groom were illiterate. The "Other district X trial interactions" controls include each of the following district-level characteristics interacted with our trial decade indicator: population density, average share of births that were illegitimate (1871-1875), female labor force participation rate, child labor force participation rate, share of workers that were in the "professional" class in 1861, and three measures of district health (overall mortality rate, mortality rate for fertile women, and the under 5 mortality rate). In column 5 we also interact each of our marriage and district characteristics as well as our "High News Exposure" variable with an indicator representing the pre-trial (1861-1871) period.

Column 4 goes even further by including the interaction between our trial decade indicator and each of the following district-level characteristics: population density, the share of births that were illegitimate, female and child labor force participation, the share of workers employed in "professional" occupations in 1861, the overall district mortality rate, the district mortality rate among fertile-aged women, and the district mortality rate among those aged 0-5. These interactions attempt to account for time-varying changes in other characteristics that are more closely related to ex-

isting theories of the fertility transition. Relative to column 2, the inclusion of this rich set of controls does not meaningfully affect the results.

We view Column 4 as our preferred specification because it controls for a wide variety of potential confounding mechanisms. Column 5 builds upon this specification to provide empirical support for the parallel trends assumption embedded in our identification strategy. That is, we want to make sure that changes in fertility in high news districts were not systematically different from low news districts prior to the trial, particularly after controlling for other confounding factors. We implement this by adding an indicator for the pre-trial decade change (i.e. 1861 to 1871 change), which we interact with our high news exposure treatment variable. This specification also includes the interactions with each of our controls. The inclusion of these interactions does not affect the point estimate for our treatment variable (high news exposure interacted with the trial decade), but more importantly the point estimate for the pre-trial decade interaction is effectively zero and statistically insignificant.

Table 2 presents our main robustness checks. Panel A presents results from a series of placebo checks that assess whether districts with higher trial exposure exhibit differential trends in the pre-trial period. In this analysis, we shorten our panel to only consider changes between 1851-1861 and 1861-1871. We then classify 1861-1871 as our "treatment" decade and compare trends in that period to the 1851-1861 decade. We consider the following outcomes: changes in marriage rates, the share of marriages where both parties were minors, the share of marriages where both parties were illiterate, district population, population density, the under 5 mortality rate, the district's child labor force participation rate, and the district's female labor force participation rate. Of the eight outcomes considered, none of the changes are statistically significant at the 10% level. This increases our confidence in the parallel trends assumption needed to interpret the main results of Table 1 as causal.

Panel B examines the robustness of our preferred specification (Column 4 of Table 1) to changes in the underlying dataset. Columns 9 through 12 remove districts that were heavily dependent on textiles, mining, metals and engineering trades or farming. These results show that our results are not being driven by populations working in any particular sector. Column 13 discards the 25% most rural districts based on population density while Column 14 discards the 25% most urban districts. Effects are stronger in urban than in rural districts, but we continue to see substantial effects

in rural areas as well. Finally, Column 15 removes all districts in Wales to ensure that our results are not being driven by a simple England vs. Wales comparison. The main result is largely unaffected by these sample restrictions, which helps alleviate concerns about our results being driven by some geographical or occupational interaction.

Panel C considers alternative ways of measuring trial exposure as well as some additional sample restrictions based on the exposure variable. Column 16 drops all districts within 25km of London to be sure that our results are not being driven by the impact of the London papers in nearby districts (recall that London itself is excluded from our sample). In Column 17, we eliminate a relatively small set of isolated districts by dropping any district more than 50km from a relevant newspaper article. Identification in this specification exploits both the comparison of districts within 25km of newspapers publishing an article to those outside of 25km but within 50km, as well as variation in the number of articles published in different locations. In Column 18 we define "high exposure" as having any article published within 25km. In this specification our control districts are those for which we found no articles published within 25km. Column 19 defines treatment using a radius of 50km, while Column 20 uses a narrower radius of 10km. Note that our point estimate actually falls when the smaller radius is used. A likely explanation for this pattern is that as we move to a smaller radius, some locations that were exposed to news about the trial may end up in the control group. In Column 21 we include in our measure of exposure to the trial only articles providing direct reporting on the trial. In Column 22 we include only articles with lengthy coverage of the trial. Results from these regressions are somewhat stronger, which is what we'd expect given that these are likely cleaner proxies for exposure to the trial.

One lingering question is how much of our newspaper exposure measure is driven by variation in the pre-existing newspaper network versus newspaper-level decisions to cover the trial. In Appendix Table 6 we offer some evidence that can help us differentiate between these two channels. These results indicate that the key source of variation behind our results is not coming from overall newspaper density but rather from variation in the choices made by different local papers regarding whether, and how intensively, to cover the trial.

Table 2: Robustness checks

Panel A: Balance tests to rule out differential pre-trial trends in district characteristics

	3-year averages							
	Δ Marriage Rate	Δ Minor Mar. Share	Δ Illit. Mar. Share	Δ ln(Pop.)	Δ Pop. Density	Δ ln(Under 5 Mort. Rate)	Δ Child Lab. Force Partic.	Δ Fem. Lab. Force Partic.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High News Exposure × Trial Decade	0.001	0.001	0.007	0.007	0.116	-0.009	0.004	-0.000
	(0.001)	(0.015)	(0.011)	(0.010)	(0.117)	(0.016)	(0.005)	(0.003)

Panel B: Robust to excluding districts based on industrial specialization or urbanization

	No Textiles	No Mining	No Metals	No Farming	No Rural	No Urban	No Wales
	(9)	(10)	(11)	(12)	(13)	(14)	(15)
High News Exposure × Trial Decade	-0.020***	-0.015**	-0.019**	-0.021***	-0.024***	-0.017**	-0.019**
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)

Panel C: Robust to alternative measures of trial exposure

	> 25km from London	< 50km from an Article	Treatment is >0 Articles	50km Exposure	10km Exposure	Only Trial Coverage	Only Lengthy Coverage
	(16)	(17)	(18)	(19)	(20)	(21)	(22)
High News Exposure × Trial Decade	-0.018**	-0.018**	-0.020**	-0.018**	-0.014*	-0.020***	-0.021***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.007)	(0.008)	(0.007)

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions include period fixed effects, district fixed effects, the "Marriage X trial interactions" and "Other district X trial interactions", as defined in Table 1, and are weighted by 1851 district population. "High News Exposure" districts are those where the number of articles published on the Bradlaugh-Besant trial within a 25km band is above the median (i.e., 7 or more articles published in 1877). In Panel A we include only data from 1851-1871. In Panel B we include data for all time periods but drop particular groups of districts. In columns 9-11 we drop the 10% of districts with the largest share of employment in textiles, mining, or metals/engineering respectively. Since these industries were geographically concentrated this removes districts representing the vast majority of employment in each of these sectors. In column 12 we drop the 25% of districts with the greatest employment share in agriculture. We use a larger share here since agriculture is more evenly spread throughout the country. In columns 13-14 we drop the 25% most rural or most urban districts based on population density.

Because our article exposure measure appears to be driven by editorial decisions, one might worry that these choices are endogenous to local conditions that affect people's willingness to change their fertility behavior. However, note that this form of endogeneity will not undermine our results unless there was some other factor that acted on people's fertility behavior right around the time of the trial. Historians looking at fertility during this period have identified law changes, such as the new child labor laws passed in 1877, as the most plausible alternative explanation for the changes occurring after 1877. However, these law changes were specific to Britain, so our results from other locations provide a strong argument against such alternative explanations. Beyond law changes we have not identified any other event likely to have generated the type of rapid changes we have documented, while still being largely confined to the Anglo-Saxon world.

It is also natural to wonder whether the effect of exposure to the trial varied with other underlying district characteristics. It is possible to examine the interaction between our trial exposure variable and other district characteristics, though we often do not have enough power to generate sharp triple difference results. We do, however, find clear evidence that trial exposure had stronger effects in more urban areas. There is also weak evidence of stronger effects in locations with higher literacy rates, though the estimate is not statistically significant, possibly due to the generally high level of literacy during this period. We do not find any evidence of differential effects associated with other district characteristics, such as the share of couples married in the Catholic Church, or the rate of child labor force participation.

4.4 Mechanisms

There are a number of dimensions along which couples could have adjusted fertility to generate the results documented thus far: they may choose to put off having children, they may choose to increase the spacing between births, they may choose to end fertility earlier, or they may choose to completely forgo having children. Individual-level microdata allow us to examine some (but not all) of these dimensions.

As a first step, we study whether families appeared to be delaying childbirth. Specifically, we looked at whether the age of parents when they had their first child appeared to increase after 1877 in locations with greater exposure to the trial. Our results, described in Appendix Table 10, indicate that mothers' age increased by a

statistically significant 0.077 years in districts more exposed to the trial after 1877.[33] Thus, there is some evidence that families may have delayed fertility, though the magnitude of this dimension of adjustment does not appear to be large.

Next, we study whether, conditional on family size, there is evidence that the probability of having additional children changed differentially after the trial in districts with greater trial exposure. This dimension of adjustment appears to be more important. For this analysis we organize our data as household-level panel and restrict our sample to families with at least one child in the household (for those with zero children it is difficult to identify the household's fertility risk because we do not observe the year in which the potential mother and father were married). We then apply the following probit specification:

$$Y_{hdt} = \begin{cases} 1 \text{ if } Y^*_{hdt} > 0 \\ 0 \text{ otherwise} \end{cases}$$

$$Y^*_{hdt} = \beta_0 + \beta_1 ARTICLES_d * TRIAL_t + \beta_2 C_{hdt} + X_{dt}\lambda + \phi_d + \eta_t + \epsilon_{dt} \qquad (2)$$

where Y_{hdt} is an indicator for whether household h in district d had a child in year t, and Y^*_{hdt} is a latent variable. This specification includes as controls a vector of household characteristics (C_{hdt}): the number of children that were in the household at the beginning of year t, the number of years since the last birth, the mother's age, and the father's age. Thus, our results can be interpreted as the effect of the trial on whether a household has an additional child, conditional on the number of children currently in the household. Because the response to the trial may differ with parity, we also generate results in which we estimate the impact of the trial separately at different levels of initial parity.

As in the district-level analysis, we include a full set of district and time fixed effects as well as a rich set of district-level control variables, each interacted with a post-trial indicator variable. As before, the variable $ARTICLES_d$ is an indicator variable that equals 1 if district d had above median trial exposure (i.e. more than 6 articles published within 25km in 1877). The variable $TRIAL_t$ is an indicator for the post-trial years, i.e. 1878 through 1881 (recall that we are looking backward using the fertility patterns revealed by child ages in the 1881 census). We confine the analysis to the period from 1874-1881, which means that we have the same number of pre-trial

[33] Fathers' age increased by 0.064 years (not statistically significant).

and post-trial years in the sample.[34]

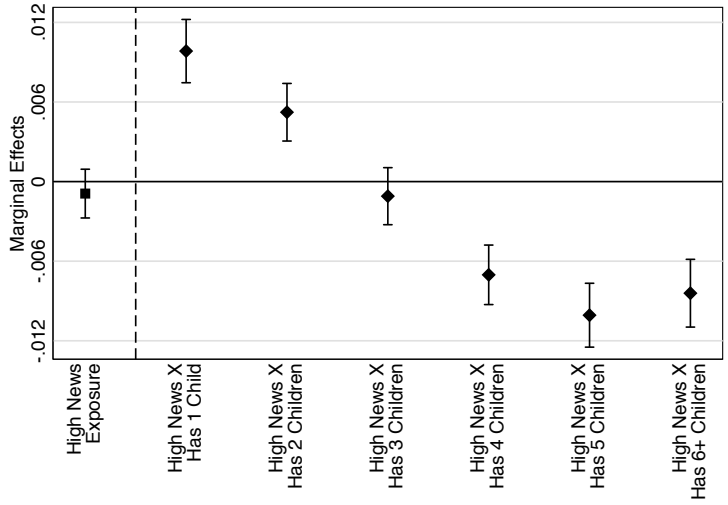
We present these results graphically in Figure 3. The coefficient on the left of the figure shows the effect of exposure to the trial on whether households had an additional child estimated across all levels of initial parity. This estimate suggests that there was a reduction in the number of additional children in households more exposed to the trial in the post-trial period, though the estimate is not statistically significant. However, this masks substantial heterogeneity. The remaining results break these effects down by parity. There we see that households with one or two children were more likely to have an additional child when exposed to the trial, but those with more than three children were substantially less likely to have additional children. The increase in the probability of having an additional child at low parities may reflect either a selection effect, since we found previously that some families were delaying having a first child, or it may reflect a behavioral response to having more control over fertility decisions that involves having fewer more closely spaced children. Distinguishing between these two channels is interesting but beyond the scope of this paper. The substantial reductions in fertility at higher levels indicate that families were trying to reduce fertility at parities above three, either by increasing spacing, or (more likely) by stopping fertility earlier.

While the results presented in Figure 3 are based on panel-data regressions using annual data, we have also explored a variety of alternative estimation approaches, such as looking across a longer pre-trial period and using multinomial logit regressions to study the number of additional children born to a family, conditional on initial parity. All of the alternative approaches that we have examined generate results showing the same basic patterns documented in Figure 3.

Overall, it appears that the key margin of adjustment in our data was earlier stopping of fertility resulting in a reduction in family size, particularly at parities above three. This represents a shift towards the type of family structures that we see in Britain today. Beyond the mechanisms explored above, it is also possible that some people chose to reduce fertility by never having children. This mechanism is difficult to identify in our data, since we do not observe complete fertility, and so we leave an exploration of this avenue for future work.

[34]We also do not want to go back too far in time, since as we go further back in time we are relying on the presence of older children to infer fertility rates, and older children are more likely to have left the household.

Figure 3: Post-trial fertility patterns among households in high news districts



The coefficient of interest comes from a difference-in-differences specification where the outcome variable is an indicator that equals 1 if the family had a child born in that year. These probit regressions include district fixed effects, birth year fixed effects, the marriage and district interactions, as defined in the notes of Table 10, as well as fixed effects for mother's age, father's age, years since most recent birth, and number of children in the household.

To summarize, the results from England & Wales suggest that fertility fell in locations more exposed to the trial and that reducing fertility at higher levels of parity was an important mechanism. Next, we look at whether similar patterns are observed among British-origin populations in other parts of the world.

5 Analysis of fertility in Canada

In this section we study the impact of the Bradlaugh-Besant trial on fertility in Canada. We focus on Canada because it allows us to exploit the fact that some Anglophone areas of the country had strong cultural and linguistic links to Britain, while other Francophone areas did not. This variation allows us to isolate the impact of information, transmitted through cultural or linguistic links, on fertility behavior. It also helps rule out the possibility that the changes observed in England & Wales were due to location-specific factors, such as changes in child labor or marriage laws.

Our analysis focuses on four provinces of Canada, Quebec, Ontario, Nova Scotia and New Brunswick.[35] The population of Quebec was mainly French speaking and of French ancestry with little cultural or linguistic tie to London, though some parts of the province had substantial English-speaking populations of British ancestry.[36] The populations of the remaining three provinces were mainly English-speaking and of British (including Irish) ancestry.

There is evidence that the trial was covered in English-language Canadian newspapers, though other factors, such as private letters and the flow of recent immigrants, were likely to have been just as important in transmitting the effects of the trial across the Atlantic.[37] Unfortunately, to our knowledge, English-language Canadian newspapers have not been systematically digitized on a large scale. However, a review of the few digitized newspapers as well as a number on microfilm shows that the Bradlaugh-Besant trial was covered in English-language papers. For example, The Globe, in Toronto, the largest English language newspaper, mentions the trial on April 20, June 19 and June 22 of 1877. We also found reports in a number of other English-language papers, including the Ottawa Daily Citizen (July 23, 1877; Feb 12 and June 20, 1878), the New Brunswick Morning Advertiser (June 19, 1877), the Naniamo Daily News (July 14, 1877) and the English-language Montreal Gazette (Feb. 13, March 2, May 30, June 4, June 6, June 20 and July 15, 1878).[38]

In contrast to English-language papers, a number of French-language papers have been digitized and are searchable in the archives of the Biblioteque et Archives National du Quebec. A search for articles about Bradlaugh and Besant in this archive turned up no articles about Bradlaugh, Besant, or the trial in the late 1870s. This

[35]Technically only Quebec and Ontario were part of Canada at the start of our study period. The Maritime Provinces of Nova Scotia and New Brunswick only joined Canada upon confederation in 1867. We do not consider other provinces because their populations were relatively small.

[36]Notably, the French-Canadian population did not undergo the early fertility transition observed in France. We can see this clearly by comparing the fertility rates for Quebec in Figure 4 to the rates shown for France in Appendix Figure 7.

[37]Letter flows between the U.K. and Canada during this period were substantial; in 1884 the Postmaster General's report shows over 1.8 million letters reached Canada from the U.K, along with over 2.1 million circulars, pamphlets, books and newspapers. In addition, tens of thousands of migrants that arrived on Canadian shores each year, many from the British Isles (McInnis, 1994).

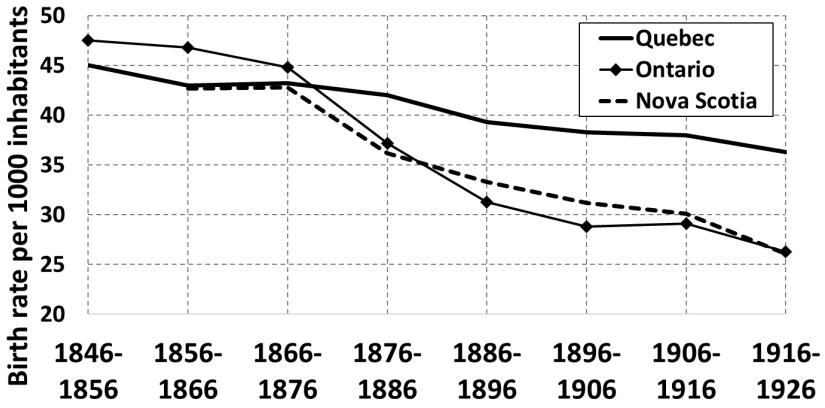
[38]There is also some evidence that other material related to the trial was being circulated. For example, on June 20, 1878, the Ottawa Citizen reported: "Toronto, 19th – A man named Robert Robins, alias Whittaker, was arrested today for sending indecent literature through the post...the indecent publication for circulating which he is arrested is Bradlaugh's Prints of [*The Fruits of*] *Philosophy*, the book recently prohibited in England."

does not appear to be simply an issue with our ability to search the French-language papers: we do find numerous reports in the French-language press about Charles Bradlaugh after 1880, when he became embroiled in a different controversy after he was elected to Parliament but refused to take the Oath required to take his seat.[39] Thus, it does not appear that the Francophone press covered the trial extensively.

5.1 Preliminary evidence

As a starting point for our analysis of Canadian fertility, Figure 4 plots the raw fertility patterns in Quebec, Ontario and Nova Scotia. These series are taken from Henripin (1968) and are calculated with census data using an approach similar to our main analysis but covering a longer time-span. These data show that, up to 1876, fertility in the mainly British-origin provinces of Nova Scotia and Ontario was similar to or even higher than in Quebec. After 1876 there is a sharp decrease in fertility in the mainly British-origin provinces and their rates dropped substantially below the rates in Quebec. This provides the first piece of evidence suggesting that something affected fertility in Canada after 1876, and that the effects were concentrated in locations with stronger ties to Britain.

Figure 4: Fertility patterns in some Canadian provinces



Data from Henripin (1968) Table B.6.

[39] This controversy led to the appointment of two different Select Committees to rule on the matter and eventually led to a brief imprisonment for Bradlaugh.

5.2 Data used in the Canadian analysis

As in the analysis of England & Wales, our analysis of Canada includes both aggregate county-level results together with microdata evidence on the mechanisms through which adjustment occurred. Our aggregate data come from the Canadian Census of Population and are available at the county level. Because Canada did not have a registry of births at this time, we analyze fertility patterns by using census data on the number of children at different ages at the time of the Census, relative to the population of fertile-aged women (which typically is taken from the previous census).[40] Since the population of children is typically reported in age groups up to age five, and then from five to ten (or in some cases six to eleven), we divide our data into roughly five-year age groups. For example, children aged 6-10 in the 1881 census give a proxy for births occurring from roughly 1871-76, while children aged 0-5 provide a proxy for births occurring from roughly 1877-81. Both of these are then divided by the number of fertile-aged women in the county in 1871, and the same procedure is used for children listed in the 1871 and 1891 censuses. Using five-year age groups is useful because it allows us to focus more closely on the changes occurring after 1877. Of course, the number of children alive in a period will be an imperfect proxy for births in that county in that period, particularly because of infant and child deaths. This affects precision but because we employ a difference-in-difference estimation strategy it will not bias our results unless mortality rates are differentially changing in locations with stronger British ties right around 1877.

We collapse some counties in order to obtain areas that are geographically consistent over time, leaving us with 133 counties. Sixty-one of these are in Quebec, forty are in Ontario, fourteen are in New Brunswick and eighteen are in Nova Scotia. The time period covered by our analysis is 1865-1886, or roughly a decade on either side

[40]The Census did ask residents about the number of births that they had in the past year. However, several factors are likely to make these data problematic. First, they cover just one year, and therefore are vulnerable to random year-to-year fluctuations in births. Second, there are concerns about how consistently parents were able to recall whether children were born within a year of the census. This issue can be seen when looking at the data on children aged 0-1 and 1-2, which show a tendency for over-reporting in the 0-1 category and under-reporting in the 1-2 age category. Another reason for concern about these data is that in Ontario this series shows a suspiciously large decrease of around 3,000 births in 1871 compared to 1861, which seems unrealistic. Because of these concerns, we follow previous research by Henripin (1968) and focus instead on the number of living children enumerated in the Census.

of the Bradlaugh-Besant trial.[41]

We want to compare fertility patterns with a measure of the strength of each county's ties to Britain. In the main analysis we focus on the share of the population in the 1871 Census that is either Canadian born and not of French origin or born in Britain (which at this time included Ireland). These variables are only available for Ontario and Quebec so we begin our analysis with just those two provinces. This is a good starting point given the economics similarities between these provinces. We also consider two other variables which are available for all four provinces: the share of the population that attended the Church of England or Church of Scotland, or conversely, share that was not Catholic.[42] All four measures ultimately deliver similar results.

The census also provides a number of useful control variables, including information on population density, the share of employment in agriculture or in manufacturing, the male/female ratio (important in a society with a lot of immigration, which skewed male), as well as information about literacy and school attendance.

As in our analysis of England & Wales, we also draw on individual-level data from the 1881 census in order to look at the margins through which fertility adjustment occurs. One particular advantage of the Canadian microdata is that it contains information on ethnic origin, which allow us to cleanly identify British households and compare them to French households. This allows us to adopt an empirical specification that examines relative changes in fertility among British and French households that resided in the same location. These data cover 288,628 households with 1.19 million births occurring between 1871 and 1881.[43]

[41]We do not use data prior to 1865 to avoid disruptions associated with the U.S. Civil War, which substantially affected the Canadian economy and in which it is estimated that forty-thousand Canadians, or about 2.5% of the male population, fought (Winks, 1998). These effects were likely systematically different in locations with many English-speaking British-origin residents, and may have affected fertility patterns.

[42]These are not perfect measures. Much of the British-origin population were not adherents of the Church of England or Church of Scotland, and some of them, particularly the Irish, were Catholics. However, in Ontario and Quebec, where both sets of variables are available, we observe strong correlations between our religion and ancestry/location of birth measures.

[43]One drawback of the 1881 Canadian census is that it did not record family relationships within the household. We overcome this issue in the following way. First, we throw out any household with more than one married male or more than one married female. This removes households that contain boarders or extended family. We then ask whether it is reasonable to assume that the two married individuals are in fact married to each other. Here we discard any household where the inferred wife is either more than 7 years older than or 17 years younger than her inferred husband. These numbers correspond to the 1-99th percentile of differences among married households in the British microdata. Next we restrict the sample to the set of households where it is reasonable to

5.3 Analysis approach and results

Our main analysis follows a difference-in-difference approach. The regression is,

$$ln\left(\frac{CHILD_{ct}}{FEM_{ct}}\right) = \alpha_0 + \alpha_1 BRIT_c * TRIAL_t + X_{ct}\lambda + \phi_c + \eta_t + \epsilon_{ct} \quad (3)$$

where $CHILD_{ct}$ is the number of children born in county c during period t, which is inferred based on the children observed in the census within each age group. The denominator, FEM_{ct}, is the number of fertile-aged females (aged 15-50) in the previous census.[44] The main explanatory variable is an interaction between a county's pre-existing connection to Britain, based on data from the 1871 census, and a time indicator for the period after the trial. Standard errors are clustered by county and regressions are weighted by county population in 1861.[45]

Our baseline regressions are presented in Table 3. The first column compares fertility in the 1871-76 and 1877-81 periods while Column 2 adds additional controls. In both cases we see strong evidence that, after 1877, fertility in counties with greater British-origin population shares fell relative to fertility in the earlier period and relative to counties with a smaller British-origin population share. Columns 3 and 4 extend the study period backwards and forwards. The results in Column 4 show that there was no evidence of a similar relative reduction in fertility in more British counties between the 1865-70 and 1871-76 period, which provides support for our identification strategy. We also see that the reduction in fertility persisted into the 1881-86 period.

assume that this married couple is the mother and father of all remaining members of the household. Specifically, we discard any household if the inferred mother's age at birth is greater than 50 or less than 14 or if the inferred father's age at birth is greater than 60 or less than 14.

[44]For example, when we use the 1881 census to measure the number of children born between 1871 and 1881, the fertile-aged female population denominator comes from the 1871 census. Alternatives, such as using the population of fertile-aged women in the county in the nearest census, rather than the previous census, does not change our results.

[45]County populations tend to be similar and so weighting has little impact on the results.

Table 3: Baseline regression results for Canada

DV: Children born per year / 1000 fertile-aged females				
Periods included:	1871-1881	1871-1881	1865-1886	1865-1886
	(1)	(2)	(3)	(4)
British-origin shr. × 1871-76				1.210
				(4.586)
British-origin shr. × 1877-81	-17.93***	-19.89***	-19.29***	-18.68***
	(1.554)	(1.570)	(2.526)	(4.562)
British-origin shr. × 1882-86			-22.17***	-21.57***
			(6.698)	(7.169)
Controls		Yes	Yes	Yes
County FEs	Yes	Yes	Yes	Yes
Period FEs	Yes	Yes	Yes	Yes
Observations	202	202	404	404
R-squared	0.754	0.811	0.520	0.520
No. of counties	101	101	101	101

*** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by county. Observations weighted by county population in 1861. Columns 2-4 include the following controls interacted with period indicator variables for each period after the first: population density in 1861, population growth in 1861-71, the agricultural employment share in 1871, and the male/female ratio in 1871.

The estimates in Table 3 reflect large changes in fertility patterns locations with stronger British ties. In 1871-76 there were around 135 children born per 1,000 fertile-aged females with relatively similar levels in both Ontario and Quebec. Thus, our results indicate that a county with a completely British-origin population experienced a decrease in fertility of 13-15% after 1877 relative to a county with an entirely French-origin population. For a one standard deviation change in the British origin share (0.235) this implies a decrease in fertility of around 3.1-3.4%. These are fairly large effects that can explain the substantial changes in relative fertility levels found by Henripin and shown in Figure 3 (note that in Figure 3 the denominator is inhabitants rather than fertile-aged females).

Table 4 considers alternative ways of measuring each county's connection to Britain. Column 1 reproduces the results from the last column of Table 3, our preferred specification. Column 2 uses the population that is not of French origin. Column 3 uses the population of non-Catholics to measure the British connection, reflecting the fact

that French Canadians were predominantly Catholic and most Catholics were French-Canadian. Column 4 uses the share of the population that attended the Church of England or the Church of Scotland.[46] Note that Columns 3-4 have more observations because these measures are available for Nova Scotia and New Brunswick, while the other measures are only available in Quebec and Ontario. All four measures show very similar results, with no evidence of differential trends between 1865-70 and 1871-76 and clear evidence of a relative reduction in fertility in counties with a stronger British connection after 1876. In terms of magnitudes, the effect of a one s.d. change in the explanatory variable implies a reduction in fertility of 2.4-3.5% across the four specifications, very similar to the magnitudes implied by the results in Table 3.

Table 4: Results for Canada with alternative explanatory vars.

DV: Children born per year / 1000 fertile-aged females				
Explanatory variable:	British origin pop. shr. (1)	Non-French origin pop. shr. (2)	Non-Catholic share (3)	Church of Eng/Scot share (4)
British connection × 1871-76	1.210	1.423	-0.0843	4.251
	(4.586)	(4.337)	(4.215)	(11.70)
British connection × 1877-81	-18.68***	-17.13***	-18.95***	-37.94***
	(4.562)	(4.351)	(4.420)	(12.92)
British connection × 1882-86	-21.57***	-20.30***	-20.97***	-44.25**
	(7.169)	(6.671)	(6.709)	(21.18)
Controls	Yes	Yes	Yes	Yes
County FEs	Yes	Yes	Yes	Yes
Period FEs	Yes	Yes	Yes	Yes
Observations	404	404	532	532
R-squared	0.520	0.520	0.496	0.481
No. of counties	101	101	133	133

*** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by county. Observations weighted by county population in 1861. All regressions use data for 1865-1886 and include the following controls interacted with period indicator variables for each period after the first: population density in 1861, population growth in 1861-71, agricultural employment share in 1871, and the male/female ratio in 1871.

[46] Of course, only a part of those of British origin were part of one of these churches, but they do provide a good indicator of local cultural ties back to Britain.

Table 5 considers the robustness of these results. Column 1 shows that the same patterns hold if we focus only on Quebec, exploiting the fact that even within that province there is substantial variation in the share of population of British origin across counties. In Columns 2-3 we add controls for the share of children in school and the share of literate adults, respectively. These are strongly correlated with the share of the population of British origin. However, including these controls does not alter our main findings.[47]

In Columns 4-5 we study the impact of different immigrant groups. In Column 4 we look at the share of the population born in England, Wales and Scotland and the share born in Ireland separately. The relative reduction in fertility after 1876 appears to be even stronger when predicted using the share of English, Welsh, Scottish or Irish migrants, suggesting that the trial may have had a greater effect in places with fresher connections back to Britain. It is interesting to note that the effect of Irish migrants appears stronger than that of the English, Welsh and Scottish immigrants, though this difference is not statistically distinguishable. Two features must be kept in mind when evaluating patterns among the Irish. First, many Irish came from Ulster, and a majority of Irish immigrants were Protestant (Houston & Smyth, 1999). Also, Ireland had much lower fertility rates than in England & Wales during the decades after the Great Famine, which may have meant that the Irish-born were more open to changes in social norms surrounding fertility behavior.

Column 5 adds in the share of all non-British immigrants to the country. This provides an important check on whether the results are being driven by connections to Britain, or just the share of immigrants in a location. The fact that the share of other immigrants has no independent effect provides additional support for our identification strategy. Finally, Column 6 presents results without weighting by initial county population. These are very similar to the results obtained when weighting.

[47] In additional results (not reported), we also find some evidence, though not statistically significant, suggesting that fertility fell more in more educated areas after 1877. This likely reflects the impact of literacy in facilitating the spread of information. We also find evidence a strong interaction between literacy and British connections.

Table 5: Robustness results for Canadian analysis

	DV: Children born per year / 1000 fertile-aged females					
	Only within Quebec	Controlling for shr. of children in school	Controlling for shr. of illiterate adults	Separating Eng/Scot and Irish immigrants	Separating all other immigrants	Without weights
	(1)	(2)	(3)	(4)	(5)	(6)
British-origin × 1871-76	-11.95***	-16.08***	-15.70***		-20.21***	-18.97***
	(2.934)	(4.283)	(5.422)		(1.525)	(1.911)
Eng/Scot imm. shr. × 1871-76				-42.75***		
				(10.74)		
Irish imm. shr. × 1871-76				-61.52***		
				(14.01)		
Other imm. shr. × 1871-76					5.641	
					(9.803)	
Shr. children in school × 1871-76		-10.30				
		(9.424)				
Shr. illiterate adults × 1871-76			9.923			
			(11.63)			
Controls	Yes	Yes	Yes	Yes	Yes	Yes
County FEs	Yes	Yes	Yes	Yes	Yes	Yes
Period FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	122	202	202	202	202	202
R-squared	0.864	0.814	0.813	0.751	0.811	0.745
No. of counties	61	101	101	101	101	101

*** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by county. Observations weighted by county population in 1861. All regressions use data for 1871-1881 and include the following controls interacted with period indicator variables for the post-trial period: population density in 1861, population growth in 1861-71, agricultural employment share in 1871, and the male/female ratio in 1871.

To summarize, the results show that after 1877 there was a substantial reduction in fertility in counties with stronger cultural ties to Britain. That this effect is closely associated with ties to Britain, whether measured by ancestry or religion, and the close temporal correspondence between this change and the reduction in birth rates within Britain, provides clear evidence in favor of the idea that fertility patterns were being strongly influenced by information transmitted through cultural or linguistic links. These results are particularly striking given the enormous differences in economic conditions that existed between Canada and Britain at this time.

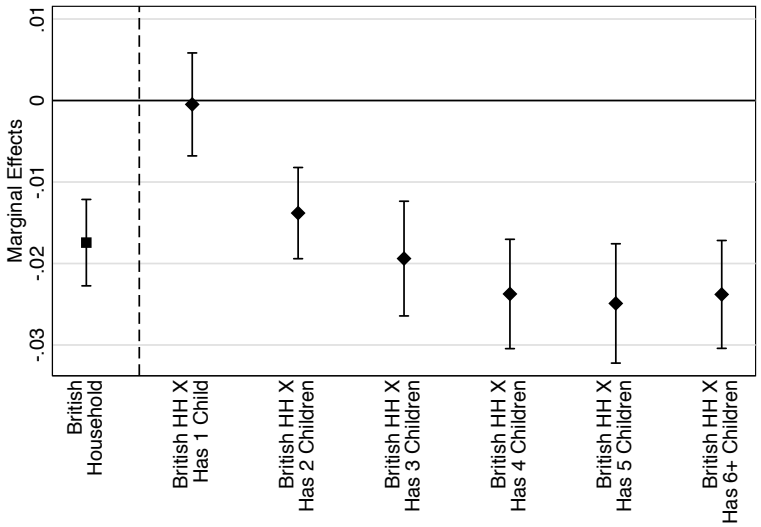
5.4 Mechanisms

We now draw on microdata to study some of the mechanisms behind these fertility adjustments. Our approach closely follows the one used for England & Wales, with one important difference. In the Canadian data we can directly identify Anglophone households, which we define as native Canadians of British origin or immigrants who were born in Britain. This provides a household-level indicator of ties back to Britain, which contrasts with the district-level variation used in the microdata analysis for England & Wales. This allows us to include county fixed effects in our specification, so that identification comes from comparing how the fertility patterns of Anglophone and Francophone populations residing within the same location change in the post-trial period relative to the years before the trial. Except for this change, our empirical approach follows the design described in Eq. 2.

The result of this exercise appears in Figure 5. The first result in this figure describes the average response among all British households. Here we see that, on average, British-origin households were less likely to have an additional child, conditional on an initial number of children in the household, than other households residing in the same county in the same year. The remaining coefficients look at how these differences vary with parity. As in the analysis of England & Wales, we find evidence that the key margin of adjustment was that households were less likely to have additional children at higher parities.

One difference between the results shown in Figure 5 and those found for England & Wales is that we do not find evidence of an increase in the probability of additional births at low levels of parity. One likely explanation for this is the selection of different types of households into fertility. In England & Wales we found evidence that after the trial households were delaying their first birth, as reflected in parents' age. In Canada, we find the opposite pattern, with parent's age at first birth decreasing among British-origin households after the trial. These different selection patterns may explain why we see differences in the effect of the trial at low parities. This begs the question why we see differences in the timing of the initiation of fertility in Canadian and British households. The most likely explanation is that Canada's frontier environment affected couple's choice of when to begin fertility, and this interacted with improved ability to limit fertility in a different way than was experienced in Britain.

Figure 5: Post-trial fertility patterns among British households in Canada



This figure presents coefficient estimates and 95% confidence intervals from difference-in-difference probit regressions comparing British-origin households to other households before and after 1877. British origin households are those where either the mother or father reports being British in the 1881 census. The outcome variable is an indicator equal to 1 if the family had a child born in a particular year. These regressions include district fixed effects, birth year fixed effects, the marriage and district interactions, as well as fixed effects for mother's age, father's age, years since most recent birth, and number of children in the household.

6 Response in other British Colonies

The results that we observe in Canada, open up the question of whether we see effects in other colonies with substantial British-origin populations. A natural candidate to study is South Africa (or more specifically, the Cape Colony), where we are able to conduct an analysis similar to what was done for Canada. This is possible because, while the Cape was British during the second half of the 19th century, it also had a substantial European-origin population–the Afrikaners–that were not of British origin and did not speak English as a primary language. These residents, descended from Dutch settlers that immigrated to the Cape in the 17th and 18th centuries, formed the majority of the white Cape Colony population, but they were also mixed with substantial numbers of more recent immigrants, mainly from the British Isles.

Our analysis of changes in South African fertility patterns follows the same pattern as the aggregate-data analysis for Canada, though we are more limited in terms of statistical power. Focusing on the white population only, we compare fertility patterns in locations with a greater share of British-origin population among the European-origin population.[48] Data tracking fertility for these groups are drawn from the Cape Colony Censuses of 1875 and 1891.[49] Since no comprehensive birth register is available, fertility rates are inferred using the number of children in different age groups observed in each census. Our analysis focuses on the division level, which is somewhat like a U.S. county. This is the lowest geographic unit for which consistent data are available. We consider two measures of a division's British connection: the share of European-origin population in a division that was born in the British Isles or the share of the white population in a division that was not a member of the Dutch Reform Church, the dominant religion among the Afrikaner population.

The results from South Africa, reported in Appendix Table 15, display the same basic pattern observed in Canada: locations with a greater connection to Britain experience a reduction in fertility in the years just after 1876, relative to the period just before. This pattern is robust to the inclusion of available control variables, using alternative measures of the British connection, or dropping the most populated locations, though the results are somewhat sensitive to whether the regressions are weighted because the British-origin population was disproportionately concentrated in more densely populated areas. Importantly, as in the Canadian results, the effects are specific to the British-origin population and do not appear when we study the (white) immigrant population originating from other locations.

There is also evidence that Australia experienced a fertility decline in the years following the Bradlaugh-Besant trial.[50] The lack of a valid comparison population means that we cannot apply a difference-in-difference approach in that setting. However, a look at the simple time-series of fertility, shown in Appendix Figure 11, indicates that a sharp reduction in fertility took place in New South Wales between 1881 and 1891,

[48]The Cape Colony also contained large native African and mixed-race populations. Since these groups were less culturally similar than the different European-origin populations and faced a number of discriminatory practices that may have influenced their fertility patterns, we focus our analysis entirely on a comparison between the different European-origin populations.

[49]See Appendix 9.4 for further discussion of the South Africa data.

[50]The Bradlaugh-Besant trial was extensively covered in Australia. For example, in the Sydney Morning Herald articles discussing the trial appeared on Feb. 15, May 25, August 20, Sept. 27 and Oct. 15 of 1877.

followed by a similar change in Victoria in the decade after 1891.[51] Interestingly, most of the decline in New South Wales appears just after 1888, the year in which there was a similar trial in Australian courts over the publication of Besant's *Law of Population*.

Taken alone we would hesitate to draw strong conclusions from the evidence available for South Africa and Australia. However, in combination with the Canadian results as well as the patterns observed in Britain, we think it is reasonable to interpret the nearly simultaneous fertility declines observed among the British-origin populations in these locations as due to the same common cause.

7 Effects in the United States

In this section we look at whether the Bradlaugh-Besant trial also altered fertility behavior among British populations residing in the United States. This is plausible because the trial was widely covered by U.S. newspapers. For example, a search of papers in the newspapers.com archive returns over 500 articles in U.S. papers mentioning either Bradlaugh or Besant in 1877. These come from all across the country: Buffalo, Reno, Honolulu, Memphis, Chicago, Philadelphia, Canton, Baltimore, etc. If anything, American papers appear to have been more supportive of Bradlaugh and Besant than the British press.[52]

If the trial impacted the United States, we would expect the effect be most pronounced among populations with stronger cultural or linguistic ties to Britain. Since the U.S. lacked a comprehensive system of birth registration at this time, we identify fertility behavior among different populations by following the microdata approach

[51] T.A. Coughlin (1904), the Government Statistician for New South Wales, wrote (p. 68), "For many years the Australian birth-rate was high, but within a certain short period between the years of 1880 and 1890, there was a complete change to a low rate. This change was manifest in all classes of the community, except amongst women of Irish birth, amongst people of every shade of opinion and of every social condition...The existing facts are compatible with only one explanation, viz., that in the years following 1880 the art of applying artificial checks to conception was successfully learnt and has continued in operation to this day."

[52] The Nashville Tennessean, for example, ran several articles about the trial, including one on July 13 with the title, "Bradlaugh and Besant Lionized in London." The Reno Gazette-Journal described the Times' negative coverage of the trial as "offensive and unjust to the defendants" (Dec. 12, 1877) though The Green Mountain Freeman (Montpelier, VT) thought the book "very objectionable" (July 18, 1877). According to The Hawaiian Gazette (Aug. 29, 1877) the trial "has excited a great deal of interest on both sides of the Atlantic."

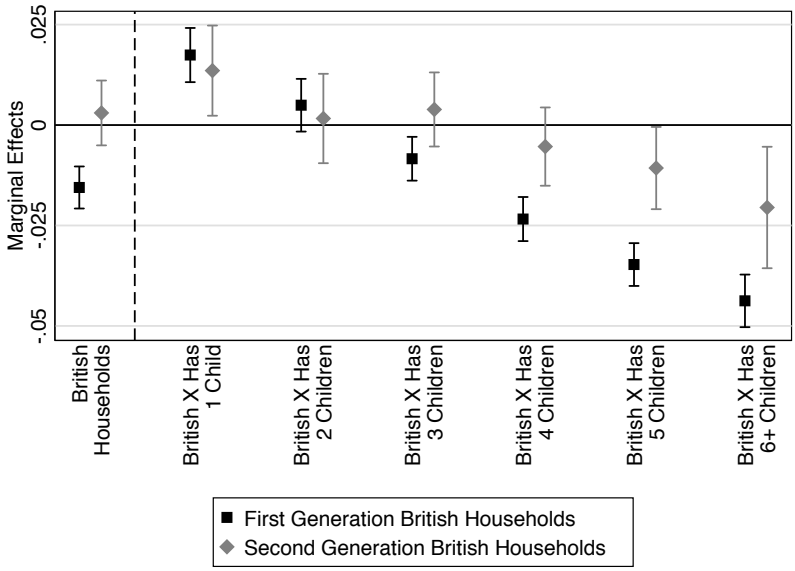
used in Canada. We examine the complete count 1880 census, as made available by IPUMS.org. As in England & Wales, this census maintains the household structure, which makes it possible to identify fertility effects within the household. While this census did not explicitly ask about ethnic origin, it did collect information about where each enumerated individual was born and where their parents were born. We thus focus our attention on first and second generation European immigrant households and ask the following questions: did British immigrant households, as compared to other European immigrant households, experience a differential fertility response following the trial, and if so, was the effect stronger for first generation British immigrant households than second generation British immigrant households?

We classify households in the following way. First generation European immigrant households are those where both the mother and father were born in Europe. Among these first generation households, a household is then classified as first generation British if either the mother or father was born in Britain. A second generation European household is one where both the mother and father were born in the United States but both sets of grandparents were born in Europe. Among these households, second generation British households are those where either both paternal grandparents or both maternal grandparents were born in Britain.

Since we are using microdata with a very similar structure to those used in the Canadian analysis, we follow essentially the same approach we used to generate the results presented in Figure 5. In particular, using the 1880 U.S. census we restrict our attention to either all first generation European households or all second generation European households. We then use a difference-in-difference approach to compare fertility behavior among these populations before and after the trial. This analysis includes a full set of year and state fixed effects, so we are essentially comparing immigrant populations within the same location.

Figure 6 presents the results, which are arranged in the same format as Figure 5. All coefficients represent the interaction between being a British household in the post-trial period. The coefficients denoted with black squares display the results where the sample only includes first generation European households while the grey diamonds represent the results from when we examine only second generation European households.

Figure 6: Post-trial fertility patterns among British households in the United States



This figure presents coefficient estimates and 95% confidence intervals from difference-in-difference probit regressions comparing British-origin households to other European-immigrant households before and after 1877. First generation British households are those where the child's mother or father was born in Britain, as recorded in the 1880 Census. Second generation British households are those where the child's mother and father were born in the United States but either both paternal grandparents or both maternal grandparents were born in Britain. The outcome variable is an indicator equal to 1 if the family had a child born in a particular year. These probit regressions include state fixed effects, birth year fixed effects, and fixed effects for mother's age, father's age, years since most recent birth, and number of children in the household. Depending on specification, the sample is restricted to either first or second generation European immigrants residing in the United States at the time of enumeration.

These estimates look remarkably similar to the patterns that we have seen in both Canada and Britain. In particular, relative to other European immigrants in the same state, British immigrants appear to have reduced fertility at higher levels of parity in the years after the trial. As in the England & Wales results, we also find some evidence of an increase in the probability of having a second child conditional on having already had a first. Notice that the effect among first generation British households is more pronounced than the effect for second generation British households. This reflects the fact that second generation British households likely had relatively weaker ties to Britain than first generation British households.

In Appendix Table 16 we also examine parents' age at the time of the birth of their first child. We do not find any strong evidence of adjustment along this margin among the British-origin population in the U.S.: mothers appear to be slightly younger, fathers slightly older. In this respect the U.S. lies somewhere between what we found in Canada and Britain. This implies that the impact of the trial on the selection into fertility lies somewhere between the pattern we observed in Canada and the pattern in England & Wales. This likely explains why the impact of the trial at low levels of parity shown in Figure 6 falls somewhere between what we observed in England & Wales, where we saw an increased probability of additional births at parities of one or two, and Canada, where we saw no evidence of an increase even at a parity of one.

8 Conclusion

This paper provides evidence that the famous Bradlaugh-Besant trial of 1877 played an important role in Britain's historical fertility transition and that this change was rapidly transmitted to populations abroad sharing strong cultural and linguistic ties to Britain. Largely due to a lack of direct and convincing evidence, the importance of family planning information in the historical fertility transition has been set-aside in recent economic literature in favor of explanations that rely on changes in the costs and benefits of having children (Guinnane, 2011), though recent work by Spolaore & Wacziarg (2016) has brought attention back toward cultural factors. Our results resuscitate the importance of family planning information, as argued by an older generation of demographers. At the same time, we see our results as strengthening the case for existing economic theories of fertility decline. By highlighting the important role played by the social norms surrounding fertility, our results help to reconcile the role of economic drivers of fertility decline with some of the patterns observed in the data, such as the simultaneous declines observed in locations with very different economic conditions, or the much earlier transition of less-industrialized France compared to Britain, that seem at odds with purely economic forces.

Given our results, it is natural to wonder whether, in the absence of the Bradlaugh-Besant trial, some other event would likely have happened soon after with the same results. Certainly that is possible. However, that Britain's transition trailed the fertility reduction in France by roughly half a century, and preceded the onset of the

transition in Germany by decades, suggests that differences in social norms have the potential to maintain cross-country differences in fertility patterns for long periods, even in the face of underlying economic forces tending towards fertility reduction.

One important message to take from this paper is that family planning should be thought of more broadly than simple technical information on contraception. Some authors have suggested that information could not have played a key role in the historical British fertility transition because contraceptive methods changed relatively little during the period in which fertility declined dramatically. However, with a broader conception of family planning it is easy to reconcile our results with evidence that changes in contraceptive methods were limited. In particular, the patterns we document appear to be a good fit for theories of social norms and cultural beliefs where salient events can have large effects when they result in a coordinated shift in beliefs about what behavior is culturally acceptable.

Our results also come with implications for modern developing countries. Two recent articles (de Silva & Tenreyro, 2017, 2018) have argued that information, culture, and social norms likely played an important role in the decline in fertility in modern developing countries. Yet they also note that establishing a clear causal connection has proven difficult. Our study provides the concrete evidence that family planning information can have a substantial impact on fertility rates, even when access to modern contraceptive methods is limited. Moreover, providing effective contraceptive technology may not have a large effect if limiting family size runs counter to cultural norms. Our findings also highlight how government policies, such as the censorship of family planning information, can delay a fertility transition even in the face of substantial shifts in the costs and benefits of having children.

References

1877. *The Queen vs. Charles Bradlaugh and Annie Besant*. London: Freethought Publishing Company.

Aaronson, D, Lange, F, & Mazumder, B. 2014. Fertility Transitions Along the Extensive and Intensive Margins. *American Economic Review*, **104**(11), 3701–3724.

Ager, P, Hansen, CW, & Jensen, PS. 2018. Fertility and Early Life Mortality: Evidence from Smallpox Vaccination in Sweden. *Journal of the European Economic Association*, **16**(2), 487–521.

Alesina, Alberto, Giuliano, Paola, & Nunn, Nathan. 2013. On the Origins of Gender Roles: Women and the Plough. *The Quarterly Journal of Economics*, **128**(2), 469–530.

Allen, RA. 2001. The Great Divergence in European Wages and Prices from the Middle Ages to the First World War. *Explorations in Economic History*, **38**, 411–447.

Alsan, M, & Wanamaker, M. 2018. Tuskegee and the Health of Black Men. *Quarterly Journal of Economics*, **133**(1), 407–455.

Austen-Smith, David, & Fryer Jr, Roland G. 2005. An economic analysis of acting white. *The Quarterly Journal of Economics*, **120**(2), 551–583.

Bailey, M. 2010. "Momma's Got the Pill": How Anthony Comstock and Griswold v. Connecticut Shaped US Childbearing. *American Economic Review*, **100**(1), 98–129.

Banks, J. A., & Banks, O.B. 1954. The Bradlaugh-Besant Trial and the English Newspapers. *Population Studies*, **8**(1), 22–34.

Bassi, V, & Rasul, I. 2017. Persuasion: A Case Study of Papal Influences on Fertility-Related Beliefs and Behavior. *American Economic Journal: Applied Economics*, **9**(4), 250–302.

Becker, GS, & Lewis, HG. 1973. On the Interaction between the Quantity and Quality of Children. *Journal of Political Economy*, **81**(2).

Becker, Sascha O, Cinnirella, Francesco, & Woessmann, Ludger. 2010. The trade-off between fertility and education: evidence from before the demographic transition. *Journal of Economic Growth*, **15**(3), 177–204.

Becker, Sascha O., Cinnirella, Francesco, & Woessmann, Ludger. 2013. Does women's education affect fertility? Evidence from pre-demographic transition Prussia. *European Review of Economic History*, **17**(1), 24–44.

Becker, SO, Cinnirella, F, & Woessmann, L. 2012. The Effect of Investment in Children's Education on Fertility in 1816 Prussia. *Cliometrica*, **6**, 29–44.

Bengtsson, T, & Dribe, M. 2014. The Historical Fertility Transition at the Micro Level: Southern Sweden 1815-1939. *Demographic Research*, **30**, 493–533.

Blanc, G, & Wacziarg, R. 2019 (Jan.). *Change and Persistence in the Age of Modernization: Saint-Germain-D'Anxure 1730-1895*. NBER Working Paper No. 25490.

Bleakley, Hoyt, & Lange, Fabian. 2009. Chronic Disease Burden and the Interaction of Education, Fertility, and Growth. *Review of Economics and Statistics*, **91**(1), 52–65.

Brodie, JF. 1994. *Contraception and Abortion in Nineteenth-Century America*. Ithaca: Cornell

University Press.

Brown, JC, & Guinnane, TW. 2002. Fertility Transition in a Rural, Catholic Population: Bavaria, 1880-1910. *Population Studies*, **56**(1), 35–49.

Bursztyn, L, Egorov, G, & Fiorin, S. 2017 (July). *From Extreme to Mainstream: How Social Norms Unravel*. Mimeo.

Bursztyn, L, Gonzalez, AL, & Yanagizawa-Drott, D. 2018 (June). *Misperceived Social Norms: Female Labor Force Participation in Saudi Arabia*. Mimeo.

Chandrasekhar, S. 1981. *"A Dirty Filty Book"*. Berkeley: University of California Press.

Coale, Ansley. 1973. The demographic transition reconsidered. *Pages 53–57 of: International Population Conference, Leige 1973*, vol. 1. International Union for the Scientific Study of Population.

Coughlin, TA. 1904. *Report of the Royal Commission on the Decline of the Birth-rate and on the Mortality of Infants in New South Wales*. Vol. 1. William Applegate Gullick, Government Printer.

Crafts, N. F. R. 1989. Duration of Marriage, Fertility and Women's Employment Opportunities in England and Wales in 1911. *Population Studies*, **43**(2), pp. 325–335.

D'Arcy, F. 1977. The Malthusian League and the Resistance to Birth Control Propaganda in Late Victorian Britain. *Population Studies*.

David, Paul, & Sanderson, Warren. 1986. Rudimentary contraceptive methods and the American transition to marital fertility control, 1855-1915. *Pages 307–390 of: Long-term factors in American economic growth*. University of Chicago Press.

de Silva, Tiloka, & Tenreyro, Silvana. 2017. Population Control Policies and Fertility Convergence. *Journal of Economic Perspectives*, **31**(4), 205–228.

de Silva, Tiloka, & Tenreyro, Silvana. 2018 (Feb.). *The Fall in Global Fertility: A Quantitative Model*. Mimeo.

Diebolt, C, & Perrin, F. 2013. From Stagnation to Sustained Growth: The Role of Female Empowerment. *American Economic Review, Papers and Proceedings*, **103**(3), 545–549.

Diebolt, C, Menard, A-R, & Perrin, F. 2016 (February). *Behind the Fertility-Education Nexus: What Triggered the French Development Process?* Working Paper.

Dribe, M. 2008. Demand and supply factors in the fertility transition: a county-level analysis of age-specific marital fertility in Sweden, 1880-1930. *European Review of Economic History*, **13**, 65–94.

Dribe, M, Breschi, M, Gagnon, A, Gauvreau, D, Hanson, HA, Maloney, TN, Mazzoni, S, Molitoris, J, Pozzi, L, Smith, KR, & Vezina, H. 2017. Socio-economic Status and Fertilty Decline: Insights from Historical Transitions in Europe and North America. *Population Studies*, **71**(1), 3–21.

Elderton, EM. 1914. *Report on the English Birthrate*. Cambridge University Press.

Fernandez, R, & Fogli, A. 2009. Culture: An Empirical Investigation of Beliefs, Work, and Fertility. *American Economic Journal: Macroeconomics*, **1**(1), 146–177.

Fernihough, A. 2017. Human Capital and the Quantity-Quality Trade-off During the Demographic Transition. *Journal of Economic Growth*, **22**, 35–65.

Franck, R, & Galor, O. 2015 (August). *Industrialization and the Fertility Decline*. Working paper.

Galor, Oded, & Weil, David N. 1996. The Gender Gap, Fertility, and Growth. *The American Economic Review*, **86**(3), 374–387.

Galor, Oded, & Weil, David N. 1999. From Malthusian Stagnation to Modern Growth. *American Economic Review*, **89**(2), 150 – 154.

Galor, Oded, & Weil, David N. 2000. Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond. *American Economic Review*, **90**(4), 806 – 828.

Glass, DV. 1951. A Note on the Under-Registration of Births in Britain in the Nineteenth Century. *Population Studies*, **5**(1), 70–88.

Glass, DV. 1967. *Population Policies and Movements in Europe*. Second edn. Frank Cass and Company Limited.

Greif, A. 1994. Cultural Beliefs and the Organization of Society: A Historical and Theoretical Reflection on Collectivist and Individualist Societies. *Journal of Political Economy*, **102**(5), 912–950.

Greif, A. 2006. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. Cambridge: Cambridge University Press.

Guinnane, Timothy. 2011. The Historical Fertility Transition: A Guide for Economists. *Journal of Economic Literature*, **49**(3), 589–614.

Hansen, CW, Jensen, PS, & Lonstrup, L. 2018. The Fertility Decline in the United States: Schooling and Income. *Macroeconomic Dynamics*, **22**, 1584–1612.

Henripin, Jacques. 1968. *Tendances et Facteurs de la Fecondite au Canada*. Ottawa: Bureau Federal de la Statistique.

Himes, NE. 1970. *Medical History of Contraception*. Schocken Books.

Houston, CJ, & Smyth, WJ. 1999. *Irish Emigration and Canadien Settlement*. Toronto: University of Toronto Press.

Jaeger, DA, Joyce, TJ, & Kaestner, R. 2018 (July). *A Cautionary Tale of Evaluating Identifying Assumptions: Did Reality TV Really Cause a Decline in Teenage Childbearing?* NBER Working Paper No. 24856.

Jensen, Robert. 2012. Do Labor Market Opportunities Affect Young Women's Work and Family Decisions? Experimental Evidence from India. *Quarterly Journal of Economics*, **127**(2), 753 – 792.

Kahn-Lang, A, & Lang, K. 2018 (July). *The Promises and Pitfalls of Differences-in-Differences: Reflections on "16 and Pregnant" and Other Applications*. NBER Working Paper No. 24857.

Kalemli-Ozcan, S, Ryder, HE, & DN, Weil. 2000. Mortality Decline, Human Capital Investment, and Economic Growth. *Journal of Development Economics*, **62**, 1–23.

Klemp, Marc, & Weisdorf, Jacob. Forthcoming. Fecundity, Fertility and The Formation of Human Capital. *The Economic Journal*.

Knodel, J, & van de Walle, E. 1986. *The Decline of Fertility in Europe*. Princeton, NJ: Princeton University Press. Chap. Ch. 10: Lessons from the Past: Policy Implications of Historical Fertility Studies, pages 390–419.

Leahy, JN. 2014. Birthing a Nation: The Effect of Fertility Control Access on the Nineteenth-Century Demographic Transition. *Journal of Economic History*, **74**(2), 482–508.

Ledbetter, R. 1976. *A History of the Malthusian League, 1877-1927*. Ohio State University Press.

Manvell, Roger. 1976. *The Trial of Annie Besant and Charles Bradlaugh.* New York: Horizon Press.

McInnis, M. 1994. *Migration and the International Labor Market.* New York: Routledge. Chap. Immigration and Emmigration: Canada in the Late Nineteenth Century, pages 139–155.

McLaren, A. 1978. *Birth Control in Nineteenth-Century England.* Holmes & Meier.

Mitchell, B. R. 2003. *International Historical Statistics, Europe 1750-2000.* Hampshire, England: Palgrave Macmillan.

Munshi, K, & Myaux, J. 2006. Social norms and the fertility transition. *Journal of Development Economics*, **80**, 1–38.

Murphy, TE. 2015. Old Habits Die Hard (Sometimes). Can Department Heterogeneity Tell Us Something About the French Fertility Decline? *Journal of Economic Growth*, **20**, 177–222.

Nunn, N, & Wantchekon, L. 2011. The Slave Trade and the Origins of Mistrust in Africa. *American Economic Review*, **101**, 3221–3252.

Schultz, T. Paul. 1985. Changing World Prices, Women's Wages, and the Fertility Transition: Sweden, 1860-1910. *Journal of Political Economy*, **93**(6), pp. 1126–1154.

Spolaore, E, & Wacziarg, R. 2016 (Feb.). *Fertility and Modernity.* California Center for Population Research Working Paper No. 2016-016.

Szreter, S. 1996. *Fertility, Class and Gender in Britain, 1860-1940.* Cambridge University Press.

Teitelbaum, MS. 1984. *The British Fertility Decline.* Princeton University Press.

van de Kaa, D. 2004. "Ready, Willing and Able": Ansley J. Coale, 1917-2002. *The Journal of Interdisciplinary History*, **34**(3), 509–511.

Wanamaker, MH. 2012. Industrialization and Fertility in the Nineteenth Century: Evidence from South Carolina. *Journal of Economic History*, **72**(1), 168–196.

Williams, Kevin. 2010. *Read All About It! A History of the British Newspaper.* London: Routledge.

Winks, Robin. 1998. *The Civil War Years: Canada and the United States.* McGill-Queen's University Press.

Woods, R. 1997 (March). *Causes of Death in England and Wales, 1851-60 to 1891-1900 : The Decennial Supplements.* [computer file].

Woods, RI. 1987. Approaches to the Fertility Transition in Victorian England. *Population Studies*, **41**(2), 283–311.

Woods, Robert. 2000. *The Demography of Victorian England and Wales.* Cambridge, UK: Cambridge University Press.

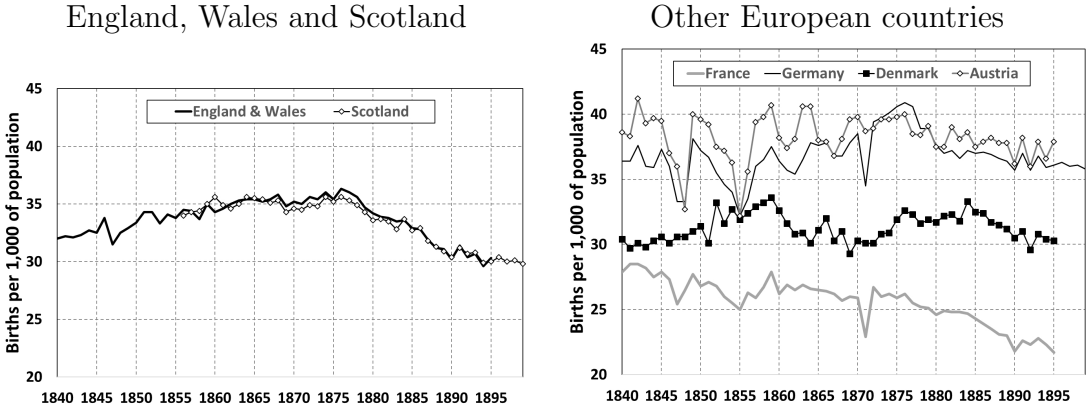
Young, HP. 2015. The Evolution of Social Norms. *Annual Review of Economics*, **7**, 359–87.

9 Appendix

9.1 Fertility patterns in other countries

Figure 7 describes fertility patterns (births per 1,000 population) in England & Wales and Scotland in the left panel and in a selection of other European countries in the right panel. The data come from Mitchell (2003). Both England & Wales and Scotland experienced a substantial and coordinated shift in fertility just after 1877. The right panel shows that France had much lower fertility than Britain by the 1840s, while Germany and Austria had considerably higher fertility rates. Notably, none of these countries shows a sharp change in fertility behavior just after 1877, though the consequences of the Franco-Prussian war (1870-71) are clearly visible in the sharp reduction in fertility in those countries in 1871. In Germany, the victor, this was followed by a mild fertility boom from 1872 to 1880 after which the country returned to roughly the level of fertility that existed prior to the war. The Mitchell data are also available for other Scandinavian countries, but we have not included them in this comparison because they suffered enormous famines from 1867-69 which substantially affected fertility patterns. However, none of them exhibited a clear decline in fertility starting in 1877. Thus, the impact of the changes that took place in 1877 appear to have been largely confined to the Anglo-Saxon world.

Figure 7: Fertility patterns in a selection of European countries

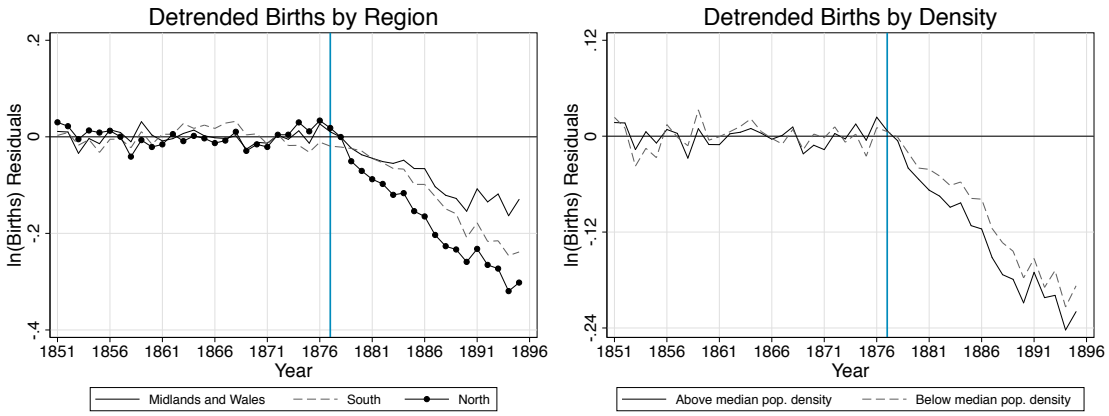


Underlying data from Mitchell (2003). Population denominators are simple linear interpolations between census years.

9.2 Appendix to the England & Wales analysis

Figure 8 plots normalized births for each region of the country (left panel) as well as for urban and rural areas (right panel). As in Figure 1, we normalize the data by plotting residuals after fitting a linear trend between 1851 and 1877.

Figure 8: Detrended Births by Region and Density

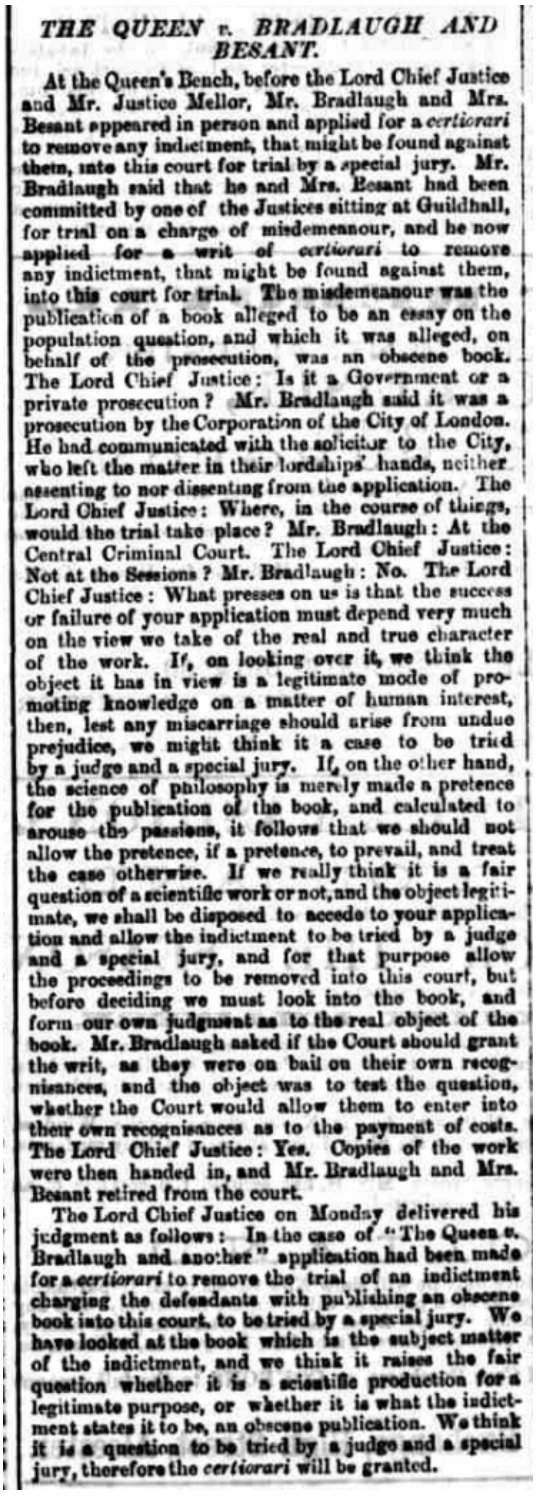


Births data were transcribed from annual reports of the Registrar General. The left-hand panel plots residuals from a regression that fits a linear trend between 1851 and 1877 for each region. The right-hand panel plots residuals from a regression that fits a linear trend between 1851 and 1877 for urban and rural areas. The vertical line at 1877 represents the year of the Bradlaugh-Besant trial.

9.2.1 England & Wales newspaper data

The newspaper data used in our analysis of England & Wales comes from the British Newspaper Archive (`www.britishnewspaperarchive.co.uk`), a joint effort by the British Library and findmypast to digitize millions of newspapers from the British Library's extensive collection. This database contains many papers from throughout the country, though not every paper is included. Some very small papers may be missing from the British Library's collection, while a few national papers, such as the *Times* are not included, presumably because they are available through alternative digital libraries. Each article was digitized using a high-quality scanner. The text was then identified using optical character recognition. Figure 9 presents a typical example article from the Alcester Chronicle (May 5, 1877), which is the first article that appears in our search when newspapers are sorted alphabetically.

Figure 9: Example article



THE QUEEN v. *BRADLAUGH AND BESANT.*

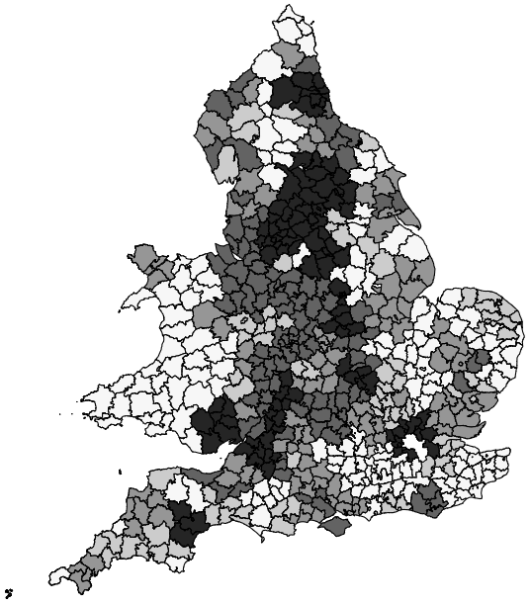
At the Queen's Bench, before the Lord Chief Justice and Mr. Justice Mellor, Mr. Bradlaugh and Mrs. Besant appeared in person and applied for a *certiorari* to remove any indictment, that might be found against them, into this court for trial by a special jury. Mr. Bradlaugh said that he and Mrs. Besant had been committed by one of the Justices sitting at Guildhall, for trial on a charge of misdemeanour, and he now applied for a writ of *certiorari* to remove any indictment, that might be found against them, into this court for trial. The misdemeanour was the publication of a book alleged to be an essay on the population question, and which it was alleged, on behalf of the prosecution, was an obscene book. The Lord Chief Justice: Is it a Government or a private prosecution? Mr. Bradlaugh said it was a prosecution by the Corporation of the City of London. He had communicated with the solicitor to the City, who left the matter in their lordships' hands, neither assenting to nor dissenting from the application. The Lord Chief Justice: Where, in the course of things, would the trial take place? Mr. Bradlaugh: At the Central Criminal Court. The Lord Chief Justice: Not at the Sessions? Mr. Bradlaugh: No. The Lord Chief Justice: What presses on us is that the success or failure of your application must depend very much on the view we take of the real and true character of the work. If, on looking over it, we think the object it has in view is a legitimate mode of promoting knowledge on a matter of human interest, then, lest any miscarriage should arise from undue prejudice, we might think it a case to be tried by a judge and a special jury. If, on the other hand, the science of philosophy is merely made a pretence for the publication of the book, and calculated to arouse the passions, it follows that we should not allow the pretence, if a pretence, to prevail, and treat the case otherwise. If we really think it is a fair question of a scientific work or not, and the object legitimate, we shall be disposed to accede to your application and allow the indictment to be tried by a judge and a special jury, and for that purpose allow the proceedings to be removed into this court, but before deciding we must look into the book, and form our own judgment as to the real object of the book. Mr. Bradlaugh asked if the Court should grant the writ, as they were on bail on their own recognisances, and the object was to test the question, whether the Court would allow them to enter into their own recognisances as to the payment of costs. The Lord Chief Justice: Yes. Copies of the work were then handed in, and Mr. Bradlaugh and Mrs. Besant retired from the court.

The Lord Chief Justice on Monday delivered his judgment as follows: In the case of "The Queen v. Bradlaugh and another" application had been made for a *certiorari* to remove the trial of an indictment charging the defendants with publishing an obscene book into this court, to be tried by a special jury. We have looked at the book which is the subject matter of the indictment, and we think it raises the fair question whether it is a scientific production for a legitimate purpose, or whether it is what the indictment states it to be, an obscene publication. We think it is a question to be tried by a judge and a special jury, therefore the *certiorari* will be granted.

The Alcester Chronicle, May 5, 1877.

Our difference-in-differences empirical approach exploits variation in exposure to newspaper articles on the trial as a way of defining treatment and control groups. As mentioned in the main text, we classify articles as covering the trial if they were published in 1877 and they mention either "Bradlaugh" or "Besant" at least once throughout the article. This leverages the fact that both names are fairly unique. As shown in Figure 2, simple plots of mentions by month and year match key moments of the trial, increasing our confidence that this query is in fact picking up exposure to the trial. Figure 10 plots the spatial variation of our newspaper exposure variable.

Figure 10: Spatial distribution of newspaper exposure



This figure maps our treatment variable of interest: number of articles published within 25 km of each district.

Because our analysis relies on the spatial variation of newspaper coverage of the trial, it is useful to consider the factors that may generate this variation. One source of spatial variation in coverage of the trial is underlying variation in newspapers in general. A second source of spatial variation in trial coverage is that some newspapers

may have been more willing to publish articles about the trial than others. Two other sources of variation in our data are related to measurement error. Our measure of the spatial variation in exposure to the trial will be affected by which newspapers are covered by the British Newspaper Archive. In addition, we may also miss some articles in newspapers that were included in the database, simply because optical character recognition failed to properly read the article text. Given the way the newspapers were printed, we find that the digitized text included in the British Newspaper Archive contains a large number of errors, which may cause us to miss some articles. However, most articles about the trial contain multiple mentions of Bradlaugh and Besant, giving the program several chances to digitize one of them correctly.

Some of these sources of variation may reflect underlying differences in local conditions. In general, this should not pose a major identification concern for our difference-in-difference strategy given that there do not appear to be other events that were likely to have led to a rapid and substantial change in fertility behavior at exactly the time of the trial. However, it is interesting to try to examine which sources of variation in exposure to articles about the trial are behind our results.

In Table 6 we present results where we have run a keyword search for other names or terms not related to the Bradlaugh-Besant trial and then use these to generate explanatory variables. We consider the names of three important politicians during this period, Gladstone, perhaps the most important politician of the period, Disraeli, Gladstone's conservative rival, and Northcote, the Chancellor of the Exchequer in 1877. These names were chosen because of their prominence and the fact that their names are sufficiently unusual. Using these variables will pick up broad political coverage. We also consider a search looking for "Monday" which is intended just to capture general newspaper coverage. The first four columns of this table include each of these alternative explanatory variables instead of our measure of trial exposure. We can see that these alternatives generate negative coefficient estimates, but these are not statistically significant. In Columns 5-8 we include these variables together with our measure of trial exposure. In these regressions we observe even stronger negative fertility effects associated with exposure to articles about the Bradlaugh-Besant trial, while each of our other alternative explanatory variables have small coefficients that are not statistically significant.

Table 6: Other News X Post Interactions

	DV is Δln(avg. birth rate)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Trial Exposure × Trial Decade					-0.021* (0.011)	-0.017* (0.010)	-0.022** (0.010)	-0.021** (0.010)
High Gladstone Exp. × Trial Decade	-0.010 (0.008)				0.004 (0.011)			
High Disraeli Exp. × Trial Decade		-0.011 (0.008)				-0.001 (0.010)		
High Northcote Exp. × Trial Decade			-0.005 (0.008)				0.007 (0.009)	
High Monday Exp. × Trial Decade				-0.009 (0.007)				0.005 (0.010)
Observations	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720
R-squared	0.627	0.627	0.626	0.627	0.628	0.628	0.628	0.628
No. Districts	430	430	430	430	430	430	430	430

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions weighted by 1851 district population. The trial decade is the 1881-1871 change, while the pre-trial decade is the 1861-1871 change. Birth rates are 3-year forward looking averages (i.e., centered on the year after enumeration). "High News Exposure" districts are those where the number of articles published on the Bradlaugh-Besant trial within a 25km band is above the median (i.e., 7 or more articles published in 1877). The "High Gladstone", "High Disraeli" "High Northcote", and "High Monday" variables are defined analogously. All regressions include period fixed effects, district fixed effects, and several district-level interactions. The "Marriage X trial interactions" include the interaction between our trial indicator and each of the following district-level marriage pattern variables: the district-level marriage rate from 1871-73, share of marriages spanning 1871-75 that took place at the Registrar's Office (which we interpret as non-religious), share of marriages that took place in a Catholic church, share of 1871-1875 marriages that were first time marriages, the share where the bride and groom were minors, and share of marriages where the bride and groom were illiterate. The "Other district X trial interactions" include the following district-level characteristics interacted with our "Trial Decade" indicator: population density, average share of births that were illegitimate (1871-1875), female labor force participation rate, child labor force participation rate, share of workers that were in the "professional" class in 1861, and three measures of district health (overall mortality rate, mortality rate for fertile women, and the under 5 mortality rate).

Overall, these results indicate that the key source of variation behind our measure of exposure to the trial is whether or not a newspaper decided to cover the trial. If instead, our results were simply due to overall newspaper coverage, or variation in the set of newspapers covered by the British Newspaper Archive, or variation in the readability across different newspapers, then we should have seen similar estimates

associated with our "placebo" explanatory variables as we found for our measure of articles about the trial.

9.2.2 Article content

We have also examined the scope and content of the articles about the trial that we have identified. As a first step, we manually reviewed each of the articles identified in our search and classified them based on content. Naturally these are somewhat rough classifications, but they can provide a useful idea of the types of articles found in our measure of trial exposure. Table 7 presents the breakdown of articles.

Roughly three quarters of the articles captured in our search were direct reporting on the trial, the first three categories shown in Table 7. We have broken these reports down into three types: regular articles, which range from a paragraph to almost a full vertical column of text; short snippets, which are typically just a couple of sentence updates about the trial; and longer articles, covering more than one full vertical column (unlike today, at this time papers published articles in columns that extended across the full height of the paper). While these length distinctions are arbitrary and not precise, they convey some idea of the extent of coverage of the trial. These reports focus mainly on the factual events of the trial, though some of them also include commentary or opinions.

About 6% of the articles mentioning Bradlaugh or Besant in 1877 discuss meetings, lectures or events associated with the Malthusian League that took place outside of the context of the trial. These include a number of public meetings that took place during the trial where either Bradlaugh or Besant spoke.

We identified 67 articles about the trial but with a focus on opinion and commentary, rather than more direct reporting of factual events. These articles span a wide range of views and many of them are particularly interesting.

A number of articles were published about a controversy related to the trial that involved the post office. For example, the Bradford Telegraph (May 18, 1877) reported that, "The Secretary of the General Post Office intimated that he claims the right to open, read and confiscate, without giving Mr. Bradlaugh any intimation, any work posted by him..." This decision, which was condemned by a number of papers, created quite a bit of controversy, including in the House of Commons.

We find 15 articles mainly related to sales of the *Fruits of Philosophy*. These come in two main varieties. One set focuses on the large number of manuscripts that were sold as a result of the publicity generated by the trial. Another set of articles discusses court cases involving sellers other than Bradlaugh & Besant. In addition, a few articles discuss the sales of copies of other pamphlets that had been given fake *Fruits of Philosophy* covers, apparently because street hawkers had other pamphlets lying around that they wanted to get rid of and this was a way to get rid of them while turning a profit. Another topic of interest was Annie Besant's colorful biography, including the fact that she was previously married to a minister and had some famous relations. Several of these appear in papers from around Cheltenham, where her husband had worked.

Bradlaugh and Besant were also mentioned in connection with another controversial book, *Priest in Absolution*, that appeared around the time of the trial. This book was published by a group of Anglican clergy and provided instructions that included asking intimate questions of women during confession. Bradlaugh and Besant are typically mentioned as a point of comparison. For example, a letter by Sir Harry Verney published in the Bucks Herald, Uxbridge Advertiser, Windsor and Eton Journal, states that, "If Mr. Bradlaugh and Mrs. Besant are to be imprisoned for publishing obscene books on physical subjects, the authors of this book [the Priest in Absolution] ought to be doubly punished for making the Church the vehicle for suggestions leading to gross licentiousness."

A somewhat odd set of eight articles have to do with an appeal by one Dr. Kenealy, an MP from Stoke, for for public subscriptions for an election fund. These articles uniformly mention how little funding (£20) Kenealy's appeal achieved in comparison to the £1,200 raised by Bradlaugh & Besant in a few weeks for their trial defense fund. At the end of the year, papers at this time commonly ran reviews of important events. A number of these mentioned the Bradlaugh-Besant trial.

Bradlaugh and Besant were also mentioned in relation to a debate over the Burial Bill, which dealt with whether religious "Dissenters" could be buried in parish graveyards. Articles against the Burial Bill typically mention Bradlaugh and Besant to raise the specter that the bill opens the door to atheists such as them orating in churchyards. A small number of articles mentioned Bradlaugh in connection with the prosecution of Edward Truelove, another secularist also arrested for publishing the

Table 7: Types of articles

Classification	No. articles	Share
Reporting on the trial – regular articles	479	42.1%
Reporting on the trial – short snippets	317	27.9%
Reporting on the trial – long articles	73	6.4%
Meetings, lectures, Malthusian League	76	6.7%
Opinion and commentary	67	5.9%
Post Office controversy	26	2.3%
Related to books/pamphlet sales	15	1.3%
Besant biographical	15	1.3%
Priests of Absolution controversy	12	1.1%
Related to Dr. Kenealy's public plea	8	0.7%
Related to the Burial Bill controversy	7	0.6%
Reviews of important events in the year	7	0.6%
Truelove prosecution	5	0.4%
Articles in Welsh	4	0.4%
Petition to the House of Commons	3	0.3%
Bradlaugh's candidacy for parliament	2	0.2%
Miscellaneous	20	1.8%

Fruits of Philosophy. Bradlaugh was active in helping with his defense.

Four of the articles were published in Welsh. Two articles, both from Northampton, mention Bradlaugh's effort to be elected as an MP for that area, which he eventually achieved in 1880. Two other articles are related to a petition in the House of Commons related to the trial in support of Bradlaugh and Besant. The remaining articles cover a wide range of miscellaneous topics, ranging from a poem about Bradlaugh and Besant to a discussion of a visit by an American Apostle of Free Love to London and even in a speech at a meeting of the North Myton Conservative Association (to "loud laughter and applause", Hull Packet and East Riding Times, Aug. 17, 1877). As another example, the pair were mentioned in connection with a debate over a proposal (rejected by the House of Commons by 229 to 87) to allow museums and galleries to open on Sundays (Huddersfield Daily Chronicle, June 11, 1877).

To gain a deeper understanding of the content of the articles, we also manually transcribed the full content for a sample of 483 articles (or about 40% of the sample).[53]

[53]Transcription was necessary because the fully automated approach employed by the British Newspaper Archive is sufficient for identifying the existence of strings of characters on a page, it often does a poor job of preserving the formatting of the article. This means that information from articles appearing before or after the relevant article are often assigned as part of the relevant article,

The sampled articles were chosen semi-randomly by sorting the articles in alphabetical order based on place of publication and then digitizing the first 40% of articles that appear.

These transcribed data allow us to provide a more quantitative picture of the scope and content of the newspaper articles written about the trial. A good starting point is to look at the size of articles. The average article length in our sample is 497 words, with the shortest article being just 15 words (a short update of when sentencing was scheduled to occur) and the longest article being 5160 words. In total, the 483 articles covering the trial that we sampled contain just over 240,000 words.

Next, we attempt to parse out common themes appearing in the articles. To do so, we begin by taking the raw text and removing any punctuation or common words.[54] After these standard cleaning steps we then identified the frequency of every individual word stem, as well as the frequency of every two-word pair. Table 8 describes the 80 most common word stems appearing in the articles (after dropping common words) and the 80 most common consecutive two-word combinations. Looking over these data, one can discern some of the key themes that appear in the articles. Beyond the expected descriptive terms, such as "bradlaugh", "court", or "chief justice", one of the striking features is the number of terms dealing with issues of morality. Among the two-word combinations, we see that "obscene book" and "public morals" appear frequently, as does "calculated deprave" and "defendants corrupt." The frequency of terms like these, and the associated word roots, indicate the centrality of the debate over the morality of limiting family size in the trial. Other terms, like "population question" and "checks population" reflect the broader debate over population control.

Conspicuously absent from this list is any word related to the technical aspects of contraception. None of the articles we transcribed included terms such as 'withdrawal" or "douching", two of the main methods advocated in the pamphlet. This tells us that newspapers were not directly transmitting contraceptive information.[55]

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and vice versa. Manual transcription is expensive, so our sample size was driven by budget concerns.

[54]For instance, the string "Mrs. Besant continued her defence, dealing with the checks on population. One of the first of these checks was infanticide but instead of that the poor wished for a scientific check, which would give them happiness and comfort in their homes." becomes "mrs besant continued defence dealing checks population one first checks infanticide instead poor wished scientific check would give happiness comfort homes."

[55]The articles did, however, generate publicity for "The Fruits of Philosophy", which may have further diffused knowledge of existing contraceptive technology by signaling where couples could obtain the relevant information.

Instead, the bulk of the trial content released by newspapers related to the arguments surrounding the morality of using scientific checks to address the population question. Since this use of scientific checks was still taboo at the time, this is entirely consistent with our interpretation that the primary role of newspapers was to help open up conversations about the topic of family planning.

Table 8: Most frequent word stems and two-word pairs in the transcribed articles

One-word stems						Two-word grams				
Rank	Word	Freq.	Rank	Word	Freq.	Rank	Word	Freq.	Rank	Word	Freq.
1	mr	2554	41	intent	314	1	mr bradlaugh	1520	41	straight mr	74
2	bradlaugh	1940	42	time	313	2	mrs besant	1000	42	said would	69
3	book	1694	43	proceed	309	3	lord chief	728	43	case queen	68
4	would	1445	44	state	306	4	chief justice	719	44	entitled fruits	65
5	besant	1282	45	object	305	5	bradlaugh mrs	461	45	learned counsel	64
6	mrs	1194	46	say	301	6	queens bench	262	46	mr alderman	63
7	said	1136	47	medic	294	7	fruits philosophy	234	47	book calculated	61
8	work	1068	48	present	292	8	bradlaugh said	227	48	publication book	60
9	justic	989	49	circul	287	9	obscene book	203	49	queen bradlaugh	57
10	court	975	50	found	286	10	public morals	199	50	verdict jury	57
11	publish	954	51	person	282	11	charles bradlaugh	145	51	publishing book	56
12	case	943	52	made	271	12	annie besant	145	52	thomas dakin	55
13	juri	917	53	matter	271	13	mr charles	137	53	defendants corrupt	55
14	lord	897	54	year	271	14	verdict guilty	134	54	24th march	55
15	defend	884	55	whether	271	15	bench division	132	55	jury found	55
16	public	859	56	philosophi	269	16	mr straight	123	56	mr bradlaughs	54
17	chief	792	57	point	268	17	quash indictment	115	57	court would	53
18	obscen	782	58	guilti	267	18	prosecution mr	112	58	douglas straight	51
19	prosecut	766	59	fruit	267	19	publishing obscene	109	59	essay population	51
20	question	595	60	address	260	20	solicitor general	109	60	mr douglas	51
21	indict	586	61	good	253	21	mrs annie	108	61	besant said	50
22	pamphlet	577	62	show	250	22	new trial	108	62	question whether	50
23	could	570	63	defenc	248	23	justice said	107	63	two years	49
24	law	518	64	peopl	246	24	mr justice	105	64	said case	48
25	one	511	65	general	245	25	special jury	103	65	years ago	48
26	verdict	511	66	two	243	26	justice mellor	102	66	sir thomas	48
27	trial	483	67	subject	242	27	alderman figgins	97	67	court justice	47
28	might	477	68	ask	241	28	trial mr	96	68	book published	45
29	popul	444	69	hand	241	29	population question	88	69	obscene libel	45
30	upon	433	70	dr	238	30	besant mr	86	70	moved quash	44
31	moral	429	71	appear	235	31	book obscene	86	71	book entitled	44
32	check	415	72	read	235	32	mr mead	85	72	jury would	44
33	queen	384	73	evid	235	33	deprave public	84	73	solicitorgeneral said	43
34	charg	374	74	word	234	34	bradlaugh besant	81	74	case adjourned	43
35	solicitorgener	353	75	refer	232	35	court queens	81	75	medical works	43
36	must	343	76	corrupt	232	36	unreadable text	81	76	besant publishing	43
37	put	331	77	man	229	37	checks population	78	77	appeared prosecution	43
38	bench	325	78	right	228	38	calculated deprave	77	78	court rose	42
39	judgment	324	79	use	228	39	central criminal	75	79	court error	42
40	call	320	80	charl	225	40	criminal court	74	80	solicitorgeneral mr	42

The first two columns present the 80 most frequent word stems found in the 483 transcribed articles. The last two columns present the 80 most frequent two-word combinations, after common connector words have been removed.

9.2.3 Other data for England & Wales

In addition to the newspaper exposure variable, we also assemble a wealth of other district-level controls. The first source is the reports of the Registrar general which cover births, deaths, and marriages. The birth series is discussed in the main text. The annual marriage series spans 1851-1884 and includes quite a bit of useful detail, including the number of marriages broken down by whether the marriage was Established (Anglican), Catholic, or another denomination, or whether marriage took place in the Registrar's Office (i.e., non-religious). There is also information on whether the number of marriages where both parties were previously unmarried, the number in which either the man or women (or both) were minors, and the number in which either the man or woman (or both) were illiterate. The mortality data we use, total mortality, under-5 mortality, and mortality amongst fertile aged women (15-55), are not available on an annual basis. Instead, we use decadal data compiled by Woods (1997), obtained from the UK Data Archive.

Population data for each decade from 1851 to 1901 were digitized from the Census of Population. These data break population down by age group and gender, which is useful when calculating fertility, mortality, and marriage rates. When calculating these rates, we use either three-year of five-year windows following each census. So, for example, the birth rate in each district in 1851 is calculated as the average annual number of births in either 1851-53 or 1851-55, divided by the number of fertile-aged women in the district in 1851. This approach avoids the need to use interpolated population denominators. However, the need for population denominators means that our analysis is conducted using decade-level rather than annual-level data.

The Census also reports the area of each district. We use this to calculate population density, a potentially important control variable. Data from the Census of Population is also used to construct controls for the industrial structure of each district, a factor that could potentially influence birthrates. Specifically, we use the district-level occupation data reported in the census to calculate the share of local employment in various sectors, such as agriculture, textiles, mining, metal goods, other manufacturing, government employment, professional occupations, etc. These occupation data come from 1861.[56]

[56]Detailed occupations are not reported at the district level after 1861. The occupation data reported in the Census of Population often corresponds more closely to industry than to what we

The district occupation data from the 1861 Census of Population also identify gender. This allows us to construct controls for female labor force participation in each district. It is worth noting that female labor force participation was generally high in Britain during this period, but varied substantially across locations. However, national data shows that female labor force participation was also falling across the study period, as Britain transitioned towards the single-breadwinner economy that dominated during the first half of the 20th century.

While employment is not broken down by age at the district level, it is possible to construct a control for the number of young workers in a district by exploiting the fact that the use of child labor during this period depended on the local industrial structure. Some industries, such as textiles, were heavily dependent on child labor, while others, such as engineering and metal industries, used relatively few child workers. Thus, we infer child labor by calculating the ratio of workers under 20 to those 20 and over, by industry, using national-level data, multiplying this ratio by employment of workers 20 and over in each industry and district, and then summing by district. The result is an inferred share of child workers in total employment as well as a child (ages 10-19) labor force participation rate.[57]

Summary statistics for the key analysis and control variables at the district level are presented in Table 9.

To examine the mechanisms of adjustment, we also draw on micro-data from the 1881 Census of Population. To construct the sample used for this analysis, we begin with the full-count Census dataset digitized by findmypast.org and standardized by the Integrated Census Microdata Project (I-CeM). The sample we analyze is constructed in the following way. We begin by extracting all households residing with at least one child born between 1871 and 1881. This yields 2,562,164 households. We discard roughly 3 percent of this initial sample because of data discrepancies that decrease our confidence the fact that we are observing actual biological relationships.[58]

think of as occupation data today. It is worth noting that this occupation data covers only those over age twenty.

[57]This procedure gives results that look very reasonable. The industries with the greatest child labor ratios are the textile sectors, messengers/porters, and miscellaneous services while the lowest ratios are government employment, clergy, and utilities. The districts with the highest child labor shares are the main Lancashire textile districts, starting with Blackburn and Ashton-under-Lyme.

[58]We then throw out any household with any of the following data discrepancies: more than one individual is coded as the household head (974 instances), more than one individual is coded as the head's spouse (4,231 instances), the household head is under the age of 16 (377 instances), there are

This leaves us with a final sample of 2,482,788 households, spanning all of England & Wales. The total number of children residing in these households is 8,588,101 with 6,268,593 of those children born between 1871 and 1881.

Table 9: Summary statistics for the district-level data

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Birth rate panel data (decadal)					
$\Delta \ln(BR_{dt})$, all decades	-0.032	0.094	-0.417	0.281	1720
$\Delta \ln(BR_{dt})$, 1871-1881	-0.052	0.066	-0.282	0.247	430
$\ln(BR_{dt})$	-1.926	0.155	-2.6	-1.419	2150
Cross-sectional variables from 1871					
Total mortality rate	0.019	0.003	0.014	0.034	430
Under 5 mortality rate	0.049	0.014	0.025	0.119	430
Fertile-age female mort. rt.	0.009	0.002	0.006	0.018	430
Shr. marriages in Estab. church	0.762	0.158	0.173	1	430
Shr. marriages Catholic church	0.019	0.035	0	0.248	430
Shr. marriages at Registrar	0.095	0.107	0	0.51	430
Shr. of first marriages	0.831	0.025	0.759	0.923	430
Shr. of minors marrying, all	0.138	0.043	0.033	0.283	430
Shr. of minors marrying, Fem.	0.204	0.062	0.032	0.406	430
Shr. of illiterate marrying, all	0.211	0.078	0.042	0.564	430
Shr. of illiterate marrying, Fem.	0.215	0.103	0.039	0.617	430
Female labor force part. rate	0.399	0.094	0.173	0.747	430
Child labor force part. rate	0.483	0.096	0.237	0.957	430
Emp. shr. in agriculture	0.243	0.12	0.004	0.62	430
Emp. shr. in metal goods	0.031	0.033	0.006	0.276	430
Emp. shr. in mining	0.023	0.045	0	0.283	430
Emp. shr. in textiles	0.047	0.08	0.002	0.447	430

more than 10 biological children (2,748 instances). We then impost some assumptions to increase the likelihood that the mother and father are the biological parents for each of the children in the household. Specifically, we throw out any household where: the mother or father was under the age of 14 when their first child was born (18,484 and 3,887 instances, respectively), the mother was over the age of 50 when their youngest child was born (16,215 instances), or the father was over the age of 60 when their youngest child was born (9,650 instances). We then throw out any household where the spouse identifier is internally inconsistent – that is, the individual whose relationship is coded as spouse does not match the person identifier (4,460 instances). We also discard any household where the head and spouse are of the same sex (2,057 instances) or where the household head is female and the spouse is male, which is rare (112 instances) and inconsistent with the enumeration instructions. Finally, we discard 2,625 households because age is missing for one or more of the children, which limits our ability to actually infer birth order, and we discard 2502 households because the span between the births of their oldest and youngest child is greater than 25 years.

9.2.4 Additional results on mechanisms in E&W

Table 10 reports results using the microdata to look at whether parents in locations more exposed to the trial put off having their first child. The first column examines how the average age of mothers at the time of their first birth changed in high news districts following the Bradlaugh-Besant trial. There we see that mothers were on average one month older when their first child was born. In the second column we examine the age of fathers and find a similar coefficient but it is less precisely estimated. While the magnitude of the effect may seem small, it is important to recognize that this effect is only estimated among those that had their first birth between 1874 and 1881. If young couples are successfully delaying their first birth such that those births don't occur until after 1881 then this will be an underestimate of the true effect. Nevertheless, these results suggest that young couples delayed having children following the Bradlaugh-Besant trial.

Table 10: Did households delay their first birth?

DV is age when first child was born		
	Mother's Age	Father's Age
	(1)	(2)
High News District ×	0.0770**	0.0637
Born after 1877	(0.0345)	(0.0421)
Observations	710912	710912
R-squared	0.016	0.015
No. districts	430	430

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions include district and birth year fixed effects as well as the following "Marriage X trial interactions" which interact our post-trial indicator with each of the following district-level marriage pattern variables: the district-level marriage rate from 1871-73, share of marriages spanning 1871-75 that took place at the Registrar's Office (which we interpret as non-religious), share of marriages that took place in a Catholic church, share of 1871-1875 marriages that were first time marriages, the share where the bride and groom were minors, and share of marriages where the bride and groom were illiterate. All regressions also include the interaction of our post-trial indicator with: population density, average share of births that were illegitimate (1871-1875), female labor force participation rate, child labor force participation rate, share of workers that were in the "professional" class in 1861, and three measures of district health (overall mortality rate, mortality rate for fertile women, and the under 5 mortality rate). The sample includes all first births occurring between 1874 and 1881.

9.3 Appendix to the analysis of Canada

9.3.1 Further details on the Canada data

Table 11 presents summary statistics for the data used in the analysis of Canada. Table 12 presents the correlations between the share of British-origin population in a county and other county features. This table shows that all four of our main measures of connections to Britain are strongly correlated, though naturally for the share of the population of French ancestry or attending the Catholic church this correlation is negative. We can also see that counties with a greater British-origin population had greater school attendance rates and a greater share of the adult population that was literate. The British-origin population tended to live in counties that were somewhat less agricultural and had somewhat greater population density.

Table 11: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Children per 1,000 women per year (1865-86)	142.5	39.4	70	455	532
British origin share 1861	0.478	0.394	0.003	0.973	101
French origin share 1861	0.486	0.422	0	0.997	101
Catholic share 1861	0.524	0.362	0.012	1	133
Church of Eng/Scot share 1861	0.162	0.129	0	0.461	133
Ag. employment share 1861	0.603	0.203	0.006	0.878	133
Male/female ratio 1861	1.057	0.147	0.878	1.917	133
Share of children in school 1871	0.691	0.169	0.261	0.986	133
Share over 20 can't read 1871	0.242	0.172	0.022	0.589	133
Eng/Wal/Scot imm. share 1861	0.054	0.076	0	0.276	133
Irish immigrant share 1861	0.057	0.072	0	0.299	133
Other immigrants share 1861	0.036	0.046	0	0.272	101
Density in 1861 (persons per acre)	0.615	2.818	0.00017	27.379	133

Table 12: Correlation of British origin share with other variables

Variable	**Correlation**
French origin share	-0.9958
Catholic share	-0.9685
Church of Eng/Scot share	0.9192
Ag. employment share	-0.2343
Male/female ratio	0.2437
School attendance rate	0.7588
Share adults that cannot read	-0.8956
Population density	0.114
Eng/Wales/Scot. imm. share of pop.	0.8255
Irish imm. share of pop.	0.7925
Other imm. share of pop.	0.5613

9.3.2 Additional results on mechanisms in Canada

Table 13 reports results using the microdata to look at whether British parents residing in Canada put off having their first child following the Bradlaugh-Besant trial. In contrast to England & Wales, here we see that the average age of first birth declined among British parents residing in Canada following the Bradlaugh-Besant trial.

Table 13: Did households delay their first birth?

DV is age when first child was born		
	Mother's Age	Father's Age
	(1)	(2)
British HH ×	-0.576***	-0.324***
Post-1877	(0.0851)	(0.0842)
Observations	61,039	61,039
R-Squared	0.080	0.069

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions include district and birth year fixed effects. Sample spans first births occurring between 1874 and 1881.

9.4 Evidence from South Africa

Our analysis of the Cape Colony compares fertility patterns in locations with a greater share of British-origin population among the European-origin population. The Cape Colony also contained large native African and mixed-race populations. Since these groups were less culturally similar than the different European-origin populations and faced a number of discriminatory practices that may have influenced their fertility patterns, we focus our analysis entirely on a comparison between the different European-origin populations.

The data available for the Cape Colony are more limited than what we have access to in Canada. Our analysis relies primarily on a single difference taken between the Census of 1875 and the Census of 1891. Our analysis focuses on the division level, which is somewhat like a U.S. county. This is the lowest geographic unit for which consistent data are available. However, a number of changes took place in division boundaries between 1875 and 1891. After collapsing our data to account for these changes, we are left with data for 32 divisions with (close to) consistent boundaries across the two periods.

As in the Canadian analysis, it is necessary to use the population of children at particular ages to infer fertility levels. Unfortunately, however, at the division level the 1891 census only reports the total number of children aged 0-14, rather than in more detailed age categories. Thus, we calculate fertility rates as the ratio of children aged 0-14 in either 1875 or 1891, relative to the fertile-aged female population in those years. We then look at whether the difference in fertility rates across these two periods is related to the location's British connection in 1875. Our baseline regression specification is,

$$\ln(BR_{d\,1891}) - \ln(BR_{d\,1875}) = \beta_0 + \beta_1 BRIT_{d\,1875} + X_{d\,1875}\gamma + \epsilon_d$$

where BR_{dt} is the ratio of children aged 0-14 to the fertile-aged (15-55) female population in district d in period t, $BRIT_{d\,1875}$ is a measure of the location's British connection in 1875, and $X_{d\,1875}$ is a set of control variables reflecting conditions in each division in 1875. Summary statistics for the variables used in our analysis are presented in Table 14.

We consider two measures of a division's British connection. The first measure

Table 14: Summary statistics for the South Africa analysis

Variable	Mean	Std. Dev.	Min.	Max.
$BR_{d,1875}$	1.879	0.24	1.208	2.314
$BR_{d,1891}$	1.773	0.188	1.194	2.04
British-born share	0.08	0.082	0.008	0.37
Not Dutch reform church shr.	0.395	0.286	0.082	1
Population density (per sq. mile)	5.687	11.842	0.116	52.892
Literacy rate (ages 15-55)	0.912	0.042	0.8	0.975
N=32				

is the share of European-origin population in a division that was born in the British Isles. This variable ranges from 37% to essentially zero. As a second measure of the British-born population, we use the share of the white population in a division that was not a member of the Dutch Reform Church, the dominant religion among the Afrikaner population. This variable ranges from essentially one down to just 8%.

The set of available control variables is somewhat limited. We include controls for population density in 1875 in all of our regressions, as well a control for literacy rates among the population aged 15-55 in 1875. Literacy rates were relatively high, ranging from 80-97.5 percent. Regressions are weighted by each division's population in 1875, a decision that reflects the fact that our outcome variables are averages, which will be more precisely measured in locations with more observations. Weighting does make a difference, since the British-origin population tended to cluster in a relatively smaller number of divisions with greater populations.

Our results are presented in Table 15. The first column presents baseline results with our preferred measure of a location's connection to Britain: the share of British-born population in the district. Column 2 adds in a control for literacy in 1875. This is our preferred specification. In Column 3 we also consider the relationship between fertility and the share of the population that was not either born in the Cape Colony or in the British Isles. It is comforting to see that the share of other immigrants does not have the same strong relationship to fertility that we observe for those immigrants born in the British Isles. Note that some of the other immigrants may have been British citizens born in other locations, which may explain why we still observe a negative coefficient estimate for this variable.

Column 4 considers an alternative measure of connections based on the popula-

tion that was not a member of the Dutch Reform Church. This alternative generates qualitatively similar results to our preferred specification, though the magnitude suggests that this is not as good a measure of a location's connection to Britain. It is worth noting that if we include both this variable and our preferred measure based on the share of British-born population in the same regression, the effects appear to be driven entirely by the British-born population share.

The results in Column 5 are estimated while dropping locations with a population density above four persons per square mile. This eliminates the four major urban centers in the Cape Colony during this period: Cape Town, Stellenbosch, Paarl, and Port Elizabeth. This selection is not particularly sensitive to using a cutoff of 10 persons per square mile; Outside of these four locations, no other division had a density above five. Columns 6 and 7 present results where the regressions are unweighted. We can see in Column 6 that weighting is important. Without weighting we still observe a sizable negative coefficient, but it is no longer statistically significant. However, Column 7 shows that simply drop the six locations with populations under 2,000 from the analysis leads to results that are almost identical to those obtained when weighting.

Table 15: Regression results for South Africa analysis

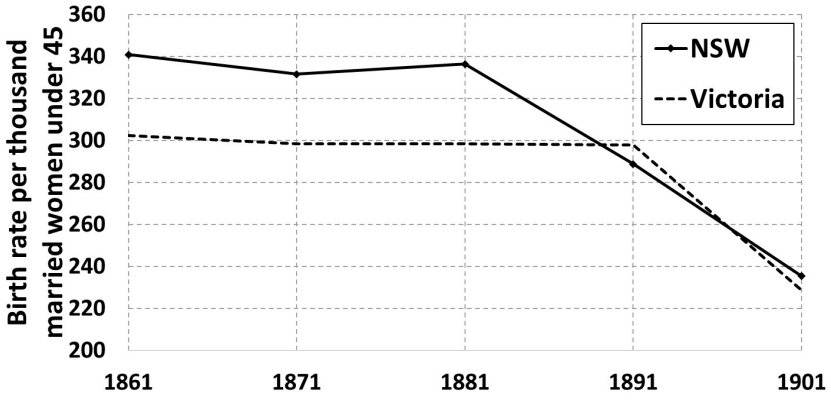
	DV: ln($BR_{d\,1891}$) - ln($BR_{d\,1875}$)						
	Base	With literacy controls	With other imm.	Dutch Reform share	Drop if density > 10/sq. mi.	Unweighted	Unweighted pop. > 2000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Brit. imm. shr.	-0.776**	-1.381***	-1.256*		-0.921**	-0.746	-1.252**
	(0.305)	(0.459)	(0.649)		(0.377)	(0.470)	(0.531)
Not Dutch Reform share				-0.178*			
				(0.0909)			
Non-British imm.			-0.355				
			(0.611)				
Pop. density	0.00538***	0.00686***	0.00677***	0.00349*	0.0270*	0.00359	0.00560**
	(0.00138)	(0.00156)	(0.00171)	(0.00186)	(0.0146)	(0.00263)	(0.00236)
Literacy		-1.398*	-1.383*	-0.511	-0.841	-0.484	-0.979
		(0.789)	(0.802)	(0.724)	(0.710)	(0.702)	(1.038)
Constant	-0.0335	1.274*	1.266*	0.447	0.692	0.425	0.904
	(0.0325)	(0.730)	(0.739)	(0.665)	(0.658)	(0.656)	(0.963)
Observations	32	32	32	32	28	32	26
R-squared	0.271	0.365	0.371	0.186	0.225	0.104	0.219

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Regressions in Columns 1-5 are weighted by district population in 1875.

9.5 Evidence from Australia

Figure 11 describes fertility patterns in Australia, specifically in New South Wales and Victoria, using data from Coughlin (1904). We can see that New South Wales experienced a substantial change in fertility patterns in the decade after 1881, while Victoria followed one decade later.

Figure 11: Fertility patterns in New South Wales and Victoria



Data from Coughlin (1904).

9.6 Additional Evidence from the United States

Table 16 reports results using the microdata to look at whether British parents residing in the United States put off having their first child following the Bradlaugh-Besant trial. Here we see evidence that first-generation British mothers were slightly younger and second generation British fathers were slightly older when their first child was born, following the Bradlaugh-Besant trial.

Table 16: Did households delay their first birth?

DV is age when first child was born				
	Mother's Age (1)	Father's Age (2)	Mother's Age (3)	Father's Age (4)
First gen. British HH × Born after 1877	-0.161**	0.100		
	(0.0737)	(0.0780)		
Second gen. British HH × Born after 1877			-0.0568	0.196***
			(0.0629)	(0.0657)
Observations	180,623	180,623	41,645	41,645
R-Squared	0.055	0.034	0.193	0.072

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions include district and birth year fixed effects. Sample spans first births occurring between 1874 and 1881.