CENSORSHIP, FAMILY PLANNING, AND THE HISTORICAL FERTILITY TRANSITION

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## <u>ABSTRACT</u>

The historical fertility transition is one of the most important events in economic history. This study provides new evidence on the role that ideas about family planning played in this transition. We begin by documenting a link between the famous Bradlaugh-Besant trial that took place in England in 1877, which revolved around the morality of family planning, and the sharp decline in fertility that took place in Britain beginning in that year. We then show that similar declines are observed among populations living outside of Britain but with strong cultural and linguistic links to Britain. Our findings highlight the importance of changing social norms in the historical fertility transition and provide novel evidence showing that cultural and linguistic ties can play an important role in rapidly transmitting social change 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]

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." Second, people 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.

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

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[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. Work on the role of female education and labor force opportunities, which may increase the cost of raising children, 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, such as Dribe (2008) and Bengtsson & Dribe (2014) on Sweden and (Brown & Guinnane, 2002) on Bavaria.

[4]Cultural conditions received substantial attention in the work of the European Fertility Project

Figure 1: Birth Rate in England & Wales, 1851-1891
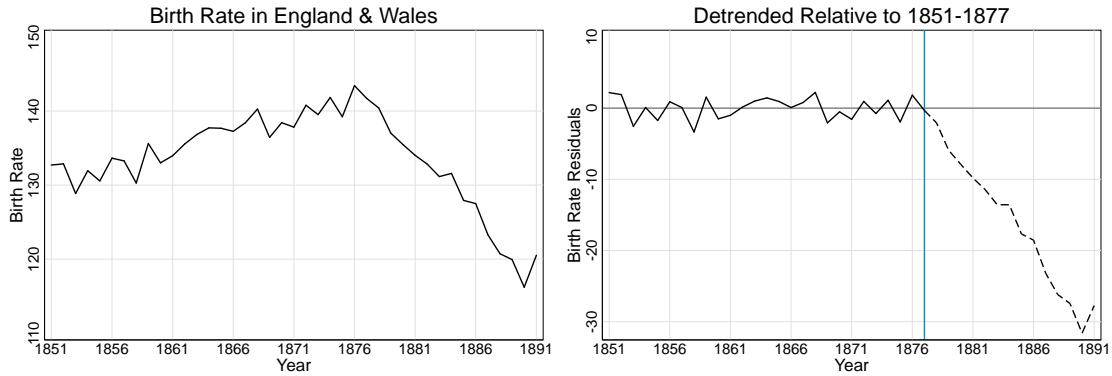


Births rates are defined as births per 1000 fertile aged women (women between the ages of 15 and 50). The births data were transcribed from annual reports of the Registrar General. The population denominator is linearly interpolated between census years. The right-hand panel plots residuals from a regression that fits a linear trend between 1851 and 1877. In this panel, the dashed line corresponds to out of sample predictions.

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. The sharp and steady decline in birth rates in England & Wales is striking and, as we show in Appendix Figure 12, 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 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 necessity of the "readiness" condition, as first hypothesized by Coale (1973).

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(Knodel & van de Walle, 1986).

We argue 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.[5] 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 techniques. 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 populations outside of the U.K. but with strong cultural or linguistic ties to Britain.

England & Wales is the natural starting point for our analysis. To find variation in exposure to the ideas disseminated by the Bradlaugh-Besant trial, we search through a rich archive of historical newspapers to identify coverage of 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 trial coverage.

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 analyze individual-level micro-data from the 1881 Census to examine the key dimension of

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[5]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 currently based primarily on the timing of the event.

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 populations that reside outside of the U.K. but nevertheless have strong cultural ties to Britain. This provides additional evidence isolating the importance of ideas 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. As a first step, we use measures of cultural ties between countries provided by Spolaore & Wacziarg (2016) to show that countries sharing stronger cultural links to Britain experienced relative fertility declines in the years just after the trial, compared to years just before. This provides some preliminary evidence that cultural and linguistic bonds acted to transmit the effects of the trial around the world.

To provide more convincing evidence on the role of cultural ties, we then focus on comparing populations living in the same country, and therefor experiencing similar economic and policy environments, but with varying cultural connections to Britain. Canada provides an ideal setting for this analysis. It was the closest large colony to Britain, and while many Canadians had recently come from Britain, there were also a substantial Francophone population with very little cultural or linguistic connection to the U.K. 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 expe-

rienced 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 South Africa, where 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.

Finally, we study the behavior of British immigrants in the U.S. There, 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, these results provide convincing evidence that the ideas disseminated 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 the trial is that the main contraceptive techniques, abstinence and withdrawal, were both rudimentary and already known.[6] That the techniques were known is not inconsistent with the importance of the trial. The literature surrounding the trial indicates that the debate focused on the morality of the argument 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 today, was highly controversial in Victorian society. As Annie Besant wrote in 1877, "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.'" The trial helped change that. As to contraceptive efficacy, even a rudimentary technology like withdrawal can bring substantial reductions in family

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

size when applied over a couple's fertile period.[7]

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 (2019) and Blanc & Wacziarg (2019), which argue that culture and social norms played an important part in the historical fertility transition.[8] 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 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 dissem-

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[7]Analysis by David & Sanderson (1986) 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.

[8]Spolaore & Wacziarg (2019) 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.

inating 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.[9]

The literature on the historical fertility transition is immense and so there are some important topics that we will not directly address. For example, many 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.

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. In section 5 we present preliminary cross-country evidence showing that countries sharing stronger cultural ties to Britain experienced similar fertility declines in the years just after the trial. We then analyze patterns within Canada in Section 6 followed by evidence from South Africa in Section 7. Section 8 studies the behavior of British immigrants in the United States. Section 9 concludes.

## 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

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

to individual self-interest.[10] In our setting, norms may have altered fertility by prohibiting discussion of topics viewed as "lewd" and "indecent", even between husbands and wives.

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 (2019) 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.*, 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

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[10]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).

punctuated equilibria, where long periods of persistence are punctuated by short burst of rapid change. This appears 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, social norms offer 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 1875-76 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. Against them, the Solicitor-General argued[11],

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[11]Quoted from Manvell (1976), p. 147.

> *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 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. 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."

Widespread newspaper coverage of the trial played a crucial role in disseminating Bradlaugh and Besant's 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."[12] 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

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

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moment no regular newspaper would touch the subject."

Figure 2 offers a more comprehensive look at newspaper coverage. The left-hand 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."[13] 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.[14] The pattern we observe for "Population Question" is particularly informative because this was a term 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.

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[13]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.

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

Figure 2: Published Articles Mentioning Various Keywords
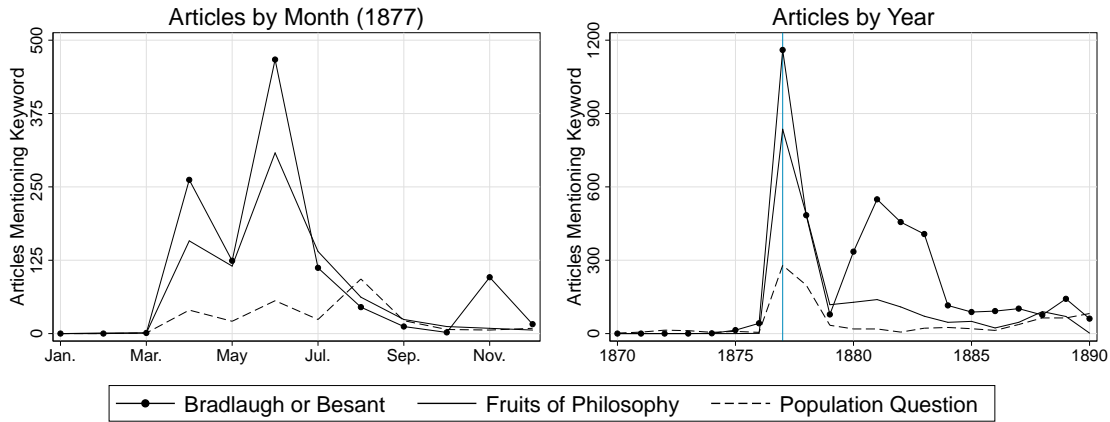


Data obtained from author's own search of digitized articles published in England & Wales as made available from https://britishnewspaperarchive.co.uk.

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.[15] Bradlaugh and Besant also gave several public lectures around the country.[16] Finally, there was the Malthusian League, an organization dedicated to spreading family planning ideas, which was established following the trial.[17] The trial also generated an enormous increase in sales of books on family planning in England & Wales.[18] For instance, data from Google N-grams,

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[15]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.

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

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

[18]This included Besant's book, *Law of Population*, which was published in 1877 and sold 175,000 copies by 1891. 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

which we reproduce in Appendix 10.1, show a dramatic increase in the appearance of terms related to the trial, such as "Bradlaugh," "Besant," "conjugal prudence," and "Fruits of Philosophy" in the years just after 1877.

News about the trial spread rapidly outside of England, particularly in British colonies. In Section 6 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 Winde-meyer, 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. Reading through these materials, it becomes clear that the central focus of the trial, and the broader debate that surrounded it, was 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 pamphlets published during this period were dedicated to arguing that couples had a right, and even a responsibility, to choose.[19] Even the morality of discussing the topic of restricting family size was up hotly debated in the press.

In addition to these moral questions, the trial and the material related to it also

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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 since the population of the U.K in 1871 was just over 31 million.

[19]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.

included a limited discussion of specific family planning techniques. However, 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.[20] It thus seems unlikely that the trial improved available contraceptive technology. This conclusion is consistent with existing work suggesting that the main methods remained unchanged during this period (see Guinnane (2011) and Szreter (1996) Ch. 8).

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 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

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[20]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.

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 the trial, indicating that our 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 5). 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.

We have also 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 10.2.2, shows that, beyond factual reporting on trial, the discussion in the newspapers was centered on the morality of fertility control, offering support for our interpretation of news coverage as exposure to the ideas at the center of the debate.

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.[21] 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.[22] To reflect the fact that provincial papers usually served not just the town where they were published but also the surround-

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[21]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).

[22]While there are over 600 districts in England & Wales, many district boundaries changed at some point during our study period. We adjust for this by combining districts where boundary changes shifted more than 200 residents from one district to the other. Our main analysis will also exclude the districts that comprise London, since it 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. These adjustments leave us with 430 consistent districts spanning 1851 to 1891.

ing 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 14 plots the spatial distribution of this measure.

## 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's birth rate: births per 1000 fertile aged women (women between the ages of 15 and 50). The births data come from the annual Reports of the Registrar General, which we digitized for the purposes of this analysis.[23] Our main analysis will consider the average birth rate over a five-year period (e.g., 1873-1877, and 1878-1882).[24] Averaging helps smooth over some of the random variation observed in annual births and increases comparability with some of our later analyses.[25]

We have also constructed a rich set of district-level control variables reflecting key factors thought to influence fertility behavior. These include controls for 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 10.2.3.

In addition to these aggregate data, 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.[26] 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

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[23]Several papers, starting with Glass (1951) have examined the quality of these data. A review of these studies by Woods (2000) (Ch. 2) indicates that the registration data captured about 98% of all births by the early 1860s and that registration was essentially complete by the mid-1870s.

[24]District-level tabulations of population by age and sex are only available in census years, and so we linearly interpolate these tabulations to construct an annual estimate.

[25]Results are not sensitive to the length of our window, but we chose five years because that is typically the smallest window that we will be able to consider when we examine birth rates in countries without comprehensive birth registration.

[26]See Appendix 10.2.3 for details on the construction of this sample.

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 useful for looking at some of the mechanisms through which fertility adjustment occurred. In particular, microdata allows us to look within families, to study whether couples were putting off childbirth, allowing more time between children, or ending fertility earlier. However, these data are not without limitations. In particular, the data are only available in 1881 and so we are only able to examine fertility decisions until 1881 census enumeration. We thus view these two sources of data as complementary.

## 4.3    Analysis approach and main results

Figure 3 offers a first look at the impact of the trial on fertility rates. There we normalize each district's birth rate by first regressing district-level birth rates (between 1851 and 1877) on a set of district fixed effects and region-specific linear time trends. We then take the residuals from this regression (for both the sample period, 1851-1877, and the post-trial period, 1878-1891) and then plot the average residual among "High Exposure" and "Low Exposure" districts for each year. "High Exposure" districts are those with more than the median number of articles (six) mentioning Bradlaugh or Besant in 1877 within a 25km radius. "Low Exposure" are districts with below median exposure. In this figure, and all subsequent analysis, we exclude London since that was the center of the trial and the home of the national press.

Figure 3 indicates that, at least after accounting for regional trends, birth rates in high and low exposure districts were trending together prior to the trial. After the trial, we see birth rates decline in both sets of districts but the decline is relatively stronger among districts with more trial coverage. This graph presents a useful framework for thinking about our results. While both sets of districts are likely treated by the shock generated by the trial, we expect the ideas to be more widely discussed in districts with greater coverage, and thus we expect a stronger decline. We will examine this relative divergence more formally within a difference-in-differences framework, though that framework is going to treat "Low Exposure" districts as our counterfactual trend. Note that, because people in our "Low Exposure" districts were also likely to have been exposed to the trial (just not as intensively as those in

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Figure 3: Birth Rates by Newspaper Exposure after Accounting for Regional Trends
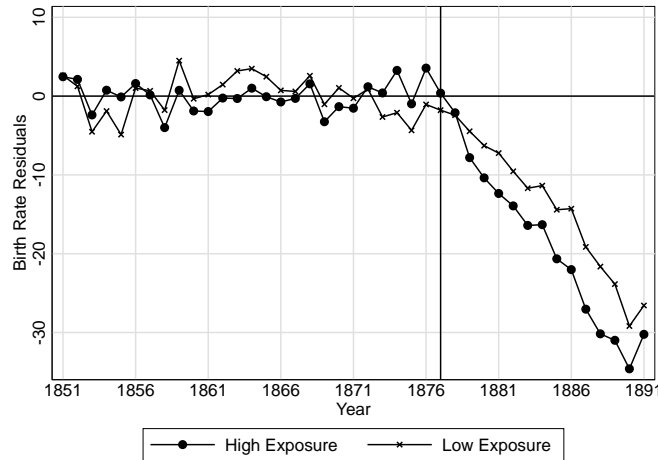


Births rates are defined as births per 1000 fertile aged women (women between the ages of 15 and 50). The births data were transcribed from annual reports of the Registrar General. The population denominator is linearly interpolated between census years. Residuals obtained by regressing district-level birth rates on district fixed effects and region-specific time trends (fitted between 1851 and 1877). The vertical line at 1877 corresponds to the year of the Bradlaugh-Besant trial. High-exposure districts are those with more than the median number of articles published within 25km. The districts that comprise London are omitted from this figure.

"High Exposure" locations), our results will be informative about whether the trial was having an impact, but not about the specific magnitude of the overall effect.

Before turning to those results, let us formally describe our estimating equation. Most of this analysis compares changes in average district-level birth rates between two five year periods (1873-1877, the pre-period, and 1878-1882, the treatment period), but some specifications will examine changes between other periods to assess they dynamics of the effect.[27] Our general specification is thus,

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

where $BR_{dt}$ is the average birth rate in district $d$ during period $t$ and $\Delta$ is a difference operator. Again, the birth rate is defined as births per 1000 fertile aged women.

We use newspaper coverage as a proxy for treatment. For each district, $d$, we

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[27]Again, we use five year averages to help cut through random year-to-year fluctuations as well as to maintain consistency with our results in other settings, where annual births data are unavailable.

begin by calculating the number of articles published within a 25km band of the district that mention Bradlaugh or Besant.[28] We then classify districts as high-exposure ($EXPOSURE_d = 1$) and low-exposure ($EXPOSURE_d = 0$), where, as in Figure 3 high-exposure districts are those with more than the median number of articles published within 25km. This 25km band reflects the fact that our districts are small and the provincial papers we study usually served surrounding areas. In the robustness exercises we consider a variety of alternative approaches.

The variable $TRIAL_t$ is an indicator for the period during which the Bradlaugh-Besant trial took place, i.e. the change between 1873-1877 and 1878-1882. The variable $\phi_r$ represents a set of region fixed effects, which can be interpreted as region-specific time trends since our outcome variable is in changes. Our regressions also include period fixed effects, denoted $\eta_t$. Finally, we adjust the standard errors by clustering at the district level.[29]

Table 1 presents our primary results for England & Wales. Column 1 offers a baseline estimate before we account for regional trends. There we find that birth rates in high exposure districts fell by 6.3 births per 1000 fertile-aged women following the trial. Relative to the mean, this represents a fertility decline on the order of 4.5%. In Column 2 we include region fixed effects (Northern, Southern, Midlands, and Wales), which reduces the magnitude to 3.4 births per 1000 fertile aged women.

One natural concern is that the fall in fertility may simply reflect prior changes in the marriage market. To address this concern, Column 3 includes several district-level controls to capture the broad features of the local marriage market. These controls include: the marriage rate from 1872-1877, the share of those marriages that took place at the Registrar's office (i.e., non-religious), the share that took place in a Catholic church (which helps control for both religious affiliation as well as the Irish population in each location), the share of marriages that were first marriages, the share of brides and grooms that were minors, and the share of brides and grooms that were illiterate at the time of marriage. With these controls, we see that places with greater trial coverage saw a statistically significant decline in birth rates following the Bradlaugh-Besant trial on the order of 2.2 births per 1000 fertile aged women.

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

[29]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.

Table 1: Main results for England & Wales

| | DV is Change in Birth Rate | | | | |
| --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) |
| High News Exposure × 1873-1887 Period | | | | | 0.474 (0.989) |
| High News Exposure × 1878-1882 Period | -6.339*** (1.151) | -3.392*** (1.059) | -2.193*** (0.837) | -2.148** (0.861) | -2.148** (0.862) |
| High News Exposure × 1883-1887 Period | | | | | -0.593 (0.758) |
| Region controls | | Yes | Yes | Yes | Yes |
| Marriage controls | | | Yes | Yes | Yes |
| Other district controls | | | | Yes | Yes |
| Period fixed effects | | | | | Yes |
| No. districts | 430 | 430 | 430 | 430 | 430 |
| Observations | 430 | 430 | 430 | 430 | 1,290 |
| R-squared | 0.101 | 0.261 | 0.538 | 0.604 | 0.622 |

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions weighted by 1861 district population. Birth rates are defined as number of births per 1000 fertile aged women (ages 15-50). These birth rates are averaged over a five year windows (e.g., 1873-1877, the pre-trial period, and 1878-1882, the post-trial period). "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. Our marriage controls include the following district-level controls: the marriage rate from 1872-1877, the share of those marriages that took place at the Registrar's office (i.e., non-religious), the share that took place in a Catholic church (which helps control for both religious affiliation as well as the Irish population in each location), the share of marriages that were first marriages, the share of brides and grooms that were minors, and the share of brides and grooms that were illiterate at the time of marriage. The "Other district controls" include population density, total mortality rate, infant mortality rate, share of births between 1873 and 1877 that were illegitimate, share of workers engaged in agriculture-related occupations, share of workers engaged in manufacturing occupations, and the number of articles published within a 25km radius that mentioned the word "Monday", a proxy for broader newspaper exposure. In Column 5 we allow our controls to be time varying by fully interacting them with our period indicators.

Since newspaper coverage was not randomly assigned, one may worry that an unrelated shock to a correlated district characteristic (e.g., urban status or industrial composition) may be driving these results. The inclusion of region fixed effects alleviates this concern to a point, but Column 4 goes even further by adding the following district-level controls: population density, total mortality rate, infant mortality rate, share of births between 1873 and 1877 that were illegitimate, share of workers engaged in agriculture-related occupations, share of workers engaged in manufacturing

occupations, and the number of articles published within a 25km radius that mentioned the word "Monday". The last control is included to capture the underlying newspaper network.[30] This rich set of controls has almost no effect on our main result.

We view Column 4 as our preferred specification because it accounts for regional trends and a wide set of district-level controls. Column 5 builds on this specification by adding additional periods to help understand the dynamics of the effect.[31] We add: the change in birth rates just prior to the treatment period (so the change between 1868-1872 to 1872-1877) and the change just after treatment (1878-1882 to 1883-1887). In the period just before treatment we see a small, positive, and statistically insignificant effect. That high news exposure districts did not exhibit differential changes in birth rates on the eve of the trial suggests that the effects observed in Columns 1 through 4 were not part of a pre-existing decline. This also helps provide empirical support for the parallel trends assumption embedded in the analysis. In the post period, we see a small, negative, and statistically significant effect, which tells us that the effect observed in Columns 1 through 4 was not rapidly reversed.

In Table 2 we assess the robustness of our main result (Column 4 of Table 1). Panel A examines whether our main result is robust to changes in the underlying dataset. Columns 1 through 4 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 5 discards the 10% most rural districts based on population density while Column 6 discards the 10% 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 7 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 B considers alternative ways of measuring trial exposure as well as some additional sample restrictions based on the exposure variable. Column 8 drops all districts within 25km of London to be sure that our results are not being driven

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[30] "Monday" is chosen as an arbitrary common word. Other words could be used as well.

[31] When we add these additional periods, we also fully interact our controls with period indicators. 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).

by the impact of the London papers in nearby districts (recall that London itself is excluded from our sample). In Column 9, we eliminate a 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. Column 10 explicitly controls for the number of articles published in the 25-50km band.

In Column 11 we seek to control for a general liberal bias by the local newspaper. To do this we control for the number of articles published between 1860 and 1869 mentioning "Bodichon". The 1860s saw several campaigns for women's causes. Barbara Leigh Smith Bodichon was a prominent leader in this movement and one that also happens to have a sufficiently unique name to allow us to identify relevant articles.[32] Controlling for exposure to these articles helps increase our confidence that the results are being driven by variation in coverage of the trial rather than local sentiments regarding women's rights or openness to social change.

In Column 12 we define "high exposure" based on the number of articles published within the district. In Column 13 we define coverage based only on articles that directly reported on the trial, and in Column 14 we further restrict attention to articles with lengthy coverage of the trial. Results from these last two specifications are somewhat stronger, which is what we'd expect given that these are likely cleaner proxies for exposure to the trial.

It is 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 suggestive evidence that trial exposure had stronger effects in more urban areas and relatively weaker effects in areas where more couples married in the Catholic Church.

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[32]Bodichon published "A Brief Summary of the Laws in England concerning Women: Together with a few observations thereon" in 1854 and "Reasons for the Enfranchisement of Women" in 1866. Other prominent women in this movement, such as Lydia Becker, Helen Taylor and Emily Davies, had much more common surnames.

Table 2: Robustness checks

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

| | No Textiles (1) | No Mining (2) | No Metals (3) | No Farming (4) | No Rural (5) | No Urban (6) | No Wales (7) |
|---|---|---|---|---|---|---|---|
| High News Exposure | -2.535*** | -1.847** | -1.940** | -2.605*** | -2.475*** | -1.767** | -1.670* |
| | (0.871) | (0.763) | (0.839) | (0.896) | (0.900) | (0.891) | (0.890) |
| | | | | | | | |
| Observations | 387 | 387 | 388 | 387 | 387 | 387 | 394 |
| R-squared | 0.615 | 0.508 | 0.486 | 0.615 | 0.617 | 0.596 | 0.587 |

**Panel b: Robust to alternative measures of trial exposure**

| | > 25km from London (8) | Within 50km of Article (9) | Control for 25-50km Exposure (10) | Control for Bodichon Exposure (11) | Own Article Only (12) | No Misc. Articles (13) | Only Lengthy Articles (14) |
|---|---|---|---|---|---|---|---|
| High News Exposure | -1.524* | -2.063** | -2.112** | -1.909** | -1.648** | -2.251*** | -2.967*** |
| | (0.918) | (0.866) | (0.856) | (0.930) | (0.826) | (0.846) | (0.858) |
| | | | | | | | |
| Observations | 420 | 412 | 430 | 430 | 430 | 430 | 430 |
| R-squared | 0.603 | 0.609 | 0.605 | 0.605 | 0.604 | 0.605 | 0.610 |

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors, clustered at the district level, in parentheses. All regressions include region fixed effect, marriage controls, and other district controls, as defined in Table 1, and are weighted by 1861 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 columns 1-4 we drop the 10% of districts with the largest share of employment in textiles, mining, metals/engineering and agriculture, respectively. Since these industries were geographically concentrated this removes districts representing the vast majority of employment in each of these sectors. In columns 5 and 6 we drop the 10% most rural or most urban districts based on population density.

## 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.[33]

In this section we focus on one dimension of adjustment that can be evaluated in the available census microdata: the probability of additional births among women who have already had at least one child. Focusing on families that already have one child is useful because it narrows are attention to a population that was at risk of additional births.[34] This population was also a primary focus of the propaganda surrounding the trial. Moreover, while this is only one of the mechanisms that may have been operating in our setting, it is one that we can study in other countries as well. That means that we can look at whether the nature of the adjustment occurring in different countries was similar, not just the timing.

For this analysis we organize our data as a household-level panel and restrict our sample to families with at least one child in the household in 1874. We then apply the following probit specification:

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

$$Y_{hdt}^* = \beta_0 + \beta_1 EXPOSURE_d * TRIAL_t + \beta_2 C_{hdt} + X_{dt}\lambda + \phi_r + \eta_t + \epsilon_{dt} \tag{2}$$

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

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[33] The main drawback in the available microdata is that we only observe changes in family size across a relatively short window and it is therefore not possible to observe completed fertility.

[34] 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.

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 and our rich set of district-level control variables, each interacted with a post-trial indicator variable. As before, the variable $EXPOSURE_d$ 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 and post-trial years in the sample.[35]

We present these results graphically in Figure 4. 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 could reflect a behavioral response to having more control over fertility decisions that involves having fewer more closely spaced children. 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 4 are based on panel-data regressions using annual data, we have also explored alternative estimation approaches including a cox proportional hazard model and multinomial logit regressions. All of the alternative approaches that we have examined generate results showing the same basic patterns documented in Figure 4. These results are in Appendix 10.2.4.

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[35]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 4: Post-trial fertility patterns among households in high news districts
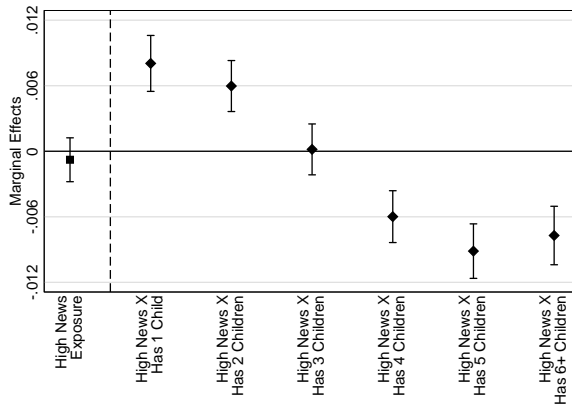


The coefficient of interest comes from a difference-in-differences specification where the outcome variable is an indicator that equals 1 if the family had a child born in that year. These probit regressions include district fixed effects, birth year fixed effects, region by period fixed effects, and the "marriage controls" and "Other district controls", as defined in the notes of Table 1, which we interact with the post period. Regressions also include fixed effects for mother's age, father's age, years since most recent birth, and number of children in the household.

The results in Figure 4 indicate that families more exposed to the trial were limiting childbirth at higher parities, consistent with earlier stopping. Note that in this short run this will be partially offset by the closer spacing of children at lower parities revealed in Figure 4, which is why the effect that we estimate across all parities is only mildly negative. Stopping at higher parities is ultimately the key determinant of completed fertility, even if children are more closely spaced.

The fact that we estimate only mild negative effects in Figure 4 when looking across all initial parities suggests that other channels, such as putting off the first birth, must have also been at work in generating the significant negative effects observed in our aggregate analysis. Consistent with this, in Appendix Table 8 we show that mothers' age increased by a statistically significant 0.13 years in districts more exposed to the trial after 1877, suggesting that women were putting of their first birth.[36] While the magnitude may seem small, it is worth noting that the sample is inherently censored as we only observe age at first birth among those whose first birth occurred by 1881. Couples that successfully delayed the birth of their first child

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[36]Fathers' age increased by 0.08 years (p-value of 0.16).

until after 1881 are not observed and are thus missing from this analysis.

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   Cross-country evidence

If the declines in fertility documented in the previous section resulted from a change in norms surrounding family planning, then it is natural to wonder whether these changes may have been transmitted to other populations with close cultural or linguistic ties to Britain. We first examine this link by combining fertility data for countries in Europe, Asia and Oceania, and the Americas (from Mitchell (2003, 2007a,b), respectively) with measures of the strength of cultural ties between each of these countries and the U.K. from Spolaore & Wacziarg (2016).

Figure 5 presents our main result from this analysis. That figure plots the change in each average birth rates among non-English speaking countries over two 15 year periods (1878-1882, the post-trial period, and 1863-1877, the pre-trial period) against linguistic proximity to England. We also fit a regression line through these data. As the figure indicates, countries with closer linguistic ties experienced relatively larger declines in fertility in the years following the trial.

In Appendix 10.6 we show that the relationship is even stronger when you include English-speaking countries and that this relationship is robust to other measures of cultural similarity (e.g., religious similarity and genetic similarity). We also show that the relationship is not sensitive to the length of our pre and post period windows. Finally, we conduct two placebo tests where we examine the relationship between changes just before and after 1867 and find no evidence that birth rates were falling among countries with close linguistic ties to England on the eve of the trial.

These results provide some preliminary evidence that countries sharing stronger cultural/linguistic ties to England & Wales experienced relative fertility declines occurring right around the time of the Bradlaugh-Besant trial. This is consistent with the idea that the trial influenced fertility rates and that this influence was transmitted across countries sharing cultural or linguistic ties. However, we may still worry that

there may have been other factors, such as economic conditions or relevant laws, that affected fertility differentially in countries with ties to England & Wales. One way to rule out this possibility is to study fertility patterns among populations sharing the same political, legal, and economic environment, but with varying cultural and linguistic ties to Britain.

Figure 5: Post-trial changes in fertility among non-English speaking countries
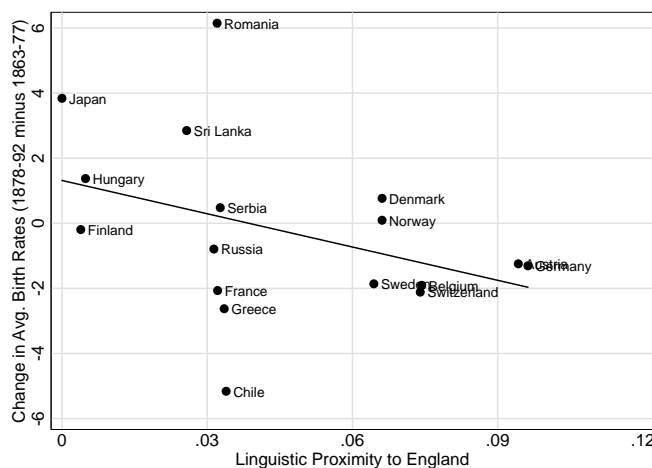


Fertility data for countries in Europe, Asia and Oceania, and the Americas are from Mitchell (2003, 2007a,b), respectively. Linguistic proximity is from Spolaore & Wacziarg (2016).

# 6 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 Canadians had strong cultural and linguistic links to Britain, while other Francophone Canadians did not. By studying differences in the fertility response of Anglophone and Francophone Canadians sharing a common political, legal and economic environment, we will be able to isolate the impact of cultural influences on fertility behavior.

Our analysis focuses primarily on Quebec and Ontario, though we also present some results including Nova Scotia and New Brunswick.[37] The population of Quebec

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[37]Technically only Quebec and Ontario were part of Canada at the start of our study period. The

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.[38] 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.[39] 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).[40]

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 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

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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.

[38]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 6 to the rates shown for France in Appendix Figure 18.

[39]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).

[40]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."

was elected to Parliament but refused to take the oath required to take his seat.[41] Thus, it does not appear that the Francophone press covered the trial extensively.

## 6.1 Preliminary evidence

As a starting point for our analysis of Canadian fertility, Figure 6 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 6: Fertility patterns in some Canadian provinces
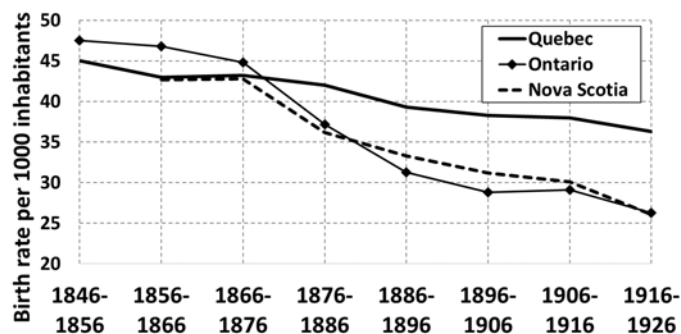


Data from Henripin (1968) Table B.6.

## 6.2 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

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[41]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.

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).[42] 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 of the Bradlaugh-Besant trial.[43]

We want to compare fertility patterns with a measure of the strength of each

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[42]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.

[43]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.

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.[44] 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.[45]

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[44]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.

[45]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 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.

## 6.3 Analysis approach and results

Our main analysis follows an approach similar to the England & Wales analysis. The specification is,

$$\Delta \frac{CHILD_{ct}}{FEM_{ct}} = \alpha_0 + \alpha_1 BRIT_c * TRIAL_t + X_{ct}\lambda + \phi_c + \eta_t + \epsilon_{ct} \qquad (3)$$

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.[46] 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.[47]

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. Note that because our dependent variable is in changes, the small and insignificant coefficient estimated for the 1882-1886 period indicates that the relative changes that occurred in 1877-1881 were persistent.

Table 3 reveals that large reductions in fertility occurred in locations with stronger British ties in the years just after the trial. 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

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[46]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.

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

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 3: Baseline regression results for Canada

| DV is change in 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*** | -19.89*** | -19.89*** |
| | (1.554) | (1.586) | (1.580) | (1.582) |
| British-origin shr. × 1882-86 | | | -2.884 | -2.884 |
| | | | (6.369) | (6.377) |
| Controls | | Yes | Yes | Yes |
| County FEs | Yes | Yes | Yes | Yes |
| Period FEs | Yes | Yes | Yes | Yes |
| Observations | 202 | 202 | 404 | 404 |
| R-squared | 0.523 | 0.633 | 0.486 | 0.486 |
| 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.

In Appendix Table 11 we consider several alternative ways of measuring each county's connection to Britain. For example, we study the share of Catholics (mainly French) in a county or the number attending the Church of England or Church of Scotland (presumably primarily British). These alternative measures deliver results that are both qualitatively and quantitatively similar.

Table 4 presents some robustness checks. 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, but their inclusion does not alter our main findings.[48]

Table 4: Robustness results for Canadian analysis

| | DV is change in 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*** (2.987) | -16.08*** (4.340) | -15.70*** (5.494) | | -20.21*** (1.546) | -18.97*** (1.931) |
| Eng/Scot imm. shr. × 1871-76 | | | | -42.75*** (10.88) | | |
| Irish imm. shr. × 1871-76 | | | | -61.52*** (14.19) | | |
| Other imm. shr. × 1871-76 | | | | | 5.641 (9.934) | |
| Shr. children in school × 1871-76 | | -10.30 (9.549) | | | | |
| Shr. illiterate adults × 1871-76 | | | 9.923 (11.78) | | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| County FEs | Yes | Yes | Yes | Yes | Yes | Yes |
| Period FEs | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 61 | 101 | 101 | 101 | 101 | 101 |
| R-squared | 0.178 | 0.640 | 0.637 | 0.516 | 0.633 | 0.435 |
| 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 1861 population. 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.

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

[48]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.

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.

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.

## 6.4   Mechanisms

The results above show that the timing of fertility adjustment in Canadian households with strong British ties matches the timing observed in England & Wales. In this section we go beyond timing, to look at whether the nature of the adjustment was also similar. Specifically, drawing on Canadian census microdata we study how fertility adjusted in families at different initial levels of parity.

Our approach closely follows the one used for England & Wales, with one impor-

tant 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 7. The first result in this figure describes the average response among all Anglophone households. Here we see that, on average, British-origin households were less likely to have an additional child in the years following the trial, 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.[49]

Figure 7 shows that the pattern of earlier stopping observed among British households that were more exposed to the trial also appears among Anglophone households in Canada, even relative to non-Anglophone households residing in the same location. Thus, the nature of the adjustment observed in Canada appears similar to what we observed in England & Wales, which strengthens the argument that these adjustments are related.

There are, however, also some differences. For example, in Canada we do not find strong 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 (see Appendix Table 12), with parent's age at first birth decreasing mildly among British-origin households after the trial. These different selection patterns may explain why we see differences in the effect of the trial at

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[49]In Appendix Figure 17 we separately estimate the effect for first and second generation British households. There we see larger point estimates for first generation British households, but the standard errors are too large to reject equality with Canadian-born but British origin households.

low parities. One likely explanation for why we see differences in the timing of the initiation of fertility is that Canada's largely agricultural 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 7: Post-trial fertility patterns among British households in Canada
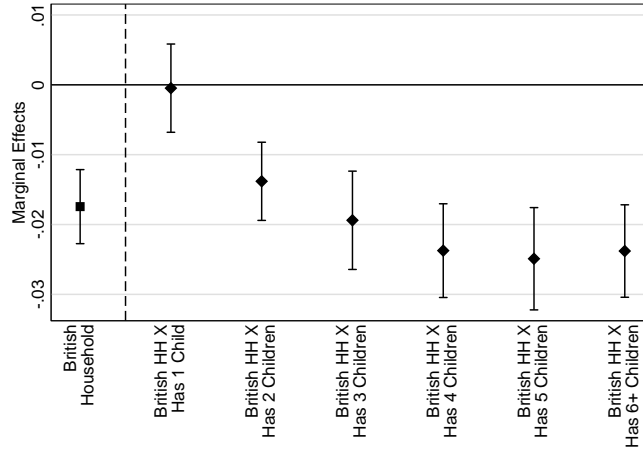


This figure presents coefficient estimates and 95% confidence intervals from difference-in-difference probit regressions comparing British-origin households to other households before and after 1877. British origin households are those where either the mother or father reports being British in the 1881 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.

# 7 Response in South Africa

South Africa, specifically the Cape Colony, provides a second useful location for studying changes in fertility patterns following the trial. 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. This facilitates a comparison of fertility patterns between the British and Afrikaner populations before and after the trial.

Our analysis of South African 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.[50] Data tracking fertility for these groups are drawn from the Cape Colony censuses of 1875 and 1891.[51] 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 14, 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 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.

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[50]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.

[51]See Appendix 10.4 for further discussion of the South Africa data.

# 8 Effects in the United States

The third setting that we consider is the United States. The trial appears to have been covered throughout the United States. A search of papers in the newspapers.com archive returns over 500 articles in U.S. papers mentioning either Bradlaugh or Besant in 1877, coming from all across the country: Buffalo, Reno, Honolulu, Memphis, Chicago, Philadelphia, Canton, Baltimore, etc.[52] If anything, American papers appear to have been more supportive of Bradlaugh and Besant than the British press.[53]

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. 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?

The U.S. lacked a comprehensive system of birth registration during the period se study, so we identify fertility behavior among different populations by following the microdata approach used in Canada. We use the complete count 1880 census, as made available by IPUMS.org. Since the census maintains the household structure, we can use surviving children to infer household fertility behavior.

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 Eu-

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[52]We have studied the possibility of using U.S. newspapers to conduct an analysis similar to what we have done for England & Wales. Unfortunately, the available digitized newspaper holdings are not sufficiently representative to allow this type of analysis (a surprisingly large fraction, for example, come from Kansas).

[53]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."

ropean 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 7. In particular, using the 1880 U.S. census we restrict our attention to first and 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. In contrast to the main Canadian results, we allow the post-trial responses to vary between first and second generation British immigrants. We also include an indicator for being a first generation European household, which we fully interact with the post period to help draw a cleaner comparison for recent British immigrants. Running the analysis separately for first and second-generation households yields nearly identical results.

Figure 8 presents the results, which are arranged in the same format as Figure 7. All coefficients represent the interaction between being a British household in the post-trial period. The coefficients denoted with black squares display the results for first generation British households while the grey diamonds represent the results for second generation British households.

The estimates in Figure 8 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, likely reflecting that that second generation British households had relatively weaker ties back to Britain.

In Appendix Table 15 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 likely explains why the impact of the trial at low levels of parity shown in Figure 8 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.

Figure 8: Post-trial fertility patterns among British households in the United States
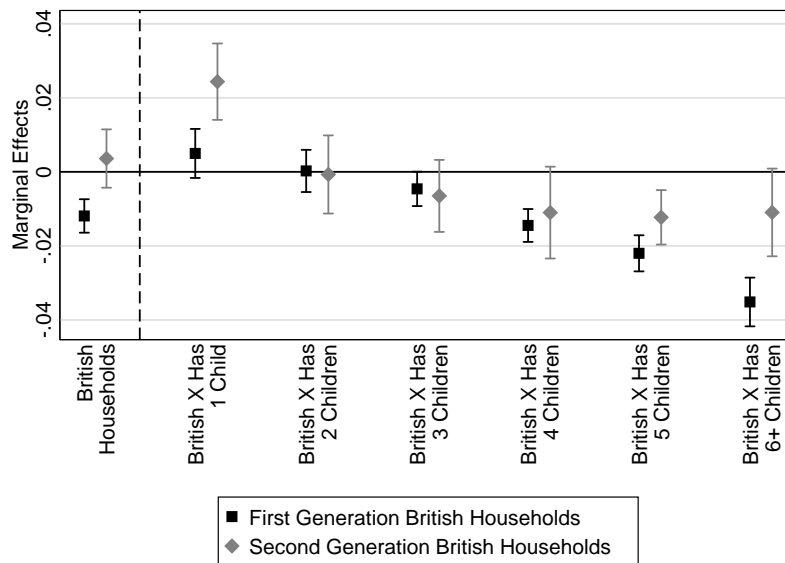


This figure presents coefficient estimates and 95% confidence intervals from difference-in-difference probit regressions comparing British-origin households to other European-immigrant households before and after 1877. First generation British households are those where the child's mother or father was 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. To draw a cleaner comparison for the recent immigrants, we also include a general first generation European household indicator, which we fully interact with the post period. In the regressions that allow the effects to vary by parity, we include a set of analogous interaction for first generation European households as well.

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# 9 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 (2019) 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 toward 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.

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# 10 Appendix

## 10.1 Google N-grams plots

Using Google N-grams to search for terms related to the trial provides an additional indicator of the importance of the events we study. For example, Figure 9 shows the appearance of "Bradlaugh" and "Besant" in the corpus of books searched by Google N-grams. As a point of comparison, we also plot the appearance of "Queen Victoria." Because Bradlaugh and Besant are reasonably unique names, this provides an indication of the prominence of these individuals in the years around the trial. We can see a clear increase in the appearance of these terms after 1877 with sustained high levels into the 1880.

Figure 10 provides results from searches of two of the phrases most commonly used in the discussion of family planning during this period, "population question" and "conjugal prudence." For both terms we see a sharp increase right around the timing of the trial. Finally, Figure 11 shows that we see a similar increase in the appearance of "Fruits of Philosophy" starting in 1878 and lasting through the 1880s.

Figure 9: Google N-grams results: Key names



Bradlaugh, Besant and Queen Victoria

Results obtained from Google N-gram Viewer (https://books.google.com/ngrams) accessed on June 3, 2019.

Figure 10: Google N-grams results: Family planning phrases

Key terms related to the debate over family planning
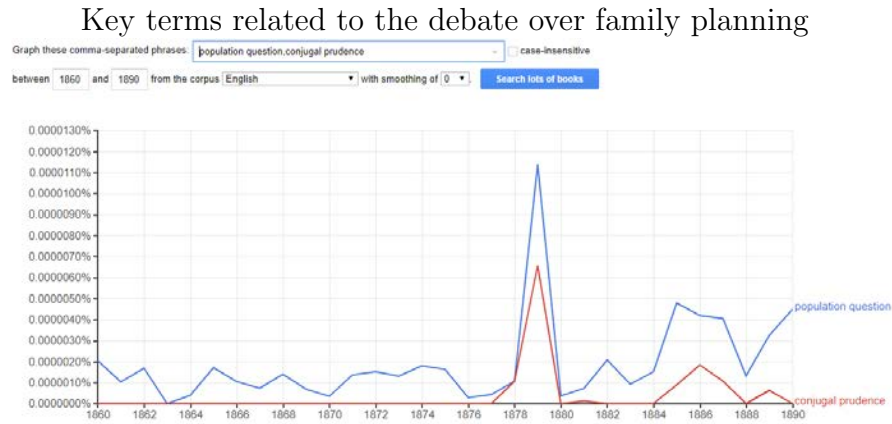


Results obtained from Google N-gram Viewer (`https://books.google.com/ngrams`) accessed on June 3, 2019.

Figure 11: Google N-grams results: Fruits of Philosophy

Mentions of *Fruits of Philosophy*
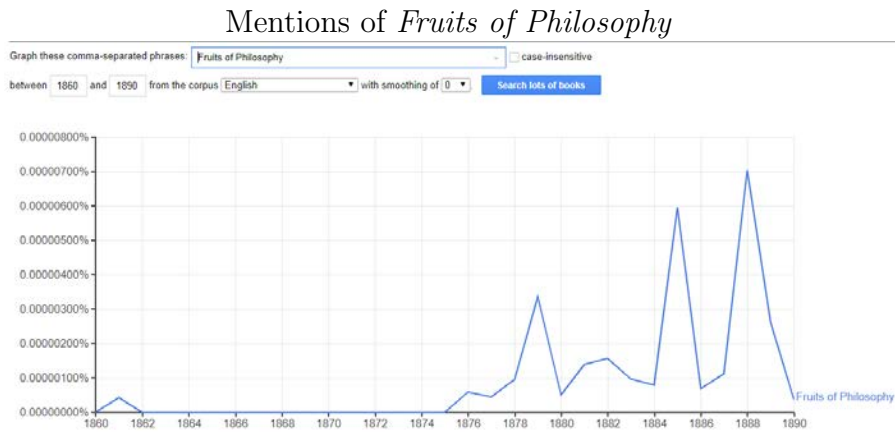


Results obtained from Google N-gram Viewer (`https://books.google.com/ngrams`) accessed on June 3, 2019.

## 10.2 Appendix to the England & Wales analysis

Figure 12 plots births rates for each region of the country (left panels) as well as for urban and rural areas (right panels). As in Figure 1, we also plot the raw birth rates (top panels) and normalized birth rates (bottom panels). To normalize, we plot the residuals obtained from a regression that fits a group-specific linear trend between 1851 and 1877.

Figure 12: Detrended Births by Region and Density
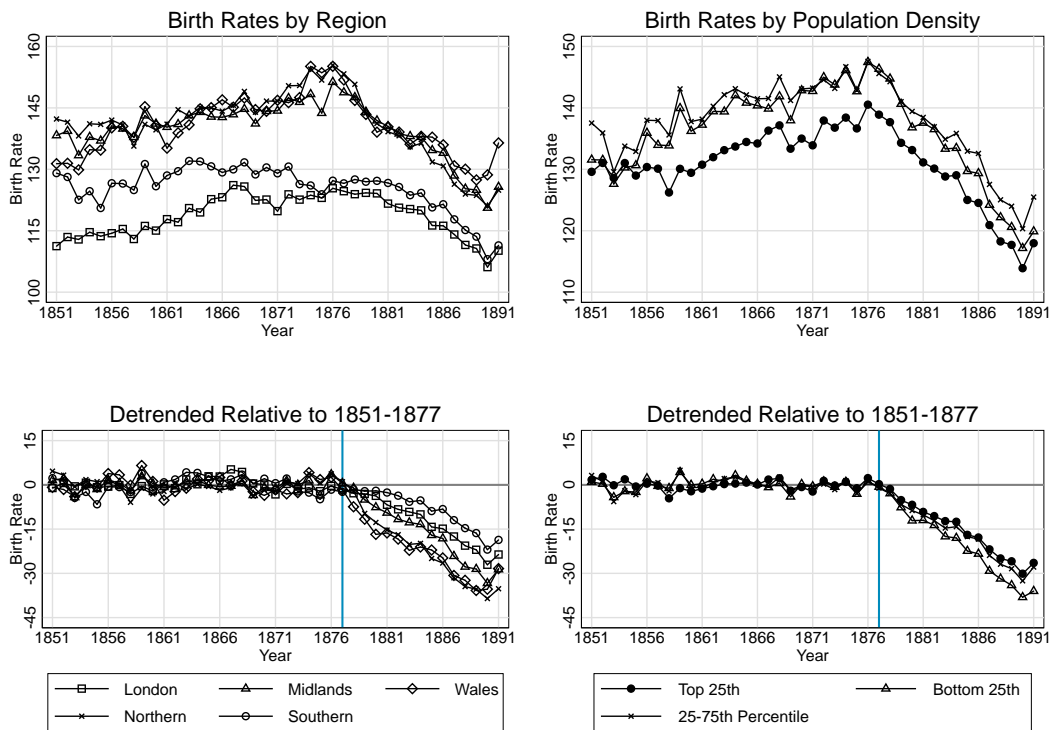


Birth rates are calculated as number of births per 1000 fertile aged women (those between the ages of 15 and 50). Births data were transcribed from annual reports of the Registrar General. The population data are linearly interpolated between census years. The vertical line at 1877 represents the year of the Bradlaugh-Besant trial.

### 10.2.1   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 13 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 13: 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 14 plots the spatial variation of our newspaper exposure variable.

Figure 14: 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. The analysis presented in the main text attempts to address both of these issues.

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.

### 10.2.2  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 5 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 5. 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 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 grave-yards. 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 *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 transcribed the full content for a sample of 483 articles (about 40% of the sample).[54] 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

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

Table 5: 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% |

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.[55] 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 6 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

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[55]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."

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.[56] 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.

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[56]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.

Table 6: 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.

### 10.2.3 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 average within each five-year period.

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.[57] Summary statistics for the key analysis and control variables at the district level are presented in Table 7.

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 de-

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

crease our confidence the fact that we are observing actual biological relationships.[58]
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 7: Summary statistics for the district-level data

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Birth rate panel data (5yr averages) | | | | | |
| Birth Rates, 1868-1883 | 135.88 | 20.441 | 78.499 | 234.951 | 1720 |
| Birth Rates, 1878 | 135.935 | 19.041 | 81.846 | 201.066 | 430 |
| Δ Birth Rate, 1878 | -3.231 | 8.852 | -55.899 | 15.851 | 430 |
| Control Variables | | | | | |
| Marriage Rate, 1873-1877 | 29.899 | 5.691 | 14 | 58.562 | 430 |
| Shr. marriages at Registrar, 1873-1877 | 0.098 | 0.108 | 0 | 0.535 | 430 |
| Shr. marriages Catholic church, 1873-1877 | 0.019 | 0.035 | 0 | 0.243 | 430 |
| Minor shr. of marrying parties, 1873-1877 | 0.14 | 0.044 | 0.031 | 0.314 | 430 |
| Illiterate shr. of marrying parties, 1873-1877 | 0.195 | 0.073 | 0.033 | 0.527 | 430 |
| First marriage shr. 1873-1877 | 0.830 | 0.025 | 0.757 | 0.934 | 430 |
| Population density, 1871 | 1.721 | 7.652 | 0.03 | 107.392 | 430 |
| Average mortality rate, 1871-1880 | 0.019 | 0.003 | 0.014 | 0.034 | 430 |
| Average under 5 mortality rate, 1871-1880 | 0.049 | 0.014 | 0.025 | 0.119 | 430 |
| Illegitimate birth share, 1873-1877 | 0.06 | 0.021 | 0.018 | 0.187 | 430 |
| Manufacturing employment share, 1861 | 0.201 | 0.099 | 0.078 | 0.585 | 430 |
| Agriculture employment share, 1861 | 0.243 | 0.12 | 0.004 | 0.62 | 430 |
| Number of "Monday" articles, 1877 | 4649.695 | 7254.574 | 0 | 44619 | 430 |

[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
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.

### 10.2.4 Additional results on mechanisms in England & Wales

Table 8 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 8: Did British households delay their first birth?

| DV is age when first child was born | | |
|---|---|---|
| | Mother's Age (1) | Father's Age (2) |
| High News District × Born after 1877 | 0.132*** (0.0477) | 0.0891 (0.0635) |
| Observations | 488,432 | 488,432 |
| R-squared | 0.093 | 0.058 |
| 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, region by period fixed effects, as well as the marriage and district controls described in Table 1. The sample includes all first births occurring between 1874 and 1881.

The main text examines household-level fertility responses within a difference-in-differences framework, examining the probability that the family has a child in each year. We have also considered adopting a Cox proportional hazard model (Figure 15) and a multinomial logit (Figure 16). These models yield qualitatively identical results.

Figure 15: Post-trial fertility patterns among households in high news districts: Cox Proportional Hazard Model
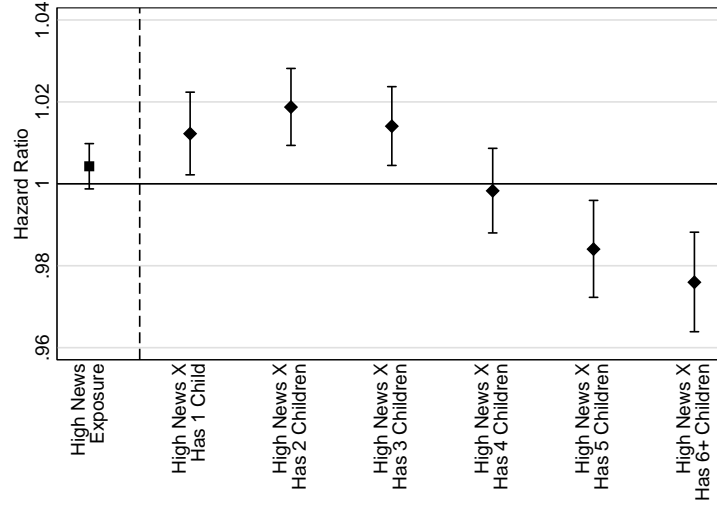


These regressions include region fixed effects and the "marriage controls" and "Other district controls", as defined in the notes of Table 1. Regressions also include fixed effects for mother's age, father's age, years since most recent birth, and number of children in the household.

Figure 16: Post-trial fertility patterns among households in high news districts: Multinomial Logit Model
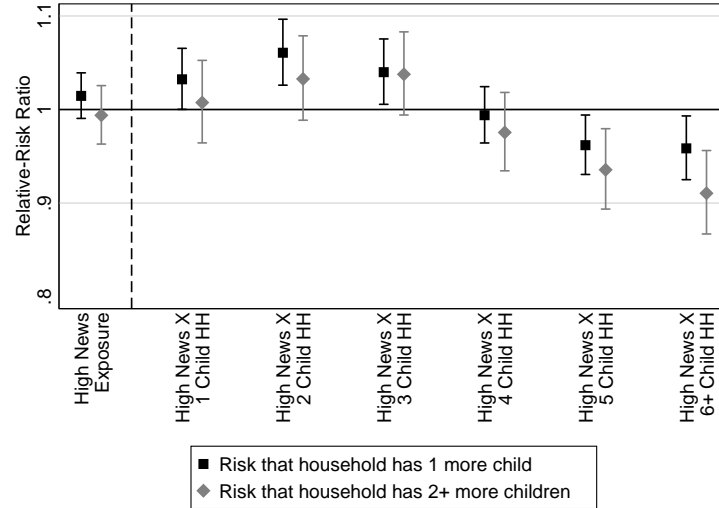


These regressions include region fixed effects and the "marriage controls" and "Other district controls", as defined in the notes of Table 1. Regressions also include fixed effects for mother's age, father's age, years since most recent birth, and number of children in the household.

## 10.3 Appendix to the analysis of Canada

### 10.3.1 Further details on the Canada data

Table 9 presents summary statistics for the data used in the analysis of Canada. Table 10 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.

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Table 9: 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 10: 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 |

Table 11 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.[59] Note that Columns

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[59]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.

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 11: Results for Canada with alternative explanatory vars.

| DV is change in children born per year / 1000 fertile-aged females | | | | |
|---|---|---|---|---|
| Explanatory variable: | British origin pop. shr. | Non-French origin pop. shr. | Non-Catholic share | Church of Eng/Scot share |
| | (1) | (2) | (3) | (4) |
| British connection × 1871-76 | 1.210 (4.586) | 1.423 (4.337) | -0.0843 (4.215) | 4.251 (11.70) |
| British connection × 1877-81 | -19.89*** (1.582) | -18.55*** (1.519) | -18.87*** (1.687) | -42.19*** (5.299) |
| British connection × 1882-86 | -2.884 (6.377) | -3.176 (5.930) | -2.014 (5.850) | -6.312 (18.03) |
| Controls | Yes | Yes | Yes | Yes |
| County FEs | Yes | Yes | Yes | Yes |
| Period FEs | Yes | Yes | Yes | Yes |
| Observations | 404 | 404 | 532 | 532 |
| R-squared | 0.486 | 0.486 | 0.473 | 0.465 |
| 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.

## 10.3.2 Additional results on mechanisms in Canada

Figure 17 presents point estimates from a specification where we allow for heterogeneous effects among first and second generation British households. While the point

estimates tend to be larger for first generation British households, who we expect to have stronger ties to Britain, the standard errors are too large to reject equality.

Figure 17: Post-trial fertility patterns among British households in Canada
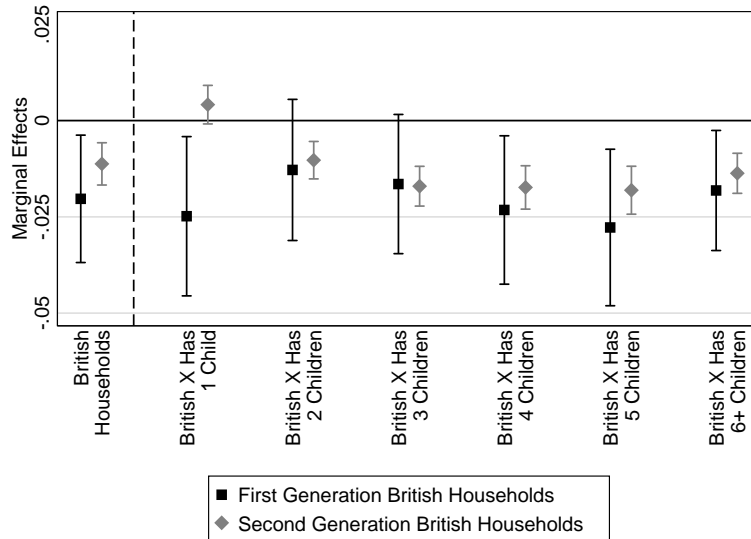


This figure presents coefficient estimates and 95% confidence intervals from difference-in-difference probit regressions comparing British-origin households to other households before and after 1877. First generation British households are those where either the mother or father reports being British in 1881 and reports being born in Europe. Second generation British households are classified similarly, except with the restriction that the parents were born in Canada. 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. To draw a cleaner comparison for the recent immigrants, we also include a general first generation European household indicator, which we fully interact with the post period. In the regressions that allow the effects to vary by parity, we also allow for heterogeneous effects among first generation European households.

Table 12 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 12: Did Canadian households delay their first birth?

| **DV is age when first child was born** | | |
| --- | --- | --- |
| | Mother's Age (1) | Father's Age (2) |
| British HH × Post-1877 | -0.576*** (0.0851) | -0.324*** (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.

## 10.4 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. Data limitations also mean that fertile aged females are defined as those aged 15-54, a group that is slightly different than the ages we used for the England & Wales and Canadian analysis. 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,

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

where $BR_{dt}$ is the ratio of children aged 0-14 to the fertile-aged (15-54) 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 13.

We consider two measures of a division's British connection. The first measure 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 14. 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

Table 13: 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 | | | | |

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 population 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 dropping the six locations with populations under 2,000 from the analysis leads to results that are almost identical to those obtained when weighting.

Table 14: Regression results for South Africa analysis

| | 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) |
| | | | **DV is $BR_{d\,1891} - BR_{d\,1875}$** | | | | |
| Brit. imm. shr. | -1.151** | -2.277*** | -1.859* | | -1.721** | -1.191 | -2.117** |
| | (0.481) | (0.734) | (1.005) | | (0.714) | (0.836) | (0.938) |
| Not Dutch Reform share | | | | -0.319* | | | |
| | | | | (0.168) | | | |
| Non-British imm. | | | -1.183 | | | | |
| | | | (0.974) | | | | |
| Pop. density | 0.00858*** | 0.0113*** | 0.0110*** | 0.00594** | 0.0515* | 0.00640 | 0.0100** |
| | (0.00195) | (0.00246) | (0.00266) | (0.00260) | (0.0289) | (0.00413) | (0.00380) |
| Literacy | | -2.602* | -2.549* | -1.250 | -1.743 | -0.959 | -1.918 |
| | | (1.410) | (1.408) | (1.337) | (1.354) | (1.286) | (1.885) |
| 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 | 0.223 | 0.329 | 0.350 | 0.184 | 0.222 | 0.086 | 0.189 |

*** 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.

## 10.5 Additional Evidence from the United States

Table 15 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 15: Did U.S. 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** (0.0737) | 0.100 (0.0780) | | |
| Second gen. British HH × Born after 1877 | | | -0.0568 (0.0629) | 0.196*** (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.

## 10.6 Cross-country analysis

In this section we use data for many countries and analyze whether countries with stronger cultural links to the U.K. were more likely to experience a reduction in fertility in the years just after the Bradlaugh-Besant Trial, compared to more culturally distant countries. To measure cultural ties, we use the data provided by Spolaore & Wacziarg (2016), which provides four measures of cultural connections across countries. Two of their measures are linguistic, one based on linguistic trees ("Trees") and the other based on the existence of cognates ("Cognates"). They also provide two measures based on religious similarity based on two different approaches to grouping related religions which we label "MFL" and "WCD". In addition to these cultural similarity measures, we also consider the measure of genetic similarity between populations that they construct. All of these measures are described in detail in Spolaore & Wacziarg (2016). For all of these measures we use the versions that are weighted by the share of different groups within a country, rather than those based exclusively on the largest group.

We compare these measures of similarity to fertility data obtained from Mitchell (2003) for Europe, Mitchell (2007b) for the Americas, and Mitchell (2007a) for Asia and Oceania. These sources provide reasonably consistent annual data on births relative to total population for 23 countries. In Europe, our data cover Austria, Belgium, Denmark, England & Wales, Finland, France, Germany, Greece, Hungary, Ireland, Norway, Romania, Russia, Scotland, Serbia, Sweden and Switzerland. Outside of Europe we have data for Chile, Japan, New Zealand, and Sri Lanka.[60] Naturally, we exclude England & Wales and Scotland (which looks very similar to England & Wales) from the cross-country analysis. We assign Serbia the values given for Yugoslavia in the Spolaore & Wacziarg (2019) data.

Just to give a sense of these data, Figure 18 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

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[60]Mitchell (2007a) also provides data on births/population for Australia, but we have doubts about those data because they do not match the patterns observed in either the fertility data we collected from Coughlin (1904) and derived from census reports, nor do they match the fertility patterns suggested by comparing the population of children aged 0-4 to the population of fertile-aged women based on the census population data in Mitchell (2007a).

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.

Figure 18: Fertility patterns in a selection of European countries
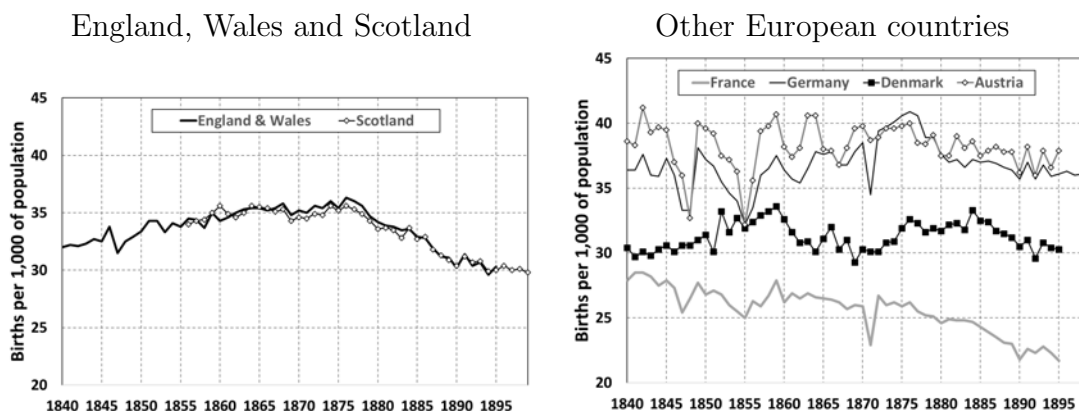


Underlying data from Mitchell (2003). Population denominators are simple linear interpolations between census years.

Using these data we consider the following simple regression specification:

$$DIFF_i = \beta_0 + \beta_1 CultPROX_i + X_i\Gamma + \epsilon_i$$

where $DIFF_i$ is the difference in the observed fertility rate in the years just after 1877 compared to the years just before in country $i$, $CultPROX_i \in 0, 1]$ is a measure of the country's cultural proximity to the U.K., and $X_i$ is a set of potential control variables. In the main specification we compare average fertility rates spanning 1878-1882 to fertility rates spanning (1863-1877). Using a 15-year window allows sufficient time for fertility to react to the trial and also helps smooth out fluctuations in fertility, which can be quite volatile year-to-year.

We begin with a set of univariate regression results looking at the different avail-

able measures of cultural distance between each observation country and the U.K. Table 16 presents these results. For all of the available measures of cultural proximity, we see that countries more culturally proximate to the U.K. experienced relative decreases in fertility in the fifteen years after 1877 compared to the fifteen years before. The effect is strongest for the linguistic measure of cultural proximity (except the measure based on cognates, where we have fewer usable observations), though we also observe results when focusing on religious proximity. This is consistent with the idea that the Bradlaugh-Besant trial caused a relative reduction in fertility in countries with stronger cultural links to the U.K.

Table 16: Univariate cross-country regression results

| DV: Fertility difference in 15 years after 1877 vs. the 15 years before | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Ling. proximity – cognates | -5.651* | | | | |
| | (3.017) | | | | |
| Ling. proximity – lang. trees | | -13.83*** | | | |
| | | (2.743) | | | |
| Religious proximity – MFL | | | -14.10*** | | |
| | | | (4.431) | | |
| Religious proximity – WCD | | | | -13.98*** | |
| | | | | (4.268) | |
| Genetic proximity | | | | | -25.27* |
| | | | | | (13.57) |
| Observations | 12 | 19 | 17 | 18 | 19 |
| R-squared | 0.298 | 0.264 | 0.268 | 0.184 | 0.109 |

*** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors in parentheses

Next, we consider some robustness results. For these we focus on the measure of similarity based on linguistic trees, which is available for a broader set of countries for which we also have fertility data than the other measures. Our robustness results are presented in Table 17. The first two columns examine results obtained when using different windows around 1877, ranging from ten to twenty years. As in the previous table, the dependent variable is the difference in fertility rates (relative to total population) in the period after 1877 to a period of equivalent length before 1877.

Columns 3-6 return to our main specification, which studies 15-year windows before and after 1877, and examines the impact of including additional control variables or restricting the sample. In Column 3 we control for the distance from each country's

capital to London. In Columns 4 and 5 we drop Ireland and New Zealand, respectively. These are the two English-speaking countries in our sample and as a result their measure of linguistic proximity to the U.K. is much higher than the other countries (particularly New Zealand). Note that dropping New Zealand actually results in a substantially larger estimated effect. This larger coefficient is driven by the fact that the measure of linguistic proximity is so high for New Zealand and the fertility response, while substantial, could only be so large, such that the inclusion of New Zealand actually pulls down the estimated coefficient. In Column 6 we focus only on countries in Europe.

Finally, in Columns 7-8 we consider some placebo regressions obtained by applying the same approach but treating 1867 as the placebo treatment date. We choose 1867 because we want a date before 1877, but we don't want to go too much earlier because we will begin to lose observations. The results show that there is no evidence of a statistically significant difference in fertility patterns in countries more culturally distant from the U.K. in either a ten-year or fifteen-year window around this placebo date.

Overall, the results in this section indicate that countries that were more culturally similar to the U.K. experienced a relative reduction in fertility in the years just after 1877, compared to the years just before, relative to more culturally distant countries. This broader cross-country evidence fits well with the results obtained in our within-country analysis and provides further evidence that cultural and linguistic ties transmitted the effects of the trial across countries. In addition, these results provide additional confirmation that the cultural factors highlighted by Spolaore & Wacziarg (2019) played an important role in the onset of the demographic transition.

Table 17: Robustness using linguistic distance

| | Different pre/post windows | | Fifteen year pre/post window | | | | Placebo regs. around 1867 | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Ten years (1) | Twenty years (2) | Additional controls (3) | No Ireland (4) | No NZ (5) | Only Europe (6) | Ten yr. window (7) | 15 yr. window (8) |
| Ling. proximity – lang. trees | -8.402*** (2.286) | -16.78*** (3.073) | -15.88* (8.706) | -13.83*** (2.743) | -13.83*** (2.743) | -28.19* (14.19) | 1.778 (1.698) | 1.920 (1.630) |
| Dist. to London | | | 7.07e-05 (0.000243) | | | | | |
| Observations | 19 | 19 | 19 | 19 | 19 | 15 | 17 | 17 |
| R-squared | 0.136 | 0.297 | 0.273 | 0.264 | 0.264 | 0.132 | 0.010 | 0.011 |

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses