Female Educational Attainment, Marriage, and Fertility: Evidence from the 1944 G.I. Bill

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September 13, 2022

Abstract

In contemporary settings, greater female earnings are typically associated with reduced marriage rates and lower fertility. One way that female 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 female WWII veteran status is associated with reduced rates of marriage, increased age at first marriage, and lower fertility, suggesting that G.I. Bill-related education could have had an important effect. 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, females 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.

Keywords: Earnings, Female Veterans, Fertility, Marriage, G.I. Bill, World War II
JEL: J12, J13, I22, I26, I28, N32, N42

*Email: lennoc@rpi.edu. Thanks to Carly Urban and participants at the 2022 American Economic Associaiton Annual Meeting for helpful comments.

1 Introduction

The 1944 G.I. Bill (officially, the "Serviceman's Readjustment Act") provided returning World War II (WWII) veterans with generous educational benefits including up to $500 per year for tuition, fees, and books, along with a $50 monthly living expense allowance. Bound and Turner (2002) and Stanley (2003) show that male veterans used their G.I. benefits to significantly increase their educational attainment. Complementing that earlier work, Lennon (2021) studies how the 1944 G.I. Bill affected female WWII veterans, finding that they 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 females. Using an instrumental variables approach, Lennon estimates an 11.6 percent increase in employment income per year of G.I. Bill-induced education.

The 1944 G.I. Bill also provides an opportunity to study how increased educational attainment affects marriage and fertility choices in a historical setting. Theory and existing evidence (Becker, 1965, 1973; Schaller, 2016; Kearney and Wilson, 2018; Shenhav, 2021) would predict that increases in female educational attainment relating to the 1944 G.I. Bill can be expected to have decreased marriage rates, increased spousal quality (i.e., higher spousal educational attainment), and perhaps to have reduced fertility among female veterans.[1]

To study whether G.I. Bill-related educational attainment affected marriage and fertility choices, I use data on veteran and non-veteran females born between 1919 and 1925 who appear in the 1980 5% United States Census Public-use Microdata Sample (PUMS). The 1980 Census was the first time females were asked about military service. I first show that WWIII veteran status is associated with reduced marriage rates and lower fertility. In 1980, female veterans were 2.7 percentage points less likely to ever have married, report being 2.1 years older at first marriage, and were 5.1 percentage points less likely to have had any children. However, differences in marriage and fertility decisions among veterans and non-veterans are not necessarily related to the G.I. Bill's educational benefits. For example, even if G.I. benefits led to greater educational attainment among female veterans, selection into the military may be 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.

[1]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://beta.womensmemorial.org/marriage-policy (last accessed 12/8/2021).

To help avoid selection issues and to separate the effect of G.I. Bill-related education from the effect of the experience and skills generated from military service itself, I limit my sample to veteran females and use age at the time of the G.I. Bill's announcement as an instrument to develop a causal estimate of the effect of educational attainment on marriage and fertility outcomes. 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 could receive more post-service support, on average. I explain how the G.I. Bill's benefits were earned and why they could not have been easily anticipated by enlistees in Section 2.

When I instrument for years of college completed, which is my preferred measure of educational attainment given female veterans had to have completed high school (Ziobro, 2012), my 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 (28%) reduction in the number of children. Because age in 1944 is not likely to be otherwise correlated with unobserved differences in marriage and fertility intentions, at least 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 that additional education. Note that I focus on females born between 1919 and 1925 because they were old enough to serve in WWII but young enough to significantly benefit from using their G.I. Bill benefits to attend college after WWII.[2]

My findings complement those of Shenhav (2021), who uses a novel application of the Bartik approach (Bartik, 1991) leveraging two sources of variation: changes in wages and differential specialization across sexes and marriage markets by occupation and industry. Using data on females aged between 22 and 44 from the 1980-2000 Censuses and the 2010 American Community Survey, Shenhav finds that a 10% increase in the relative female wage leads to (1) "a 16% increase in the share of women married to a higher-educated spouse," (2) "a 3.1 percentage point (p.p.) increase in the share of never-married women," (3) "a 1.7 p.p. increase in the share of divorced women," and (4) reduces "the share of women with children present by 3 p.p. or 5%." Shenhav's estimates build upon those of Blau et al. (2000), Bertrand et al. (2015), Schaller (2016), Huttunen and Kellokumpu

[2]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 for details on enlistment requirements.

(2016), Kearney and Wilson (2018), and Autor et al. (2019), who each study how changes in relative labor market conditions for males and females affect marriage market outcomes and/or fertility decisions in contemporary settings.

In addition to complementing the existing work in this area, 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* females (Kossoudji and Dresser, 1992; Acemoglu et al., 2004; Jaworski, 2014; Bellou and Cardia, 2016; Rose, 2018), I document that WWII led to significant changes in marriage and fertility choices for female veterans via increased educational attainment. Second, during the 20th century, female educational attainment increased significantly, while marriage rates and fertility declined over the same time period (Mulligan and Rubinstein, 2008; Goldin, 2014).[3] My findings suggest 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 females. 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.

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 U.S. 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 females.[4] While men had to be aged 18

[3] Notably, 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.

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

or older and pass mental and physical fitness requirements, Ziobro (2012) explains that females had to be at least 21 and a high-school graduate to enlist. Female enlistees served in non-combat roles typically within dedicated female-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).[5]

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. 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.[6] 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.[7] 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.[8]

Despite the number of females who served in 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.[9] Although his focus is mainly on Korean War veterans, Stanley (2003) reports that the Korean War and WWII G.I. Bills "increased total

[5]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 females across each branch of the military.

[6]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).

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

[8]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).

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

post-secondary attainment among all men born between 1921 and 1933 by about 15 to 20 percent." 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).

Looking at the effect of WWII on females, the economics literature focuses on *non-veteran* females. According to that work, WWII had significant effects on 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) among non-veteran females. In contrast, Lennon (2021) examines the effect of WWII G.I. Bill benefits on female veterans' educational attainment and later-life earnings. Lennon 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 females. As I briefly mention earlier, Lennon estimates an 11.6 percent increase in employment income per year of G.I. Bill-induced education. While around 60,000 females served in the Army Nurse Corps (Bellafaire, 1993), most female veterans were employed as typists, administrative assistants, mail sorters, or in other clerical roles. Lennon finds significant increases in educational attainment and earnings even among veterans who are neither nurses or doctors in 1980. It is worth noting that females were not conscripted into service and were not required to serve for any particular period of time, which likely generates variation in the quantity of G.I. benefits females received. In contrast, males 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 female earnings increase relative to male 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 relative female 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 female earnings, either via increases in female earnings or declines in male 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 female 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 females 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, and find that "for every 100 displaced females, there are three fewer children born." However, Huttunen and Kellokumpu's focus on existing couples limits what we can learn about the overall effects of greater female earnings on fertility. In contrast, Schaller (2016) and Shenhav (2021) find that improvements in women's 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

In Table 1, I present relevant summary statistics for 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, I use data from the 1980 Census because it is the first to ask about veteran status for females. One benefit of using 1980 data is that fertility decisions are almost certainly complete for all females born between 1919 and 1925. I first 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). I then restrict my estimation sample to females 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.[10] Further, I restrict my sample to those born no earlier than 1919 to ensure 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 shows that average age at first marriage for non-veteran females 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 female patterns of enrollment in the military, with 3.26 percent (966 out of a total of 30,596) of females 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 females entered the army *in response* to the benefits provided by the G.I. Bill.

Alongside the information on cohort sizes by year of birth, I also provide the percent of each cohort that attended any college. Notice that females 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 females 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.

[10] 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).

3.2 Estimation

Before attempting to isolate the effect of G.I. Bill-induced education on marriage and fertility outcomes for veteran females, I first describe the association between years of college completed and my outcomes of interest. The econometric specification I use 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 female 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 females 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 I now include 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 females.

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 female 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 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 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;

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

I present my descriptive and instrumental variable estimates of how WWII veteran status and the 1944 G.I. Bill affected marriage, divorce, spousal quality, and fertility decisions, in the next section. I also consider how marital status and educational attainment at the time of enlistment could affect my findings and the validity of my IV approach.

4 Main Findings

Table 2 provides descriptive estimates of the association between veteran status, educational attainment, and marriage and fertility outcomes. I include state fixed effects along with controls for age (measured in quarters) and race in each specification. 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, I use 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.

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 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 a 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 try to isolate how increased education relating to the G.I. Bill affected marriage and fertility for female veterans, I limit my sample to only veterans and use age at the time of the G.I. Bill's announcement to instrument for increased educational attainment. 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. I explain my instrumental variables approach in detail in Section 3. To summarize that 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 two-stage least squares estimates, alongside descriptive 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 estimates in Panel A of Table 3 show that, among veteran females, 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 marriage and fertility. Note that the estimates in Panel A of Table 3 are developed from a subsample limited only to veterans and are therefore not directly comparable to the estimates in Table 2.

My two-stage least squares IV estimates, which I present in Panel B of Table 3, suggest that G.I. Bill-induced educational attainment had large effects on marriage and fertility. Looking at marriage outcomes, the effect of an additional year of education is now an 8 percentage point decline in the probability of ever getting married by 1980, a 4.7 year increase in age at first marriage, and an 8.8 percentage point lower probability of being divorced. 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, with slightly smaller effects conditional on marriage and having any children. Given a sample average of 2.42 children, the 28% decline in the number of children amounts to about 0.67 fewer children per G.I. Bill-induced year of additional college education. Note that the first stage F-statistics in Panel B of Table 3 demonstrate that the instrument is not weak. However, my 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), making them most relevant to policymakers attempting to induce a "marginal" student to attend college.

Notice also that I focus on the effect of educational attainment on marriage and fertility. In contrast, much of the related literature focuses on the effect of earnings on those 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 females in their late fifties and early sixties in 1980. Focusing only on females 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. 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. However, due to a combination of indirect effects of the G.I. Bill on earnings and a smaller sample size, the

F-statistic from the first stage is now 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.

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 females 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 the G.I. Bill led to greater educational attainment, another threat to identification would be if veterans who could enlist earlier in the war effort were less likely to be married. In such a case, the G.I. Bill would have caused greater educational attainment among those who were already not married, leading to a correlation among education and marriage outcomes that is not causal. 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.[11] 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.[12]

[11] See https://aad.archives.gov/aad/series-list.jsp?cat=WR26, (last accessed 12/20/2021).

[12] I ignore the very small number of WAC enlistees who report being aged 19 in 1944, who would have turned 21 in 1946. Such females could still have qualified for some 1944 G.I. Bill benefits as the official WWII service period ended only in late 1947.

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 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 females being slightly more likely to have ever married at the time of enlistment. In contrast, the main threat to identification would be if older females were systematically *less* likely to have been married when enlisting. Therefore, there is no evidence to suggest that, at the time of the G.I. Bill, older females who could obtain greater G.I. benefits because they were eligible to enlist earlier in the war effort, were less likely to be married. It is worth cautioning, however, that the WAC enlistment records refer to females in just one particular branch of the military. While the WAC was the largest female-only branch of the military, it is possible that these records are not representative of female WWII enlistees more generally.

One additional concern with my IV approach is that the conscription of males could have affected marriage and fertility outcomes. To rule out such a concern, 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 as an appendix item. In the descriptive estimates, I again see that educational attainment is associated with lower marriage rates, later marriages, and fewer children when looking at descriptive estimates. In contrast, the IV estimates when looking at non-veteran females 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 only works for female veterans *because* they qualified for the 1944 G.I. Bill's educational benefits. I summarize my key findings and offer some 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 females 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 female labor market outcomes caused by 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 females 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 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, can be interpreted as causal effects.

My estimates provide further evidence that improvements in labor market prospects for females can lead to significant changes in marriage and fertility choices. Given the reduction in marriage and fertility and increased educational attainment among females across the 20th century (Goldin, 2014), my findings also suggest that there is a causal relationship driving these changes. One limitation is that I am focused on females who chose to serve in the military during WWII. 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 micro-level evidence to) earlier work in economic history that studies how fertility responded to macro-level changes (Guinnane, 2011).

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Table 1: Summary Statistics

		WWII Veterans		**Non-Veterans**	
		Summary Statistic	Std. Dev.	Summary Statistic	SD
% in Labor Force		57.5		52.8	
Annual Earnings (if working)		$11,597	8,592	$ 9,518	7,116
% Any College		53.8		33.5	
% Completed College		21.7		13.5	
Years of College Completed	0	4,160		164,443	
	1	863		20,397	
	2	1,151		20,944	
	3	876		8,253	
	4	1,029		19,222	
	5+	926		14,036	
Year Born (Number, % attended any college)	1919	966 (60.8)		29,630 (33.7)	
	1920	1,371 (60.8)		33,915 (33.6)	
	1921	1,615 (56.4)		35,027 (33.9)	
	1922	1,686 (53.3)		35,434 (33.5)	
	1923	1,641 (49.9)		36,328 (32.8)	
	1924	1,227 (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	
% 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	
	% Black	1.9		5.4	
	% Other	0.7		1.5	
Observations		9,005		247,295	

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.

Table 2: Association between Years of College, WWII Veteran Status, and Marriage and Fertility Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ever Married	Age at 1st Marriage	Spouse Attended College	Currently Divorced	Any Children	Number of Children	Number of Children (if Married)	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.

Table 3: College Educational Attainment and Marriage and Fertility Outcomes Among Female WWII Veterans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ever Married	Age at 1st Marriage	Spouse Attended College	Currently Divorced	Any Children	Number of Children	Number of Children (if ever Married)	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 F-Statistic	168.22	129.96	93.62	129.96	168.22	168.22	129.96	97.43
Observations	9,006	8,333	6,238	8,333	9,006	9,006	8,333	7,183
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 female, 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 F-statistic in Panel B shows that the instrument is not "weak."

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 females aged 20 to 25 at the time of the G.I. Bill's announcement in 1944 (i.e., veteran females born between 1919 and 1925).

Appendix Material

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 female 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 females in their late fifties and early sixties in 1980. Focusing only on working females 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 females 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)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ever Married	Age at 1st Marriage	Spouse Attended College	Currently Divorced	Any Children	Number of Children	Number of Children (if ever Married)	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 F-Statistic	6.63	2.76	0.53	2.76	6.63	6.63	2.76	2.43
Observations	4,608	4,167	2,757	4,167	4,608	4,608	4,167	3,640
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 female, 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. Note that the first stage F-statistic in Panel B shows that the instrument is relatively "weak" when used to predict earnings.

IV Estimates for Non-veterans

One concern with my IV approach is that the conscription of males could have affected marriage and fertility outcomes for differently for earlier- versus later-born birth-year cohorts, potentially explaining my main findings. To help rule out such a concern, I repeat the estimates from Table 3 in the main text using a sample limited to non-veterans born between 1919 and 1925 who are high school graduates.

In Table B1, I again see a familiar pattern in my descriptive estimates in Panel A, with greater educational attainment associated with lower marriage rates, later marriages, and fewer children. In contrast, the IV estimates when looking at non-veteran females show no consistent pattern and many of the estimates are frankly implausible. This is because, as we can see from the first stage F-statistics in the table, the instrument is very weak with $F \leq 1$ in all specifications. The weakness of the instrument means that the second-stage estimates provide no meaningful information. 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.

Table B1: College Educational Attainment and Marriage and Fertility Outcomes Among Female Non-Veterans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ever Married	Age at 1st Marriage	Spouse Attended College	Currently Divorced	Any Children	Number of Children	Number of Children (if ever Married)	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 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 female, 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 females. 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 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 females.