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Women's educational attainment, marriage, and fertility: Evidence from the 1944 G.I. Bill☆

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ABSTRACT

In contemporary settings, greater earnings among women are typically associated with reduced marriage rates and lower fertility. One way that women's earnings may increase is via changes in educational attainment. To study whether educational attainment affects marriage and fertility choices in a historical setting, I rely on the variation in educational attainment among female WWII veterans created by the 1944 G.I. Bill. Using data from the long-form 1980 census, I first show that WWII veteran status is associated with reduced rates of marriage, increased age at first marriage, and lower fertility, which suggests that G.I. Bill-related education could have had an important effect for veteran women. I then use age at the time of the G.I. Bill announcement as an instrument to establish a causal effect of educational attainment on marriage and fertility outcomes among female veterans. My instrumental variable estimates suggest that each year of G.I. Bill-induced educational attainment is associated with an 8 percentage point decrease in the probability of ever getting married, a 4.7 year increase in age at first marriage, and a 0.67 reduction in the number of children. Using age at the time of the G.I. Bill announcement as an instrument is valid because the benefits could not have been easily anticipated, women had to be 21 to enlist, and the generosity of one's G.I. Bill benefits depended on the number of years of WWII service.

1. Introduction

Women have achieved substantial progress in recent decades, surpassing men in educational attainment and entering the labor market in greater numbers while also seeing their earnings increasingly converge with those of men (Goldin, 2014; Blau and Kahn, 2017). These changes mean that women face new decisions about marriage and fertility. In particular, because paid employment is a substitute for home production, theory and evidence suggests that improved labor market opportunities for women decreases marriage rates, has a positive effect on spousal quality (e.g., in terms of earnings or education), and tends to be associated with lower fertility (Becker, 1965; Becker, 1973; Schaller, 2016; Kearney and Wilson, 2018; Shenhav, 2021).[1] Existing evidence on this issue, however, focuses on contemporary settings. In contrast, changes in fertility and family formation choices began to occur during the

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[1] It is worth noting that education and marriage rates are positively correlated. The available causal evidence, however, suggests greater education reduces marriage rates, all else equal. See Isen and Stevenson (2010) for more information on marriage rates and education over time and Shenhav (2021) for causal evidence on this issue.

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first half of the twentieth century. As an example, Guinnane (2011) shows that fertility per 1,000 U.S. persons declined from 30 in 1900 to fewer than 17 in 1970.[2]

In this paper, I use the variation created by the 1944 G.I. Bill to study how greater educational attainment and improved labor market opportunities affected women's marriage and fertility choices in a historical setting. The G.I. Bill (officially, the "Serviceman's Readjustment Act") provided generous educational benefits to returning World War II (WWII) veterans.[3] Bound and Turner (2002) and Stanley (2003) show that male veterans used their G.I. benefits to significantly increase their educational attainment. Complementing those findings, in previous work I estimate that female WWII veterans were 19 percentage points more likely to have attended college and 7.8 percentage points more likely to have completed college relative to comparable non-veteran females (Lennon, 2021). Moreover, each year of G.I. Bill-induced education led to an 11.6 percent increase in annual employment income.

To examine how the G.I. Bill affected marriage and fertility choices, I use data on female WWII veterans born between 1919 and 1925 who appear in the 1980 5% Census Public-use Microdata Sample (PUMS). The 1980 Census was the first where women were asked about military service. My analysis focuses on women born between 1919 and 1925 because they were old enough to serve in WWII (women had to be at least 21 to enlist) but young enough to be unmarried and in a position to benefit from using their G.I. Bill benefits to attend college.[4]

I first provide descriptive estimates that show that female veterans who were high school graduates and born between 1919 and 1925 were 2.7 percentage points less likely to ever have married, report being 2.1 years older at the time of their first marriage, and were 5.1 percentage points less likely to have had any children relative to non-veterans when surveyed in 1980. However, differences in marriage and fertility decisions among veterans and non-veterans are not necessarily related to the G.I. Bill's impact on educational attainment and future labor market outcomes. For example, even if G.I. benefits led to greater educational attainment among female veterans, selection into the military might have been otherwise correlated with future marriage and fertility plans. Further, the experience of serving in the military could have affected labor market outcomes leading to differences in marriage and fertility outcomes for female veterans relative to non-veterans.

To address potential selection issues, my main estimates use age at the time of the announcement of the G.I. Bill as an instrument for educational attainment as measured by years of college completed. The instrument aids identification because G.I. benefits were determined based on length of service, ensuring that those who were old enough to enlist earlier in the war effort would receive more post-service support, on average. In these estimates, my sample is limited to only veteran women ensuring that my estimates cannot be easily explained by the experience or skills gained from serving in the military. In Section 2, I provide details about how G.I. Bill benefits were earned and why they could not have been easily anticipated by enlistees.

My instrumental variables estimates suggest that that each year of G.I. Bill-induced educational attainment is associated with an 8 percentage point decrease in the probability of ever getting married, a 4.7 year increase in age at first marriage, and a 0.67 (28%) reduction in the number of children among female veterans. Because age in 1944 is not likely to be otherwise correlated with unobserved differences in marriage and fertility intentions among female veterans born between 1919 and 1925, my IV estimates ease concerns that veterans who attended college because of the G.I. Bill would have experienced different marriage and fertility outcomes absent any additional education.[5]

My findings add historical evidence to complement the work of Blau et al. (2000), Bertrand et al. (2015), Schaller (2016), Huttunen and Kellokumpu (2016), Kearney and Wilson (2018), Autor et al. (2019), and Shenhav (2021), who each study how changes in relative labor market conditions for men and women affect marriage market outcomes and/or fertility decisions in contemporary settings. For example, Shenhav (2021) focuses on women aged between 22 and 44 from the 1980–2000 Censuses and the 2010 American Community Survey. Using a Bartik approach (Bartik, 1991) Shenhav finds that a 10% increase in the relative wage for women leads to a 16% increase in the proportion of women who are married to a highly-educated spouse, a 3.1 percentage point increase in the proportion of women who have not been married, a 1.7 percentage point increase in the proportion of women who are divorced, and reduces the proportion of women who have children by 5%.[6]

By studying marriage and fertility among female veterans in a historical context, I make three unique contributions to the literature. First, while several studies examine the impact of WWII on educational attainment, labor market outcomes, and family formation for *non-veteran* women (Kossoudji and Dresser, 1992; Acemoglu et al., 2004; Jaworski, 2014; Bellou and Cardia, 2016; Rose, 2018), my work is the first to document that WWII led to significant changes in marriage and fertility choices for veteran women via G.I. Bill-induced educational attainment. Second, during the 20th century, women's educational attainment increased significantly, while marriage rates and fertility declined over the same period (Mulligan and Rubinstein, 2008; Goldin, 2014).[7] While I focus only on

[2] See Figure 1, p. 519 of Guinnane (2011).

[3] These benefits were sufficient to cover the cost of tuition at Ivy-league schools while also providing a relatively generous monthly living stipend. See Section 2 for more information.

[4] The National Museum for the U.S. Army states that female enlistees had to be "high school graduates between 21 and 45 years of age." See https://armyhistory.org/skirted-soldiers-the-womens-army-corps-and-gender-integration-of-the-u-s-army-during-world-war-ii/, (last accessed 12/13/2021). See Section 2 (and Ziobro, 2012) for more details on enlistment requirements.

[5] Note that, except for a short time period in the naval service and limits on same-branch marriages, marital status did not preclude service. See http://www.beta.womensmemorial.org/marriage-policy (last accessed 12/8/2021).

[6] Shenhav leverages two sources of variation to develop her Bartik instrument: changes in wages and differential specialization across sexes and marriage markets by occupation and industry.

[7] Those patterns have continued into the 21st century. Blau and Kahn (2017) show that, by 2011, women had higher average levels of education (by 0.2 years, on average) and were 2.8 percentage points more likely to have an advanced degree than men.

veteran women, my findings are consistent with the idea that there is a causal relationship at the heart of those trends. Finally, my approach provides an historical estimate of the effect of educational attainment on marriage and fertility during a uniquely interesting period in the economic history of American women. In contrast, prior work in economic history focuses mainly on explaining reductions in fertility relating to macroeconomic changes prior to WWII. Guinnane (2011) provides a comprehensive review of that work while Wanamaker (2012) and Kitchens and Rodgers (2020) offer further recent examples.

To support a causal interpretation for my findings, I show that marriage rates at the time of enlistment (using hand-collected Women's Army Corps enlistee records) cannot explain my findings. Further, I show that there are no comparable effects for non-veteran women. If my findings were driven by pre- or post-war economic events or the indirect impacts of male enlistment and their G.I. benefits, we would expect to see similar effects on marriage and fertility outcomes for women who were not veterans. One limitation of my analysis, however, is that I cannot completely isolate the effects of the G.I. Bill's impact on educational attainment. It is at least possible that some of the effects I observe are related to how longer periods of military service affected skills, the depth of social ties, and prospective marriage partners. While it is not immediately clear how each of these aspects would affect the outcomes I study, a more conservative interpretation for my findings would be to consider any impacts on fertility or marriage as being the joint effect of longer periods of military service and greater G.I. Bill benefits.

In Section 2, I provide more information on WWII and the 1944 G.I. Bill. In Section 3, I summarize the 1980 5% Census Public-Use Microdata Sample and describe my approach to estimation. I present my main findings in Section 4. I offer concluding remarks in Section 5.

2. G.I. bill background, the effects of WWII, and the economics of marriage and fertility

The United States officially entered WWII after the 1941 attack on Pearl Harbor. Congress began preparations for war, however, with the passage of the Selective Training and Service Act (the "draft") in September of 1940. According to the Department of Veteran's Affairs, more than 16 million Americans served during WWII, including over 330,000 women.[8] While men had to be aged 18 or older and pass mental and physical fitness requirements, Ziobro (2012) explains that women had to be at least 21 and a high-school graduate to enlist. Female enlistees served in non-combat roles typically within dedicated women-only military branches including the Women's Army Corps (WAC), the Women Airforce Service Pilots (WASP), and the Women Accepted for Volunteer Military Services (WAVES).[9]

In June of 1944, to help veterans readjust to civilian life, Congress passed the nation's first G.I. Bill ("Servicemen's Readjustment Act"), providing generous educational benefits to all individuals who had served in the U.S. armed forces during the World War II period. Educational benefits began to accrue after completing a minimum of one year of training plus service. Veterans earned an additional month of benefits for each month of service, with four years of benefits being the maximum possible (Stanley, 2003). Using their benefits, those who chose to attend college could do so tuition-free up to $500 while also receiving a cost of living stipend of $50 per month. For context, average tuition in 1948 was just over $400 at private universities and the federal minimum wage was 40 cents per hour.[10] With the help of the G.I. Bill's educational benefits, more than 2.2 million WWII veterans pursued a college education in the years following the war.[11] It is worth noting that the G.I. Bill's benefits could not have been easily anticipated - even as late as mid-1944 - because the G.I. Bill passed the U.S. Senate by just a single vote.[12]

While more than 300,000 women served in the military during WWII, the economics literature on the WWII G.I. Bill focuses on male veterans. For example, Bound and Turner (2002) use data from the 3 percent 1970 Census sample to examine the collegiate attainment of white male WWII veterans. Comparing veterans to non-veterans in the most-affected birth cohorts, they find that serving in WWII was associated with more than a 100 percent difference in college completion rates along with similar effects on the number of years of college completed.[13] Although his focus is mainly on Korean War veterans, Stanley (2003) reports that the Korean War and WWII G.I. Bills "increased total post-secondary attainment among all men born between 1921 and 1933 by about 15 to 20 percent" (p. 671). Other work on later-life outcomes for veterans, not limited to WWII veterans, also tends to focus on males including Angrist (1993), Angrist and Krueger (1994), and Card and Lemieux (2001).

When considering how WWII affected women, the literature has examined labor force participation decisions (Kossoudji and Dresser, 1992; Acemoglu et al., 2004; Rose, 2018), labor demand (Shatnawi and Fishback, 2018), marriage and fertility decisions (Larsen et al., 2015; Doepke et al., 2015), and later occupational choices (Bellou and Cardia, 2016). In each of these studies, the data would naturally include a small number of women who were veterans, even if they cannot be identified from the data. Focusing on the effect of WWII G.I. Bill benefits on female veterans' educational attainment and later-life earnings, my own earlier work finds that female WWII veterans were 19 percentage points more likely to have attended college and 7.8 percentage points more likely to have completed college compared to non-veteran women (Lennon, 2021). I also find an 11.6 percent increase in employment income

[8] See https://www.benefits.va.gov/persona/veteran-world_war_II.asp (last accessed 12/27/2021).

[9] To a lesser degree, women also served in the Marines and the Coast Guard. See https://libguides.mnhs.org/wwii_women (last accessed 12/12/2021). See Appendix B of Lennon (2021) for more on the variations in requirements for women across each branch of the military.

[10] See p.676 in Stanley (2003) for more information on benefits and tuition costs in the late 1940s. See https://www.dol.gov/agencies/whd/minimum-wage/history/chart for historical federal minimum wage information (last accessed 8/5/2021).

[11] For more on this, see the Department of Veteran's Affairs - https://www.benefits.va.gov/gibill/history (last accessed 9/18/2021).

[12] Rep. John Gibson had to be "rushed" to the Capitol to cast the tie-breaking vote. See https://www.benefits.va.gov/gibill/history.asp (last accessed 12/27/2021).

[13] My summary of Bound and Turner's findings refers to their estimates for the 1923 to 1928 male birth cohorts.

per year of G.I. Bill-induced education, when using an instrumental variables approach. While around 60,000 women served in the Army Nurse Corps (Bellafaire, 1993), most female veterans were employed as typists, administrative assistants, mail sorters, or in other clerical roles, I found increases in educational attainment and earnings persist even among veterans who are neither nurses or doctors in 1980. It is worth noting that women were not conscripted into service and were not required to serve for any particular period of time, which likely generates substantial variation in the quantity of G.I. benefits women received. In contrast, men were drafted into service for the duration of the war effort leading to less variation in benefit generosity; Stanley (2003) estimates that more than 80% of male veterans qualified for four full years of educational benefits, which was the maximum possible benefit.

The theoretical work of Becker (1973) and Shenhav (2021) would predict that increases in educational attainment and earnings among female veterans due to G.I. Bill benefits would lead to fewer marriages and higher quality spouses. For example, Becker (1973) shows that the gains from household specialization decrease when expected women's earnings increase relative to men's earnings leading to an overall decrease in the benefit of getting married relative to remaining single. Shenhav (2021) extends Becker's model to predict that as their relative earnings increase, women work more and the threshold for acceptable husband quality rises, leading to fewer marriages and higher-quality husbands among those that do marry. Shenhav's own careful empirical work and the findings of Blau et al. (2000), Bertrand et al. (2015), Kearney and Wilson (2018), and Autor et al. (2019) provide support for Becker and Shenhav's theoretical predictions, with each finding that relative gains in women's earnings, either via absolute increases in women's earnings or declines in men's earnings, lead to fewer marriages.

To the extent that fertility occurs within marriage, especially during the middle of the 20th century, fewer marriages can be expected to reduce overall fertility. However, Becker (1965) highlights that the relationship between women's earnings and fertility is largely an empirical issue. If children can be viewed as normal goods, an increase in income would tend to increase fertility. On the other hand, improved labor market opportunities for women raise the opportunity cost of caring for children. Therefore, the overall effect on fertility is ambiguous. Illustrating the ambiguity, Huttunen and Kellokumpu (2016), focusing on job losses withing existing couples, find that "for every 100 displaced women, there are three fewer children born" (p. 420). However, Huttunen and Kellokumpu's focus on existing couples limits what we can learn about the overall effects of increased earnings on fertility among women. In contrast, Schaller (2016) and Shenhav (2021) find that improvements in womens labor market conditions reduce fertility.

In the next section, I describe my data and how I use the variation in G.I. benefits among female WWII veterans to study whether greater educational attainment affects marriage and fertility choices in a historical setting.

3. Estimation strategy and data

3.1. Data

My analysis focuses on female high school graduates born between 1919 and 1925 who appear in the 1980 5% Census Public-use Microdata Sample (PUMS). As I mention earlier, the sample consists of 1980 Census respondents because it was the first to ask about veteran status for women. One benefit of using 1980 data is that fertility decisions are almost certainly complete for all women born between 1919 and 1925. I eliminate those without a high school diploma from my sample because female WWII enlistees had to be a high school graduate (Bellafaire, 2005; Ziobro, 2012). My estimation sample is restricted to women born in 1925 or earlier because veterans had to be 21 to enlist and the official WWII service period, for the purposes of calculating G.I. Bill benefits, ended in July of 1947.[14] Further, focusing on those born no earlier than 1919 ensures that my sample consists of those young enough to attend college at the end of the war. In addition, limiting the sample to those born in 1919 or later helps to avoid selection relating to marriage and fertility decisions prior to the advent of WWII. Table 1 provides some summary statistics for my sample and shows that average age at first marriage for non-veteran women in my sample is 22.8 years.

The summary statistics in Table 1 also highlight that, in 1980, WWII veterans had higher earnings, more education, were more likely to be white, and were less likely to be married relative to comparable non-veterans. While it is not clear they are related to greater educational attainment, the marital status patterns are particularly noteworthy with veterans being less likely to ever marry or be currently married and more likely to be currently divorced. Further, female veterans' husbands are much more likely to have attended college. Looking at fertility, veterans are less likely to have any children, but have similar numbers of children overall, suggesting any reductions in fertility are primarily coming from changes on the extensive margin. Table 1 also demonstrates patterns of enrollment in the military for women, with 3.26 percent (966 out of a total of 30,596) of women born in 1919 reporting that they were WWII veterans. That proportion rises to 4.54 percent of those born in 1922 before declining markedly for those eligible to enlist after 1944. Such a pattern helps to ease concerns that many women entered the army *in response* to the benefits provided by the G.I. Bill.

With the information on cohort sizes by year of birth, I provide the percent of each cohort that attended any college. Notice that women who were born earlier, and therefore eligible to enlist in the war effort sooner, are more likely to report having attended college. The same pattern is not evident among non-veterans. The difference in female veterans' educational attainment across birth cohorts suggests that the G.I. Bill might have affected women differently by year of birth. I later exploit this variation to instrument for the G.I. Bill's impact on educational achievement. I describe my approach to estimation in the following section.

[14] Significant demobilization began in 1945. According to the National WWII Museum, "[b]etween September and December 1945, the Army discharged an average of 1.2 million soldiers per month." See https://www.nationalww2museum.org/war/articles/points-system-us-armys-demobilization. Also, see https://armyhistory.org/skirted-soldiers-the-womens-army-corps-and-gender-integration-of-the-u-s-army-during-world-war-ii/ for more on the requirements for female enlistees (last accessed 12/13/2021).

Table 1
Summary statistics.

		WWII Veterans		Non-Veterans		All women	
		Summary Statistic	Std. Dev.	Summary Statistic	SD	Summary Statistic	Std. Dev.
% in Labor Force		57.5		52.8		62.3	
Annual Earnings (if working)		$11,597	8592	$ 9518	7116	$ 9420	7151
% Any College		53.8		33.5		36.2	
% Completed College		21.7		13.5		15.7	
Years of College Completed	0	4,160		164,443		126,050	
	1	863		20,397		15,943	
	2	1,151		20,944		16,969	
	3	876		8253		7,662	
	4	1,029		19,222		17,490	
	5+	926		14,036		13,423	
Year Born (Number, % attended any college)	1919	966 (60.8)		29,630 (33.7)			
	1920	1371 (60.8)		33,915 (33.6)			
	1921	1615 (56.4)		35,027 (33.9)			
	1922	1686 (53.3)		35,434 (33.5)			
	1923	1641 (49.9)		36,328 (32.8)			
	1924	1227 (46.5)		38,317 (33.1)			
	1925	499(45.7)		38,644 (34.0)			
% Ever Married		92.5		95.1			
% Currently Married		69.3		73.7		77.5	
% Spouse Attended College		48.6		37.6			
Age at First Marriage		24.9		22.8			
% Any Children		79.8		84.7			
No. of Children		2.42		2.49			
No. of Children (if ever married)		2.61		2.61			
% Currently Divorced		23.0		18.6			
Race	% White	97.4		93.1		91.2	
	% Black	1.9		5.4		6.8	
	% Other	0.7		1.5		2.0	
Observations		9,005		247,295		197,537	

Data: Female high-school graduates born between 1919 and 1925 who appear in the 1980 Census 5 Percent Public Use Micro Sample. Observation count refers to veterans and non-veterans who meet the sample selection criteria. There are fewer observations when a summary statistic is conditioned on working or marriage status/history.

3.2. Estimation

Before attempting to isolate the effect of G.I. Bill-induced education on marriage and fertility outcomes for veteran women, I first describe the association between years of college completed and my outcomes of interest. My econometric specification is as follows:

$$Y_i = \alpha + \beta \times years_i + X_i\Pi + \epsilon_i. \tag{1}$$

In the estimating equation, Y_i represents various marriage (marriage, divorce, spousal educational attainment, age at first marriage) and fertility (any children, number of children) outcomes of interest for woman i. On the right hand side of the equation, $years_i$ refers to years of college education completed, X_i refers to demographic controls and fixed effects, and ϵ_i represents an idiosyncratic error term. In this framework, β tells us the association between one additional year of college education and outcome Y_i. Note that the coefficient cannot be considered a causal effect because individuals choose their education.

Next, I examine differences in outcomes for veteran women relative to comparable non-veterans. The general specification is as follows;

$$Y_i = \alpha + \tau D_i + X_i\Psi + \varepsilon_i. \tag{2}$$

Equation (2) is similar to equation (1), except that the specification now includes a binary indicator D_i that equals one for those who report being a World War II veteran and zero otherwise. In this framework, τ tells us the difference in outcome Y_i for veterans relative to non-veterans. Again, the coefficient cannot be viewed as a measure of the causal effect of being a WWII veteran or the G.I. Bill's benefits as selection into the military was voluntary for women.

Instead, to establish a causal relationship between G.I. Bill-induced education and marriage and fertility choices, I employ a two-stage least squares instrumental variables approach, instrumenting for years of college using age at the time of the G.I. Bill's announcement. As Stanley (2003) explains, G.I. benefits were based on length of service meaning that, on average, female veterans who were old enough to enlist earlier in the war could obtain more educational benefits, providing me with a valid instrumental variable. To give an example, a woman born in 1920 could enlist in 1941, while one born in 1922 could not enlist until 1943. Given the G.I. Bill was unexpected and applied retroactively, it therefore generated variation in educational benefits that is unlikely to be

Table 2
Association between years of college, WWII veteran status, and marriage and fertility outcomes.

	(1) Ever Married	(2) Age at 1st Marriage	(3) Spouse Attended College	(4) Currently Divorced	(5) Any Children	(6) Number of Children	(7) Number of Children (if Married)	(8) Number of Children (if any Children)
Panel A - Years of College								
Years of College Completed	–0.013***	0.472***	0.121***	–0.002***	–0.017***	–0.025***	–0.010***	–0.004***
	(0.000)	(0.007)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Panel B - Veteran Status								
WWII Veteran	–0.027***	2.093***	0.100***	0.042***	–0.051***	–0.017**	0.011	0.044***
	(0.003)	(0.059)	(0.006)	(0.005)	(0.004)	(0.008)	(0.008)	(0.007)
Panel C - Interaction Estimates								
Years of College Completed	–0.013***	0.456***	0.121***	-0.002***	-0.017***	-0.025***	-0.011***	-0.005***
	(0.000)	(0.007)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
WWII Veteran	–0.013***	1.809***	0.043***	0.047***	–0.037***	-0.007	0.006	0.036***
	(0.003)	(0.076)	(0.008)	(0.006)	(0.006)	(0.011)	(0.010)	(0.009)
Veteran × College Years	–0.004**	–0.004	–0.011***	-0.003	-0.002	0.003	0.008*	0.007*
	(0.002)	(0.034)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)
Observations	256,326	243,570	188,616	243,570	256,326	256,326	243,570	216,780
Mean of Dep Var	0.950	22.83	0.380	0.187	0.846	2.491	2.616	2.946

Data: 1980 PUMS 5 Percent Census Sample. Standard errors, corrected for heteroskedasticity, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. I restrict the sample to female, high-school graduates, who turned 21 between 1940 and 1946. Non-veterans are, therefore, female high-school graduates born between 1919 and 1925 who do not enlist in the armed forces during the WWII period. In Panel A, the estimates reflect the association between years of college education and the noted outcome. In Panel B, the estimates show the association between veteran status and the outcome of interest. In Panel C, I include the indicator for veteran status, the number of years of college education, and the interaction of the two, in a single specification to show that veterans experienced similar effects from additional years of college education conditional on being a veteran.

related to prior or planned educational attainment or unobserved ability. The untestable exclusion restriction is naturally that the quantity of G.I. benefits affects marriage and fertility choices among veterans only via its effects on educational attainment. My first stage specification, where $Age\ in\ 1944_i$ refers to the age (in years) of individual i, is;

$$years_i = \alpha + \gamma(Age\ in\ 1944_i) + X_i\Delta + \nu_i. \tag{3}$$

I then use the predicted years of education, $\widehat{years_i}$, to establish the causal effect, δ, of an additional year of education on outcome Y_i as follows;

$$Y_i = \chi + \delta(\widehat{years_i}) + X_i\Omega + \upsilon_i. \tag{4}$$

In the next section, I examine the effects of WWII veteran status and the 1944 G.I. Bill on marriage, divorce, spousal quality, and fertility. I also address several potential threats to identification, such as the influence of pre-enlistment marital status and education on my estimates and the validity of my IV strategy, including the possible confounding role of military service duration on these outcomes independently of G.I. Bill educational benefits.

4. Main findings

Table 2 provides descriptive estimates of the association between veteran status, educational attainment, and marriage and fertility outcomes. In each specification, I include state fixed effects along with controls for age (measured in quarters) and race.[15] In the estimates in Panel A of Table 2, the coefficients refer to the association between one additional year of college education and the outcome variable for female high school graduates born between 1919 and 1925 who appear in the 1980 5% Census Sample. When the outcome variable is an indicator, my estimates come from a linear probability model estimated via OLS, which means that the coefficients should be viewed as percentage point differences. For example, the -0.013 coefficient in column (1) indicates that each year of college education is associated with a 1.3 percentage point lower probability of ever having married, at least by 1980. In contrast, when the outcome is a count variable, such as the number of children, I use a Poisson specification. Poisson regression coefficient estimates represent differences in the log of the expected counts for a one unit change in the independent variable. For values close to zero, the coefficients therefore approximate a percent change. For example, in column (6) of Panel A, the coefficient estimate suggests that each year of education is associated with 2.5% fewer children. We can see from the estimates that decreased marriage rates perhaps explain much of this lower fertility as the difference in fertility is significantly smaller conditional on ever marrying and among those who have any children. In Panel A, each additional year of college is also associated with later marriage, greater spousal educational attainment, and a lower divorce probability.

[15] See Lennon (2023) for the replication files for this project.

In Panel B, I provide estimates of the association between WWII veteran status and the outcomes of interest. Here, non-veterans are female high-school graduates born between 1919 and 1925 who do not enlist in the armed forces during the WWII period. In the estimates, we can see that veteran status is associated with a 2.7 percentage point lower probability of ever having been married by 1980, being 2.1 years older at the time of first marriage, a 10 percentage point greater probability that one's spouse attended college, a 4.2 percentage point larger proportion who report being divorced, and a 5.1 percentage point lower proportion who have any children. However, the number of veterans who do not have children is balanced by female veterans having 4.4% more children conditional on having at least one child, leading to only 1.7% fewer children among veterans overall.

In Panel C, I present estimates from specifications where I include the indicator for veteran status, the count of years of college completed, and the interaction between the two terms. The coefficients on the veteran status indicator are significantly attenuated when including years of college completed, indicating that greater educational attainment may be an important explanation for differences in veterans' marriage and fertility outcomes. However, the value of this specification is provided mainly by the interaction term, which tells us the association between additional educational attainment for veterans and marriage and fertility outcomes relative to the same estimates for non-veterans. If years of college completed led to the same differences in outcomes for veterans and non-veterans, then the interaction term coefficient in each specification would be zero. Instead, the interaction term in each specification is not zero but it is relatively small in magnitude when compared to the main effect of either veteran status or years of college. For example, the estimates in column (1) of Panel C suggest that an additional year of college and veteran status are both associated with a 1.3 percentage point lower probability of ever being married. However, among veterans, one additional year of college is associated with a further 0.4 of one percentage point lower probability of ever being married. Similarly, each year of college completed is associated with a 12.1 percentage point larger proportion of non-veterans' spouses who attended college and an 11 percentage point larger proportion among veterans. The other interaction coefficient estimates are not statistically significantly different from zero at the 5% confidence level. Overall, these estimates show there is no reason to suspect that additional education for veterans affects outcomes very differently to non-veterans. This matters because it speaks to the external validity of my estimates. Specifically, it is plausible that the effects of G.I. Bill-induced education can inform us about the broader historical effects of educational attainment on marriage and fertility outcomes.

Given veterans had access to G.I. benefits, and given existing work shows that female veterans used those benefits to attend college, the estimates in Table 2 suggest that it is possible that veterans were less likely to choose to subsequently get married and have lower fertility *because* of their additional educational attainment. However, as I explain in Section 3, attributing causation is not possible when comparing veterans to non-veterans. Even if the additional education of female veterans always occurred only after their period of military service and only because of the G.I. Bill's educational benefits, it is still possible that selection into the military was otherwise correlated with intended marriage and fertility decisions.

To isolate how increased education relating to the G.I. Bill affected marriage and fertility for female veterans, I limit my sample to veteran women and use age at the time of the G.I. Bill's announcement to instrument for increased educational attainment, using the two-stage least squares approach that I outline in the previous section. Limiting my sample to only those who report being a veteran helps to avoid confounding relating to (1) selection into military service and its correlation with marriage and fertility choices and (2) the skills developed during military training. To summarize my approach, the idea is that army enlistment patterns, the 1944 announcement of the G.I. Bill, and the fact that longer periods of service granted more G.I. benefits, mean that female veterans born in 1919, and therefore old enough to enlist several years prior to the G.I. Bill's announcement, could take greater advantage of the G.I. Bill's unexpected benefits.

I present the two-stage least squares estimates, alongside descriptive OLS estimates for comparison purposes, in Table 3. All specifications include state fixed effects while also controlling for race. I cannot control for year-quarter of birth in these estimates because I am using age as an instrumental variable. The descriptive OLS estimates in Panel A of Table 3 show that, among veteran women, an additional year of education is associated with reduced marriage rates, later marriages, an increase in spousal quality (i.e., spouse is more likely to have attended college), and fewer children, mainly via an increase in the proportion who do not have any children. These descriptive estimates again suggest that it is possible that the G.I. Bill (via increased education) led to reduced rates of marriage and fertility. Note that the estimates in Panel A of Table 3 refer only to veterans and are therefore not directly comparable to the estimates in Table 2.

My two-stage least squares IV estimates, in Panel B of Table 3, suggest that G.I. Bill-induced educational attainment had large effects on marriage and fertility. Looking first at marriage outcomes, the instrumented effect of an additional year of education is now an 8 percentage point decline in the probability of ever getting married by 1980 and, conditional on ever marrying, a 4.7 year increase in age at first marriage and an 8.8 percentage point lower probability of being divorced. It is challenging to interpret outcomes conditional on marriage, as it is itself affected by the instrument. For example, the 4.7 year increase in age at first marriage is potentially an overestimate if those who select out of marriage due to the treatment would otherwise have married at a relatively younger age. A similar argument can be applied to divorce outcomes.

The first stage F-statistics included in the table demonstrate that my instrument is not weak and the first stage coefficient indicates that being one year older in 1944, relative to other female veterans, was associated with about 0.14 more years of college completed by 1980. However, even if the assumptions for valid IV estimation hold, IV estimates can only be interpreted as local average treatment effects. That is, the coefficients refer to the change in the outcome variable of interest for those induced to obtain additional education because of the treatment (i.e., G.I. benefits). Put differently, they can be interpreted as the effect on the "marginal" student, defined as the student who would not have attended college absent the G.I. Bill's educational benefits. This is a further reason why the estimates using an IV approach can be larger in magnitude than OLS estimates.

Table 3
College educational attainment and marriage and fertility outcomes among female WWII veterans.

	(1) Ever Married	(2) Age at 1st Marriage	(3) Spouse Attended College	(4) Currently Divorced	(5) Any Children	(6) Number of Children	(7) Number of Children (if ever Married)	(8) Number of Children (if any Children)
Panel A - Descriptive Estimates								
Years of College Completed	–0.015***	0.394***	0.109***	–0.003	–0.016***	-0.019***	-0.002	0.003
	(0.002)	(0.034)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)
Panel B - IV Estimates								
Years of College Completed	–0.080***	4.727***	0.097***	–0.088***	–0.143***	-0.280***	-0.195***	-0.100***
	(0.013)	(0.417)	(0.024)	(0.020)	(0.020)	(0.033)	(0.032)	(0.025)
First Stage Coefficient	0.143***	0.143***	0.145***	0.143***	0.143***	0.143***	0.143***	0.147***
	(0.011)	(0.011)	(0.013)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)
First Stage F-Statistic	168.22	129.96	93.62	129.96	168.22	168.22	129.96	97.43
Observations	9006	8333	6238	8333	9006	9006	8333	7183
Mean of Dep Var	0.925	24.85	0.486	0.230	0.798	2.419	2.612	3.033

Data: 1980 PUMS 5 Percent Census Sample. Standard errors, corrected for heteroskedasticity, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In these estimates, I restrict the sample to women who are high-school graduates, who are a WWII veteran, and who turned 21 between 1940 and 1946. In Panel A, the estimates reflect the association between years of college education and the noted outcome for veterans only. In Panel B, the estimates are two-stage least squares instrumental variables estimates using age in 1944 (the time of the announcement of the G.I. Bill) to instrument for completed years of college (see Section 3 for more information). The first stage coefficient refers to the association between age in 1944 (a linear term, measured in years) and years of college completed. The first stage F-statistic in Panel B shows that the instrument is not "weak."

Looking at fertility outcomes, the IV estimates imply each year of college is associated with a 14.3 percentage point decline in the proportion who have any children and a 28% decline in the number of children. Given a sample average of 2.42 children, that amounts to about 0.67 fewer children per G.I. Bill-induced year of additional college education. I find slightly smaller effects conditional on marriage and having any children. Again, I caution against any strong causal interpretation of the conditional outcomes as marriage and fertility are both affected by the instrument, potentially leading to an overestimate of the treatment effect. In particular, age at first marriage is later for those induced to obtain greater education because of their G.I. Bill benefits, limiting potential fertility. In estimates not presented here, when I include age at first marriage as a control variable when examining the number of children among those who were ever married, the coefficient estimate falls to -0.083 with a standard error of 0.041 (significant at the 95% confidence level).

Note that my estimates focus on the effect of additional educational attainment on marriage and fertility. In contrast, much of the related literature focuses on the effect of earnings on those outcomes. I examine the effect of educational attainment for two main reasons. One, the G.I. Bill affected educational attainment directly while affecting earnings only indirectly. Two, my sample consists of women in their late fifties and early sixties in 1980. Focusing only on women who are still working would limit my sample size considerably and might introduce bias as labor force status in 1980 may be dependent on earlier fertility and marriage choices. That being said, it is appropriate to view my estimates as the effect of additional educational attainment and any associated labor market benefits. For completeness, however, I report estimates where I examine the relationship between earnings and marriage and fertility outcomes for veterans (who are still working) as an appendix item. There, I find a similar pattern of estimates when using age at the time of the G.I. Bill's announcement as an instrument for earnings rather than educational attainment. However, due to a combination of indirect effects of the G.I. Bill on earnings and a smaller sample size due to the restriction to working veterans only, the F-statistic from the first stage is weak ($\leq$10) by conventional measures. In the next subsection, I present further evidence to support the use of age in 1944 as an instrument for educational attainment.

4.1. Is age in 1944 a valid instrumental variable?

Table 1 shows that age in 1944 is clearly correlated with educational attainment in 1980, with female WWII veterans who turned 21 earlier being significantly more likely to report having attended college. My instrumental variables approach is valid only to the extent that such a pattern emerges *because* of greater G.I. benefits among those who were old enough to enlist earlier in the war effort. An alternative explanation would be that earlier-born female WWII veterans attended college in greater proportions *before* serving, relative to veterans who were born later. It is not immediately clear why such a pattern would emerge. Leaving aside that administrative records show that more than 19% of female veterans used their G.I. benefits to attend college (Ritchie and Naclerio, 2015, p.339), Lennon (2021) uses a combination of 1940 Census data and Women's Army Corps enlistment records to show that enlistees had comparable educational attainment to women of the same ages in the 1940 census. Therefore, educational attainment at the time of enlistment cannot easily explain the greater educational attainment among female veterans in 1980.

Even if G.I. benefits increased educational attainment among female veterans, however, the additional educational attainment might not be the cause of differences in marriage and fertility rates. For example, veterans born in 1919 or 1920 might have been

Table 4
Marital status in WAC enlistment records.

Age in 1944	Single		Married		Divorced/Widowed		Total	
	N	%	N	%	N	%	N	%
20	4,378	67.7%	1,813	28.0%	274	4.2%	6,465	100.0%
21	4,455	64.1%	2,170	31.2%	324	4.7%	6,949	100.0%
22	5,030	65.5%	2,255	29.4%	389	5.1%	7,674	100.0%
23	8,384	67.9%	3,418	27.7%	553	4.5%	12,355	100.0%
24	5,891	66.4%	2,430	27.4%	555	6.3%	8,876	100.0%
25	4,175	65.8%	1,754	27.7%	413	6.5%	6,342	100.0%
Observations	32,313	66.4%	13,840	28.4%	2,508	5.2%	48,661	100.0%

Source: Women's Army Corps Enlistment Records for women aged 20 to 25 at the time of the G.I. Bill's announcement in 1944 (i.e., veteran women born between 1919 and 1925).

less likely to be married than those who were born in later years, for reasons unrelated to the G.I. Bill's educational benefits. If it was the case that older veterans were less likely to be married by 1944, and then used their G.I. Bill benefits to obtain greater educational attainment (before eventually marrying), that would create a correlation between education and marriage age that is not causal (i.e., later-born veterans married at a younger age and then also had access to fewer G.I. benefits). To address this potential concern, I turn to the publicly-available Women's Army Corps (WAC) Enlistment Records, "scraped" from the United States National Archives.[16] The WAC enlistment records provide educational attainment and other background information including age, race, marital status, and birthplace at the time of enlistment. To closely match my estimation sample, I focus on 48,000 female WAC enlistees who were aged between 20 and 25 at the time of the G.I. Bill's announcement in 1944.[17]

Table 4 presents a summary of marital status at the time of enlistment by age in 1944 (i.e., by year of birth) for female enlistees in the enlistment data. In the table, "single" refers to only those who are not yet married, with a separate category for those who are divorced/widowed. The data illustrates that there is a relatively mild age-marital status gradient, with older women being slightly more likely to have ever married at the time of enlistment. In contrast, the main threat to identification would be if older women were systematically *less* likely to have been married when enlisting, creating a mechanical relationship between increased educational attainment and later marriage. Therefore, there is no evidence to suggest that, at the time of the G.I. Bill, older women who could obtain greater G.I. benefits because they were eligible to enlist earlier in the war effort, were already less likely to be married. It is worth cautioning, however, that the WAC enlistment records refer to women in just one particular branch of the military. While the WAC was the largest women-only branch of the military, it is possible that these records are not representative of female WWII enlistees more generally.

Next, I consider a slightly different concern relating to pre-G.I. Bill marriage decisions. Focusing only on those who were already married in 1944, it could be that the earlier-born veterans were systematically older when they married. In such a case, those who had already married at a later age would have been the same women who could access greater benefits. In turn, even if all marriages that occurred after 1944 were unaffected by educational attainment, I would observe a relationship between age at first marriage and quantity of G.I. benefits. To help rule out this potential source of bias, I present estimates where I eliminate any veterans who report being married prior to 1944 from my sample. In Table 5, the estimates suggest that (1) the number of female veterans who were married prior to 1944 is relatively small (approximately 1 in 6) and (2) any bias introduced by those who were married before 1944 is negligible. Indeed, in most cases, the IV coefficient estimates focused only on those who were not married in 1944 are larger than my main estimates, although the 95% confidence intervals overlap considerably.

Another potential threat to my IV strategy is that other G.I. Bill benefits could affect the outcomes I study. The main benefits that transferred resources to veterans were subsidized mortgage loans and unemployment assistance. However, these benefits were not strongly related to years of military service, whereas it took at least three years of service to earn the maximum educational benefits. For example, WWII veterans only needed 90 days of service to be eligible for subsidized mortgage loans.[18] Notably, even if these loan benefits had been closely related to years of service, women were essentially excluded from banking or obtaining credit until the 1960s (see Krippner, 2017). Unemployment assistance was $20 per week for up to 52 weeks in the 24 months following military discharge. It accrued as 24 weeks for 3 months of service and then 4 more weeks for each additional month of service. As veterans would be eligible for the maximum benefit with less than one year of service, it is unlikely that unemployment assistance could be driving my findings.

A further potential concern with my IV approach is that the conscription of millions of young men and the G.I. benefits they subsequently received could indirectly be driving my findings. For example, Fetter (2013) shows that subsidized mortgage loans for WWII and Korean War veterans had large impacts on home-ownership between 1940 and 1960. However, such indirect im-

[16] See https://aad.archives.gov/aad/series-list.jsp?cat=WR26, (last accessed 12/20/2021).
[17] I ignore the very small number of WAC enlistees who report being aged 19 in 1944, who would have turned 21 in 1946. Such women could still have qualified for some 1944 G.I. Bill benefits as the official WWII service period ended only in late 1947.
[18] The Social Security Administration website explains the G.I. Bill's unemployment benefits - https://www.ssa.gov/policy/docs/ssb/v7n7/v7n7p3.pdf, accessed April 2023.

Table 5
Outcomes among female veterans who were not married by 1944.

	(1) Ever Married	(2) Age at 1st Marriage	(3) Spouse Attended College	(4) Currently Divorced	(5) Any Children	(6) Number of Children	(7) Number of Children (if ever Married)	(8) Number of Children (if any Children)
Panel A - Descriptive Estimates								
Years of College Completed	–0.015***	0.259***	0.109***	0.001	0.002	0.008*	0.008*	0.005
	(0.002)	(0.035)	(0.004)	(0.003)	(0.002)	(0.005)	(0.005)	(0.004)
Panel B - IV Estimates								
Years of College Completed	–0.114***	6.248***	0.099***	–0.112***	–0.179***	-0.326***	-0.204***	-0.093***
	(0.015)	(0.539)	(0.024)	(0.021)	(0.022)	(0.035)	(0.033)	(0.025)
First Stage Coefficient	0.155***	0.155***	0.161***	0.155***	0.155***	0.155***	0.155***	0.164***
	(0.012)	(0.013)	(0.015)	(0.013)	(0.012)	(0.012)	(0.013)	(0.014)
First Stage F-Statistic	151.11	121.72	151.11	121.72	162.32	162.32	121.72	145.65
Observations	7465	6792	5126	6792	7465	7465	6792	5844
Mean of Dep Var	0.910	25.98	0.498	0.198	0.783	2.385	2.618	3.046

Data: 1980 PUMS 5 Percent Census Sample. Standard errors, corrected for heteroskedasticity, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In these estimates, I restrict the sample to women who are high-school graduates, who are not a WWII veteran, who turned 21 between 1940 and 1946, and who were not married by 1944. I present only two-stage least squares instrumental variables estimates using age in 1944 (the time of the announcement of the G.I. Bill) to instrument for completed years of college (see Section 3 for more information). The first stage coefficient refers to the association between age in 1944 (a linear term, measured in years) and years of college completed.

Table 6
College educational attainment and marriage and fertility outcomes among female non-veterans.

	(1) Ever Married	(2) Age at 1st Marriage	(3) Spouse Attended College	(4) Currently Divorced	(5) Any Children	(6) Number of Children	(7) Number of Children (if ever Married)	(8) Number of Children (if any Children)
Panel A - Descriptive Estimates								
Years of College Completed	–0.013***	0.456***	0.121***	–0.002***	–0.017***	-0.025***	–0.011***	–0.005***
	(0.000)	(0.007)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Panel B - IV Estimates								
Years of College Completed	0.783	–267.399	–3.890	7.669	5.673	22.014***	33.693***	-210.877***
	(1.306)	(692.888)	(4.264)	(19.851)	(9.214)	(0.762)	(1.159)	(8.569)
First Stage Coefficient	–0.001	–0.001	0.002	–0.001	–0.001	-0.001	-0.001	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
First Stage F-Statistic	0.38	0.15	0.89	0.15	0.38	0.38	0.15	0.00
Observations	247,320	235,237	182,378	235,237	247,320	247,320	235,237	209,597
Mean of Dep Var	0.951	22.76	0.376	0.186	0.847	2.494	2.616	2.943

Data: 1980 PUMS 5 Percent Census Sample. Standard errors, corrected for heteroskedasticity, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In these estimates, I restrict the sample to women who are high-school graduates, who are not a WWII veteran, and who turned 21 between 1940 and 1946. In Panel A, the estimates reflect the association between years of college education and the noted outcome for non-veteran women. In Panel B, the estimates are two-stage least squares instrumental variables estimates using age in 1944 (the time of the announcement of the G.I. Bill) to instrument for completed years of college (see Section 3 for more information). The first stage coefficient refers to the association between age in 1944 (a linear term, measured in years) and years of college completed. The first stage F-statistic in Panel B shows that the instrument is extremely "weak," indicating that age in 1944 had little effect on educational attainment among non-veteran women.

pacts would be expected to also affect marriage and fertility outcomes among non-veteran women. To show this is not the case, I repeat the descriptive and IV estimates from Table 3 using a sample limited to non-veterans born between 1919 and 1925 who are high school graduates and present those estimates in Table 6. In the descriptive OLS estimates, I again see that educational attainment is associated with lower marriage rates, later marriages, and fewer children. In contrast, the IV estimates for non-veteran women show no consistent pattern and many of the estimates are implausibly large. This occurs because the instrument is very weak with $F \leq 1$ in all specifications, suggesting that my IV works for female veterans precisely *because* they qualified for the 1944 G.I. Bill's educational benefits. Overall, these estimates provide further confidence in my IV strategy, showing that the marriage and fertility outcomes of female veterans are affected in ways that cannot be explained by the conscription of young men into WWII service.

The estimates focused on non-veterans also help to rule out any concern that differences across birth year cohorts among female veterans in my sample could be driven by the political and economic events of the 1920s and 1930s. We would expect those to affect all women in relevant cohorts, rather than only women who also served in the military. It is important to emphasize, however,

that I cannot rule out the possibility that some of the effects I am attributing to the G.I. Bill's educational benefits are instead directly related to years of military service. For example, veterans who had more years of service had more time to acquire skills that would help in the labor market, could develop deeper social ties, and encountered different prospective marriage partners. The available data does not allow me to examine these potential channels. I summarize my key findings and offer concluding remarks in Section 5.

5. Conclusion

By providing generous benefits to veterans, the 1944 Servicemen's Readjustment Act (the "G.I. Bill") improved access to higher education for millions of Americans. While the vast majority of veterans were men, I examine how G.I. Bill-related educational attainment affected marriage and fertility decisions among female World War II veterans who appear in the 1980 Census 5% Public-use Microdata Sample. As I mention earlier, Becker (1973), Shenhav (2021), and others suggest that any G.I. Bill-induced education among women can be expected to reduce marriage rates, delay marriage among those who do marry, increase spousal quality, and decrease fertility, because of relative changes in labor market outcomes related to the additional education.

Using an instrumental variables approach, instrumenting for the number of years of college completed using age at the time of the G.I. Bill's announcement, two-stage least squares estimates show that one additional year of G.I. Bill-induced education leads to an 8 percentage point decline in the probability of getting married (by 1980), a 4.7 year increase in age at first marriage, an 8.8 percentage point lower probability of being divorced, a 14.3 percentage point decline in the proportion who have any children, and a 28% decline in the number of children. Each year of education for female veterans also leads to a 9.7 percentage point increase in the proportion of spouses who have attended college, indicating that greater education among women leads to greater educational homogamy and perhaps assortative mating (Gihleb and Lang, 2020). Given the G.I. Bill could not have been easily anticipated, that my own earlier work (Lennon, 2021) shows that educational attainment in 1980 cannot be explained by educational attainment at the time of enlistment, and that there is no evidence that those who are older and therefore could enlist earlier were less likely to be already married, the G.I. Bill's effects on marriage and fertility, via greater educational attainment, appear to be causal in nature. On the other hand, I cannot rule out the possibility that some of the effects I attribute to the G.I. Bill's educational benefits are instead directly related to the number years of military service.

Overall, my estimates provide further evidence to suggest that improvements in labor market prospects for women can lead to significant changes in marriage and fertility choices. Given the reduction in marriage and fertility and increased educational attainment among women across the 20th century (Goldin, 2014), my findings are consistent with the idea that there is a causal relationship driving those changes. One limitation is that I am focused on women who were high-school graduates, chose to serve in the military during WWII, and whose behavior was altered by the G.I. Bill's provisions. On the other hand, the estimates in Panel C of Table 2 show that education affected female veterans quite similarly to non-veterans. Finally, my estimates complement and add novel micro-level evidence to earlier work in economic history that studies how fertility responded to macro-level changes (Guinnane, 2011).

Data availability

Data will be made available on request.

Appendix A. Instrumenting for Earnings

In my main estimates, I focus on the effect of educational attainment on marriage and fertility. In contrast, much of the related literature focuses on the effect of women's earnings on these outcomes. There are two reasons for why I focus on educational attainment. One, the G.I. Bill affected educational attainment directly while affecting earnings only indirectly. Two, my sample consists of women in their late fifties and early sixties in 1980. Focusing only on working women would limit my sample size considerably. It also potentially introduces bias as labor force status in 1980 may be dependent on earlier fertility and marriage choices.

For completeness, however, in Table A1 I replicate Table 3 but instrument for earnings (measured in thousands of 1980 dollars) rather than years of college completed. In Panel A, I report descriptive estimates showing that greater earnings are associated with similar effects as greater educational attainment, including reduced rates of marriage, fewer children, and increased age at first marriage. For example, each one thousand dollars of (around 8% of annual earnings, see summary statistics in Table 1) is associated with 1.6% fewer children and a 0.7 percentage point lower proportion of women who have any children.

In Panel B, I instrument for annual earnings using age at the time of the G.I. Bill's announcement. I find similar patterns to my main estimates with the two-stage least squares estimates showing reduced rates of marriage, later marriage, and fewer children. However, notice that my sample size declines by about 50% and the F-statistic from the first stage regression is now "weak" by the heuristic "$F \geq 10$" rule for instrumental variable analyses. For that reason, I report these estimates only as an appendix item.

Table A1
Earnings and marriage and fertility outcomes among female WWII veterans.

	(1) Ever Married	(2) Age at 1st Marriage	(3) Spouse Attended College	(4) Currently Divorced	(5) Any Children	(6) Number of Children	(7) Number of Children (if ever Married)	(8) Number of Children (if any Children)
Panel A - Descriptive Estimates								
Earnings (in $ thousands)	–0.005***	0.023**	0.005***	0.002***	–0.007***	–0.016***	–0.009***	–0.006***
	(0.001)	(0.010)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Panel B - IV Estimates								
Earnings (in $ thousands)	–0.083**	4.929*	–0.047	–0.096	–0.095**	–0.210***	–0.186***	–0.138***
	(0.033)	(2.956)	(0.103)	(0.065)	(0.039)	(0.035)	(0.049)	(0.041)
First Stage Coefficient	0.202**	0.132*	–0.075	0.132*	0.202**	0.202**	0.132*	0.134
	(0.078)	(0.079)	(0.102)	(0.079)	(0.078)	(0.078)	(0.079)	(0.086)
First Stage F-Statistic	6.63	2.76	0.53	2.76	6.63	6.63	2.76	2.43
Observations	4608	4167	2757	4167	4608	4608	4167	3640
Mean of Dep Var	0.904	24.87	0.469	0.271	0.790	2.358	2.606	2.985

Data: 1980 PUMS 5 Percent Census Sample. Standard errors, corrected for heteroskedasticity, in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In these estimates, I restrict the sample to women who are high-school graduates, who are a WWII veteran, who turned 21 between 1940 and 1946, and who are currently working. In Panel A, the estimates reflect the association between earnings (in thousands) and the noted outcome for veterans only. In Panel B, the estimates are two-stage least squares instrumental variables estimates using age in 1944 (the time of the announcement of the G.I. Bill) to instrument for earnings. The first stage coefficient refers to the association between age in 1944 (a linear term, measured in years) and earnings (in thousands). Note that the first stage F-statistic in Panel B shows that the instrument is relatively "weak" when used to predict earnings.

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