

# Toward Better Informed Decision-Making: the Impacts of Mass Media Campaign on Women’s Outcomes in Occupied Japan

Yoko Okuyama

October 17, 2019

## 1 Introduction

Can we use a targeted mass media campaign to lead women toward better-informed decisions? Evidence suggests that women are often more disadvantaged in information acquisition compared to men<sup>1</sup>. Because such gender informational inequality can be a root of gender inequality in behaviors, policy makers have been viewing targeted information provisions toward women as potent policy levers to address gender inequality. However, no paper has yet to examine the causal impact of targeted mass media intervention on women’s outcomes. This is what I shed light on.

In this paper, I examine the impact of exposure to women’s radio programs on women’s decision-

---

<sup>1</sup>For example, Beaman and Dillon (2018 [6]) conducts an experiment to provide information on a new agricultural technology to a central node of a social network, and shows that women are socially less connected and therefore receive less information, which results in gender inequality in agricultural outputs

making on political participation, labor market participation, and family formation. In particular, I examine an historical context, Japan during the American occupation (Occupied Japan 1945-1952). Occupied Japan provides us a unique opportunity to answer the questions above for the following three reasons. First, the occupying authorities externally implemented women's radio programs and brought information shocks to Japanese women. Second, Occupied Japan's unique setting mitigates the concern that other media outlets may crowd-out the impact of women's radio programs. During the period that I shed light on in this study (1945-1952), newspaper supply was limited due to paper scarcity, there was no competing radio station due to the government's regulation on radio industry and TV had yet to start. Therefore, the unique setting allows us to look at the maximum-possible impact of women's programs. Third, because the occupying authorities considered women's emancipation as a barometer for their occupation success, they documented it in detail. One such documentation is the weekly radio report by the radio unit, whose texts I analyze to motivate my empirical analysis.

In an effort to emancipate Japanese women, the occupying authorities aired daily women's radio programs, the access to which varied across the nation due to the differential radio signal. As my archival study together with historians' accounts reveal, the women's programs covered a wide range of topics, including politics, gender equality, marriage, labor law, birth spacing, and health, providing a whole package of new information to Japanese women. In other words, women's programs were multifaceted. Thereby I ask how the exposure to women's radio programs affected women's electoral turnout, labor market participation, marriage, and fertility.

To identify the causal impact of the exposure to women's radio program on the four outcomes above, I exploit variation in the ground wave field strength, which locally varies due to differential soil type after controlling for the distance from a nearby transmitter. I argue that the local variation in the field strength is as good as random to potential radio listeners while I show that it increases the radio exposure. Therefore I can utilize the ground wave field strength (or field strength in short) to instrument for radio exposure, which I proxy by the radio subscription.

To carry out my empirical analysis, I digitize all but population census for this paper and construct a unique panel dataset. Three points deserve the reader's attention: first I draw five-year record on the radio contents published by the occupying authorities. The record reveals the multifaceted nature of women's radio programs. Second, I digitize a map on the field strength, which allows me to construct my instrumental variable and therefore at the heart of my identification strategy. Third, for some outcome variables, no centralized data repository is available. Thereby I hand-collect men's and women's electoral turnout from local newspapers, and marriage and fertility rates from prefecture yearbooks. Although the resulted sample does not cover the entire nation, I show that the average turnout, marriage, and fertility rate in my sample are comparable with the national average.

Using the conditional field strength as an instrument variable, I find that greater exposure to women's programs significantly increases women's political participation in 1946, both as voters and representatives: a standard deviation increase in exposure to women's radio programs increases women's electoral turnout by 2.5 percentage points, closing the gender gap in turnout by 35 percent. The same increase in exposure also raises female candidate's vote shares by 1.3 percentage points, a figure that is much greater than the median win loss margin of 0.23. Moreover, radio exposure contributes to the birthrate decline between 1949 and 1960: a one standard deviation increase in radio exposure contributes to the annual birthrate decline by 1.79 per 1,000 population of a prewar baseline birthrate of 30.8 per 1,000 population. On the other hand, I do not find any significant impacts on women's labor market participation nor marriage. My findings on labor market participation, marriage, and fertility together suggest that the time a mother would spend at home per a child would increase. Therefore, the impacts of women's radio programs are not limited to women themselves but potentially extended to the next generation.

I argue that my findings are not driven by a direct association between the conditional field strength and outcome variables. In theory, one might be worried that, for example, the soil type happens to capture environmental factor for human fertility, which then directly determines the birth rate. Such direct association between the field strength and my outcomes of study would undermine the exclusivity of the IV. However I argue that such concern is unlikely by showing no correlations between the IV and pre-intervention outcomes.

What are potential mechanisms through which women's radio programs substantially affect women's political participation in 1946 and fertility rate from 1949 to 1955? I suggest that the impact on political participation arises primarily through informational channel. Women's radio programs provide information on how elections work to women, who otherwise would not have been exposed to such information. As a result, better-informed women turned out more. On the other hand, multifaceted nature of women's radio programs can affect fertility through multiple channels: first, women's radio programs provide information on the health benefit of birth spacing and thus affect fertility through informational channel. Second, women's programs provide information on child bearing and therefore they may change women's preference over quality of children. Third, earlier impacts of women's radio programs on women's political participation may change socioeconomic environment, and further affect fertility decisions. Although it is beyond the scope of my study to disentangle different channels, it would be an interesting avenue of future research.

My findings contribute to four strands of literature. First, a growing body of economic literature has examined the impacts of public policies targeting women and shown that targeted policies can deliver better outcomes for women as well as children, and can even lead economic growth (Doepke, Le Tertilt, and Voena (2012 [13]); Duflo (2012 [14]) for review). Such policies take various forms, including legal rights (land ownership (Field (2003 [17])) and voting rights (Lott and Kenny (1999 [23]), Miller (2008 [27])), targeted provision of financial means (conditional cash transfer (Benhassine, Devoto, Duflo, Dupas, and Pouliquen (2015 [8]), Lundberg, Pollak, and Wales (1997 [24]), and agricultural investment (Udry (1996 [40])), reserving leadership positions (gender quota in politics (Beaman, Chattopadhyay, Duflo, Pande, and Topalova (2009 [5]), Duflo and Chattopadhyay (2004 [15])) and corporate board (Bertrand, Black, Jensen, and Lleras-Muney (2019 [9])), and access to contraception (Ashraf, Field, and Lee (2014 [4])). My paper is the first one to provide causal evidence that targeted mass media intervention toward women can also have substantial effects on women's outcomes. Second, a rich body of literature has examined the causal impact of mass media on electoral turnout and election outcomes. As DellaVigna and Gentzkow (2010 [12]) as well as Strömberg (2015 [35]) review, mass media can increase electoral turnout while it can decrease turnout if it substitutes away other information sources that are more relevant to electoral turnout. My study strengthens their view by showing a substantial positive impact of radio on women's electoral turnout in a setting with a scarcity of other media outlets (TV or newspapers). Third,

while Jensen and Oster (2009 [19]) as well as La Ferrara, Chong, and Duryea (2012 [22]) have shown that entertainment content on TV can decrease fertility, we had less known about the impact of other types of media on fertility. To this end, my study is the first to show that information provision through radio can also decrease fertility. Last not but not least, my paper contributes to a growing body of literature examining the impacts of radio broadcasting on various socioeconomic outcomes, such as political knowledge (Strömberg (2004 [34])), price convergence (Svensson and Yanagizawa-Drott (2008 [36])), mass-killing (Yanagizawa-Drott (2014 [42])), emergence of a dictatorial regime (Adena, Enikolopov, Petrova, Santarosa, and Ekaterina (2015 [2])) resistance (Gagliarducci, Onorato, Sobbrino, and Tabellini (2017 [18])), and immigrants' assimilation (Russo (2019)).

Granted, the American occupation of Japan is a unique event, and I call for caution in drawing direct policy implications. Nonetheless, my results provide evidence that information can change women's behavior and lend support to the contemporary initiatives by UN, NGOs and NPOs to use mass media to reach out to women who have limited access to information.

The remainder of the paper is organized as follows. Section 2 provides a brief background of the women's radio programs in Occupied Japan to highlight some key features that are critical to my empirical analysis. Section 3 explains the model, identification, and estimation strategy. Since the data collection and digitization are also the key stepping stones of this project, Section 4 discuss them in detail. Then Section 5 discusses the results and address potential threats to my identification strategy. Section 6 concludes and briefly discusses future research agendas.

## **2 Contextual background: women's radio program in Occupied Japan**

This section provides a brief historical background of the occupying authority's plan to emancipate Japanese women, preexisting radio broadcasting infrastructure in the period leading up to the allied occupation

and how contents of women's program evolved throughout American occupation.

## **2.1 Women's emancipation in Occupied Japan**

After World War II, Japan was occupied by the Allied Powers from September 2, 1945 to April 28, 1952. Although officially called "Allied Occupation," it was mostly an American undertaking with contributions from Australia, India, New Zealand, and the United Kingdom, and therefore often called the "American Occupation". General Douglas MacArthur oversaw the occupation as the Supreme Commander for the Allied Powers. The acronym SCAP was soon used to refer not only the commander himself, but to the offices of occupation set up under him to guide Japan to demilitarize and democratize the nation.

When General MacArthur set up five major reforms on October 11, 1945, later known as the Five Major Reform Directives, one of them turned out to be the emancipation of Japanese women <sup>2</sup>. The idea behind it was that SCAP arguably attributed the prewar militant political system to the patriarchal Japanese social system (Kobayashi [20]). The emancipation of Japanese women was placed at the core of the occupation policies as a major pathway for a peacebuilding <sup>3</sup>.

Women's emancipation under the Allied Occupation was considered not only radical in relation to the status quo in Japanese society in 1945, but also more liberal compared to Western society. This is mainly due to the fact that the postwar Japanese Constitution, enacted in 1947, guarantee the equal rights of men and women not only in the public domain but also in marriage and family life. In fact, in the new Japanese Constitution, Article 14 reads "All people are equal under the law and there shall be no discrimination in political, economic or social relations because of race, creed, sex, social status or family origin" while Article 24 states that "marriage shall be based on the mutual consent of both sexes and it shall be maintained through mutual co-operation with

---

<sup>2</sup>The other four reforms were to abolish the secret police, to encourage the formation of labor unions, to liberalize education system, and to democratize the economy. Source: Diplomatic Records A' 1.0.0.2-3-4 "Conference Abstracts and Memoranda between the Supreme Commander for the Allied Powers and his Staff and the Prime Minister and other ministers of Japan" <GAI-1, Reel No. A'-0055>

<sup>3</sup>Uemura [41] provides a detailed historical analysis of women's emancipation during the Allied Occupation

the equal rights of husband and wife as a basis; With regard to choice of spouse, property rights, inheritance, choice of domicile and other matters pertaining to marriage and the family, laws shall be enacted from the standpoint of individual dignity and the essential equality of the sexes.” As Pharr [32] argues, there were no other countries except for Communist countries such as the USSR and Poland that guaranteed equal rights between sexes in domestic life. Pharr [32] calls it “the US experiment with women’s rights in Japan.”

It is important to note, however, that the Allied Forces’ efforts to emancipate women had already been underway since the onset of the occupation <sup>4</sup>. In fact, as early as October 1, 1945, just one month after the Allies started to occupy Japan, the government-sponsored radio station began to air educational programs targeting women. The women’s programs aimed “to raise political, social, and cultural standards of ordinary women and the breaking away from feudalism”, and “in order to select qualified female leaders, [the women’s radio programs introduced] not only anti-militarists who remained silent during the war but also many unknown progressive, young women.” (Japan Broadcasting Corporation Yearbook (1947); translated by the author). In other words, the women’s radio programs served as a policy lever within the context of the Allies’ broader efforts to emancipate women.

The fact that educational radio programs toward women came earlier than other legal reforms is crucial for my study. The timing mitigates the concern that the causal impacts of the women’s radio programs may confound the impacts of other public policies affecting women’s lives. In the next subsection, I look deeper into how the Allied utilized the radio broadcasting to reach out to Japanese women.

## **2.2 Radio reception and use in Occupied Japan**

Next, I explain the preexisting radio broadcasting infrastructure that existed before Allies’ arrival, which allowed GHQ/SCAP to introduce women’s radio program in the very early stage of the occupation period. Not only was the program on air, but it was also well received by female listeners, as I uncover from

---

<sup>4</sup>Table 6 in Appendix A provides more detailed time line of SCAP’s policy toward emancipation Japanese women.

listeners' surveys.

On the onset of the Allied occupation, there were 53 radio transmitters and 39 amplifiers across the nation, all of which were connected and operated by a single state-sponsored radio station, Japan Broadcasting Corporation or JBC for short. The JBC has a primary channel, channel 1 (*daiichi hoso* in Japanese) which aired various programs throughout the day, and a secondary channel, channel 2 (*daini hoso*) which was utilized only for part of the day. Until 1952, there was no private radio broadcasting. Therefore, during the period that I study, radio holders had at most two channels to choose from when they turned on the radio. Such a narrow choice set turns out to be critical for our empirical analysis. I should also note that JBC mandated all radio holders to register and pay subscription fees<sup>5</sup>. To collect the fees, the JBC kept record on the number of households subscribing to radio as well as the total number of households in all municipalities. The record allows me to calculate the radio subscription rate, which I later use as an independent variable in my empirical analysis.

During the Allied occupation, the JBC operated under the close supervision of the GHQ/SCAP Civil Information and Education Section Radio Unit (later also called Radio Branch and hereafter the Radio Unit). Radio broadcast content was censored in advance by the Radio Unit. Besides, the Radio Unit guided how to produce radio programs as well as conduct a modern listener's survey (Mayo 1988 [26], Luther and Boyd 1997 [25], Smulyan 2002 [33]). In effect, the Radio Unit had a large say over what kind of contents were on air and therefore played a key role in disseminating information to meet the GHQ's purposes.

JBC started airing the flagship women's program "Women's Hour (*Fujin no jikan*)" as early as October 1st in 1945, just about a month after the Allies started occupying Japan. The program was carefully designed to draw as much of women's attention as possible: a time slot allotted to the women's program was the lunch break when women used to listen to war-time women's program during World War II; a director of the production team, as well as moderators, were women to be friendly to female listeners; music was played here and there for a pause so that listeners could maintain concentration.

---

<sup>5</sup>See Table 8 in Appendix A on annual radio subscription fee from 1925 to 1955. Data are drawn from Okabe 2018 [30]



As JBC's listener's survey reveals, women's programs were indeed well received. In 1947 survey, more than 70 percent of women with a radio subscription said that they currently listen to or used to listen to the women's program. Not only did they listen to the women's program, but more than 60 percent of them answered that they had gained new knowledge through the program. This survey provides evidence that reassures that women's programs conveyed new information to women as GHQ/SCAP intended.

As time went by and the JBC's production capacity increased, JBC added more time slots for women's programs. By the end of 1950, the weekly airtime that JBC allocated to women's program quadrupled compared to its onset in October 1945<sup>6</sup>. This fact underscores the fact that GHQ/SCAP maintained and strengthened their efforts on women's emancipation throughout the occupation. As the airtime expands, content covered by the women's programs expanded as I will show in detail in the next subsection.

Before diving into the radio content analysis, I should also note that my analysis primarily focuses on the occupation period (1945-1952) although JBC continued airing women's program until 1963. I restrict my attention mainly to the occupation period because, at the end of the occupation period, private radio broadcasting, as well as TV broadcasting started, giving more choices to potential listeners. Competition among different mass media outlets may have fundamentally changed the nature of media content as well as complicated the listeners' decision process on which information they acquire and why. Though this transition in the broadcasting market opens up a new avenue of research, it's beyond the scope of my current analysis.

## **2.3 Contents of women's programs**

What kind of information did the women's programs try to disseminate? Answering this question is key to determine which women's outcome I should look at. Thereby I turn to the Weekly Radio Reports (from January 1946 to December 1950), which document daily radio content in English, classify them into topics, and

---

<sup>6</sup>See Figure A.7 in Appendix A. NHK Yearbook (1947, 1949) and GHQ/SCAP CIE Weekly Report (Radio Education Branch, 1946 - 1950).

see how the composition of topics changed over the course of the Allied occupation.

The Weekly Radio Report is reported every week, with one section dedicating in the featured programs of the week. The following are examples of content explanations.

Women's Hour (26 July 1947, from 13:00 to 14:00)

"Marriage and Pregnancy", a straightforward talk on the importance of honest information on sex for adolescent boys and girls and young married people, was presented with simple good taste by Dr. Fusao Hori"

Women's Hour (11 November 1948, from 13:00 to 14:00)

"Mrs. Ohara, interviewer for the Tokyo Domestic Court, Prof. Kawashima of Tokyo University, and Mrs. Fujioka, editor of "Consumer's Co-Op Magazine", discussed the problem of inheritance of all property by the eldest son as it was formerly observed before the Civil Code was revised. Even though the law now provides that the wife and younger children will share an inheritance equally with the first son, many people cling to the old way of doing things"

Two things should be noted in the above examples: first, academics, policymakers, and corporate leaders spoke on the show to provide specialized knowledge. Second, as we notice from honorifics, both men and women are invited as speakers. In fact, by counting the number of honorifics "Mrs", "Ms" and "Mr" that appeared in the Weekly Report from January 1946 to December 1950, I find that the share of female speakers was 49.9 percent: women's radio programs provided an equal playing field for men and women on air.

Furthermore, to understand the topic composition of the women's radio programs in a more systematic manner, I classify daily contents of women's programs using Latent Dirichlet allocation, and show year-by-year topic composition (Figure 1). I find that, women's programs were primarily about politics and elections in 1946, which is consistent to what Okahara (2007 [31]) finds in her case study. Interestingly, the

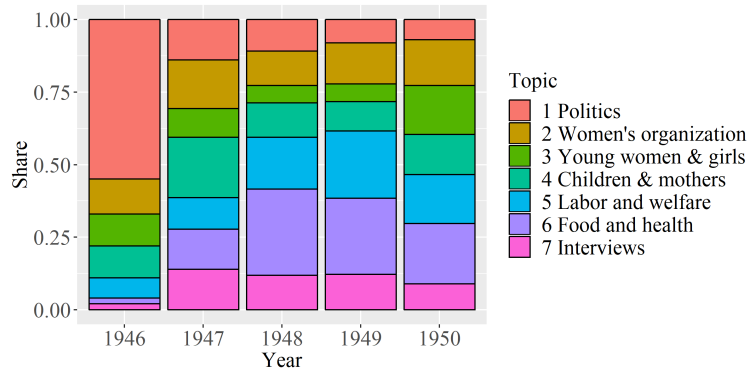


Figure 1: Topic compositions of women's radio over the course of the Allied Occupation. Contents descriptions are drawn from GHQ/SCAP CIE Weekly Report (Radio Education Branch, 1946 - 1950) and classified using Latent Dirichlet allocation.

contents covered by the women's programs became more diverse over the years: they covered women's organizations, contents catered to young women and girls' interests, child development, new labor and welfare laws, and information on food and health.

The fact that program content became diverse overtime motivates me to explore whether the exposure to women's radio programs can affect not only political behaviors but also other women's outcomes, particularly labor market participation, marriage rate, and fertility rate. Based on the words and phrases that appear in the radio content, I hypothesize the following: first, women's electoral turnout increases in response to larger exposure to the women's radio, which "urged" women to vote in the 1946 general election. Second, women's labor market participation increases in response to greater exposure to women's radio, which talked about women's careers and labor laws that protect women's rights in the work place. Third, the annual marriage rate decreases, at least in the short run, in response to larger exposure to the women's radio programs, which emphasized women's freedom to choose their own marriage partners. Forth, the annual birth rate decreases in response to greater exposure to women's radio programs, which discussed the benefit of birth spacing for women's health. Table 1 summarizes the association between topics within the women's radio programs and women's outcomes that I examine in this paper.

Table 1: Topics within the women’s radio programs, associated phrases, and women’s outcomes

Topics	Outcomes to examine	Key words and expected impact
Politics Women’s organization	Turnout in the 1946 general election	+ “urge to vote”
Children and mothers	Fertility (1949-1960)	- “birth control” “[birth] spacing”
Young women and girls	Marriage (1949-1960)	- “seeking marriage by their own choice” “marriage vs. career”
Labor and welfare	Labor force participation (1950)	+ “new labor law” “interesting careers”

### 3 Model, identification, and estimation

Based on the content analyses, I hypothesize and test that exposure to women’s radio programs can affect women’s decision-making in the political sphere, the workplace, and family formation. To identify the causal effects of radio exposure, I instrument for the exposure to the radio using quasi-random variation in AM radio reception induced by geographical conditions and perform an IV analysis.

#### 3.1 Model

I assume a linear causal model between the exposure to women’s radio program and the outcomes of interests. What I wish to identify here is a causal parameter  $\beta_1$  below, which captures the impact of the exposure on each outcome.

$$\text{Outcome}_{j,t} = \beta_0 + \beta_1 \text{radio exposure}_{j,1946} + \gamma x'_{j,t} + u_{j,t} \quad (1)$$

where  $j$  indicates a district.

Though I describe how I measure each variable in detail in Section 4, I forewarn that I proxy radio exposure by the district-level radio subscription rate, defined as the share of households subscribing to radio, which has both advantages and shortcomings. On the one hand, the subscription rate captures actual listener rate better than signal strength or cable introduction, which potentially overstate the radio listenership but are nonetheless used as a main explanatory variable by most of the existing papers on mass media. To this end, I take advantage of the radio receiver license system in Japan, which provides me with data on municipality-level radio subscription rates. Having the actual radio subscription turns out to be especially critical in my study because the average radio subscription rate is 36.7 percent, being far from 100 percent, while the radio signal covers almost the entire nation however weak it is. On the other hand, one may worry that radio subscription captures the impact of radio listenership in general but not necessarily the exposure to the women's programs. To address this concern, whenever possible, I perform regressions for both men and women and show that only women react to the radio subscription rate.

### **3.2 Identification strategy**

The key empirical challenge that I need to overcome is that radio exposure, proxied by the radio subscription rate as above, may be endogenous and therefore undermines the identification of the causal effect  $\beta_1$ . Such a concern arises when the radio subscription are correlated with subscribers' unobserved characteristics such as attitude toward American occupation, openness to new ideas, and willingness to acquire new information. For example, women with greater interests in politics may subscribe to radio to obtain information on politics. Such a positive correlation between the subscription and unobserved characteristics overstates the causal effect  $\beta_1$ .

To address the endogeneity issue, I leverage quasi-random variation in radio reception quality during the daytime hours, which is as good as random to potential subscribers but increases their likelihood of radio

subscription. The metric of the radio reception I use is the ground wave field strength (hereafter field strength), which depends on the horizontal distance from a nearby transmitter, output power of the transmitter, the wave length, and the ground conductivity between the transmitter and the receiver. The ground conductivity measures how fast the AM radio wave can propagate through a given soil type and depends on the moisture and salt contents of the soil. The key idea is that, while the distance to nearby transmitter, output power, and wavelength may be based on strategic considerations, the ground conductivity is as good as random to potential subscribers. Therefore, the local variation in the field strength after controlling for the distance and transmitter fixed effects can serve as an instrumental variable for the radio subscription rate.

I should reemphasize that controlling for distance and transmitter fixed effects is critical so that the field strength meets the exogeneity condition of the IV. Controlling for distances mitigates aforementioned concern that radio transmitters were strategically placed in the area with higher political aspirations, higher aspiration for freedom of marriage, higher demand for birth control, higher potential supply of female labor force, and so forth. Although such a concern might be unwarranted given the historical background of radio, as I described in Section 2, these unobserved characteristics of women may indirectly relate to transmitter locations through urbanness, and therefore it is still important to control for the distance.

Furthermore, I also control for other district characteristics: I include industry composition, measured by the labor share in 10 industries (agriculture, forestry, fishery, mining, construction, manufacturing, whole sale and retail, finance and real estate, information and transportation, and service; the omitted category is public service), in order to address the concern that the soil may reflect how fertile the land is and correlate with the economic status of a given area. I also include the number of households, the number of households per square km, and a city indicator to control for the urbanness. Moreover, I control for the fact that a district was subject to bombing during World War II to take into account that bombings may have affected citizens' attitudes toward American Occupation. Finally, prefecture fixed effects control for any inter-prefectural public policy differences.

Figure 2 shows the residualized field strength after controlling for the distance, transmitter fixed ef-

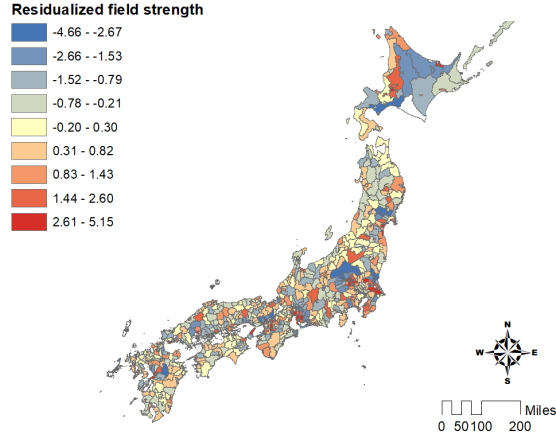


Figure 2: Residualized field strength

fects, and all the other control variables. Notice that even an area with high residualized field strength, in dark blue, and an area with low residualized field strength, in dark red, are adjacent to each other. It is reassuring that there is no systematic pattern.

Formally, our conditional exogeneity condition and the relevance conditions take the form

$$E[\text{Field strength} \times u | \text{transmitter fe, distance, } \mathbf{x}] = 0$$

$$E[\text{Field strength} \times \text{Radio exposure} | \text{transmitter fe, distance, } \mathbf{x}] \neq 0$$

With the IV at our hand, I estimate the causal impact of the radio exposure on each outcome of interest via two-stage least squares and compute robust standard errors.

## 4 Data

I hand-collect data on election turnout, labor market participation, marriage, and fertility, as well as geographical reach of the radio from various historical resources. All variables are observed at the district (*shi* and *gun*) unless stated otherwise. Using these variables, I construct a unique, district level panel dataset. Table 7 in Appendix A summarizes all the data sources for the reader’s convenience.

### 4.1 Radio exposure, field strength, and distance to a nearby transmitter

As I have mentioned in Section 3.1, I proxy the degree of exposure to the women’s radio programs by the radio subscription rate, which is defined as the share of households subscribing to radio in 1946. I draw the radio subscription rate from the 1946 yearbook published by the Japan Broadcasting Corporation, which kept the number of households subscribing radio as well as the total number of households at village level in order to collect subscription fees. In 1946, the village level subscription rate ranges from less than 10 percent to over 80 percent, with the average of 37.7 percent. Figure 3a shows how radio subscription varies in the nation. The map is colored based on the decile bins: from areas with low subscription rate in yellow to areas with high subscription rate in dark blue.

I draw data on the AM wave field strength, which serves as the instrumental variable for radio exposure, from the map that the Japan Broadcasting Corporation published in 1949. As far as the I know, this is the oldest map on the field strength published after the World War II. I digitize the map (Figure 3b) and compute the district level average field strength to construct the instrumental variable.

Finally, I compute the distance from each district to the nearest radio transmitter by utilizing the information on latitudes and longitudes of radio transmitters taken from the Japan Broadcasting Service 1947



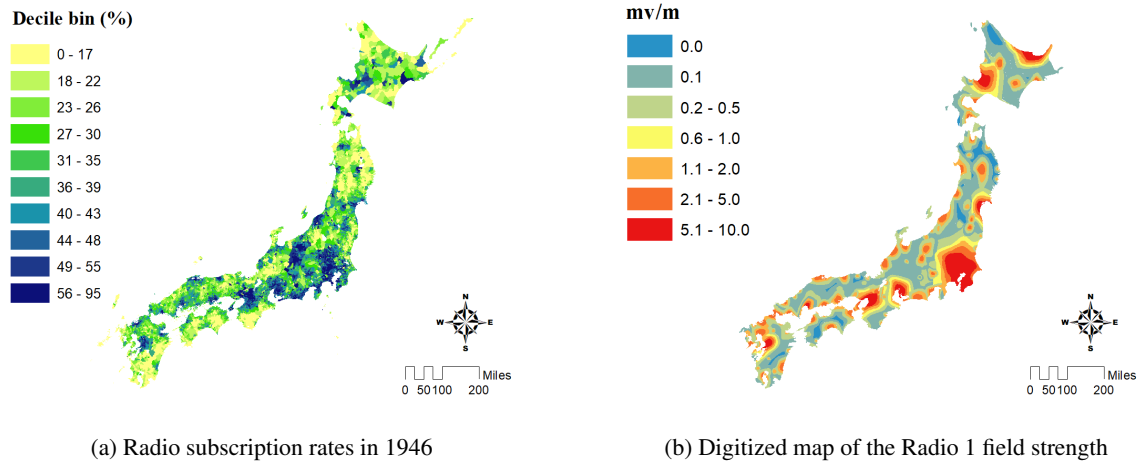


Figure 3

yearbook as well as administrative boundaries<sup>7</sup>.

## 4.2 Election turnout

I draw data on electoral turnout by sex in the 22nd House of Representative Election held on April 10th 1945, the first election after women's suffrage. I collected them from local editions of three national news papers as well as prefectural news papers, that reported district level turnout by sex between April 12 and April 14, 1945<sup>8</sup>. My final datasets cover 26 prefectures, which covers 56.7 percent of all the eligible voters in 1946 election, across the nation.

Although turnout is available for only a subset of the nation, the average turnout in my sample is statistically indistinguishable from the nationally aggregated turnout by sex<sup>9</sup>: In my sample, women's average turnout rate is 0.64 with standard deviation of 0.08 while the national average is 0.67. On the other hand, men's

<sup>7</sup>I use shape files on administrative boundaries provided by Maruyama Lab, Tsukuba University, Japan.

<sup>8</sup>The three national news papers are Yomiuri, Asahi, and Mainichi.

<sup>9</sup>Tabulated statistics on electoral turnouts by sex are drawn from Japan Ministry of Internal Affairs and Communications and compiled by the National Women's Education Center [11]

average turnout rate is 0.76 with standard deviation of 0.09 in my sample, while the national average is 0.78. The gender difference of 0.13 is statistically significant.

Additionally, I digitize votes that female candidates obtained by district as well as total votes cast in each district to compute the vote share of female candidates. In the 1946 general election, 79 females ran for office, accounting for 3 percent of all candidates. The average vote share is 0.08 with a minimum of 0 and a maximum of 0.58.

### **4.3 Labor market participation**

I compute women's labor force participation at the district level by using the 1950 Population Census: I divide the number of women aged 14 or above who participate in the labor force by the total number of women who are in the respective age group <sup>10</sup>. Using the same data source, I also compute women's labor force participation at district level by excluding women in family business, most of whom are farmers' wives at the time. Moreover, 1950 Population Census also provides labor share of industries which I use as control variables.

For placebo tests, I also compute women's labor force participation at the district level by using 1940 Population Census: because age breakdown of population is not available at district level, I divide the number of women in labor force by the total number of females <sup>11</sup>.

---

<sup>10</sup>The total number of women in work force is drawn from Table 8 and the total number of women is drawn from Table 4 of the 1950 Japan Population Census digitized by Kishimoto Lab [38]

<sup>11</sup>The total number of women in work force is drawn from Table 2-1 and the total number of women is drawn from Table 1-1 of the 1930 Japan Population Census digitized by Kishimoto Lab, Tsukuba University, Japan.

#### **4.4 Annual marriage rate and birth rate**

I draw the annual marriage rate, defined as the number of marriages per 1,000 population, and the annual birth rate, defined similarly as the number of births per 1,000 population, from prefecture yearbooks between 1949 and 1960 in five prefectures (Iwate, Chiba, Mie, Nara, and Tokushima prefectures), which are the only five prefectures that provide the necessary information to my best knowledge. I digitize these prefecture yearbooks and spatially merge them across years using municipality boundaries. As Figure A.8 in Appendix A shows, the average annual marriage and birth rates in my sample resembles the national averages. Furthermore, for placebo tests, I digitize 1935 vital statistics to obtain prewar annual marriage and birth rates.

#### **4.5 World War II damage**

In order to proxy the degree of war damage, I draw data on district-level total casualty during the World War II from *Overall Report of Damage Sustained by the Nation During the Pacific War* published by Economic Stabilization Agency, Planning Department, the Office of the Secretary General (1949 [16]) and digitized by Japan Air Raid Org. Casualties, which were estimated in May 1948, includes casualty due to air raid bombings (in many places such as Tokyo and Yokohama), atomic bombings (in Hiroshima and Nagasaki) and naval artillery (in some coastal cities such as Kamaishi, Muroran and Hamamatsu). Since the report presents district-level casualties only for cities with significant number of casualty, I further create a dummy variable which takes one if the war casualties are above median.

### **5 Findings**

This section presents the main result that exposure to women's radio program causes changes in women's decision-making on political participation (section 5.1), labor market participation (section 5.2), and

family formation (section 5.3).

## 5.1 Political participation

First, I turn to the impact of radio exposure on women’s electoral turnout. Table 2 shows the OLS estimates. The radio subscription has a strong positive association with women’s turnout (Column 1) but not with men’s turnout (Column 4). These associations turn out to be causal: focusing on Column 3, estimates with a full set of control variables, the estimated impact of the radio subscription (which takes a value between 0 and 1) on the women’s turnout is about 2.5 percentage point. On the other hand, I do not find any impact on men’s outcome (Column 5). In addition, Column 6 shows the impact on the female share among voters, defined by the share of women out of men and women who casted ballots, and confirms that the radio exposure shifted the female share by 1.3 percentage point.

The magnitude is not only statistically significant but also socio-economically significant: it accounts for 29.5 percent of the standard deviation of women’s turnout. A back-of-the-envelope calculation, assuming that the impact is homogenous across women, suggests that the radio exposure overall reduced the gender disparity in turnouts by 4.8 percentage point. This accounts for almost one-third of the gender gap.

A natural question that follows is if women’s greater turnout in the election translates into greater women’s representation at the Diet. To see this, Table 3 presents the impacts of the radio exposure (Column 2) as well as the female turnout share (Column 4) on the female candidate’s vote share, each of which is instrumented by the field strength. As Column 2 shows that the greater radio exposure increases a female candidate’s vote share by 1.3 percentage points. The direct impact of female turnout is also positive although the estimate is noisier (Column 4): one percentage point increase in female turnout share increases female candidate’s vote share by 1.29 percentage point. Putting it differently, 1.3 percentage point increase in the female turnout share further increases the female candidate’s vote share by  $1.3 \times 1.29 \simeq 1.89$  percentage point.

Was the impact large enough to push female candidates to win? I calculated a win-loss margin, defined as a difference in vote shares of the lowest-ranked winner and the runner up in each electoral district. It turned out that the 1946 election was quite competitive: the minimum win-loss margin was 0.005 percentage point, the median win-loss margin was 0.23 percentage points, and the maximum win-loss margin was 2.19 percentage points <sup>12</sup>. Therefore, I conclude that the impact of one standard deviation of radio exposure on the female vote share, 1.3 percentage point, is above the median win-loss margin and thus seizable.

Taken all together, I conclude that the women's radio programs successfully amplified women's voice in the political sphere: the women's programs effectively induce more women to vote, which in turn translates into a greater vote share of female candidates. The findings also echo what the GHQ/SCAP Radio Unit wrote in their weekly radio report: the women's programs "undoubtedly contributed in a large measure to the fact that 65 percent of the eligible women voters went to the polls" <sup>13</sup>.

---

<sup>12</sup>In order to calculate the win-loss margin, I draw the total number of men and women who cast ballots from the government's official report. Moreover, I draw data on vote counts of winners and runner-ups from *The Mainichi*, one of the major newspapers, published on April 13, 1946. Because the vote counts were not finalized in five electoral districts (Hokkaido 2nd district, Tokyo 2nd district, Chiba, Nagasaki, and Kagoshima), I calculated win-loss margins with and without these five districts. The distribution of win-loss margin is robust.

<sup>13</sup>Weekly radio report, SCAP Civil Information and Education Section

Table 2: OLS and TSLS results

The impact of the radio subscription in 1946 on turnout in the first postwar election

	Women's turnout Mean 0.66 Std.dev. 0.08			Men's turnout Mean 0.79 Std.dev. 0.06		Turnout female share Mean 0.37 Std.dev. 0.06
	(1) OLS	(2) TSLS	(3) TSLS	(4) OLS	(5) TSLS	(6) TSLS
Radio subscription in std.dev. unit	0.0289*** (0.00515)	0.0245** (0.00999)	0.0248* (0.0142)	0.00727 (0.00468)	0.0106 (0.00769)	0.0147** (0.00654)
$R^2$	0.706	0.707	0.740	0.653	0.615	0.739
Distance control	decile bins	decile bins	decile bins	decile bins	decile bins	decile bins
N.of HH, HH density	✓	✓	✓	✓	✓	✓
Transmitter FE	✓	✓	✓	✓	✓	✓
Prefecture FE	✓	✓	✓	✓	✓	✓
City indicator			✓			
Industrial composition			✓			
Male to female ratio						✓
Observations	341	346	346	332	336	256

<sup>1</sup> Standard errors are in parentheses.\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ <sup>2</sup> The sample size is reduced in men's regression because only women's (but not men's) turnout was reported in one prefecture (Miyazaki prefecture).

Table 3: OLS and TSLS results

The impact of greater exposure to women's radio on the vote share of a female candidate

	Female vote share Mean .077 Std.dev. .08			
	(1) OLS	(2) TSLS	(3) OLS	(4) TSLS
Radio subscription (std.dev)	0.00310 (0.00193)	0.0133** (0.00656)		
Female share turnout (p.p.)			0.00143** (0.000670)	0.0129 (0.00887)
$R^2$	0.534	0.527	0.622	0.415
Distance control	decile bins	decile bins	decile bins	decile bins
Electoral district FE	✓	✓	✓	✓
Electoral district controls	✓	✓	✓	✓
Transmitter FE	✓	✓	✓	✓
N.of HH and HH density	✓	✓	✓	✓
War casualty	✓	✓	✓	✓
Candidate controls	✓	✓	✓	✓
Candidate FE				
Std.error clustered	Yes	Yes	Yes	Yes
Observations	954	954	465	465

Standard errors are in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The sample size is larger than the dataset on women's turnout analysis because (i) I have data on all female candidates (whereas the data on turnout had missing values) and (ii) some electoral districts had multiple female candidates.

Table 4: The impact of the radio subscription in 1946 on labor force participation by marital status

	(1) Women's LFP Mean 0.521 Std.dev. 0.134	(2) Women's LFP excl. family emp Mean 0.283, Std.dev. 0.06	(3) Female share in LF mean: 0.398 sd. 0.065
Radio subscription in std.dev. unit	-0.00923 (0.00736)	-0.00994 (0.00708)	-0.00263 (0.00357)
Male to female ratio	-0.297*** (0.0385)	-0.572*** (0.0371)	-0.433*** (0.0187)
Distance control	decile bins	decile bins	decile bins
N.of HH, HH density	✓	✓	✓
Transmitter FE	✓	✓	✓
Prefecture FE	✓	✓	✓
Prewar LF participation	✓	✓	✓
Industrial composition	✓	✓	✓
Observations	674	674	674

<sup>1</sup> Standard errors are in parentheses.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

<sup>2</sup> The mean women's labor participation is .513 with the standard deviation of .137.

## 5.2 Labor market participation

If radio exposure effectively encourages women to participate in politics, what about labor market participation? Table 4 presents the OLS (Column 1) and TSLS (Column 2) estimates, where I do not find any impact of exposure to the women's radio program on labor market participation. This zero causal impact is robust for different measurements of labor participation: Column 3 in Table 4 uses the female labor force participation rate excluding family employees while the Column 4 uses the women's share out of all the labor force. In no case, the impact of the radio subscription is distinguishable from zero.

## 5.3 Family formation

Lastly, I turn to the impact of exposure to the women's radio programs on decision-making on family formation, namely marriage and fertility. Because marriage and childbirth are infrequent decisions, I use a panel

dataset of 10 years to capture any lagged impact. Accordingly, I modify the main model (1) as follows

$$\begin{aligned}
\text{Crude rate}_{j,t} = & \beta_0 + \beta_{1t} \text{radio exposure}_{j,1946} + \iota_t \\
& + \gamma_1 \text{Crude rate}_{j,1935} + \gamma_2 \text{Male-to-female ratio}_{j,1950} \\
& + f(\text{distance to a nearby transmitter}_{j,1946}) + \nu_{\text{transmitter}(j)} \\
& + \kappa_t \text{industries}'_{j,1950} + \pi_{h1} \text{N of HH}_j + \pi_{h2} \frac{\text{N of HH}_j}{\text{SqKM}_j} + \delta_{\text{prefecture}(j)} \\
& + I_{j=\text{city}} + \psi_{\text{bombed}(j)} + u_{j,t}
\end{aligned} \tag{2}$$

where crude rate refers to either the number of marriages or births per 1,000 population in a specified year. I allow the impact of the radio exposure ( $\beta_{1t}$ ) vary across time. I add four control variables to the main model (1): first,  $\text{Crude rate}_{j,1935}$  controls for the baseline marriage or birth rate prior to the US occupation to make sure that any preexisting marriage and fertility patterns do not drive my results. Keeping the baseline rate constant is important also because, as the baseline rate is higher, there is more room to decline (or vice versa). Second, I also include the postwar male to female ratio ( $\text{Male-to-female ratio}_{j,1950}$ ) as a determinant of marriage and fertility rate. The idea of the sex ratio determining marriage-market outcomes dates back to Becker (1973 [7]), and a growing body of empirical literature exploits the war-induced variation in male to female ratio and shows its causal impacts on marriage and fertility<sup>14</sup>. Third, year fixed effect  $\iota_t$  takes into account the nationwide trend in marriage and fertility rate. Last but not least, I allow coefficients on the industrial composition ( $\text{industries}'_{j,1950}$ , a vector of labor share of 10 out of 11 industries in 1950) vary across time to capture industry-specific time trends. Industry-specific time trends accommodate the fact that postwar birth-control first emerged among wives of coal miners and factory workers (Tama 2006 [39], Ogino 2008 [29], Takagi 2012 [37]). Other control variables remain the same as the main model (1).

---

<sup>14</sup>Abramitzky, Delavande, and Vasconcelos 2011 [1] in the post World War I France, Bethmann and Kvasnicka 2013 [21] in the German state of Bavaria during and after the World War II, Brainerd 2017 [10] in the post World War II Soviet Union and Ogasawara and Komura 2018 [28] in the post World War II Japan.



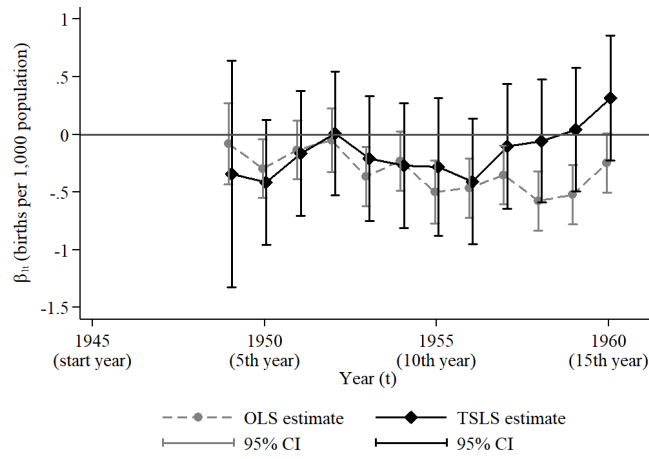


Figure 4: The impact on the annual marriage rate

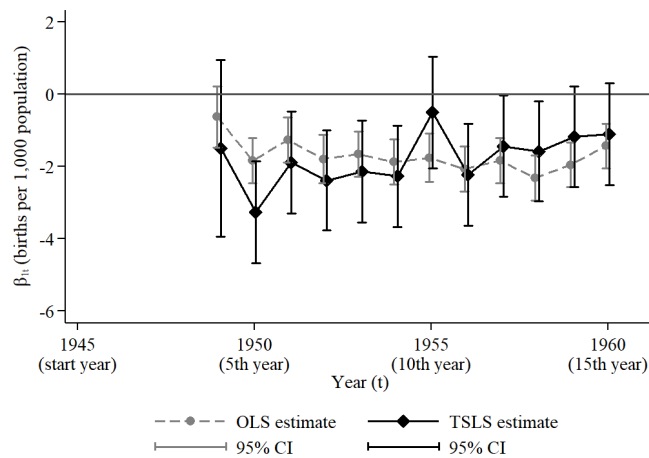


Figure 5: The impact on the annual crude birth rate

Figure 4 plots the TSLS coefficients ( $\hat{\beta}_{1t}$ ) for marriage rate. We do not find any significant effect of the radio intervention on marriage rates. On the other hand, Figure 5 plots the TSLS coefficients ( $\hat{\beta}_{1t}$ ) for birth rate. We find negative impacts up until the 10th year (1955) from the onset of the women's radio programs, and then the impact starts to fade out over time. In other words, in the area where women are more exposed to the women's radio programs, they decrease their fertility around 1.79 per 1,000 on average. The fertility decline comes from within-marriage fertility decision because marriage rates remain the same. Putting the result into context, the time period that I study saw a substantial decline in birth rate as Appendix A Figure A.11 shows. The back-of-the-envelope calculation shows that the radio intervention contributes of 4.4 per 1,000 population out of an overall decline 13.5 per 1,000 from prewar to 1960 <sup>15</sup>.

Why can the impact so substantial? I examine two possibilities: first, the high baseline birthrate prior to the US occupation may leave a larger room for change. In fact, prior to the US occupation, the annual birthrate remained the level of around 30 per 1,000 population, or 4.8 children per a married woman (Appendix A Figure A.10). To test this hypothesis, I split my sample into two groups, districts with the baseline birthrate higher or lower than the median of 34.37 per 1,000 population in 1935, rerun the regression (2), and see if the impact of the exposure to women's radio programs is higher in the high birth-rate districts. The difference is, however, statistically indistinguishable (Appendix A Figure A.12) and not in favor of my first hypothesis.

Thus I propose an alternative interpretation: the multifaceted nature of women's radio programs caused the large impact through multiple channels. By the multifaceted nature, I mean that the women's radio programs covered various topics, including politics, marriage, children, health and labor market. As I summarize in a diagram (Figure 6), there are at least three ways through which the women's programs can cause the fertility decline: first, women can update their belief on the health benefit of birth spacing and subsequently change the fertility decision. Second, women can change their preference over the quality of children against the quantity of children in response to new information on childrearing. Third, recall my earlier finding that the radio exposure increases women's political participation in Section 5.1. Past literature also shown that

---

<sup>15</sup>I draw data from the National Institute of Population and Social Security Research. The prewar average birth rate is 30.8 per 1,000 population, which is the average between 1932 and 1937 (plus and minus two years of the base year 1935). The average birthrate at the end of the sample period is 17.3 per 1,000 population, which is the average between 1957 and 1962 (plus and minus two years of 1960).

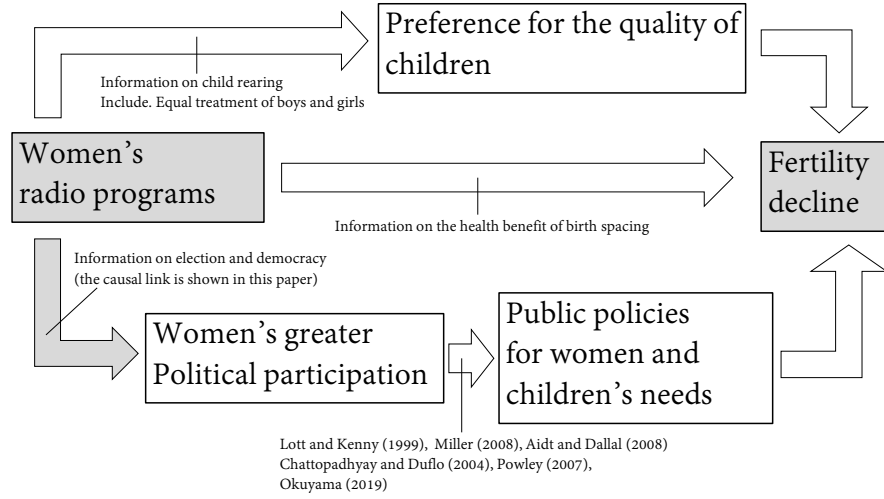


Figure 6: Potential channels through which the women's radio programs can contribute to the birth rate decline.

greater women's political participation can lead more public spending on women's and children's issues <sup>16</sup> and therefore can cause changes in socioeconomic environment surrounding childrearing. Taken all together, the multifaceted nature of women's radio programs can cause a larger impact on fertility compared to a situation where an information campaign focuses only on the health benefit of the birth spacing. Disentangling these channels is beyond the scope of my paper although it would be an interesting avenue of future research.

#### 5.4 Addressing potential threats for the instrumental variable

Last but not least, I discuss potential mechanisms through which my instrumental variable may violate the conditional exogeneity assumption. Then I provide a series of tests to show that they are not first-order concerns in this context.

One may be concerned that the soil type, which provides local variation in the field strength, directly determines the outcomes that I am interested in. Such concern arises if soil types happen to indicate agricultural

---

<sup>16</sup> [15], [23], [27], [3]

Table 5

	(1)	(2)	(3)	(4)
	Birth rate 1935	Marriage rate 1935	LFP 1940 (men and women)	LFP 1940 (women)
	Mean 32.70 Std.dev. 4.28	Mean 8.50 Std.dev. 1.30	Mean 0.45 Std.dev. 0.05	Mean 0.37 Std.dev. 0.10
Field strength in std.dev.	0.000433 (0.00212)	-0.00487 (0.00352)	-0.282 (0.172)	-0.0321 (0.0790)
$R^2$	0.854	0.902	0.841	0.634
Distance control	decile bins	decile bins	decile bins	decile bins
N.of HH, HH density	✓	✓	✓	✓
Transmitter FE	✓	✓	✓	✓
Prefecture FE	✓	✓	✓	✓
City indicator	✓	✓	✓	✓
Industrial composition	✓	✓	✓	✓
Male to female ratio	✓	✓	✓	✓
Observations	648	648	771	771

Standard errors are in parentheses.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

<sup>1</sup> In column 1, the birth rate is defined as the annual number of birth in 1935 per 1,000 population. Similarly in column 2, the marriage rate is the annual number of birth in 1935 per 1,000 population. I draw the number of births and marriages from the 1935 vital statistics (*Shi-cho-son betsu zinko dotai tokei: showa 10 nen*), which I have digitized for this project.

<sup>2</sup> In columns 3 and 4, LFP stands for the labor force participation rate, which is a share of respective population who work out of all the population (but not the working-age population). I draw the number of men and women working from Table 2-1 of the Japan Population Census 1940 while I draw the number of total population from Table 1-1 of the same census.

<sup>3</sup> I spatially merge data in different years using year-by-year municipality boundaries, in order to take into account municipality mergers. The match rate was lower for the year of 1935, which results in a smaller sample size in columns 1 and 2.

productivity, which then directly determines the optimal labor input. For another example, suppose the soil type happen to capture environmental factor for human fertility, which then directly determines the birth rate. In either case, the direct association between the outcomes and the field strength would undermine the exclusion restriction of the IV.

To address the above concerns, I regress the pre-intervention outcomes on the field strength and full set of control variables. As Table 5 shows, the outcome variables are not associated with field strength, in the absence of the radio intervention.

## 6 Conclusion

This paper examines the impact of women's radio programs on women's outcomes, namely electoral turnout, labor force participation, marriage, and fertility in Occupied Japan (from 1945 to 1952). I find that greater exposure to women's programs significantly increases women's political participation, both as voters and representatives: a standard deviation increase in exposure to women's radio programs increases women's electoral turnout by 2.5 percentage points, closing the gender gap in turnout by 35 percent. The same increase in exposure also raises female candidate's vote shares by 1.3 percentage points, a figure that is much greater than the median win loss margin of 0.23. Moreover, radio exposure contributes to the birthrate decline: a one standard deviation increase in radio exposure contributes to the annual birthrate decline by 1.79 per 1,000 population of a prewar baseline birthrate of 30.8 per 1,000 population. On the other hand, I do not find any significant impacts on women's labor market participation nor marriage.

I suggest that the impact on political participation arises primarily through informational channel. Women's radio programs provide information on how elections work to women, who otherwise would not have been exposed to such information. As a result, better-informed women turned out more. On the other hand, multifaceted nature of women's radio programs can affect fertility through multiple channels: first, women's radio programs provide information on the health benefit of birth spacing and thus affect fertility through informational channel. Second, women's programs provide information on child bearing and therefore they may change women's preference over quality of children. Third, earlier impacts of women's radio programs on women's political participation may change socioeconomic environment, and further affect fertility decisions. Although it is beyond the scope of my study to disentangle different channels, it would be an interesting avenue of future research.

My findings open new avenues of economic research. First, it is still an open question if the intervention during the American occupation has had a long-term effect and triggered a virtuous cycle toward gender equality in Japanese society. Second, Occupied Japan's case limits my ability to investigate what would have

happened if both men and women, or only men, were exposed to women's radio contents. This limitation, however, may motivate us to design field experiments to understand the nature of targeted information interventions further. Third, my findings also call for a theoretical framework, which incorporates gender disparity in information access and gender disparity in behavioral outcomes.

Nonetheless, my results provide evidence that information can change women's behavior and lend support to the contemporary initiatives by UN, NGOs and NPOs to use mass media to reach out to women who have limited access to information.

## References

- [1] Ran Abramitzky, Adeline Delavande, and Luis Vasconcelos. American Economic Association Marrying Up: The Role of Sex Ratio in Assortative Matching. *American Economic Journal: Applied Economics*, 3(3):124–157, 2011.
- [2] Maja Adena, Ruben Enikolopov, Maria Petrova, Veronica Santarosa, and Ekaterina Zhuravskaya. RADIO AND THE RISE OF THE NAZIS IN PREWAR GERMANY\*. *The Quarterly Journal of Economics*, pages 1885–1939, 2015.
- [3] Toke S Aidt and Bianca Dallal. Female voting power: the contribution of women’s suffrage to the growth of social spending in Western Europe (1869-1960). *Public Choice*, pages 391–408, 2008.
- [4] Nava Ashraf, Erica Field, and Jean Lee. Household Bargaining and Excess Fertility: An Experimental Study in Zambia âĀĀ. *American Economic Review*, 104(7):2210–2237, 2014.
- [5] Lori Beaman, Raghavendra Chattopadhyay, Esther Duflo, Rohini Pande, and Petia Topalova. Powerful Women: Does Exposure Reduce Bias? <sup>\*</sup>. *Quarterly Journal of Economics*, 124(4):1497–1540, nov 2009.
- [6] Lori Beaman and Andrew Dillon. Diffusion of agricultural information within social networks: Evidence on gender inequalities from Mali. *Journal of Development Economics*, 133:147–161, jul 2018.
- [7] Gary S Becker. A Theory of Marriage : Part I. *Journal of Political Economy*, 81(4):813–846, 1973.
- [8] Najy Benhassine, Florencia Devoto, Esther Duflo, Pascaline Dupas, and Victor Pouliquen. Turning a Shove into a Nudge? A "Labeled Cash Transfer" for Education. *American Economic Journal: Economic Policy*, 7(3):86–125, 2015.
- [9] Marianne Bertrand, Sandra E Black, Sissel Jensen, and Adriana Lleras-Muney. Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labour Market Outcomes in Norway and ADRIANA LLERAS-MUNY UCLA and NBER 192 REVIEW OF ECONOMIC STUDIES. *Review of Economic Studies*, 2019.

- [10] Elizabeth Brainerd. THE LASTING EFFECT OF SEX RATIO IMBALANCE ON MARRIAGE AND FAMILY: EVIDENCE FROM WORLD WAR II IN RUSSIA. *The review of Economics and Statistics*, 2017.
- [11] National Women’s Education Center. Gender statistics database.
- [12] Stefano Dellavigna and Matthew Gentzkow. Persuasion: Empirical Evidence. *Annual Review of Economics*, 2010.
- [13] Matthias Doepke, Michè Le Tertilt, and Alessandra Voena. The Economics and Politics of Women’s Rights. 2012.
- [14] Esther Duflo. Women Empowerment and Economic Development. *Journal of Economic Literature*, 50(4):1051–1079, 2012.
- [15] Esther Duflo and Raghavendra Chattopadhyay. Women as Policy Makers : Evidence from a Randomized Policy Experiment in India. *Econometrica*, 72(5):1409–1443, 2004.
- [16] Office of the Secretary General Economic Stabilization Agency, Planning Department. Overall Report of Damage Sustained by the Nation During the Pacific War. Technical report, 1949.
- [17] Erica Field. Fertility Responses to Urban Land Titling Programs: The Roles of Ownership Security and the Distribution of Household Assets. 2003.
- [18] Stefano Gagliarducci, Massimiliano Gaetano Onorato, Francesco Sobbrino, and Guido Tabellini. War of the Waves: Radio and Resistance During World War II. *Ssrn*, 12746, 2017.
- [19] Robert Jensen and Emily Oster. The Power of TV: Cable Television and Women’s Status in India. Technical Report 3, 2009.
- [20] Yoshie Kobayashi. *A Path Toward Gender Equality: State Feminism in Japan*. Routledge, 2004.
- [21] Michael Kvasnicka and Dirk Bethmann. World War II, Missing Men, and Out-of-Wedlock Childbearing. *The Economic Journal*, 123(567):162–194, 2012.



- [22] Eliana La Ferrara, Alberto Chong, and Suzanne Duryea. Soap Operas and Fertility: Evidence from Brazil. *American Economic Journal: Applied Economics*, 2012(4):1–31, 2012.
- [23] John R Lott and Lawrence W Kenny. Did Women’s Suffrage Change the Size and Scope of Government? *Journal of Political Economy*, 107(6), 1999.
- [24] Shelly J Lundberg, Robert A Pollak, and Terence J Wales. Do Husbands and Wives Pool Their Resources? Evidence from the United Kingdom Child Benefit. *The Journal of Human Resources*, 1997.
- [25] Catherine A. Luther and Douglas A. Boyd. American Occupation Control over Broadcasting in Japan, 1945–1952. *Journal of Communication*, 47(2):39–59, 1997.
- [26] J. Marlene Mayo. The War of Words Continues: American Radio Guidance in Occupied Japan. In *The Occupation of Japan: Arts and Culture*. Norfolk, VA, 1988.
- [27] Grant Miller. WOMEN’S SUFFRAGE, POLITICAL RESPONSIVENESS, AND CHILD SURVIVAL IN AMERICAN HISTORY\*. *The Quarterly Journal of Economics*, 2008.
- [28] Kota Ogasawara and Mizuki Komura. Consequences of War: Japan’s Demographic Transition and the Marriage Market. 2018.
- [29] Miho Ogino. *Kazoku Keikaku e no Michi: Kindai Nihon no Seishoku o Meguru Seiji*. Iwanami Shoten, 2008.
- [30] Tadanobu Okabe. *The 50 years of Japanese Radio 1925-75*. Japan Radio Museum, Matsumoto, Japan, 2018.
- [31] Miyako Okahara. *America senryoki no minshuka seisaku*. 2007.
- [32] Susan Pharr. The Politics of Women’s Rights. In *Policy and Planning During the Allied Occupation of Japan*, chapter 8. University Press of Hawaii, 1987.
- [33] Susan Smulyan. Now It Can Be Told: the Influence of the United States Occupation on Japanese Radio. In *Radio Reader: Essays in the Cultural History of Radio*, chapter 14. Routledge, 2002.

- [34] David Stroemberg. Radio's Impact on Public Spending. *Quarterly Journal of Economics*, 119(1):189–221, 2004.
- [35] David Strömberg. Media Coverage and Political Accountability. In *Handbook of Media Economics*, pages 595–622. 2015.
- [36] Jakob Svensson and David Yanagizawa. Getting prices right: The impact of the market information service in Uganda. *Journal of the European Economic Association*, 7(2-3):435–445, 2009.
- [37] Masahi Takagi. Sengo Shoki Nihon ni okeru Jutai Chosetsu Shido. *Fukuoka University Review of Literature & Humanities*, 44, 2012.
- [38] D. Takita, Y. Ogasawara, and K. Kishimoto. Kokusei Chousa (1950 Nen) Shikuchousonbetsu Deeta Beesu Sakusei ni Tsuite. Technical report, Tsukuba University, 2012.
- [39] Yasuko Tama. *Kindai Kazoku to Body Politics*. Sekai Shiso Sha, 2006.
- [40] Christopher Udry. Gender, Agricultural Production, and the Theory of the. Technical Report 5, 1996.
- [41] Chikako Uemura. *Josei kaiho o meguru senryo seisaku*. Sosho jenda bunseki, Tokyo, 2007.
- [42] David Yanagizawa-Drott. Propaganda and Conflict: Evidence from the Rwandan Genocide. 2014.

## A Supplemental figures and tables

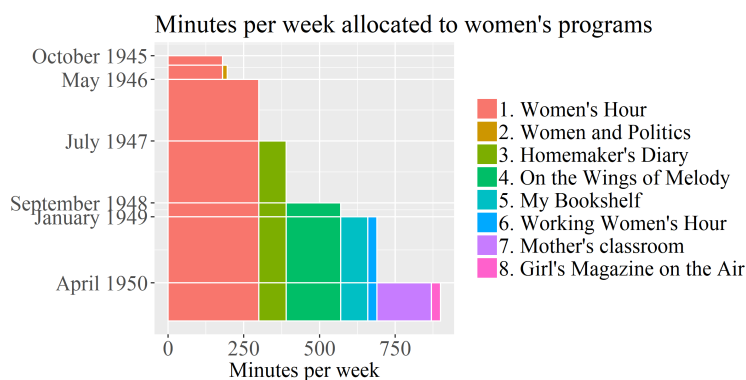


Figure A.7: Airtime allocated to women's programs. Above programs were categorized as "Women's program" by the Japan Broadcasting Corporation. Source: NHK Yearbook (1947, 1949) and GHQ/SCAP CIE Weekly Report (Radio Education Branch, 1946 - 1950).

Table 6: Time line for women's emancipation under Allied Occupation

October 1, 1945	The flagship women's radio program "Women's Hour" was on air for the first time
December 17, 1945	Women were granted voting rights in national elections.
April 10, 1946	House of Representative General Election. Women voted for the first time.
November 3, 1946	New Japanese Constitution was enacted.
1947	Women's and Minor's Bureau was established withing the Ministry of Labor.
1948	Women were allowed to go to college.

Table 7: Data sources

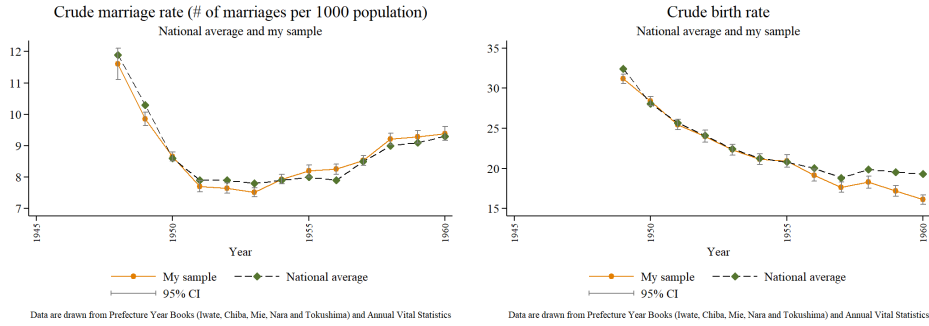
Data source	Variable
Japan Broadcasting Corporation Statistic Report 1946	Post-war radio subscription rate N. of households in 1946
A map on medium wave field strength 1949	Field strength
Latitudes and longitudes of transmitters obtained from Japan Broadcasting Corporation Yearbook 1947 District boundaries year by year provided by Maruyama Lab, Tsukuba University	Distance to a nearby transmitter
Prefecture Annual Statistics Book (annually from 1949 to 1960)	Postwar crude birth rate
The Annual Vital Statistics Report in 1935	Prewar marriage rate and birth rate
Population Census 1940	Prewar labor force participation
Population Census 1950	Postwar labor force participation Industrial composition
News papers	Turnout in the 1946 election by sex
The 22nd House of Representatives election results A list of female candidates provided by Ito (2008)	Female candidate's vote share
Overall Report of Damage Sustained by the Nation During the Pacific War	District-level total casualty during the World War II

Table 8: Radio subscription fees

	Radio subscription fee (monthly)	TV subscription fee (monthly)	Starting teacher salaries (monthly)	Japanese soba noodle unit price
1925	1.00		45.00	0.10
1930	0.75		45.00	0.10
1933	0.75		55.00	0.10
1937	0.50		55.00	0.13
1941	0.50		55.00	0.16
1946	2.50		400.00	-
1948	35.00		2000.00	-
1950	35.00		5000.00	15.00
1954	67.00	300.00	7800.00	30.00
1955	67.00	300.00	7800.00	30.00

Source: Okabe (2018 [30]) “*The 50 Years of Japanese Radio 1925-1975*” The Japan Radio Museum.

In real terms radio subscription fees had been declining before the World War II. Table 8 shows the monthly radio subscription fee (in Japanese Yen) from 1925 to 1955 along with the monthly salary for first-year teachers and a unit price for Japanese soba noodles. While inflation accelerated, the Japan Broadcasting Service decreased the monthly fee and made radio more accessible for a wide income-range of Japanese: the fee was 1 Japanese yen compared to 45 yen of starting teacher salaries in 1925. In 1941, however, the fee halved while the teacher salaries moderately grew. After the World War II, the inflation outpaced the increase in nominal subscription fee, and thus the subscription fee further drops in real terms. Therefore, we would less worry that subscription fees deterred low income Japanese from listening to the radio.

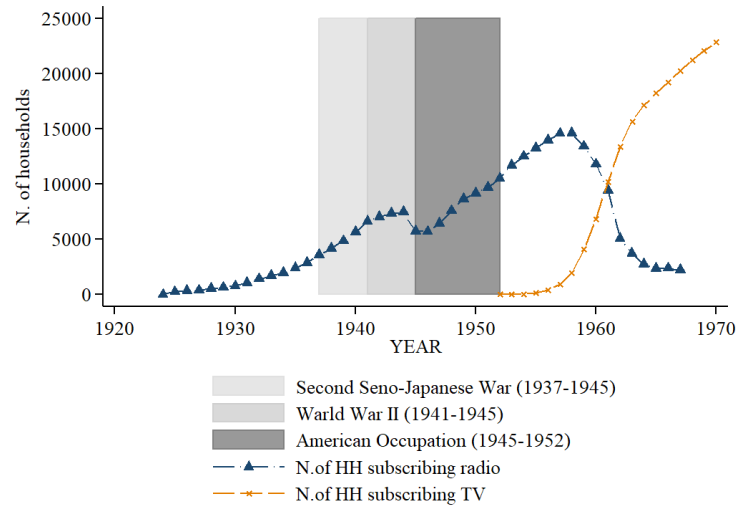


(a) The annual marriage rate

(b) The annual birth rate

Figure A.8: Annual marriage and birth: comparing the national average and the average in my sample

Figure A.9: Radio and TV subscriptions



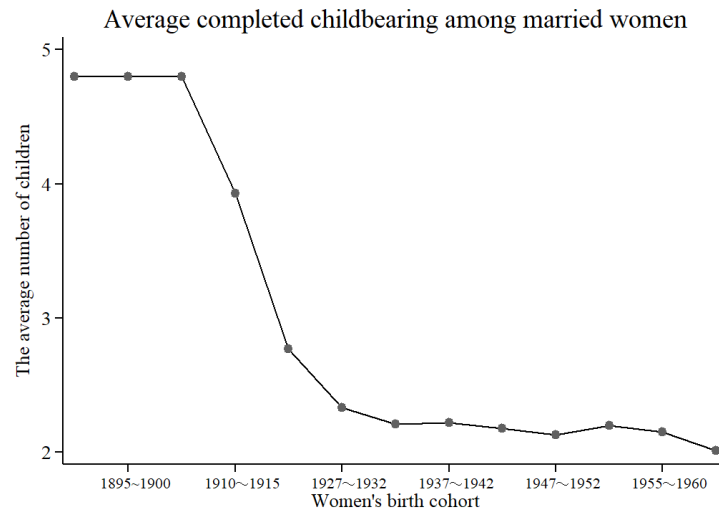


Figure A.10: Average number of children per married woman. Data are drawn from Census and Vital Statistics and compiled by the National Institute of Population and Social Security Research. Okinawa prefecture is not included during 1947-1970. Female population include foreign citizens who were living in Japan until 1940 but only Japanese citizens in 1941 and onward.

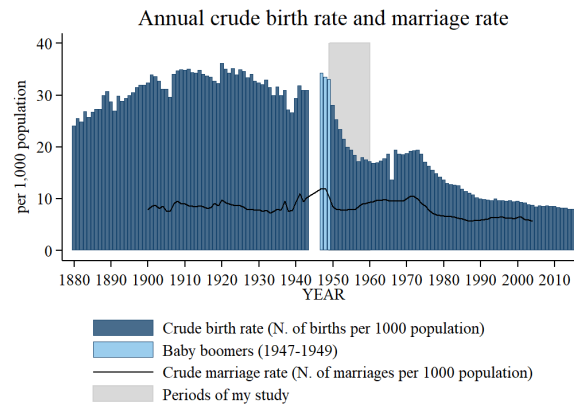


Figure A.11: The number of births per 1,000 population in Japan from 1880 to 2015

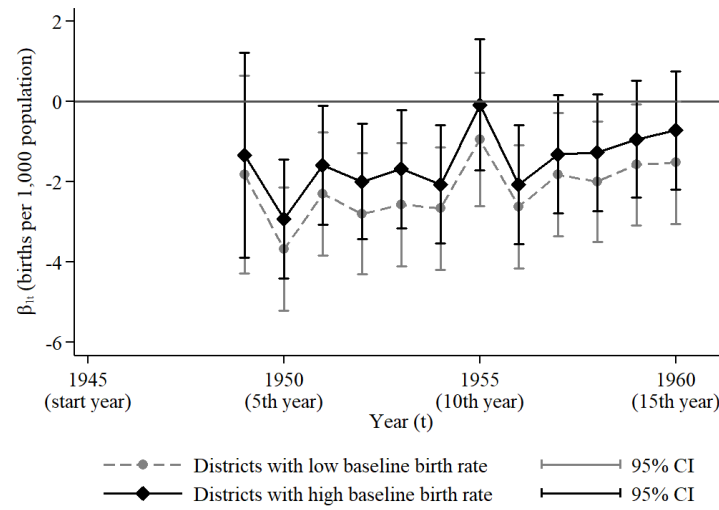


Figure A.12: Heterogenous impacts of the radio exposure on birth rates. The radio exposure is in standard deviation unit. Regressions include the full set of control variables presented in the equation (2). The sample is split into two groups, based on the baseline birth rate compared to its median.