NBER WORKING PAPER SERIES

HOW DO MORTGAGE SUBSIDIES AFFECT HOME OWNERSHIP? EVIDENCE FROM THE MID-CENTURY GI BILLS

Daniel K. Fetter

Working Paper 17166
http://www.nber.org/papers/w17166

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2011

For helpful comments at various points in this project, I am grateful to James Alm, Erica Field, Price Fishback, Joshua Goodman, Eric Hilt, Richard Hornbeck, Gray Kimbrough, Erzo Luttmer, Robert Margo, Patrick McEwan, Marianne Page, Rohini Pande, Ken Snowden, Eugene White, Heidi Williams, and numerous seminar participants at the Federal Reserve Bank of St. Louis, Harvard, Northwestern-Kellogg, Mathematica Policy Research, Rutgers, UC-Davis, UNC-Greensboro, UPenn-Wharton, Wellesley, and the Spring 2011 meeting of the NBER Development of the American Economy Program. I am especially indebted to Edward Glaeser, Claudia Goldin, and Lawrence Katz for detailed feedback. I also gratefully acknowledge financial support from the Taubman Center for State and Local Government, the Real Estate Academic Initiative, and the Harvard Graduate School of Arts and Sciences. All errors are my own. The views expressed herein are those of the author and do not necessarily reflect the views of the National Bureau of Economic Research.

How Do Mortgage Subsidies Affect Home Ownership: Evidence from the Mid-century GI Bills

Daniel K. Fetter

NBER Working Paper No. 17166
June 2011
JEL No. N00,N22,N92,R00,R28

ABSTRACT

The sharpest increase in U.S. home ownership over the last century occurred between 1940 and 1960, associated primarily with a decrease in the age at first ownership. To shed light on the contribution of several coincident large-scale government interventions in housing finance, I examine veterans' home loan benefits provided under the postwar GI Bills. I use two breaks in the probability of military service by date of birth, for cohorts coming of age at the end of World War II and the Korean War, to estimate the impact of veteran status on home ownership. I find significant, positive effects of veteran status on home ownership in 1960. Consistent with a model in which the impact of easier loan terms declines with age, these effects are larger for younger veterans and diminish in 1970 and 1980 as the cohorts age. Complementary evidence suggests veterans' non-housing benefits and military service itself are unlikely to explain the observed differences in home ownership. Veterans' housing benefits appear to have increased aggregate home ownership rates primarily by shifting purchase earlier in life; they can explain approximately 7.4 percent of the increase in aggregate home ownership from 1940 to 1960, and 25 percent of the increase for the affected cohorts.

Daniel K. Fetter
Department of Economics
Wellesley College
106 Central Street
Wellesley, MA 02481
and NBER
dfetter@wellesley.edu

1 Introduction

The primary focus of federal housing policy over the last eighty years has been intervention in mortgage markets. In large part, the goal of these policies has been to extend home ownership to marginal home buyers, and many observers have argued that the mortgage policies born of the Great Depression and World War II are responsible for the dramatic transformation in United States housing markets and home ownership in the mid-20th century.[1] But surprisingly, neither the effect of these policies on historical rates of home ownership, nor the set of factors driving changes in housing markets during and after World War II, is well understood. The recent crisis and debate over the government's role in housing finance makes evidence on these questions particularly timely.[2]

Of the interventions that began in the 1930's and 1940's, the mortgage insurance and guarantees provided through the Federal Housing Administration (FHA) and Veterans Administration (VA) were among the largest in scale. The establishment of these programs coincided with the most striking changes in home ownership in the last century. Between 1940 and 1960, the rate of home ownership increased sharply from 44 to 62 percent, as younger individuals became home owners at unprecedented rates. The profile of home ownership by age was nearly linear up to age 60 in every Census year from 1900 to 1940, but by 1960 had taken the concave shape that persists today.[3]

This paper provides estimates of the contribution of the VA home loan program to increased rates of home ownership. Past work, such as Jackson (1985), Shiller (2005), and Vigdor (2006), has discussed the potential role of the FHA and VA in explaining the observed changes in housing markets over the 20th century.[4] However, a number of other major changes over the same period could have driven the increase in home ownership. The favorable tax treatment of owner-occupied

[1] Examples are Jackson (1985) and Schwartz (2010).

[2] See, for example, the Obama Administration's plan to wind down Fannie Mae and Freddie Mac, among other things (U.S. Department of the Treasury, 2011).

[3] Figure 2 depicts the changing age structure of ownership in the United States over the 20th century. Aaron (1972) discusses the particularly large increases in home ownership for younger age groups over this period, and Collins and Margo (2001) note an increase in the concavity of the age-ownership profile in their study of racial differences in home ownership over the 20th century.

[4] A large body of work provides evidence on the impact of borrowing constraints on home purchase in more recent periods. Examples include Linneman and Wachter (1989), Duca and Rosenthal (1994), Haurin, Hendershott and Wachter (1997), and Linneman et al. (1997). Chiuri and Jappelli (2003) compare age-ownership profiles across countries and argue that the terms of mortgage finance, and down-payments in particular, are an important determinant of the distribution of home ownership across age groups.

housing became more important during World War II as the federal income tax covered more of the population (Aaron, 1972; Rosen and Rosen, 1980; Rosen, Rosen and Holtz-Eakin, 1984). Rising real incomes and savings rates during World War II and afterwards, or increased rates of family formation in the period of the baby boom, may have increased demand for housing.[5] Decreased transportation costs in the postwar era (Baum-Snow, 2007) may have increased home ownership by lowering the cost of suburban residence.[6] Finally, even if changes in housing finance played an important role, the extent to which federal credit aids were themselves a major factor is an open question.

My empirical design attempts to hold these other factors constant, and allows the estimated effects of terms on home finance to vary with a person's age. The conceptual framework underlying the empirical work points to the importance of taking life-cycle factors into account. I present a simple life-cycle model with tenure choice and down-payment constraints in home finance, and run simulations with loan terms similar to those of VA and non-VA loans. Results from the simulations suggest that for the ages I examine, one should expect to see larger impacts of easier finance on the probability of home ownership for younger individuals, as lower down-payments allow home purchase earlier in the life cycle.

In the empirical analysis I use the home loan benefits provided to veterans under the World War II and Korean War GI Bills as variation in the mortgage terms available to an individual. Because of selection into military service during World War II and the Korean War, direct comparisons of veterans to non-veterans are problematic.[7] However, the smoothness of home ownership rates in age motivates between-cohort comparisons in the spirit of a regression discontinuity design; this variation is similar to that used in previous work on the GI Bill, such as Bound and Turner (2002). The probability of military service by date of birth fell steeply with the declines in inductions

[5] Chambers, Garriga and Schlagenhauf (2011) calibrate a dynamic general equilibrium model to study the causes of the 1940-60 increase, and argue that changes in real income and demographics were important drivers of the change. For detailed data series on savings rates, see Carter et al., eds (2006).

[6] This may be the case if, for example, a lower price of land more distant from city centers facilitates construction of larger, single-family detached dwellings, and for agency reasons these tend to be owner-occupied more often than multi-family structures (Glaeser and Shapiro, 2003).

[7] Note that positive selection into the military does not necessarily imply that naive comparisons of veterans to non-veterans would yield upwardly-biased estimates. For example, positively selected individuals may make investments that delay first home purchase. A comparison of age-ownership profiles for college and high school graduates suggests that over this period, college graduates were less likely to own early in life, and more likely to own later in life.

under the draft at the end of World War II and the Korean War. Comparison between, rather than within, cohorts alleviates concerns that differences in later life outcomes are due to pre-existing differences in characteristics between veterans and non-veterans.[8] The presence of two 'breaks' – one associated with the end of World War II and one with the end of the Korean War – gives estimates at two ages in a single year. Testing for differences at each break in each Census from 1960 to 1980, I estimate the impact of veteran status at multiple ages and points in time.

The results of the analysis are consistent with the prediction that the effects of easier housing finance should decline with age. I find large effects of veteran status on the probability of home ownership in 1960 at both breaks. In 1960, men born at the World War II break were 32 years old, and about 53 percent owned their homes. I estimate an effect of 13 percentage points for men who were induced into military service at the break as a result of their date of birth. Men at the Korean War break were 26 years old in 1960, and about 28 percent were home owners. For these men, the analogous effect was 18 percentage points. Consistent with effects that decline with age, the 1960 Korean War estimate is larger than the World War II estimate in both percent and percentage point terms, and I find no evidence for positive effects of veteran status on home ownership at either break in 1970 or 1980, when a person born at either break would have been at least 36 years old. In other words, mortgage subsidies appear to have increased aggregate rates of home ownership by shifting home purchase earlier in life, rather than by shifting those who never would have purchased into home ownership.[9]

The GI Bills provided several other benefits as well, such as support for education, and military service itself also may have influenced an individual's demand for housing. I present several pieces of evidence suggesting that the observed effects of veteran status on home ownership are not due primarily to non-housing benefits or direct impacts of military service. First, to address possible differences in education or income, I note that there is evidence of higher income in 1960 only for veterans at the Korean War break, and estimates of the impact of veteran status on home

[8] This research design does not address the issue that service itself may have direct impacts on later outcomes, a potential confound I address in Section 5.

[9] It is also possible that benefits increased the amount of housing consumed. A similar strategy applied to various measures of housing consumption give estimates with broadly similar trends, but which tend to be imprecisely estimated. In the paper I focus on the tenure decision; I discuss results for housing consumption in Appendix 3.

ownership change little after controlling for income directly. Second, the housing outcomes of World War I veterans, who received some benefits but no national housing benefits, suggest that 'service effects' were not the driving force behind veterans' higher rates of ownership: World War I veterans at age 23 in 1920 and age 33 in 1930 appear no more likely to have owned their homes than similar non-veterans. Finally, over the decade following World War II, veterans' rates of home purchase responded significantly to plausibly exogenous year-to-year changes in the availability and generosity of the home loan benefit.

I use the baseline RD estimates to assess the contribution of VA home loan benefits to the overall increase in home ownership from 1940 to 1960.[10] The estimates suggest that about 39 percent of the increase for men of age 26, and about 26 percent of the increase for men of age 32, can be attributed to VA home loan benefits. I extrapolate from these age-specific estimates to calculate the share of the overall increase that can be attributed to the VA mortgage program. I find that the program can explain about 7.4 percent of the overall increase in home ownership from 1940 to 1960, and about 25 percent of the increase for men of the ages affected by the program. To the extent that the VA program increased house prices, as argued by Vigdor (2006), it is possible that this figure may be an overestimate, reflecting crowd-out of non-veterans rather than net increases in home ownership. However, investigation of cross-state variation in the veteran share of the population turns up little evidence that the estimates are driven by crowd-out: across a variety of controls and specifications, a greater veteran presence is, if anything, positively associated with non-veterans' rates of home ownership.

In addition to shedding light on the factors driving changes in housing markets in the 1940's and 1950's, this paper complements work on the impacts of veterans' education benefits (Bound and Turner, 2002; Stanley, 2003; Page, 2006) by investigating the effects of other major benefits provided under the GI Bills. A similar paper to this one is Yamashita (2008), who examines discontinuities in home ownership around the World War II break in 1960 and 1980 and finds similar results.[11] Boustan and Shertzer (2010) investigate the impact of World War II veteran status on residential

[10] Note that there is nothing special about using 1940 as a base year – the empirical exercise is an estimation of a counterfactual 1960 age profile of home ownership, which can be compared to any previous Census year.

[11] I became aware of Yamashita's unpublished work after completing the main analysis and a draft of this paper. Our results for home ownership at the World War II break are similar, despite differences in implementation.

location; as noted above, Vigdor (2006) also examines the VA home loan program, but focuses primarily on whether it affected house prices.

2 Background

2.1 Trends in housing tenure over the 20th century

In the history of living arrangements in the United States over the 20th century, the period from 1940 to 1960 was distinctive in terms of the large overall increase in home ownership. Figure 1 shows the share of occupied dwelling units that were owner-occupied, the measure of 'home ownership' for which the most complete time series data exist.[12] Home ownership rose from 44 percent in 1940 to 62 percent in 1960. A fact that has gone unrecognized in much of the recent economics literature is that more than half of the overall increase over these two decades took place by the end of 1945. Since the VA home loan program gave out relatively few loans before the end of World War II, ideally one would be able to measure the contribution of the VA to the increase in home ownership after 1945. My empirical analysis, however, focuses on home ownership at the level of the individual rather than that of the dwelling unit, and therefore provides an estimate of the counterfactual 1960 home ownership rate at the individual level. Since 1940 is the last year before the creation of the VA home loan program for which microdata are available for calculating an individual-level home ownership rate, my discussion emphasizes the change from that year.

In the following descriptive statistics and the analysis below, I restrict the sample to US-born men 18 years old and above, and classify an individual as a home owner if he was the household head or spouse of the head in an owner-occupied dwelling.[13] By this measure, the increase in home

[12]The data from the Decennial Census are available at `http://www.census.gov/hhes/www/housing/census/historic/owner.html`. The figures for 1944, 1945, and 1947 are estimates, from supplements to the October 1944, November 1945, and April 1947 sample surveys for the Monthly Report on the Labor Force (U.S. Bureau of the Census, 1945, 1946, 1947). The figure for 1956 is from the National Housing Inventory (U.S. Bureau of the Census, 1958).

[13]The following statistics are based on IPUMS Census microdata (Ruggles et al., 2008). The microdata list a single head and tenure status for each household. In addition to identifying owners in this way, I classify an individual as a renter if he is the head or the spouse of the head in a renter-occupied unit, or is a boarder in a dwelling owned by someone else, and as 'living with relatives' if he is otherwise related to the head. The remainder, always under 8 percent, encompasses group quarters, such as military barracks or rooming houses; domestic employees; and other arrangements that could not be classified. Microdata from the 1950 Census of Housing were destroyed after tabulation (U.S. Bureau of the Census, 1984), so in these statistics and the analysis below no information is given on living

ownership was also most striking from 1940 to 1960, increasing from 27 to 53 percent. Aggregate trends in individual-level living arrangements are shown in Appendix Figure A2.1.

The crucial characteristic of the mid-century increase in home ownership was that it largely represented a change in the age pattern of ownership. This is evident in Figure 2, which shows ownership rates for men 18 and above, by age, in Censuses from 1900 to 1980.[14] The age profile of home ownership was stable in every year up to 1940, and nearly linear up to age 60, but from 1960 onwards became strikingly more concave. Home ownership rates for men in their early 30's more than doubled, while home ownership among older age groups increased substantially less in these two decades.[15] The increase in ownership in the 1940's and 1950's thus largely represented earlier purchases among individuals who likely would have purchased later in life. In this respect, the increase in home ownership from 1940 to 1960 stands out from other periods of rising ownership, such as the 1920's, when the age structure of ownership remained largely unchanged.

To connect the aggregate increase to changes in age-specific ownership rates more formally, I present a simple decomposition of the change in the aggregate home ownership rate from 1940 to 1960. This decomposition provides a measure of the share of the aggregate increase that can be explained by changes in the age structure of the population. I decompose the 1940 to 1960 difference of .26 as follows:[16]

$$\overline{own}_{60} - \overline{own}_{40} = \sum_{g=18}^{G} (w_{g60} - w_{g40})\overline{own}_{g60} + \sum_{g=18}^{G} (\overline{own}_{g60} - \overline{own}_{g40})w_{g40},$$

where g indexes age and w_{gy} is the share of individuals of age g in the population in year y. The first term gives the difference attributable to the change in the age structure of the population; the latter measures the difference due to increases in within-age rates of ownership. This calculation yields a value of .048 for the first term and .209 for the second, suggesting that increased home

arrangements in 1950.

[14] For visual clarity in interpreting the 1940-60 change, 1990 and 2000 are not shown. In these years, the age profile was somewhat less steep but its basic concavity persisted.

[15] Conditioning on household head status gives, as one might expect, higher home ownership rates for both the youngest and the oldest age groups, and a nearly linear age profile of home ownership well beyond age 60 in 1940 and earlier.

[16] In 1940 I apply sampling weights to calculate averages; the 1960 sample is a flat sample of the population and requires no weighting.

ownership within age groups was far more important than changing age structure.[17] Furthermore, it suggests that holding the age structure constant at its 1940 distribution, within-age increases for individuals 45 and younger could account for over half of the observed aggregate increase from 1940 to 1960.

2.2 Broad changes in finance and the VA home loan guaranty program

The observed decrease in the age at first home ownership suggests that changes in finance played a central role in changes in housing markets between 1940 and 1960. Table 1 shows observed loan terms on the stock of first mortgages in 1950, 1960 and 1970, from the Census Residential Finance Survey, and compares these terms to 'typical' loan terms of the 1920's.[18] It also compares VA loans to those of the Federal Housing Administration (FHA), which provided insurance on somewhat less generous terms than VA loans, and to 'conventional' loans that had no government insurance.

Down-payments fell substantially between 1920 and 1960, as reflected by increases in the median loan-to-value ratio (LTV). In 1920 a down-payment of 40 to 50 percent would have been needed, but by 1960 the median down-payment for first mortgages was about 20 percent. The lower down-payments were concentrated in the government-insured market: VA-guaranteed loans typically had the lowest down-payments, with a median of about 9 percent, followed by FHA with a median of about 17 percent. A substantial share of VA loans had loan-to-value ratios of 100 percent or more: between one-fifth and one-third in each Census year from 1950 to 1970.

Lower down-payments were accompanied by lengthening loan maturities. Maturities lengthened in all sectors of the market, with VA and FHA providing the longest maturities. As a result, monthly payments remained more or less stable as loan-to-value ratios increased. Government-insured mortgages also typically had lower interest rates than conventional loans. In part, the lower rates reflected interest rate ceilings on government loans, as discussed below.

[17] It makes little difference to use 1940 ownership and 1960 weights, or the average of 1940 and 1960 for ownership and weights, rather than this form of the decomposition. In both cases the decomposition yields values of about .04 for the term describing changing age structure and .22 for the term describing changing ownership rates.

[18] Figures for the 1920's come from Aaron (1972), and originally from the NBER's Urban Real Estate Finance Project; Morton (1956) provides a description of the results and sample. As discussed there, the sample may not be fully representative of the population of loans in the 1920's. A full picture of lending in the 1920's would also require discussion of junior mortgages and the arrangements offered by Building and Loan associations (Snowden, 2010).

VA loans typically had the lowest down-payments of the various types of loans, but even though they had lower interest rates as well, based on the median terms shown here they may not have had the lowest monthly payments. Using the median terms for 1950, for example, a 20-year VA loan with a 10 percent down-payment and 4 percent interest rate, used to purchase a $7,500 house,[19] would have a monthly payment of about $41. The monthly payment for a 20-year FHA loan with a 20 percent down-payment and a 4.5 percent interest rate used to purchase the same house would have a lower monthly payment, about $38. For this reason, in much of my discussion I emphasize down-payments rather than monthly payments, even though VA benefits did, all else equal, lower the latter.[20]

Terms for all types of loans became easier over time, and the median terms for FHA loans in particular came to resemble those for VA loans. By 1970, the median LTV for FHA loans had risen to 93 percent, compared to 95 percent for VA loans. Even into 1970, however, VA loans remained far more likely than other types of loans to have an LTV of 100 percent or more.[21]

The easier terms observed for VA mortgages were associated with a home loan guarantee program that was initially authorized under the Servicemen's Readjustment Act of 1944, better known as the GI Bill. Eligibility for this loan guarantee was one of several benefits extended to veterans, with the broad aim of speeding readjustment to civilian life.[22] The main VA home loan program, under Section 501, was a guarantee to lenders against losses on home loans that had been approved by the VA, up to a specified amount. It was not a loan directly from the government. If a borrower became delinquent, the mortgagee would typically be expected to foreclose and convey the property to the VA, which would compensate the lender for losses incurred. The guarantee thus eliminated much of the risk to the lender, allowing easier terms for borrowers. As of 1945, this guarantee was limited to 50 percent of the outstanding loan amount at any point in the life of the loan, up to

[19] The median self-reported value of one-unit owner-occupied structures in 1950 was $7,354: `http://www.census.gov/hhes/www/housing/census/historic/values.html`.

[20] In the example above, if the VA loan had a 20 percent down-payment but other terms were the same, the monthly payment would be a little more than $36.

[21] These trends are also evident in flow measures of lending terms, as reflected in Appendix Figure A2.2, which shows the loan-to-value ratio for mortgages originated in each year from 1946 to 1967. By 1960 the gap between the average LTV for newly originated VA loans and that for FHA loans had disappeared, although it widened again by the early 1960's.

[22] The following discussion of the VA home loan program follows ORC Macro (2004) and Aaron (1972).

a maximum of $4,000, but the limit was relaxed in later years. Interest rates could not exceed a specified maximum rate, initially 4 percent. At the time, many observers argued that when returns on alternative investments were greater, the interest rate cap severely limited lenders' willingness to provide loans on VA terms, and hence led to unusual volatility in the number and volume of VA loans (Klaman, 1961). I return to this point in Section 5.

Eligibility for the veterans' housing benefit was determined by dates of service: an individual was eligible under the 1944 GI Bill if he or she had served for at least 90 days with some service occurring between September 16, 1940 and the official termination of the war, later determined to be July 25, 1947. The program was initially intended to last only a few years, but was later extended and re-extended several times before becoming permanent. Subsequent GI Bills covered veterans of other periods – the Korean War GI Bill (passed in 1952) covered individuals who served between June 17, 1950 and January 31, 1955, and the 'Cold War' GI Bill (passed in 1966) ultimately covered individuals who began service after January 1955, although slightly less generously. Active-duty servicemembers were made eligible under the Veterans' Housing Amendments Act of 1976.

A large share of veterans used the housing benefit, and loans granted under the VA program represented a substantial portion of the mortgage market in the postwar period. Estimates from the 1977 National Survey of Veterans suggest that of about 17 million male veterans of World War II and the Korean War living at the time, roughly 6.3 million had used a VA loan, and 5.5 million had used a VA loan for their first home (Hammond, 1980). Widespread use of the benefit made VA loans a substantial share of the overall market: over the period from 1946 through 1960, VA loans composed about 16 percent of the total dollar volume of all nonfarm mortgage recordings of $20,000 or less, and about 12 percent of the total number.[23]

Responses from the 1977 Survey of Veterans also suggest that the availability of VA loans induced earlier home purchase, or purchase of a more expensive house, for a large segment of the veteran population.[24] For veterans who reported using a VA loan for their first home, the 1977 survey asked if they would have been able to purchase the home without the VA loan. About 61

[23]These figures are my calculations using data from Housing and Home Finance Agency (1961). FHA was of comparable magnitude, making up about 13 percent of the total dollar volume between 1946 and 1960.

[24]The following estimates are based on the tabulations in Appendix E of Hammond (1980).

percent of World War II and Korean War veterans who had used a VA loan for their first home reported that they would not have had a sufficient down-payment for the house without the VA loan; an additional 6 percent said that they would have purchased a less expensive house. About 30 percent said they could have purchased the home anyway (the remainder gave either multiple answers or no answer).

Given their scale, the VA and FHA programs almost certainly influenced terms in conventional lending. Aaron (1972) argues that the VA and FHA led to more liberal terms in conventional markets by demonstrating that smaller down-payments and longer maturities would not increase risk as much as lenders had anticipated. More concretely, the FHA in particular was credited with standardizing the analysis of mortgage lending risk, and its creation in 1934 with the intent of providing fully amortized, high-LTV mortgages also necessitated the modification of laws in many states that restricted state-regulated financial institutions from investing in mortgages with LTV's of more than 50 or 60 percent (Semer et al., 1976). The indirect effects of the FHA and VA were surely important, but in this paper I focus on the direct effect of the VA.

3 Conceptual framework

A simple life-cycle model of tenure choice clarifies the impact of a reduction in down-payments on home ownership rates of different age groups, providing a more formal basis for understanding the differential increases in ownership by age. Past theoretical work, such as Artle and Varaiya (1978), has typically assumed that all individuals prefer to own, either because 'pride of ownership' means the same house provides greater utility if owned rather than rented, or because favorable tax treatment or the elimination of a principal-agent problem between the landlord and tenant makes owner-occupied housing less costly than equivalent rental housing. If a down-payment is necessary to obtain financing for the purchase of housing, young people without sufficient assets for a down-payment may depress consumption early in life in order to have greater consumption later. Under these conditions, relaxing the down-payment constraint can induce earlier purchase as the burden of reduced consumption in the beginning phase of the life cycle is alleviated. Broadly speaking, since young individuals with few assets are most likely to face this constraint, they see

larger increases in ownership from a relaxation of down-payments than do older individuals, who are likely to have already accumulated assets. However, if the required down-payment is not reduced to zero, the largest effects may not be for the youngest individuals, who still need to save for the smaller but positive down-payment. Simulations such as those in Hayashi, Ito and Slemrod (1988) and Sheiner (1995) have calibrated such models to fit recent periods, and have found evidence that these constraints are quantitatively important.[25]

A similar model and calibration clarifies the predictions of this framework at the ages I examine in the empirical analysis, in the context of the mid-century rise in home ownership. Consider the infinite-horizon optimization problem of an individual with discount rate r, whose per-period utility $U(C_t, H_t)$ is defined over a composite consumption good C_t and housing H_t. All individuals begin life as renters, with no assets, but may purchase a house at $T \in (0, \infty)$ subject to a down-payment constraint. I follow Hayashi, Ito and Slemrod (1988) in assuming that $U(C_t, H_t) = \alpha \log C_t + (1 - \alpha) \log H_t$. For simplicity, I impose the condition that housing is available only in a fixed quantity H_R for renters, and H_O for owners, and capture the idea that 'pride of ownership' may give greater utility from owning a given amount of housing rather than renting it by supposing that for an owner, $H_t = \gamma H_O$, where $\gamma \geq 1$.

An individual has income y_t each period. She may save only for home purchase, at an interest rate ρ, and chooses an amount of savings s_t in each period for which she is a renter. Normalizing the price of the consumption good to 1, the price of a unit of rental housing is R, and the analogous price of owner-occupied housing is P. Finally, ϕ is a constant that converts the amount PH_O into a per-period payment $\phi P H_O$. As discussed in the previous section, since maturities increased at the same time as down-payments fell, I will assume that changes in down-payments do not affect the per-period payment.

If an individual chooses to buy at some finite T, she solves

$$\max_{\{s_t\}_{t=0}^{T}, \{C_t\}_{t=0}^{\infty}, T} \int_0^T e^{-rt} \left[\alpha \log C_t + (1 - \alpha) \log H_R\right] dt + \int_T^\infty e^{-rt} \left[\alpha \log C_t + (1 - \alpha) \log \left(\gamma H_O\right)\right] dt$$

[25] Ortalo-Magné and Rady (1999) emphasize the differential effects of reduced down-payments by age groups in a more general model with overlapping generations and supply constraints, with a similar finding that easier terms on housing finance leads to a shift towards ownership at younger ages.

subject to

$$y_t = C_t + RH_R + s_t \text{ for } t < T \tag{1}$$

$$y_t = C_t + \phi P H_O \text{ for } t \geq T \tag{2}$$

$$\int_0^T e^{\rho[T-t]} s_t dt = \delta P H_O \tag{3}$$

$$s_t \geq 0 \ \ \forall \, t. \tag{4}$$

I will consider the simple case in which income is constant at y and $\rho = r$. Under these conditions, the savings rate is constant, and reductions in down-payments lead to earlier home purchase. To calibrate the model, I assume that rented and owned housing are identical and deliver a single unit of housing services, or $H_R = H_O = 1$, but that owned housing gives greater utility than the same amount of rented housing, with $\gamma = 1.5$. I set $\alpha = .8$. Other parameters are meant to correspond specifically to housing market conditions in 1960. In particular, I set the annual rent at \$700 and the house price at \$12,000. I assume that the interest rate ρ and the monthly payment conversion factor ϕ are both .05. The latter condition implies that per-period housing costs are lower for an owner than for a renter. Heterogeneity in the simulation comes from variation in income. I draw income from a truncated lognormal distribution with mean 8 (corresponding to an income of \$3,000), standard deviation 1, and a minimum income that allows everyone to afford the \$700 annual rent. Each person then chooses the optimal time of home purchase (or, equivalently, per-period savings).

The simulation results in Figure 3, shown for down-payments of 10 and 20 percent meant to correspond to VA and FHA terms, confirm that reductions in down-payments are likely to have especially large effects on younger individuals. The age-ownership profiles themselves, tracing the share of a cohort that owns over time, are somewhat more concave than those found in the data. However, the increases in home ownership at each age that result from reducing the down-payment from 20 to 10 percent reflect the differentially large impacts of lower down-payments on younger individuals. Importantly, there are some individuals who never choose to own under certain down-payment regimes, and lower barriers to ownership induce some of these individuals to become

owners at some point. It is therefore possible in principle that one would observe long-lasting effects of eligibility for lower down-payments on home ownership. However, the main result that I will bring forward into the analysis is that at the ages I examine, differences in home ownership between individuals facing different down-payments are likely to be larger when they are younger than when they are older.

4 Effects of Military Service and Benefits on Home Ownership

4.1 Data and Empirical Design

The main empirical analysis is based on IPUMS Census microdata in 1960, 1970, and 1980 (Ruggles et al., 2008). I use the 1960 1 percent sample, an aggregation of the three 1 percent 1970 Form 2 samples, and a 3 percent sample drawn from the 1980 5 percent State sample. I use the remainder of the 1980 5 percent State sample, in addition to four remaining 1% samples from the 1980 Census, for the break searches described below (I refer to this as the 1980 'break' sample, to distinguish it from the 'analysis' samples). I restrict the sample to men born in the United States within the relevant bandwidth: for the pilot bandwidth, this includes men born from 1925 to 1936. Other sample restrictions are discussed in Appendix 1.

The steep declines in military service by date of birth for men coming of age at the end of World War II and the Korean War are evident in Figure 4, which shows the share of men in the 1960 Census who reported being veterans of the World War II or Korean War periods.[26] The two steep declines in the probability of military service were associated with cohorts coming of age for military service just as inductions fell at the end of hostilities in World War II in 1945, and similarly in the Korean War in 1953. Throughout this discussion, I will refer to the first break, associated with the decline in inductions in 1945, as the "World War II break" and to the second, corresponding to the decline in 1953, as the "Korean War break." To estimate the effect of service and benefits on home ownership or other outcomes, ideally there would be some marginal date of birth at which the

[26] As noted above, veterans' benefits were not extended to veterans of other periods until 1966. I identify a veteran as an 'eligible veteran' in 1960 if he reports having served during the World War II or Korean War periods, and as an eligible veteran in 1970 and 1980 if he reports having served during any period. Appendix Figure A2.3 shows the share of the same cohorts that reported being veterans of any conflict in the later Census years.

probability of military service exhibits a discrete shift, to which a regression discontinuity design could be applied directly. As is evident in Figure 4, however, the actual declines in service rates were somewhat more continuous. I take three different approaches to using this variation while still allowing estimated effects to vary with age, and find similar results across the alternative strategies.

4.1.1 Preliminary estimates: cohort-trend models

As a first step, I estimate a 'cohort-trend' model similar to that used in much of the previous literature on the GI Bill. This approach rests on the assumption that the share of each cohort that served in the military was driven by military manpower needs and not by other between-cohort differences.[27] In each Census cross-section, I regress the average outcome for a birth cohort on the share of men who were benefits-eligible veterans in the cohort, controlling for an underlying trend. That is, in a single cross-section from year t, I estimate

$$\overline{y}_{ct} = \alpha_t + \beta_t \overline{V}_{ct} + \gamma_t(c) + \lambda_t' \mathbf{X}_{ct} + \varepsilon_{ct} \tag{5}$$

where c indexes cohorts, $\overline{V}_{ct}$ is the share of men who were benefits-eligible veterans in birth cohort c in year t, $\gamma_t(c)$ is either a linear or a quadratic cohort trend, and $\mathbf{X}_{ct}$ is a vector of controls. This model has the benefit that it does not require a discrete shift in the probability of veteran status at a single date of birth. As a main specification, however, it is less natural for examining effects that may be heterogeneous in age, since it estimates an effect of veteran status averaged over the ages in the sample, rather than one at a clear cutoff. In my estimation of the model, I attempt to address heterogeneity of treatment effects by estimating the equation in fairly narrow windows around the two periods of decline, but turn to other specifications to estimate effects at specific ages more precisely.[28]

[27] Examples are Bound and Turner (2002), Page (2006), and Bedard and Deschênes (2006). Angrist and Krueger (1994) use a slightly different form of variation that exploits within-year-of-birth differences in call-up rates.

[28] Following Page (2006) and Bound and Turner (2002), I have also explored models that assume a parametric form of heterogeneity, interacting the veteran share with a linear or quadratic trend. With home ownership as an outcome, I found the results to be sensitive to different specifications of the underlying trend. Un-interacted versions within narrow windows are substantially more stable across specifications.

4.1.2 Main estimates: local linear specifications

The main estimates, more in the spirit of a regression discontinuity design, address heterogeneity in age by estimating local polynomial regressions at each break. A challenge in implementing this approach is to determine a specific cutoff; I do so using structural break estimation techniques in the 'break' sample, as described below. Given the cutoffs estimated in the break sample, I apply a regression discontinuity framework in the analysis sample to estimate the size of the decline in the probability of military service at each cutoff. The estimate is the difference between two counterfactuals: one predicting the probability of military service for an individual at the cutoff based on the cohorts immediately preceding him, and one predicting his probability of service based on the cohorts following him. Implementing the same approach with housing or other outcomes as the dependent variable, I then follow standard practice in fuzzy RD designs and scale the reduced form estimate by the estimate of the discontinuity in veteran status. In practice, the implementation uses a two-stage least squares estimator, in which I use birth before the cutoff as an instrument for veteran status. Because the declines at the cutoffs were not perfectly discontinuous, I also estimate specifications in which I drop the birth cohort that immediately precedes each cutoff and the cohort that immediately follows it, thus extending the extrapolation to the cutoff by an additional quarter.

The pilot bandwidth for the analysis is three years on either side of each break.[29] In the baseline specification, I follow Imbens and Lemieux (2008) and estimate a local linear regression within this bandwidth in the three Census cross-sections:[30]

$$y_{it} = \alpha_t + \beta_t \mathbf{1}(\text{yqob}_{it} < c) + \gamma_t(\text{yqob}_{it} - c)\mathbf{1}(\text{yqob}_{it} < c) + \delta_t(\text{yqob}_{it} - c)\mathbf{1}(\text{yqob}_{it} > c) + \lambda_t' \mathbf{X}_{it} + \varepsilon_{it}, \quad (6)$$

for individual i observed in year $t \in \{1960, 1970, 1980\}$, where c represents the relevant cutoff, yqob_{it} his year and quarter of birth, $\mathbf{1}(\text{yqob}_{it} < c)$ indicates that he was born before the cutoff, $\mathbf{1}(\text{yqob}_{it} > c)$ indicates birth after the cutoff, and $(\text{yqob}_{it} - c)$ represents the time in quarters

[29] A cross-validation procedure following Imbens and Lemieux (2008), applied to both the first stage and the reduced form, suggests a bandwidth of 3 or 4 years for housing outcomes; the cross-validation criterion is relatively flat for the first stage but suggests that a shorter bandwidth would be better. I choose the 3-year bandwidth, and present specifications with shorter bandwidths in Appendix Table A2.1.

[30] The t subscripts indicate that coefficients are allowed to vary by Census year, and that individuals are not necessarily followed over time.

between his date of birth and the cutoff. $\mathbf{X}_{it}$ is a vector of controls, including fixed effects for the quarter of the year in which an individual was born, fixed effects for state of birth, and an indicator for nonwhites. Coarse measurement of date of birth suggests clustering standard errors by year and quarter of birth (Lee and Card, 2008), but conventional heteroskedasticity-robust standard errors are typically of similar magnitude or larger: in the tables that follow I present the latter.[31]

To determine the cutoffs, I apply the structural break estimation techniques used in, for example, Chay et al. (2005) and Card et al. (2008). To determine a location for the World War II cutoff, I use the 1980 break sample, and limit the sample to men born between 1925 and 1930. I then estimate separate models with candidate cutoffs placed between each pair of neighboring birth cohorts from 1926 to 1929, and choose the cutoff that gives the highest R^2 in a regression with flexible linear trends. In the search for the Korean War cutoff, I restrict the sample to men born between 1931 and 1936, and consider candidate cutoffs between 1932 and 1935. Applied to either the probability of being a veteran of the World War II or Korean War period, or to being a veteran of any period, this technique places the World War II cutoff between 1927q4 and 1928q1 (which I will refer to as a cutoff of January 1, 1928) and the Korean War cutoff between 1933q3 and 1933q4 (which I refer to as October 1, 1933). Comfortingly, a visual inspection of the first stage suggests these cutoffs are reasonable.

4.1.3 Supplementary estimates: re-centered local linear specifications

A final alternative, which I use as a further check on the main estimates, is to estimate 're-centered' specifications that exploit the local character of the draft. For the decline in service rates associated with the end of hostilities in Korea, for example, the absence of a single, discrete shift in the national series is due in part to a local component of the draft: men were liable to be drafted from age $18\frac{1}{2}$, but there was a general policy of drafting older men first, and in particular to exhaust the supply of men 19 and above in the local draft board area before drafting younger men (U.S. Selective Service System, 1953). Even if the decision rule of each local draft board entailed a discrete shift in the

[31] Another issue accounting for estimation of the location of the break in the standard errors; but as discussed by Card et al. (2008), if a break does exist, the estimator of its location is n-consistent, and variance estimators that treat the location of the break as known are consistent.

probability of being drafted at some marginal date of birth, when averaged over all draft boards the actual share veteran by cohort could exhibit a more gradual decline.

Figure 5 depicts the rate of military service by date of birth for men born in Ohio and California, and provides evidence both that local variation in the draft may explain the non-discrete shift in the national series, and also that state of birth, in some cases, provides a reasonable proxy for an individual's local draft board regime. In both states discontinuities in the probability of military service are visually evident, but the location of the breaks differs between the two states.[32] I apply the same structural break technique as described above to estimate state-specific breaks in the 1980 break sample. I then 're-center' by generating a new running variable for each individual that represents the distance between his quarter of birth and the cutoff estimated for his state of birth. To address possible recall bias, or differences in the surviving veteran population in 1980 relative to 1960, I also estimate state breaks in the 1960 analysis sample (referred to below as '1960 breaks' to distinguish them from the '1980 breaks'), but given the potential biases arising from using the same sample for both the break search and analysis, I treat these results as supplementary.

4.2 Results

Table 2 presents means of key variables for the two cohorts around each break in each Census year, to aid in the interpretation of magnitudes of the effects estimated below. Men at the World War II break were 32 years old at the time of the 1960 Census. Slightly more than half owned their homes in 1960. The share rose to 73 percent in 1970, and to 80 percent in 1980. The men around the Korean War break were 26 in the 1960 Census, and 28 percent owned their homes. This increased to 66 percent in 1970, and to 79 percent in 1980. In the 1960 data, therefore, one observes these cohorts as they transition rapidly into home ownership; subsequent changes between decades reflected a leveling of the age-ownership profile.

[32] Other states do not always exhibit discontinuities as visually evident as these, presumably because of more heterogeneity across draft boards within the states, marginal dates of birth falling in the middle of a birth quarter, or application of a different decision rule by draft boards. A full set of state graphs, with the corresponding break points, are posted at `http://www.wellesley.edu/Economics/dfetter/`.

4.2.1 Preliminary estimates: cohort-trend models

As a baseline, I present estimates of the cohort-trend model of equation (5) in Table 3. Including men born from 1923 to 1938, as has been done in previous work, gives large, statistically significant positive estimates of the effect of veteran status on home ownership in 1960, although the magnitude varies with the specification of the underlying trend. Narrowing the sample to cohorts born within a few years of each break gives greater stability across different specifications of the trend, although it also reduces the sample size considerably. With controls, the cohort-trend model gives estimates of 13-15 percentage points at the World War II break and 19-20 percentage points at the Korean War break.[33] The Korean War estimates are significant at the 5 percent level using conventional standard errors (except column (6) of Panel B, significant at 7 percent); the World War II estimates are not. It is also notable that there is no evidence for a positive effect of veteran status on home ownership at either break in 1970 or 1980.[34] This finding is consistent with the prediction that the effect of easier finance should decline with age, as I discuss at greater length below.

4.2.2 Main estimates: local linear specifications

My preferred, local linear specifications give very similar, but more precise point estimates. Table 4 presents estimates of equation (6) without re-centering the data, and Figure 4 shows the corresponding means by cohort and estimated trends for both the first stage and reduced form. First-stage estimates of the decline in the probability of being a benefits-eligible veteran in 1960 are large and highly significant at each break: those in Panel A imply that men on the earlier side of the World War II break were 11 percentage points more likely to be eligible than those born slightly later. The corresponding estimate of the Korean War break is 16 percentage points.

[33] Note that the World War II and Korean War veteran shares are not entered separately in equation (5). At the World War II break, where those on the earlier side mostly served in World War II, and those on the later side mostly served in the Korean War, this model imposes the restriction that the effects of military service and benefits in the two conflicts are the same as of year t (1960 or later). Justifications for doing so are that the housing benefits were very similar for the two conflicts, and that by 1960 men on both sides of the World War II break would have been back for several years. If the 'true' World War II effect as of 1960 was larger than the corresponding 'true' Korean War effect, my estimate at the World War II break is likely an overestimate; conversely, if the 'true' World War II effect was smaller then my estimate is probably an underestimate. With home ownership as an outcome, the results when both are entered separately are unstable across alternative specifications. Men at the Korean War break would have been too young to serve in World War II, so this caveat does not apply there.

[34] In 1970 the estimate at the Korean War break with controls is, in fact, significant and negative, although this is not the case in the local linear estimates discussed below.

The IV estimates in columns (3) and (6) suggest that being an eligible veteran led to large increases in the probability of owning one's home in 1960. For individuals coming of age at the end of World War II, the estimated treatment effect of service and benefits is 13 percentage points. The predicted probability of home ownership for a comparable non-veteran at the break is 43 percent, suggesting that service and benefits increased the rate of ownership at the World War II break by about 30 percent. For individuals coming of age at the end of the Korean War, the estimated treatment effect in 1960 is larger, at 18 percentage points.[35] The predicted probability of home ownership for comparable non-veterans is 22 percent at the break, giving an 80 percent increase in the probability of home ownership at the Korean War break. Estimates in Panel B address the issue of 'intermediate' levels of treatment right around the breaks by dropping the two cohorts on either side of each break. Doing so has little effect on the World War II estimate – it increases to 13.6 percentage points (an effect of 32 percent relative to a predicted probability of ownership for comparable non-veterans of 42.5 percent); the Korean War estimate falls to 13 percentage points (a 54 percent effect relative to a corresponding predicted value of 24 percent), but is of broadly similar magnitude and still statistically significant.

4.2.3 Supplementary estimates: re-centered local linear specifications

Re-centered local linear specifications present further evidence supporting the main estimates. Figure 6 shows the means and estimated trends at each break in 1960, and Table 5 presents the corresponding estimates. Downward shifts in the probability of home ownership are perhaps more visually evident in these graphs than in the un-recentered versions, but the point estimates are quite similar. Using the 1980 breaks gives estimates of 15 percentage points for each break in 1960, very similar to the main specifications. The 1960 breaks also give an estimate of 15 percentage points

[35] The use of educational deferments during the Korean War somewhat complicates interpretation of the IV estimates at the Korean War break: as emphasized in the literature on the Vietnam-era draft (e.g., Card and Lemieux (2001)), men at risk of being drafted may have entered college as a way to avoid military service. Given that deferments were not introduced until 1951, after the Korean War had begun, this is likely to be more of an issue in interpreting the estimate at the Korean War break. I cannot definitively say how much of the reduced-form difference should be attributed to greater educational attainment among non-veterans in the cohorts at higher risk of being drafted. But in my 1960 analysis sample, a simple difference suggests that at age 26, college completion was associated with a lower probability of home ownership, by about 4.5 percentage points. If higher risk of being drafted increased rates of college completion, and if the true effect of college completion on home ownership at age 26 is negative, it suggests that my estimate at the Korean War break is biased downward.

at the World War II break in 1960, but a somewhat smaller estimate at the Korean War break. All of the estimates of the veteran effect on home ownership in 1960 are statistically significant at conventional levels.

4.2.4 Interpretation: the pattern of effects by age

Section 3 suggested that effects of easier terms on housing finance should decline as individuals age and accumulate assets. One implication is that tracing the same cohorts over time, the size of the estimated difference in home ownership at each cutoff should decline. Indeed, the results for home ownership in 1970 and 1980 give no evidence of significantly higher ownership in either of the later years, at either break.[36] Point estimates are negative, for the most part indistinguishable from zero, and significantly different from the 1960 coefficients.

Interpreting convergence at the cutoffs over time as declining effects of finance does face the complication that terms on non-VA loans improved by the end of the 1960's. Table 1 suggests that VA loans were still available on easier terms than FHA loans in 1970, but at a level different from earlier years; a market-wide shift towards easier terms could lead to a smaller veteran-nonveteran difference in 1970 even without effects that vary by age. An alternative test for heterogeneity of effects by age that suffers less from this issue is to compare the World War II and Korean War estimates within a single Census year.[37] Across the cohort-trend and the local linear specifications in Tables 3, 4, and 5, estimates of the veteran effect at the Korean War break are larger in percent terms than those at the World War II break; they are also often as large or larger in percentage point terms. The estimated differences between the breaks within Census years are not statistically significant, but the general pattern of effects is consistent with the prediction that the effects of the VA program should decline with age.

[36] The magnitude of the first stage declines at the Korean War break between 1960 and 1970; this is due to a change in the definition of 'benefits-eligible' veteran from being a veteran of the World War II or Korean War period to being a veteran of any period, as described in Section 2.

[37] Just as a comparison of estimates at the same break over time may confound an 'age' effect with a 'time' effect, a comparison of estimates at the two breaks within the same cross section may confound an 'age' effect with a 'cohort' effect. If the characteristics of compliers are different at the two breaks, for example, comparison within a single Census year is a comparison of local average treatment effects for two different populations. Neither comparison is entirely satisfactory, but by exploiting the presence of two breaks to make both comparisons, I am able to provide at least some degree of cross-validation.

The estimated effects of service and benefits on home ownership are quite stable across specifications: the alternative approaches all provide evidence of large, positive effects of veteran status on home ownership early in life, and attenuation of the effect of veteran status in later years. Generalizing the results to mortgage subsidies that are not bundled with other benefits or military service itself requires disentangling the different aspects of the 'veteran treatment'; this is the task of the next section.

5 Evaluating alternative explanations

The results presented above answer the question of what impact the combination of an individual's military service and eligibility for veterans' benefits had on his housing outcomes, but does not necessarily isolate the effect of easier mortgage financing. It is not immediately obvious whether one should expect service or other benefits to have had a positive or negative effect on the probability of home ownership. Military service may have reduced rates of ownership on return to civilian life if separation from the labor market lowered earnings. On the other hand, service may have increased the probability of ownership if temporary separation from civilian life led to preferences for earlier household formation, or lower desired mobility, after service was complete. Education benefits may have increased ownership rates either through higher permanent income or other complementarities with home ownership; other benefits, such as job training, may have also increased earnings. To the extent that higher education benefits increased desired mobility during college attendance,[38] they could have instead reduced the probability of home ownership at younger ages. In three complementary analyses below, I assess the potential importance of these other factors.

5.1 Possible impacts of other benefits

There are several reasons to think it unlikely that veterans' eligibility for education and training benefits explains the positive effects on home ownership that I find in 1960. Past work on the draft and educational benefits on educational attainment, such as Stanley (2003), has emphasized

[38] Studying the Vietnam draft, Malamud and Wozniak (2010) suggest that one channel through which education may increase mobility is through attending college in a different state.

that the World War II GI Bill was largely compensatory in its effects, making up for the large disruption effects of military service on education. At the Korean War break, the ownership effects in 1960 are likely too early to be due to Korean War veterans taking advantage of their education benefits. I find that a similar application of the regression discontinuity design estimates a net positive effect of service and benefits on various measures of educational attainment in 1970, in line with the findings of Bound and Turner (2002). Yet the same type of estimate also suggests that high school completion rates were lower for earlier cohorts at the World War II break in all three Census years, and provides no evidence for greater educational attainment for veterans at the Korean War break in 1960. Moreover, even to the extent that education benefits under the GI Bills more than compensated for the disruption of education during military service, the costs of service also included forgone labor market experience, which likely depressed wages (Angrist, 1990).

In the absence of complementarities between education and ownership as a form of housing tenure, the natural argument for a positive effect of education benefits on home ownership in 1960 is through increased income. More broadly, other benefits, such as on-the-job training or preferences in hiring, may have increased income for veterans as well. As a rough summary measure of the possible effects of education or other benefits, it is therefore natural to test for discontinuities in income across cohorts. However, the rapidly changing curvature of the income profile for these age groups makes an application of the RD framework somewhat more problematic.[39] Nevertheless, I test for discontinuities in the log of total personal income, conditional on positive income, using all of the approaches above and present the estimates in Table 6.[40] There is little evidence based on these specifications that income could be driving the results for the World War II break: most point estimates are negative and not significant at conventional levels. For the Korean War break, some specifications suggest higher income for veterans, although it is worth noting that the estimates decline in both size and significance when estimated using a shorter bandwidth, as suggested by a cross-validation procedure.

To explore further whether or not the documented effects of veteran status on home ownership

[39] Indeed, a cross-validation procedure suggests using a shorter bandwidth for income than for home ownership.

[40] As is evident in Table 2, almost all men at the cutoff earned positive income by 1960. I find no evidence of a discontinuity in the probability of positive income at either break.

could be due to increased income, in the remainder of Table 6 I re-estimate the main specifications adding log income as a right-hand-side variable. In most specifications, controlling for income leads to small increases in the estimates at the World War II break and small decreases in the estimates at the Korean War break, but the estimates remain positive, statistically significant, and comparable in magnitude. These results, of course, do not imply that other benefits played no role in higher home ownership rates for veterans, but they do suggest that other benefits were not the primary cause.

5.2 Estimating service effects: World War I veterans

No national program of home loan benefits existed for veterans of the First World War. A similar regression discontinuity analysis gives an estimate of the possible direct effects of service in World War I that one may consider in evaluating the relevance of service effects to explaining the observed differences in home ownership at the World War II and Korean War breaks. Due to state and national veterans' benefits that did exist after World War I, the estimates I present are likely an upper bound on possible direct effects of service. These benefits included a generous national bonus and slightly smaller bonuses in 21 states, as well as home loan benefits in four states.[41]

I use IPUMS data from the 1920 and 1930 Censuses. These Censuses do not record year or quarter of birth, only age in years. I calculate an approximate year of birth assuming each individual's birthday fell after the day of the Census. Because the 1920 Census did not ask for veteran status, I report only reduced form estimates for 1920, but I report both reduced form and IV estimates for 1930.[42]

The upper panel of Figure 7 shows the share of each birth cohort reporting service in World War I in the 1930 Census. Applying the same break search procedure as in the main analysis, I locate a break between 1896 and 1897.[43] A cross-validation procedure applied to both the first

[41] Dillingham (1952) provides a review of the national bonus, which was to be paid out in full in 1945 but which could be used as a security for borrowing as early as 1925; the full amount of the bonus was eventually paid out in 1936. A survey of all state veterans' benefits provided after World War I is given in U.S. House of Representatives (1945).

[42] As shall be seen, the reduced form results in 1920 show little that would merit a two-sample IV procedure.

[43] In particular, I limit the sample to men born from 1891 to 1902, place candidate cutoffs between each pair of neighboring years of birth from 1892 to 1900, and estimate a piecewise linear model allowing flexible trends on either side of each candidate cutoff. The break between 1896 and 1897 yields the model with the highest R^2.

stage and reduced form suggests a bandwidth of 5 years; the results below are not sensitive to the choice of bandwidth.

The results in Table 7 and the lower panel of Figure 7 offer no evidence that service in World War I led to earlier home purchase. Although the first stage is large and significant, reduced form coefficients in both 1920 and 1930 are very close to zero and fairly precise, as is the scaled estimate for 1930. Moreover, to the extent that the benefits that were extended to World War I veterans raised their rates of home ownership relative to non-veterans, it suggests that on net, the direct effects of service were negative, not positive. The experience of World War I veterans thus weighs against the notion that direct effects of service can explain the observed discontinuities for veterans of World War II and the Korean War in 1960.

5.3 Further evidence on service effects: timing of purchase

The timing of use of the VA housing benefit, and home purchase for veterans, provides complementary evidence that the effects of veteran status on home ownership in 1960 were not driven by service-induced preferences for earlier household formation. While the government provided a guarantee to lenders, obtaining a loan still required that a private lender was willing to give a veteran a loan on VA terms. An analysis of the timing of veterans' home purchase relative to non-veterans suggests that in periods when VA loans became more appealing to suppliers of funds, and thus available at lower down-payments, veterans were differentially more likely to purchase homes.

In the decade following World War II, the number and volume of VA loans exhibited large swings from year to year. The year-to-year volatility in VA lending is evident in the upper panel of Figure 8, in which the bold line shows the number of VA loans closed, by quarter, from 1946 through 1956. While the number peaked soon after World War II and again after the Korean War, the latter peak appears not to be due solely to the return of Korean War veterans. I use annual figures on the share of loans made under the World War II entitlement (U.S. Veterans Administration, 1962) to estimate the number of loans to World War II veterans from 1952 onwards. The large share of World War II veterans in the 1955 peak suggests that it was not driven solely by the return of veterans from the Korean War.

Given the presence of three large spikes in use of the benefit among World War II veterans, a natural question is what drove these fluctuations, if not veteran demand shocks. An explanation given by many contemporary observers, such as Klaman (1961) and the Veterans Administration itself (e.g., U.S. Veterans Administration (1948)), was that they were driven by lenders' willingness to supply loans on VA terms. In particular, the interest rate ceiling on VA loans discussed in Section 2.2 meant that as yields on alternative investments increased, the market could adjust only by reducing the supply of funds for VA mortgages and changing other terms of the loans, such as down-payments.[44] Conventional loans, on the other hand, had no interest rate ceiling, while FHA loans had an interest rate ceiling that was higher than that on VA loans and tended to be less binding.[45] As a result, non-VA loans did not exhibit the same degree of year-to-year volatility over this period that VA loans did.[46] The lower panel of Figure 8 shows the difference between the maximum interest rate for VA loans and the annualized yield on lowest-risk corporate bonds. It is unmistakable that over this period rises and declines in the number of VA loans track similar changes in the difference between VA rates and the yield on corporate bonds, while any similar trend for non-VA loans appears much more muted.

Rationing VA loans through higher down-payments may have been one way that markets adjusted. The top panel of Figure 9 shows the difference between the average LTV for VA loans and that for FHA loans originated in each year, and the bottom panel shows the annual mean of the difference between the VA cap and the yield on corporate bonds. In years when VA loans would have been more (less) appealing to suppliers of funds, the difference in average loan-to-value ratios between VA and FHA loans was greater (smaller).

To the extent that the increases in the number of VA loans reflect the supply of funds rather than demand shocks, it is informative to ask whether periods when VA loans were available on easier terms, relative to the alternatives, saw differentially greater rates of home purchase by veterans.

[44] Grebler (1960) noted that trading VA mortgages at prices below par was seen as having an "aura of 'unethical' practice," and hence that mortgage discounts failed to adjust the yield on VA mortgages.

[45] In the 1950 Residential Finance Survey, over 99 percent of the stock of VA mortgages had an interest rate of 4%, precisely at the cap, while roughly 25 percent of the stock of FHA mortgages had interest rates below the FHA cap of 4.5% that was in place prior to 1950. In 1950, this cap was lowered to 4.25%.

[46] Conventional loans did exhibit more pronounced seasonality than VA loans did, probably for reasons having to do with the institutional structure of the market: see Klaman (1961), page 123.

The early years of the Survey of Consumer Finances, which was carried out annually beginning in 1947, provide a rare source of data to do so. The SCF did not ask about entry into home ownership consistently over time, but did ask reasonably consistently about purchase of a home the previous year, and collected data on whether the head of each 'spending unit' was a veteran up through the 1957 survey.[47] To focus on the age group most likely to be entering home ownership, in each year I limit the sample to spending units whose heads were between 25 and 34 years old.[48]

From the middle panel of Figure 9, it appears that in years when veterans had differentially greater increases in access to credit, they also purchased homes at differentially higher rates. Spending units with World War II veterans are more likely to purchase than those without veterans in each year.[49] But the difference was greater in years when the top and bottom panels would suggest that VA loans would be easier to obtain, or available with differentially lower down-payments. Table 8 presents a quantitative estimate of this result: column (1) implies that an increase of 0.1 in the difference between the VA rate and the corporate bond yield is associated with an increase in the rate of house purchase that is greater by 0.008 for veterans, a little more than 10 percent of the average share of spending units buying a house each year.

It is possible that these patterns simply reflect a situation in which military service induces preferences for earlier home purchase, and in which veterans do not face liquidity constraints but rather simply delay or accelerate their purchase to occur when VA loans are more available. But these results seem more supportive of the hypothesis that eligibility for housing benefits led to earlier purchase by relaxing borrowing constraints, and less supportive of the hypothesis that military service itself drives the results shown in Section 4.2.

[47] The spending unit is the basic unit of observation in the SCF. It is defined as a group of related individuals living in the same dwelling who pool their incomes for major items of expense. A married couple is always grouped together, and an individual who does not earn an income over a certain threshold cannot form a separate spending unit. Between 1947 and 1957, there were about 3,000 spending units interviewed in each year.

[48] Unfortunately age is measured quite coarsely in the SCF, making it impossible to control for age more finely. Hence, in any year the average age of veterans is likely to be different from non-veterans. From patterns of military service by birth cohort, one can infer that for this age group, non-veterans would tend to be older than veterans up until the last two or three years.

[49] In this figure I exclude spending units with Korean War veterans, to de-emphasize any effects driven by purchase immediately after a veteran's return from war. Including them leads to no obvious difference in the graph.

6 Discussion: Aggregate effects

The regression discontinuity estimates I present above can be used to calculate the share of the increase in ownership from 1940 to 1960 at ages 26 and 32 that can be explained by military service and veterans' benefits. With some further assumptions, they can also be used in a rough calculation of the share of the overall change from 1940 to 1960 that can be explained by the VA home loan program. These calculations assume that the estimates of the effect of changing an individual's eligibility can be applied to the thought experiment of changing the eligibility of a large portion of the population. I attempt to shed some empirical light on the magnitude and direction of possible general equilibrium effects below.

6.1 Estimates of the impact of the VA on the overall rate of ownership

The main estimate of the effect of veteran status at the World War II break, in Table 4, is 13 percentage points. In 1940, 19 percent of men 32 years old owned their homes versus 53 percent of individuals 32 years old in 1960; 69 percent of 32 year-old men were benefit-eligible veterans in 1960. These figures imply that about 26 percent of the increase for individuals of age 32 can be attributed to service and benefits. Similarly, the estimated effect of veteran status at the Korean War break, for individuals 26 years old, is 18 percentage points. Of 26 year-old men in 1940, 9 percent were home owners, versus 29 percent in 1960. Of 26 year-old men in 1960, 44 percent were eligible veterans. The same calculation suggests that about 39 percent of the increase for 26 year-olds can be attributed to service and benefits.

It is necessary to extrapolate from the estimates at each discontinuity in order to estimate the share of the overall increase in home ownership from 1940 to 1960 that can be explained by the effects of service and benefits. Given only two points, I assume a linear decline in the percent effect with age, and use the two estimates to extrapolate to ages around the discontinuity. The assumption of linearly declining effects in percent terms implies a zero effect of the VA at ages 36 and above. This is is consistent with the finding of no discontinuity in home ownership at the Korean War cutoff in 1970 and later, when these individuals were 36 and older. As might be expected from age requirements for service during the Korean War period, no men 22 or below are

recorded as being benefits-eligible veterans in 1960. Thus any effects in this calculation are limited to individuals between 23 and 35.

The calculation suggests that VA home loan benefits can explain a substantial share of the aggregate trend in home ownership from 1940 to 1960. Using the observed share veteran and home ownership rates in 1960, along with the extrapolated effects on home ownership, I calculate the increase in aggregate ownership due to the VA as $\sum_{g=23}^{35} w_{g60}\hat{\beta}_g \Pr(\text{vet})_{g60}$, where g indexes ages, w_{g60} gives the share of men 18 and above that were of age g in 1960, and $\hat{\beta}_g$ is the estimated percentage point effect for men of age g. This calculation suggests that the rate of home ownership for men 18 and above would have been about 1.9 percentage points lower in 1960 in the absence of the VA program, or 7.4 percent of the overall increase from 27 to 53 percent. A similar calculation suggests that the VA can explain 25 percent of the 1940 to 1960 increase in home ownership for men at the 'affected' ages from 23 to 35 (for whom ownership rates rose from 13 to 41 percent).

A point estimate of a 1.9 percentage point difference in the 1960 home ownership rate appears reasonable in the context of veterans' survey responses in the 1977 National Survey of Veterans (discussed in Section 2.2). The results of the 1977 Survey suggest that there were approximately 3.23 million veterans in 1977 who had used a VA loan for their first home but would not have had a sufficient downpayment for it without their VA eligibility. A plausible interpretation of this figure is that roughly this many individuals would have delayed home ownership if they had been ineligible for the VA program. This number is not directly comparable to my estimates, which instead represent how many veterans were home owners in 1960 but would not have been without the VA benefit. However, the 1979 Survey of Veterans (SOV-II), while not asking about whether veterans could have purchased without a VA loan, did ask about the year of first home purchase. I calculate the share of veterans from the 1979 survey who used a VA loan for their first home and first bought between 1955 and 1960, and assume that roughly this fraction of the 3.23 million veterans would not have been home owners in 1960 in the absence of VA eligibility.[50] This calculation suggests that the home ownership rate would have been about 1.6 percentage points lower in the absence of

[50]The baseline assumption of a five-year difference is motivated by a comparison of estimated age-ownership profiles under the two counterfactuals of all individuals being eligible for the VA and of none being eligible. The estimates suggest that conditional on owning eventually, VA benefits lowered the age that the median individual became an owner by roughly 5 years.

the VA, reasonably close to my point estimate of 1.9 percentage points.[51] Using instead the share first buying between 1956 and 1960, the estimate would instead be 1.2 percentage points; using the share buying between 1954 and 1960 it would be 2.0 percentage points.

It is important to note that these estimates are for a specific point in time, and it is likely that if one were able to perform a similar analysis on earlier years, estimates would be higher, given the convergence of terms on other loans to VA terms over the 1950's. On the other hand, effects on the rate of home ownership in later years would probably be lower, due in part to the aging of the veteran population. It is also worth noting that since terms on all loans were becoming easier over the postwar period, this figure is probably a lower bound for the impact of broader changes in finance.

Vigdor (2006) also provides an estimate of the impact of the VA program on home ownership, calculating that about 20 percent of the increase from 1940 to 1970 was due to veterans' home loan benefits. This result is based on a direct comparison of veterans to non-veterans that controls for a variety of characteristics, including age. My estimates suggest smaller effects, with the difference likely due to characteristics of selection into military service during World War II and Korea. As emphasized in the literature on the education benefits of the GI Bill (Bound and Turner, 2002; Page, 2006; Stanley, 2003), non-veterans who were of the right age to have served in World War II were likely strongly negatively selected, and thus less likely to own in 1970 for other reasons.

6.2 Are the estimates driven by crowd-out of non-veterans?

To the extent that the VA mortgage program affected house prices or the demand for home ownership among non-veterans, these estimates may over- or understate the aggregate effect of the VA. It is natural to suppose that the relaxation of liquidity constraints increased prices for all prospective

[51] The details of the calculation are as follows. About 3.233 million veterans of World War II and/or the Korean War, but not of later conflicts, reported in 1977 that they would have had an insufficient down-payment for their first home without the VA loan. Data from the 1979 Survey of Veterans suggests that about 26 percent of that group first purchased a home between 1955 and 1960. For comparison with the counterfactual estimate from my main analysis, I then multiply by the share of World War II and Korean War veterans in 1960 who were US-born (0.972), since my calculations from the Census use only native-born men. The resulting estimate of the number of men who were owners in 1960 but who would not have been if they were ineligible for the VA program is 817,043, or about 1.6 percent of the number of native-born men of age 18 and above in 1960 (51,125,748, from the 1960 Census of population).

buyers, as suggested by Shiller (2005) and Vigdor (2006), and hence that the estimates above partly reflect crowd-out of non-veteran owners as well as net additions to the stock of home owners. On the other hand, it is also easy to imagine that general equilibrium effects may have been positive on net. As one example, the change in market demand associated with the VA may have induced suppliers to incur the fixed costs of building new suburban housing developments. Here I attempt to shed some empirical light on the probable direction of these effects, focusing primarily on whether the estimates are likely to be overstated as a result of crowd-out of non-veterans.

If the VA benefit did not add to the stock of owners, but rather shifted ownership from non-veterans to veterans, then all else equal, we should observe that in housing markets with a greater presence of veterans, non-veterans were less likely to own their homes.[52] The approach I take here is to compare non-veterans' probability of home ownership in states with a greater or lesser presence of World War II and Korean War veterans in the market, both in a 1960 cross-section and in a panel specification using the 1940 and 1960 IPUMS samples.[53]

To take into account confounding factors that could be correlated both with the propensity to own and the state's share veteran in 1960, I rely on work by Acemoglu, Autor and Lyle (2004), which argues that the variation in state mobilization rates for World War II can be understood as a combination of 'economic' factors (share farmers, average education, and share non-white), 'non-economic' factors (the age structure of the population and the share German-born), and other variation that cannot be explained by existing data, such as idiosyncratic behavior of local draft boards. In the regressions I present below I attempt to isolate the last source of variation by controlling for this set of state characteristics, as well as the urban share of the population in 1940.

Even if the state veteran shares are orthogonal to omitted determinants of home ownership in 1960 once these state characteristics are held constant, there is an additional complication that in states with more veterans, the characteristics of the marginal (and hence the average) veteran may be different. To alleviate this concern, I include specifications that restrict the sample to men who were born too late to serve in WWII, and compare their propensity to own across states with more

[52] It could also be that a greater presence of veterans in a housing market changed veterans' propensity to own, but since this is not a necessary implication of the crowd-out story, I do not examine it here.

[53] A state is admittedly somewhat coarse as a representation of a housing market, but no finer level of geographical information is currently available in the 1960 IPUMS.

or fewer WWII veterans, while controlling for the state's Korean War veteran share.

Column (1) of Table 9 presents a comparison of non-veterans across states in a 1960 cross-section that controls only for individual-level characteristics. Column (3) presents analogous panel specifications, with fixed effects for year and state of residence, that use IPUMS samples from 1940 and 1960 and define all men as 'non-veterans' in 1940. The coefficient on the variable of interest – the share of men 18 and above in the state who were eligible for benefits in 1960 – is not significantly different from zero in either specification.[54] Columns (2) and (4) control for 1940 state characteristics and Census division fixed effects, interacted with time dummies in the panel specification. Inclusion of these characteristics appears to alleviate a downward bias in the coefficient on the state veteran share.[55] The cross-section specification in column (2) gives a coefficient estimate of 0.791, suggesting that for non-veterans aged 23-35 in 1960, those living in a state with a veteran share greater by 5 percentage points were about 4 percentage points more likely to own their homes in 1960. The panel specification in column (4) gives a very similar coefficient estimate of 0.794. The cross-section and panel estimates are significantly different from zero at the 10 and 5 percent levels, respectively.

As discussed above, even if the specifications in Panel A adequately control for all relevant characteristics correlated with the state's veteran share, it may be that the observed differences are driven by the link between a state's veteran share and the characteristics of the marginal veteran. For men too young to have served in World War II, however, once we control for the Korean War veteran share, in principle the World War II veteran share should have no relationship with the characteristics of the marginal veteran. In Panel B, I present similar specifications that limit the sample to men aged 23-29 in 1960. The coefficient of interest is the share of men who were World War II veterans. The coefficient estimates in the cross-section and panel specifications are similar, at 0.874 and 0.750, respectively, both significant at the 5 percent level. In states with a greater

[54]The share of all men 18 and above who were World War II or Korean War veterans may not be the relevant measure of benefits-eligible veterans in the housing market. But defining the veteran presence instead as, for example, the share of men aged 18 to 45 (or 18 to 35, 18 to 55, or 18 to 65) gives qualitatively similar estimates.

[55]This appears to be driven largely by the variables measuring agricultural activity in 1940: the share of men who were farmers and the urban share of the population. Due to agricultural exemptions in the World War II draft, rural states tended to have lower mobilization rates; at the same time, they had both high levels of home ownership and large increases between 1940 and 1960.

presence of eligible veterans, non-veterans appear to have been more likely to own in 1960.

The finding of a positive relationship between the share veteran in a market and the probability of home ownership for non-veterans is in line with the findings of Vigdor (2006). While emphasizing that veterans' benefits may have increased prices relative to rents, Vigdor also finds that controlling for an individual's veteran status, the probability of home ownership in a 1970 cross-section is higher in metropolitan areas with more veterans – although the difference is smaller (but still positive) for individuals of low SES.

Isolating fully transparent variation in states' veteran shares in 1960 is beyond the scope of this paper, so the conclusions we may draw from these results are necessarily more speculative than for the RD estimates presented above. The finding of a significant, positive relationship between veteran shares and non-veterans' probability of home ownership, however, weighs against an interpretation of the RD results as reflecting crowd-out of non-veterans rather than net additions to the set of home owners.

7 Conclusion

What role did government interventions in mortgage markets play in the mid-century increase in home ownership? The change in the age profile of home ownership from 1940 to 1960 suggests that much of the increase was associated with a decrease in the age at entry into ownership, for which one natural explanation would be a trend towards easier terms in mortgage borrowing. Yet the many concurrent changes in housing markets over this period make it difficult to isolate the effect of government mortgage market interventions.

To shed light on this question, this paper uses sharp changes in the probability of military service by birth cohort, for men coming of age at the end of hostilities in World War II and the Korean War, to estimate the effect of veterans' home loan benefits on the probability of home ownership from 1960 to 1980. Men more likely to have served by merit of their date of birth had significantly higher rates of home ownership in 1960, with some evidence of larger effects at younger ages. At the same time, the positive effect diminished as the affected cohorts aged. These findings are consistent with the prediction of a standard life-cycle model that relaxing borrowing constraints

should have the largest effects on younger individuals. Non-housing veterans' benefits and direct effects of military service appear not to explain the observed differences, leaving veterans' housing benefits as the most likely explanation for the effect of veteran status.

A simple calculation of the effect of service and benefits on the overall home ownership rate suggests that in the absence of this treatment, the rate of home ownership would have been about 1.9 percentage points lower in 1960 than it was. This suggests that VA housing benefits may explain about 7.4 percent of the overall change in home ownership for men 18 and above from 1940 to 1960, and 25 percent of the change for the affected cohorts.

The results underscore the idea that programs subsidizing borrowing, to the extent that they raise home ownership rates, are likely to do so primarily by shifting purchase earlier rather than by leading to home ownership for individuals who would never have purchased otherwise. In this respect these results are in line with arguments in more recent periods that FHA financing primarily serves to accelerate ownership (Goodman and Nichols, 1997).

This paper presents evidence that changes in mortgage markets played a critical role in the observed increase in home ownership in the mid-20th century. But it is noteworthy that much of the 1940 to 1960 increase occurred before the end of World War II, when construction of new housing was severely curtailed. The dramatic rate of increase in home ownership from 1940 to 1945 suggests that further research into changes in housing markets during World War II is necessary to understand the mid-20th century increase in home ownership more fully.

References

Aaron, Henry J., *Shelter and Subsidies: Who Benefits from Federal Housing Policies?*, The Brookings Institution, 1972.

Acemoglu, Daron, David H. Autor, and David Lyle, "Women, War, and Wages: the Effect of Female Labor Supply on the Wage Structure at Midcentury," *Journal of Political Economy*, 2004, *112* (3), 497–551.

Angrist, Joshua D., "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records," *American Economic Review*, 1990, *80* (3), 313–336.

_ **and Alan B. Krueger**, "Why Do World War II Veterans Earn More than Nonveterans?," *Journal of Labor Economics*, 1994, *12* (1), 74–97.

Artle, Roland and Pravin Varaiya, "Life Cycle Consumption and Homeownership," *Journal of Economic Theory*, 1978, *18*, 38–58.

Baum-Snow, Nathaniel, "Did Highways Cause Suburbanization?," *Quarterly Journal of Economics*, 2007, *122* (2), 775–805.

Bedard, Kelly and Olivier Deschênes, "The Long-Term Impact of Military Service on Health: Evidence from World War II and Korean War Veterans," *American Economic Review*, 2006, *96* (1), 176–194.

Bound, John and Sarah Turner, "Going to War and Going to College: Did World War II and the G.I. Bill Increase Educational Attainment for Returning Veterans?," *Journal of Labor Economics*, 2002, *20* (4), 784–815.

Boustan, Leah Platt and Allison Shertzer, "Demography and Population Loss from Central Cities, 1950-2000," NBER Working Paper 16435, 2010.

Card, David, Alexandre Mas, and Jesse Rothstein, "Tipping and the Dynamics of Segregation," *Quarterly Journal of Economics*, 2008, *123* (1), 177–218.

_ **and Thomas Lemieux**, "Going to College to Avoid the Draft: The Unintended Legacy of the Vietnam War," *American Economic Review*, 2001, *91* (2), 97–102.

Carter, Susan B., Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright, eds, *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition*, Cambridge University Press, 2006.

Chambers, Matthew, Carlos Garriga, and Don E. Schlagenhauf, "Did Housing Policies Cause the Post-War Boom in Homeownership? A General Equilibrium Analysis," 2011. Towson University Department of Economics Working Paper No. 2011-01.

Chay, Kenneth Y., Patrick J. McEwan, and Miguel Urquiola, "The Central Role of Noise in Evaluating Interventions That Use Test Scores to Rank Schools," *American Economic Review*, 2005, *95* (4), 1237–1258.

Chiuri, Maria C. and Tullio Jappelli, "Financial Market Imperfections and Home Ownership: A Comparative Study," *European Economic Review*, 2003, *47*, 857–875.

Collins, William J. and Robert A. Margo, "Race and Home Ownership: A Century-Long View," *Explorations in Economic History*, 2001, *38*, 68–92.

Dillingham, William P., *Federal Aid to Veterans, 1917-1941*, University of Florida Press, 1952.

Duca, John V. and Stuart S. Rosenthal, "Borrowing Constraints and Access to Owner-occupied Housing," *Regional Science and Urban Economics*, 1994, *24*, 301–322.

Economic Behavior Program, Survey Research Center, University of Michigan, "Survey of Consumer Finances, various years," Institute for Social Research, Social Science Archive 1973. Distributed by Inter-university Consortium for Political and Social Research, 1999.

Glaeser, Edward and Jesse Shapiro, "The Benefits of the Home Mortgage Interest Deduction," *Tax Policy and the Economy*, 2003, *17* (1), 37–82.

Goodman, John L. and Joseph B. Nichols, "Does FHA Increase Home Ownership or Just Accelerate It?," *Journal of Housing Economics*, 1997, *6*, 184–202.

Gordon, Robert J., ed., *The American Business Cycle: Continuity and Change*, University of Chicago Press, 1986. NBER Studies in Business Cycles, Vol. 25.

Grebler, Leo, *Housing Issues in Economic Stabilization Policy*, National Bureau of Economic Research, 1960. Occasional Paper No. 72.

Haines, Michael R., "Historical, Demographic, Economic, and Social Data: The United States, 1790-2002," Ann Arbor, MI: Inter-university Consortium for Political and Social Research 2010. doi:10.3886/ICPSR02896.

Hammond, Richard, *National Survey of Veterans: Summary Report*, U.S. Veterans Administration, 1980.

Haurin, Donald R., Patric H. Hendershott, and Susan M. Wachter, "Borrowing Constraints and the Tenure Choice of Young Households," *Journal of Housing Research*, 1997, *8*, 137–154.

Hayashi, Fumio, Takatoshi Ito, and Joel Slemrod, "Housing Finance Imperfections, Taxation, and Private Saving: A Comparative Simulation Analysis of the United States and Japan," *Journal of the Japanese and International Economies*, 1988, *2*, 215–238.

Herzog, John P. and James S. Earley, *Home Mortgage Delinquency and Foreclosure*, Columbia University Press, 1970.

Housing and Home Finance Agency, *Housing Statistics, Historical Supplement*, Vol. 14(10) October 1961.

Imbens, Guido W. and Thomas Lemieux, "Regression Discontinuity Designs: A Guide to Practice," *Journal of Econometrics*, 2008, *142*, 615–635.

Jackson, Kenneth T., *Crabgrass Frontier*, Oxford University Press, 1985.

Klaman, Saul B., *The Postwar Residential Mortgage Market*, Princeton University Press, 1961.

Lee, David S. and David Card, "Regression Discontinuity Inference with Specification Error," *Journal of Econometrics*, 2008, *142*, 655–674.

Linneman, Peter and Susan M. Wachter, "The Impacts of Borrowing Constraints on Homeownership," *AREUEA Journal*, 1989, *17*, 389–402.

_ , Isaac F. Megbolugbe, Susan M. Wachter, and Man Cho, "Do Borrowing Constraints Change U.S. Homeownership Rates?," *Journal of Housing Economics*, 1997, *6*, 318–333.

Malamud, Ofer and Abigail K. Wozniak, "The Impact of College Education on Geographic Mobility: Identifying Education Using Multiple Components of Vietnam Draft Risk," NBER Working Paper 16463, 2010.

Morton, Joseph E., *Urban Mortgage Lending: Comparative Markets and Experience*, Princeton University Press, 1956.

ORC Macro, "Evaluation of VA's Home Loan Guaranty Program, Final Report," 2004. Available at `http://www.homeloans.va.gov/pdf/final%20report.pdf`.

Ortalo-Magné, François and Sven Rady, "Boom In, Bust Out: Young Households and the Housing Price Cycle," *European Economic Review*, 1999, *43*, 755–766.

Page, Marianne, "Father's Education and Children's Human Capital: Evidence from the World War II GI Bill," 2006. UC Davis Department of Economics Working Paper No. 06-33.

Rosen, Harvey and Kenneth T. Rosen, "Federal Taxes and Homeownership: Evidence from Time Series," *Journal of Political Economy*, 1980, *88* (1), 59–75.

_ , _ , and Douglas Holtz-Eakin, "Housing Tenure, Uncertainty,and Taxation," *The Review of Economics and Statistics*, 1984, *66* (3), 405–416.

Ruggles, Steven, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander, "Integrated Public Use Microdata Series: Version 4.0," Minnesota Population Center 2008.

Schwartz, Alex F., *Housing Policy in the United States*, 2nd ed., Routledge, 2010.

Semer, Milton P., Julian H. Zimmerman, Ashley Foard, and John M. Frantz, "Evolution of Federal Legislative Policy in Housing: Housing Credits," in "Housing in the Seventies: Working Papers" US Department of Housing and Urban Development 1976.

Sheiner, Louise, "Housing Prices and the Savings of Renters," *Journal of Urban Economics*, 1995, *38*, 94–125.

Shiller, Robert J., *Irrational Exuberance*, second ed., Princeton University Press, 2005.

Snowden, Kenneth A., "The Anatomy of a Residential Mortgage Crisis: A Look back to the 1930's," NBER Working Paper 16244, 2010.

Stanley, Marcus, "College Education and the Midcentury GI Bills," *Quarterly Journal of Economics*, 2003, *118* (2), 671–708.

U.S. Bureau of the Census, "Characteristics of Occupied Dwelling Units, for the United States: October, 1944," July 1945. Housing – Special Reports, Series H-45, No. 2.

_ , "Characteristics of Occupied Dwelling Units, for the United States: November, 1945," May 1946. Housing – Special Reports, Series H-46, No. 1.

_ , "Housing Characteristics of the United States: April, 1947," October 1947. Current Population Reports – Housing, Series P-70, No. 1.

_ , *1956 National Housing Inventory*, U.S. Government Printing Office, 1958.

_ , "Census of Population, 1950: Public Use Microdata Sample," Washington, DC: US Department of Commerce, Bureau of the Census and Madison, WI: University of Wisconsin, Center for Demography and Ecology 1984. Distributed by Inter-university Consortium for Political and Social Research, 1999. doi:10.3886/ICPSR08251.

U.S. Department of the Treasury, "Reforming America's Housing Finance Market: A Report to Congress," 2011. Downloaded from `http://www.treasury.gov/initiatives/Documents/Reforming%20America%27s%20Housing%20Finance%20Market.pdf`.

U.S. House of Representatives, "State Veterans Laws, Special compilation to January 1, 1945," U.S. Government Printing Office 1945. 78th Cong., 2d Session, House Committee Print No. 10.

U.S. Selective Service System, *Annual Report of the Director of Selective Service for the Fiscal Year 1953*, United States Government Printing Office, 1953.

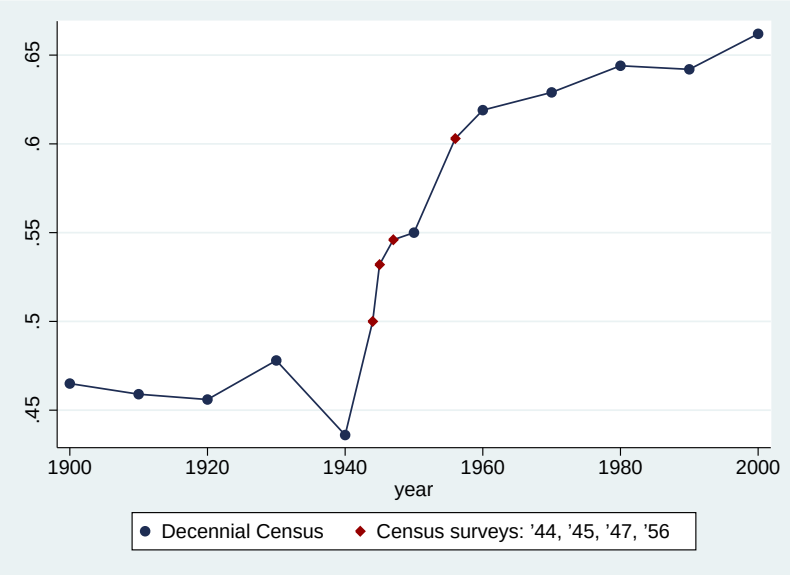
U.S. Veterans Administration, *Annual Report for Fiscal Year Ending June 30, 1948*, U.S. Government Printing Office, 1948.

_ , *Annual Report, 1962*, U.S. Government Printing Office, 1962.

Vigdor, Jacob L., "Liquidity Constraints and Housing Prices: Theory and Evidence from the VA Mortgage Program," *Journal of Public Economics*, 2006, *90*, 1579–1600.

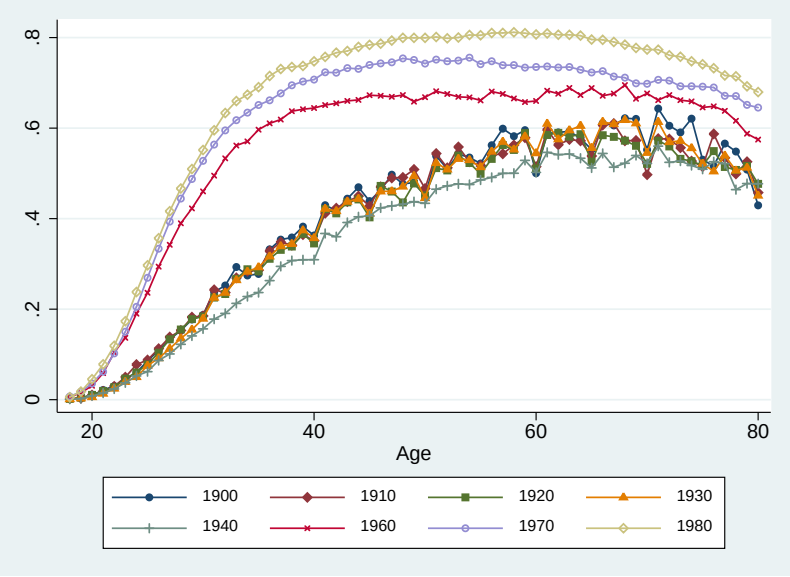
Yamashita, Takashi, "The Effect of the G.I. Bill on Homeownership of World War II Veterans," 2008. Available at `http://academic.reed.edu/economics/yamashita/Homeownerhip.pdf`.

Figure 1: Rate of owner-occupancy over the 20th century



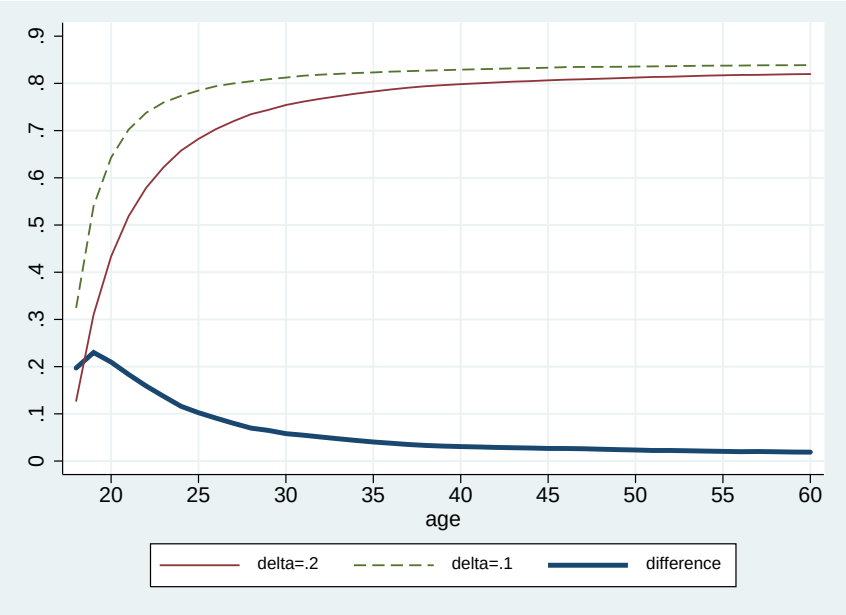
Notes: Figure shows share of occupied dwelling units that are owner-occupied. See text for sources.

Figure 2: Home ownership by age, 1900-1980



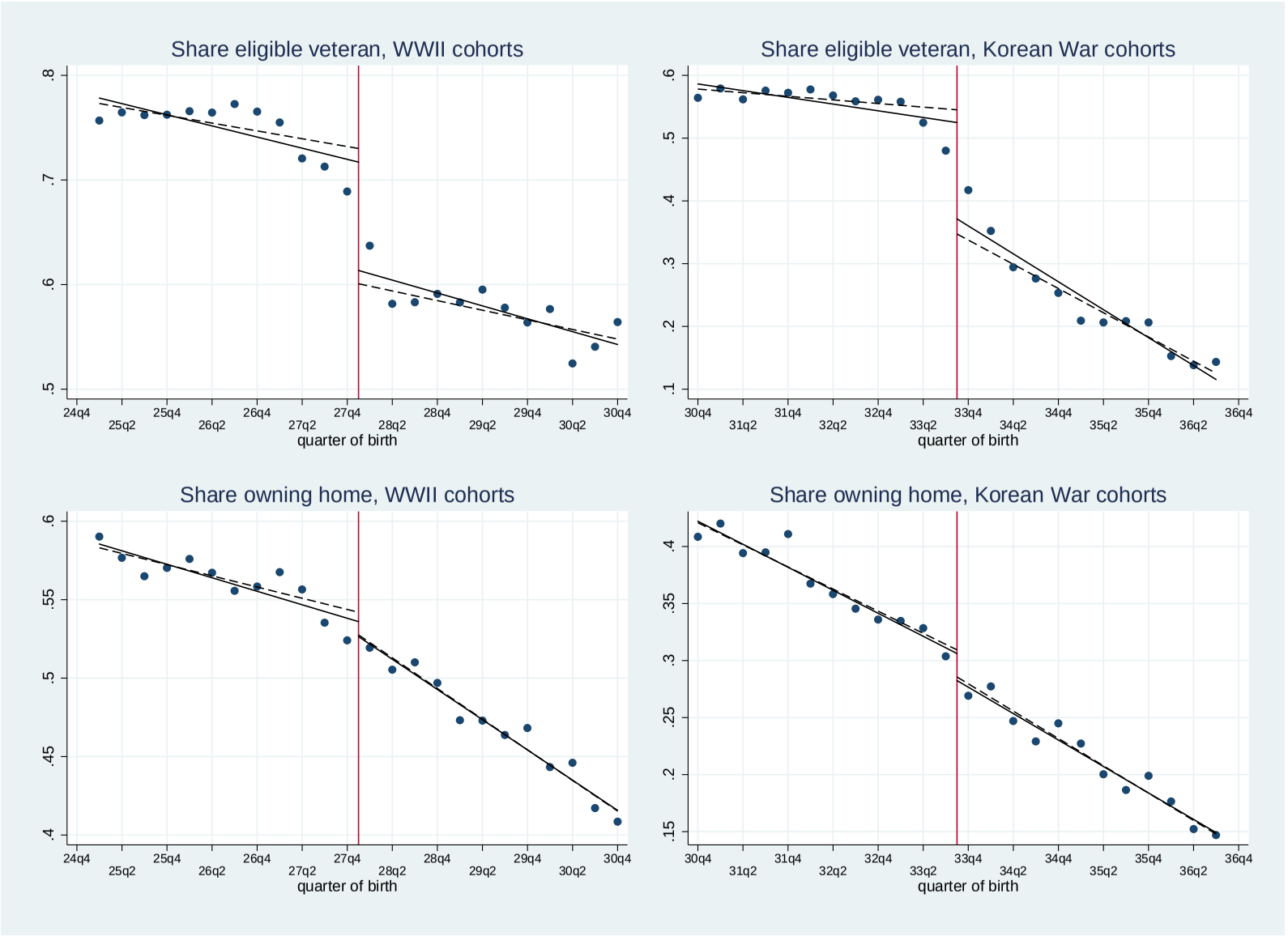
Notes: Figure shows share of men of each age from 18 to 80 who are home owners in each Census year. Lower lines are 1900-1940, upper lines are 1960-1980. Data are from Ruggles et al. (2008). For definitions, see text.

Figure 3: Simulated home ownership profiles for 10% and 20% down-payments



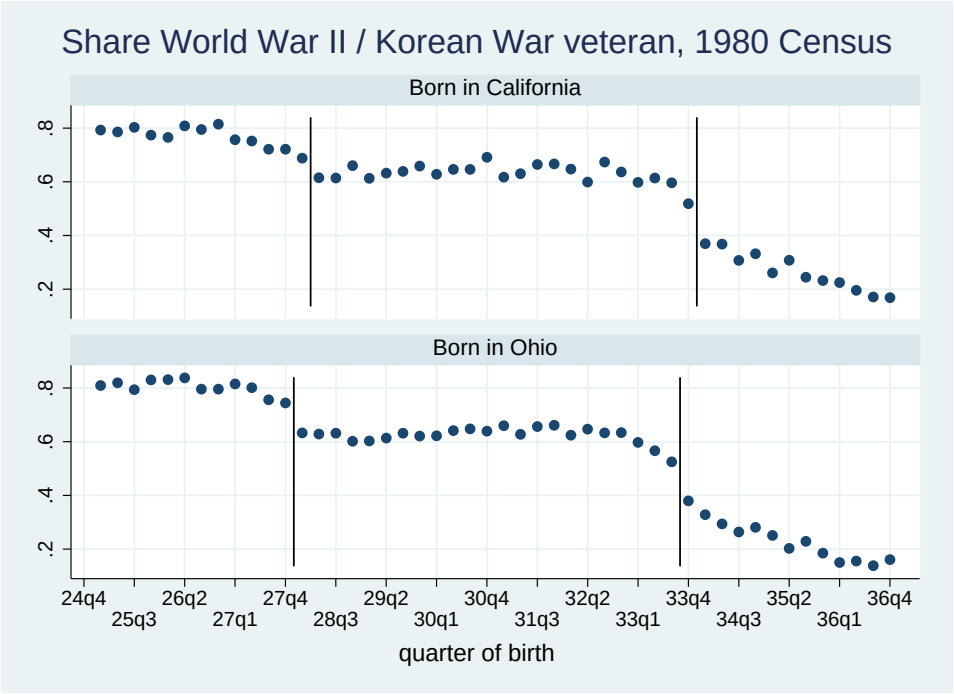
Notes: Figure shows home ownership rates by age calculated in the simulation described in Section 3, for down-payments of 10% ($\delta = .1$) and 20% ($\delta = .2$). Heavy line shows difference between home ownership in low down-payment and high down-payment regime at each age.

Figure 4: Estimated trends and discontinuities in veteran status and home ownership in 1960



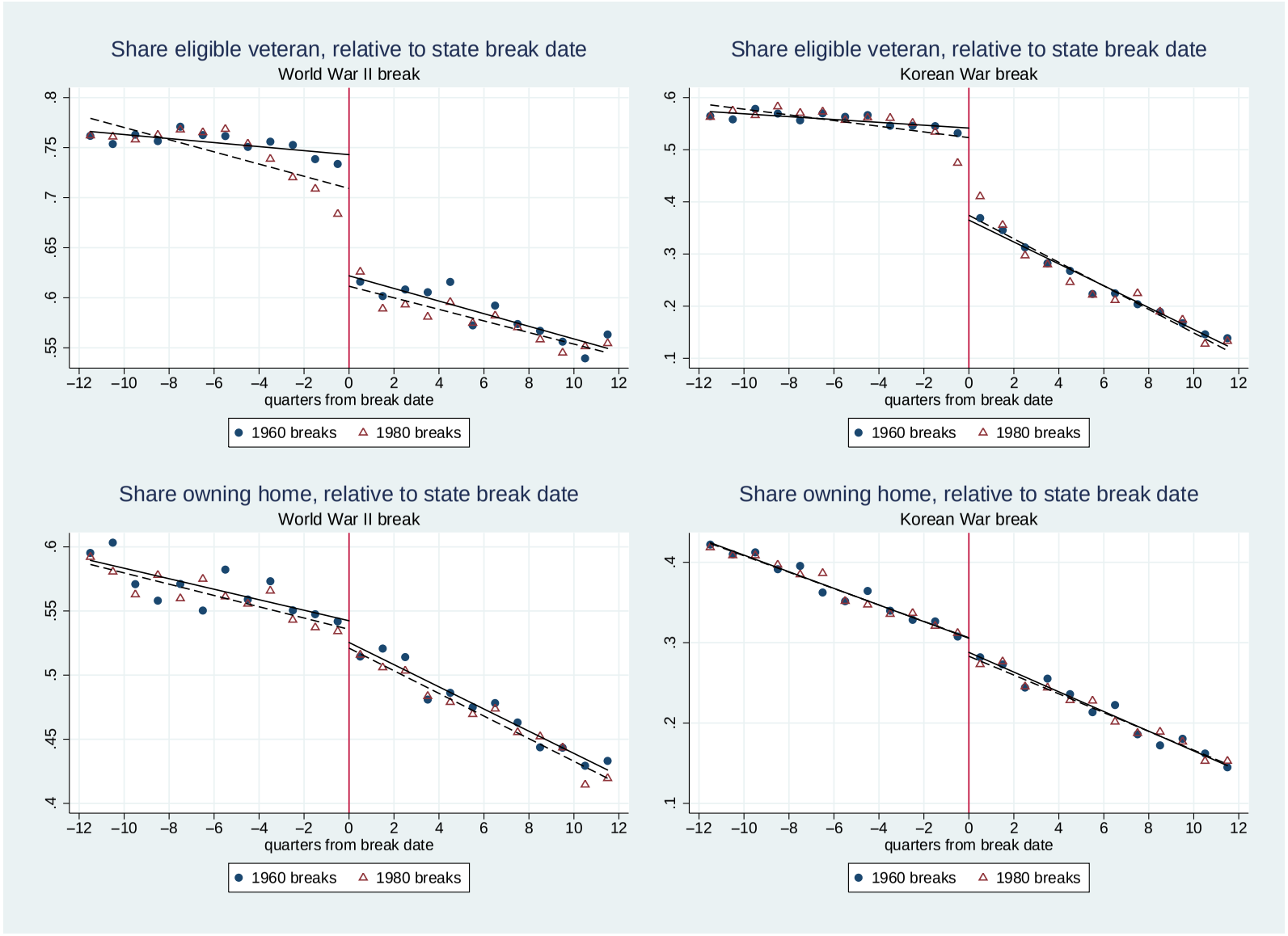
Notes: Top panels show share of each birth cohort that reported being a veteran of the World War II or Korean War period in the 1960 Census. Bottom panels show share of each cohort owning home. Solid and dashed lines show linear fits that estimate the regression function at the boundary point. Solid lines are estimated using all cohorts; dashed lines are estimated excluding the two cohorts on either side of the indicated threshold.

Figure 5: Illustration of first-stage break search in 1980 Census



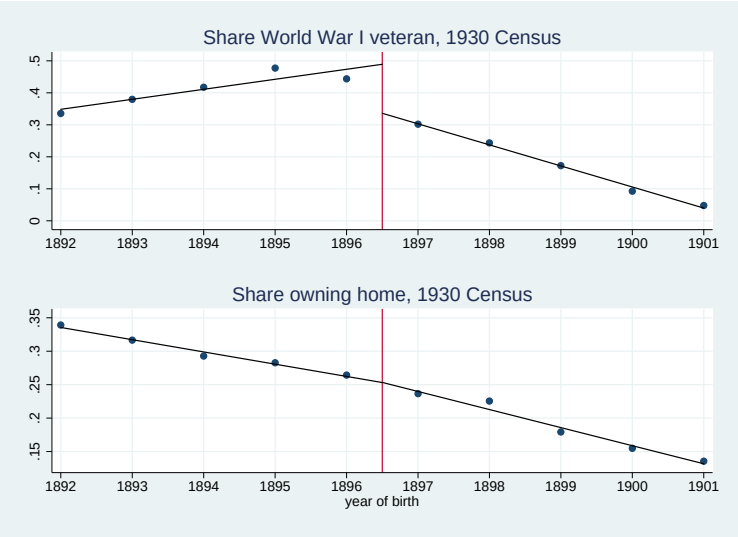
Notes: Circles show share of each quarter-of-birth cohort in each state reporting being a veteran with service during the World War II or Korean War periods. Vertical lines show location of estimated break in probability of service for each state.

Figure 6: Re-centered trends and discontinuities in veteran status and home ownership in 1960



Notes: Top panels show share of each birth cohort that reported being a veteran of the World War II or Korean War period in the 1960 Census, relative to estimated state-level breaks in probability of veteran status. '1960 breaks' are those estimated on the full 1960 sample, and '1980 breaks' are those estimated on a partial sample from the 1980 Census, as discussed in Section 3. Bottom panels show share of each cohort owning home. Solid and dashed lines show linear fits that estimate the regression function at the boundary point. Solid lines are estimated using 1960 breaks; dashed lines use 1980 breaks.

Figure 7: Estimated trends in veteran status and home ownership, 1930 Census

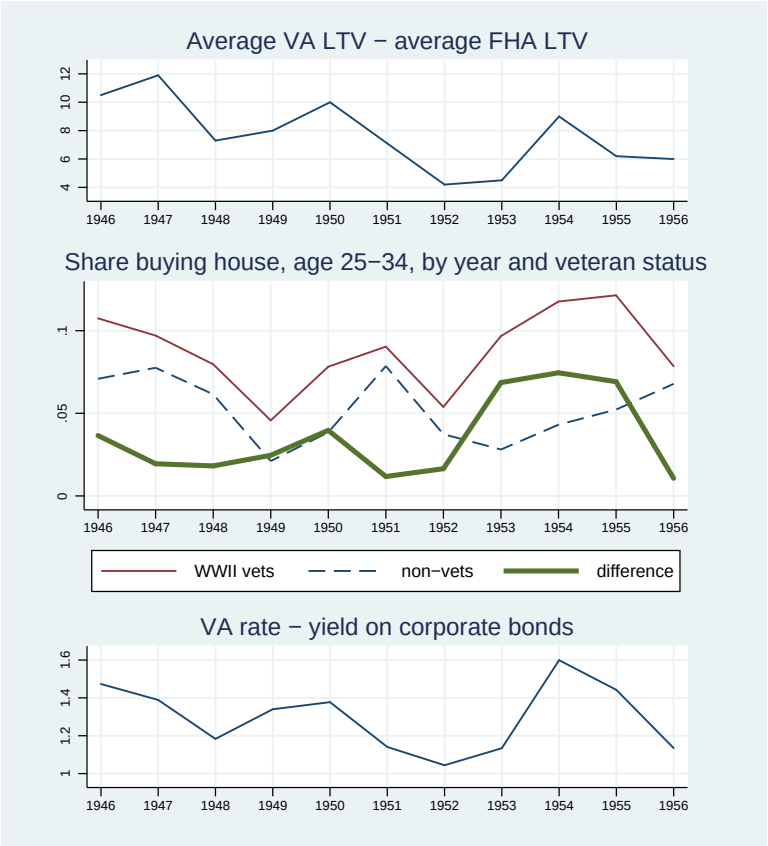


Notes: Upper panel shows share of men of each 'year of birth' reporting being a veteran of World War I in the 1930 Census, lower panel shows share of men owning homes. Year of birth is calculated as (1929-reported age). Vertical line indicates estimated location of 'break,' as described in Section 5.

Figure 8: Number of VA loans closed by quarter and difference between VA and alternative yields

Notes: Figure shows number of VA and non-VA loans closed each quarter, the estimated number closed under the World War II entitlement for 1952 onwards, and the difference between the maximum VA interest rate and yields on AAA-rated corporate bonds. Data on number of VA loans from Housing and Home Finance Agency (1961), share under WWII entitlement from U.S. Veterans Administration (1962). Corporate bond yields are from NBER series m13035, at `http://www.nber.org/databases/macrohistory/contents/chapter13.html`.

Figure 9: Differential rates of purchase for vets relative to non-vets



Notes: Top panel shows difference in average loan-to-value ratios between VA and FHA loans in each year, using data from Herzog and Earley (1970). Middle panel shows share of spending units reporting having purchased house in the specified year. Korean War veterans omitted; bold line shows difference in rate between spending units with World War II veterans and those with no veteran. Bottom panel shows annual average difference between VA interest rate and corporate bond yields, as discussed in text and Figure 8.

Table 1: Loan terms on one-unit owner-occupied properties

	1920	1950	1960	1970
Median LTV (percent)	50 to 60	75	79	84
VA		91	91	95
FHA		79	83	93
Conventional		66	68	77
Percent with LTV ≥100		12	9	14
VA		32	20	34
FHA		1	3	12
Conventional		9	6	10
Median loan term (years)	5 to 11	13	20	25
VA		20	25	29
FHA		20	24	29
Conventional		11	15	21
Median interest rate	6 to 7	5.0	5.1	6.0
VA		4.0	4.5	5.4
FHA		4.5	4.6	5.8
Conventional		5.0	5.6	6.0

Notes: Data for 1920 are 'typical' loan terms, from Aaron (1972). Data for 1950-1970 are from the US Census, Residential Finance Survey, and represent the stock of first mortgages. Loan-to-value (LTV) is defined as the amount of the first mortgage loan as a percent of purchase price, for properties acquired by purchase with first mortgage made or assumed at time of purchase.

Table 2: Means of key variables for cohorts immediately around each cutoff

	WWII break			Korean War break		
	1960	1970	1980	1960	1970	1980
Veteran of WWII/ Korean War period	0.660	0.686	0.677	0.393	0.431	0.421
Veteran of any period	0.694	0.726	0.699	0.574	0.620	0.617
Currently in military	0.032	0.014	0.002	0.056	0.038	0.007
Owns home	0.527	0.726	0.804	0.279	0.662	0.789
Positive income	0.978	0.984	0.978	0.971	0.984	0.977
Total income | positive income (1980 dollars)	14543	21980	21279	11019	20648	21756
N	21464	59085	58482	18552	52328	54307

Notes: Table reports mean of each outcome for men in the sample born in 1927 or 1928 (near the World War II break) and for those born in 1933 or 1934 (near the Korean War break). For sample restrictions, see Appendix 1. 'Currently in military' indicates that reported employment status was in armed forces; those in military are not classified as veterans. 'Owns home' indicates that individual was the head of household or spouse of the head in an owner-occupied dwelling unit. 'Positive income' gives share of sample with total personal income greater than zero. Total income, conditional on positive income, is scaled to 1980 dollars using the Consumer Price Index.

Table 3: Cohort-trend estimates of the effect of veteran status on home ownership

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline: all cohorts		World War II break		Korean War break	
	1923-38	1923-38	1926-29	1926-29	1932-35	1932-35
Panel A. Linear cohort trend						
1960	0.269	0.322	0.063	0.145	0.157	0.191
	(0.027)***	(0.025)***	(0.086)	(0.132)	(0.068)**	(0.081)**
	[0.029]***	[0.024]***	[0.090]	[0.195]	[0.065]**	[0.122]
1970	0.070	0.026	0.002	-0.036	-0.006	-0.105
	(0.061)	(0.067)	(0.064)	(0.075)	(0.09)	(0.042)**
	[0.058]	[0.065]	[0.066]	[0.098]	[0.085]	[0.057]
1980	0.071	0.049	-0.070	-0.102	-0.004	-0.030
	(0.020)***	(0.023)**	(0.063)	(0.094)	(0.064)	(0.066)
	[0.024]***	[0.028]*	[0.086]	[0.126]	[0.094]	[0.107]
Panel B. Quadratic cohort trend						
1960	0.069	0.136	0.089	0.127	0.158	0.197
	(0.032)**	(0.032)***	(0.084)	(0.143)	(0.070)**	(0.091)*
	[0.032]**	[0.033]***	[0.089]	[0.269]	[0.073]*	[0.135]
1970	-0.011	-0.039	0.005	-0.035	-0.011	-0.112
	(0.029)	(0.024)	(0.069)	(0.081)	(0.094)	(0.046)**
	[0.029]	[0.022]	[0.072]	[0.133]	[0.091]	[0.063]
1980	0.022	-0.015	-0.102	-0.089	0.035	-0.024
	(0.019)	(0.020)	(0.064)	(0.084)	(0.074)	(0.075)
	[0.026]	[0.028]	[0.081]	[0.151]	[0.109]	[0.141]
Controls	No	Yes	No	Yes	No	Yes
N	64	64	16	16	16	16

Notes: Table reports coefficients on benefits-eligible veteran share in a quarter-of-birth-cohort level OLS regression of home ownership on the veteran share and a linear or quadratic trend in quarter of birth, by Census year. Additional controls in columns (2), (4), and (6) are season (quarter) of birth indicators, share nonwhite, and real GNP in the cohort's quarter of birth (from Gordon, ed (1986)). Sample includes men born in the US within the specified years. Conventional standard errors are in parentheses, HC_3 standard errors in brackets. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table 4: Local linear estimates of effect of veteran status on home ownership

	(1)	(2)	(3)	(4)	(5)	(6)
	World War II			Korean War		
	first stage	reduced form	IV	first stage	reduced form	IV
Panel A. All cohorts						
1960	0.107	0.014	0.129	0.159	0.028	0.177
	(0.008)***	(0.008)*	(0.075)*	(0.008)***	(0.008)***	(0.049)***
N	63882	63882	63882	56901	56901	56901
1970	0.107	-0.002	-0.022	0.065	-0.004	-0.064
	(0.004)***	(0.004)	(0.041)	(0.005)***	(0.005)	(0.075)
N	175263	175263	175263	162057	162057	162057
1980	0.119	-0.005	-0.044	0.072	-0.003	-0.039
	(0.004)***	(0.004)	(0.033)	(0.005)***	(0.004)	(0.058)
N	174867	174867	174867	165032	165032	165032
Panel B. Excluding two intermediate cohorts						
1960	0.129	0.018	0.136	0.198	0.026	0.130
	(0.009)***	(0.009)*	(0.072)*	(0.009)***	(0.009)***	(0.045)***
N	58499	58499	58499	52402	52402	52402
1970	0.135	-0.005	-0.034	0.085	-0.005	-0.054
	(0.005)***	(0.005)	(0.037)	(0.006)***	(0.006)	(0.066)
N	160551	160551	160551	149180	149180	149180
1980	0.142	-0.009	-0.064	0.087	-0.004	-0.047
	(0.005)***	(0.004)**	(0.032)**	(0.006)***	(0.005)	(0.055)
N	160363	160363	160363	151703	151703	151703

Notes: Table reports estimated discontinuities at the cutoffs in probability of being an eligible veteran (columns 1 and 4), home ownership (columns 2 and 5), and scaled estimates of the impact of veteran status on home ownership (columns 3 and 6). 'Eligible veteran' is defined as being a veteran of the WWII or Korean War period in 1960, and being a veteran of any period in 1970 and 1980. Bandwidth for all specifications is 12 quarters. Heteroskedasticity-robust standard errors are in parentheses. All specifications include fixed effects for season (quarter) of birth, race (white/non-white), and state of birth. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table 5: Re-centered local linear estimates of effect of veteran status on home ownership

	(1)	(2)	(3)	(4)	(5)	(6)
	World War II			Korean War		
	first stage	reduced form	IV	first stage	reduced form	IV
Panel A. State break estimates from 1980						
1960	0.097	0.015	0.152	0.149	0.023	0.152
	(0.007)***	(0.008)*	(0.080)*	(0.008)***	(0.008)***	(0.051)***
N	63758	63758	63758	56950	56950	56950
1970	0.094	-0.004	-0.037	0.061	-0.004	-0.059
	(0.004)***	(0.004)	(0.045)	(0.005)***	(0.005)	(0.078)
N	174459	174459	174459	161638	161638	161638
1980	0.108	-0.001	-0.009	0.072	0.000	0.006
	(0.004)***	(0.004)	(0.035)	(0.005)***	(0.004)	(0.055)
N	174687	174687	174687	165492	165492	165492
Panel B. State break estimates from 1960						
1960	0.120	0.018	0.150	0.176	0.017	0.096
	(0.007)***	(0.008)**	(0.064)**	(0.008)***	(0.008)**	(0.043)**
N	63793	63793	63793	57136	57136	57136
1970	0.091	-0.001	-0.014	0.055	-0.005	-0.088
	(0.004)***	(0.004)	(0.047)	(0.005)***	(0.005)	(0.086)
N	174789	174789	174789	161271	161271	161271
1980	0.090	-0.005	-0.053	0.054	-0.000	-0.004
	(0.004)***	(0.004)	(0.042)	(0.005)***	(0.004)	(0.075)
N	174686	174686	174686	165015	165015	165015

Notes: Table reports estimated discontinuities at the cutoffs in probability of being an eligible veteran (columns 1 and 4), home ownership (columns 2 and 5), and scaled estimates of the impact of veteran status on home ownership (columns 3 and 6). 'Eligible veteran' is defined as being a veteran of the WWII or Korean War period in 1960, and being a veteran of any period in 1970 and 1980. Bandwidth for all specifications is 12 quarters. Heteroskedasticity-robust standard errors are in parentheses. All specifications control for age in quarters and include fixed effects for season (quarter) of birth, race (white/non-white), and state of birth. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table 6: Robustness check: estimates of veteran status on 1960 income, and on ownership conditional on income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			World War II				Korean War	
Dependent variable	Income	Owns home	Owns home	Owns home	Income	Owns home	Owns home	Owns home
cohort-trend	-0.187	0.145	0.136	0.195	0.160	0.191	0.183	0.220
	(0.178)	(0.132)	(0.134)	(0.139)	(0.121)	(0.081)**	(0.078)**	(0.088)**
unrecentered	-0.153	0.129	0.117	0.145	0.140	0.177	0.164	0.145
(all cohorts)	(0.109)	(0.075)*	(0.076)	(0.072)**	(0.080)*	(0.049)***	(0.050)***	(0.049)***
unrecentered	-0.129	0.136	0.122	0.146	0.201	0.130	0.119	0.091
(2-cohort window)	(0.102)	(0.072)*	(0.072)*	(0.069)**	(0.074)***	(0.045)***	(0.046)***	(0.045)**
recentered	-0.080	0.152	0.145	0.159	0.137	0.152	0.140	0.121
(1980 breaks)	(0.113)	(0.080)*	(0.080)*	(0.077)**	(0.083)*	(0.051)***	(0.052)***	(0.051)**
recentered	0.057	0.150	0.144	0.133	0.090	0.096	0.083	0.070
(1960 breaks)	(0.092)	(0.064)**	(0.065)**	(0.063)**	(0.069)	(0.043)**	(0.043)*	(0.042)*
Controls	base	base	base	base, ln(inc)	base	base	base	base, ln(inc)
Sample	inc>0	all	inc>0	inc>0	inc>0	all	inc>0	inc>0

Notes: Columns (1) and (5) show estimates of the impact of veteran status on the log of total personal income in 1960, conditional on positive income, for each specification used. Columns (2) and (6) repeat estimates shown in the tables above. Columns (3) and (7) show estimates in sample with positive income. Columns (4) and (8) show estimate of veteran status on home ownership controlling for income. Conventional standard errors shown for cohort-trend models, heteroskedasticity-robust standard errors for all other specifications. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table 7: Results from World War I local linear estimation

Dependent variable	(1) veteran	(2) owns home reduced form	(3) owns home IV
1920		0.001	
Mean ownership: 0.037		(0.003)	
N		78089	
1930	0.153	-0.0002	-0.001
Mean ownership: 0.250	(0.007)***	(0.006)	(0.042)
N	74732	74962	74732

Notes: Table reports estimated reduced form discontinuities at cutoff in probability of being a veteran (1) and owning home (2). IV estimates (3) scale by the estimate of the corresponding discontinuity in veteran status. Threshold is between 1896 and 1897, and 'mean ownership' is rate of home ownership for men born in 1896 or 1897, where year of birth is calculated as (Census year-reported age-1). Bandwidth includes men born in the US between 1892 and 1901. Difference in number of observations between column (2) and columns (1) and (3) is due to missing data on veteran status. Specifications are piecewise linear in year of birth. Heteroskedasticity-robust standard errors are in parentheses. All specifications include fixed effects for race (white/non-white) and state of birth. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table 8: Differential effects of changes in interest rates on veterans' house purchase

Dependent variable	(1) bought house last year	(2) bought house last year
Mean over period	0.074	0.075
Vet*difference	0.081	0.073
	(0.040)**	(0.038)*
Korea vets in sample	No	Yes
N	6510	6865

Notes: Sample includes spending units surveyed in the Survey of Consumer Finances, 1947 to 1957, whose head was age 25-34 and which reported positive income. Dependent variable indicates that the spending unit reported having bought a house the previous year. Vet*difference is the interaction of an indicator for veteran in the spending unit with the average difference between the VA rate and corporate yield in the previous year. Both specifications also control for veteran status, year fixed effects, and log(income). Heteroskedasticity-robust standard errors in parentheses. Estimated using SCF sampling weights. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table 9: Nonveterans' probability of home ownership and state share veteran

	Cross-section: 1960		Panel: 1940 and 1960	
	(1)	(2)	(3)	(4)
Panel A. Nonveterans aged 23-35				
Share men 18+ WWII or KW vets	-0.135	0.791	0.078	0.794
	(0.315)	(0.463)*	(0.220)	(0.389)**
N	60215	60215	189158	189158
Panel B. Nonveterans aged 23-29				
Share men 18+ WWII vets	0.060	0.874	-0.283	0.750
	(0.365)	(0.430)**	(0.319)	(0.365)**
Share men 18+ KW vets	-0.779	-0.429	0.744	-0.733
	(0.991)	(1.189)	(0.913)	(0.921)
N	40524	40524	114194	114194
Controls				
Individual age, race, state of birth	Yes	Yes	Yes	Yes
1940 State characteristics	No	Yes	No	Yes
Census divison FE / trends	No	Yes	No	Yes

Notes: Dependent variable is an indicator for home ownership, as defined above. WWII / KW veteran shares are zero for all states in 1940. Standard errors are clustered by state. Individual controls include race (white/nonwhite), age, and fixed effects for state of birth. Cross-section specifications control for age in quarters, panel specifications for age in completed years. In panel specifications, individual controls (except for state of birth), as well as 1940 state characteristics and Census division effects, are interacted with time dummies. 1940 state characteristics include share farmers, share nonwhite, average years of education, share aged 13-24, share aged 25-34, and share German-born among men aged 13-44 in the 1940 IPUMS. 1940 state characteristics also include share of the total 1940 population living in urban areas. Panel specifications also include fixed effects for state and year. All specifications use Census sampling weights. Sample includes residents of the 48 contiguous states and the District of Columbia. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Appendix 1: Data

Census Data

The data for all of the empirical analysis, except for Section 5.3, are drawn from IPUMS Census microdata (Ruggles et al., 2008). I use the 1% samples from 1900 to 1960, a combination of the State, Neighborhood, and Metro 1% Form 2 samples from 1970, the 5% State sample and the four 1% samples from 1980, and the unweighted 1% samples from 1990 and 2000. In all analyses, the sample contains only men born in the United States who were 18 years or older at the time of the Census. In Section 2, in cases where allocation flags are available, I drop any observation whose age, sex, place of birth, group quarters status, or home ownership status was allocated by the Census Bureau. In all other sections, I also drop men whose veteran status or income was allocated (in the samples where allocation flags are available).

I categorize living arrangements into the mutually exclusive categories of owning, renting, living with relatives, and a residual category. I classify men who were listed as the household head or the spouse of the head in an owner-occupied dwelling as home owners. Renters include household heads, or spouses of heads, in dwellings identified as renter-occupied; I also classify as a renter anyone listed as a roomer, boarder, or lodger. Men 'living with relatives' are those who are otherwise related to the household head. The remainder consist mostly of men in group quarters – for example, institutions and military quarters – and household servants.

State veteran shares in Section 6.2 are calculated from the 1960 IPUMS sample using the same data allocation restrictions as for the main 1960 analysis sample. All controls are calculated from IPUMS data, except the urban share of each state, which is from Census counts (Haines, 2010).

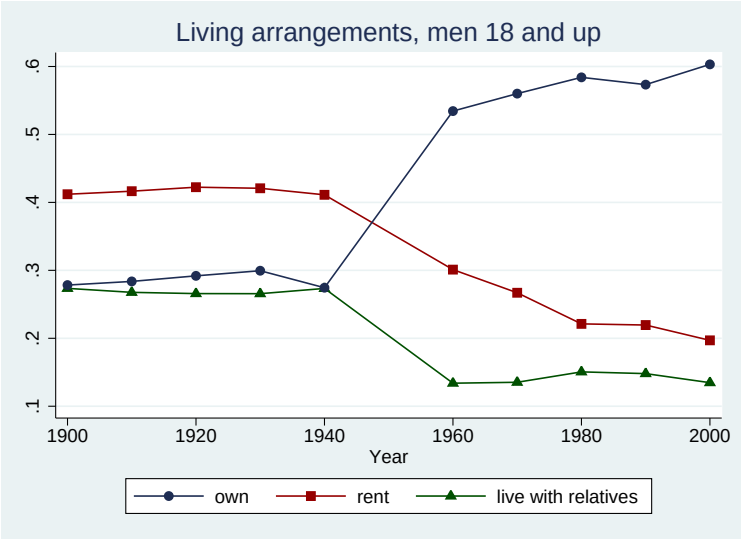
Survey of Consumer Finances

Data on the timing of veterans' house purchase in Section 5.3 are drawn from the Survey of Consumer Finances from 1947 to 1957 (Economic Behavior Program, Survey Research Center, University of Michigan, 1973). As discussed in the main text of the paper, the unit of observation in the SCF is a spending unit, defined as a group of related people living in the same dwelling who pool their incomes for major items of expense. For example, an adult son living with his parents would be classified as a separate spending unit if he does not pool his income with that of his parents, but otherwise would be part of the same spending unit. Spending units are further grouped into 'family units' of related individuals, with a single 'primary' spending unit and other 'secondary' spending units. Housing tenure is not reported consistently for spending units living on farms, so these are excluded from the analysis. I keep only spending units whose head was between 25 and 34 years old in the survey year, and also omit spending units missing data on veteran status.

There was some variation in questions asked each year, requiring adjustment for consistency over time. For the 1947 sample I define a 'veteran' spending unit as one with at least one veteran; from 1948 to 1953 as one whose head reported being a veteran, and from 1954 onwards as one whose head reported being a veteran of World War II (or similarly for the Korean War). I classify a spending unit as purchasing a house in the previous year if it reported buying any real estate in the previous year (1947), buying a house in the previous year (1948), or buying its current home in the previous calendar year (1949 to 1957). Secondary spending units who do not report any information on having bought a home the previous year are classified as not having purchased a home.

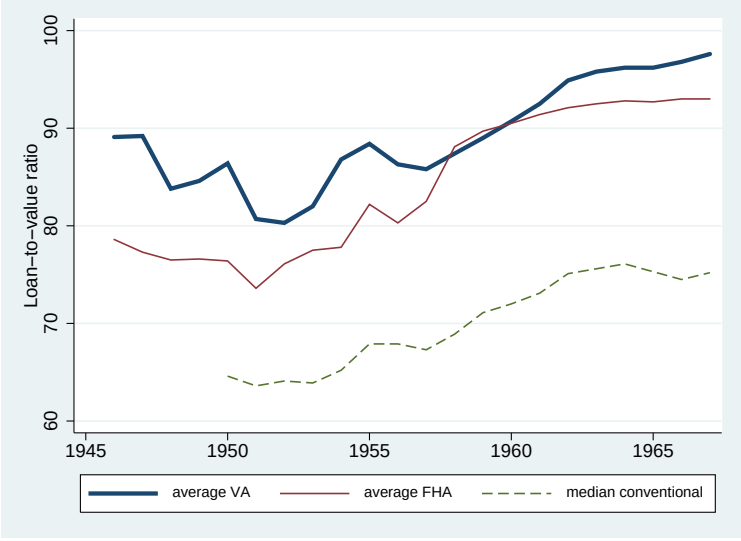
Appendix 2: Additional Tables and Figures

Figure A2.1: Home ownership at the individual level over the 20th century



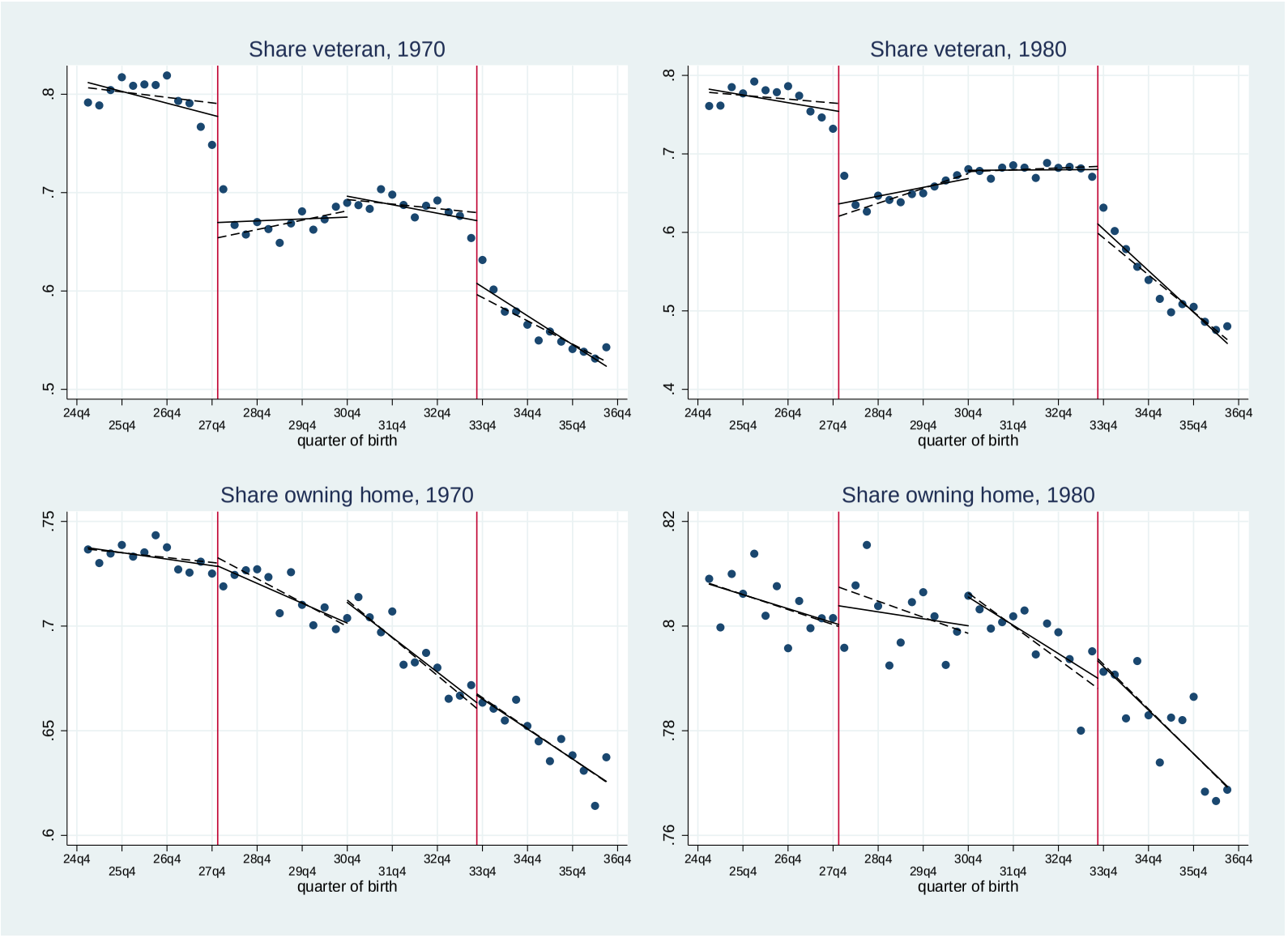
Notes: Figure shows share of men 18 and older owning, renting, and living with relatives. Residual category is omitted. Details are given in Appendix 1. Source: IPUMS (Ruggles et al., 2008).

Figure A2.2: Loan-to-value ratio on new VA and alternative mortgages, 1946-67



Notes: Figure shows average loan-to-value ratio for new VA and FHA loans in each year, and median loan-to-purchase price ratio for new conventional loans originated by savings and loan associations. Conventional data provided by U.S. Savings and Loan League for 1950-64, and from Federal Home Loan Bank Board for 1965-67. Source: Herzog and Earley (1970).

Figure A2.3: Estimated trends and discontinuities in veteran status and home ownership in 1970 and 1980



Notes: Top panels show share of each birth cohort that reported being a veteran in the 1970 and 1980 Censuses. Bottom panels show share of each cohort owning home. Solid and dashed lines show linear fits that estimate the regression function at the boundary point. Solid lines are estimated using all cohorts; dashed lines are estimated excluding the two cohorts on either side of the indicated threshold.

Table A2.1: Sensitivity of 1960 local linear estimates to alternative bandwidths

	(1)	(2)	(3)	(4)	(5)	(6)
	World War II			Korean War		
	first stage	reduced form	IV	first stage	reduced form	IV
Panel A. All cohorts						
12 quarters	0.107	0.014	0.129	0.157	0.028	0.177
(baseline)	(0.008)***	(0.008)*	(0.075)*	(0.008)***	(0.008)***	(0.049)***
N	63882	63882	63882	56901	56901	56901
10 quarters	0.097	0.016	0.161	0.142	0.026	0.183
	(0.008)***	(0.009)*	(0.088)*	(0.009)***	(0.008)***	(0.060)***
N	53154	53154	53154	47320	47320	47320
8 quarters	0.090	0.012	0.136	0.120	0.026	0.214
	(0.010)***	(0.011)	(0.117)	(0.011)***	(0.010)**	(0.087)**
N	42267	42267	42267	37957	37957	37957
6 quarters	0.080	0.008	0.098	0.088	0.029	0.333
	(0.011)***	(0.012)	(0.145)	(0.012)***	(0.011)***	(0.134)**
N	31796	31796	31796	28310	28310	28310
Panel B. Excluding two intermediate cohorts						
12 quarters	0.129	0.018	0.136	0.198	0.026	0.130
(baseline)	(0.009)***	(0.009)*	(0.072)*	(0.009)***	(0.009)***	(0.045)***
N	58499	58499	58499	52402	52402	52402
10 quarters	0.118	0.023	0.198	0.183	0.019	0.104
	(0.010)***	(0.011)**	(0.089)**	(0.011)***	(0.010)*	(0.056)*
N	47771	47771	47771	42821	42821	42821
8 quarters	0.116	0.020	0.168	0.166	0.017	0.103
	(0.012)***	(0.013)	(0.109)	(0.013)***	(0.012)	(0.075)
N	36884	36884	36884	33458	33458	33458
6 quarters	0.115	0.016	0.137	0.121	0.023	0.192
	(0.016)***	(0.016)	(0.142)	(0.017)***	(0.016)	(0.135)
N	26413	26413	26413	23811	23811	23811

Notes: Table reports estimated discontinuities at the cutoffs in probability of being an eligible veteran (columns 1 and 4), home ownership (columns 2 and 5), and scaled estimates of the impact of veteran status on home ownership (columns 3 and 6). 'Eligible veteran' is defined as being a veteran of the WWII or Korean War period. Heteroskedasticity-robust standard errors are in parentheses. All specifications include fixed effects for season (quarter) of birth, race (white/non-white), and state of birth. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Appendix 3: Results for housing consumption

I have not emphasized the possible effects of subsidized borrowing on the characteristics of housing consumed, but the estimation strategy used in the paper can be applied to a number of other related outcomes. In Appendix Table A3.1, I present estimates from the un-recentered RD design (with no omitted cohorts) of the effect of veteran status on various outcomes measuring size, quality, and location of housing, as well as a rough measure of migration.

Few of the estimates are significantly different from zero, but several are suggestive that veteran status increased the quantity or quality of housing in 1960. Estimates of the effect of service on the number of rooms in one's dwelling are small and positive (here all individuals are included in the sample, with the number of rooms defined as zero for those living in group quarters). At the Korean War break, veteran status is associated with a 9 percentage point higher probability of having complete plumbing, significant at the 5 percent level (having 'complete plumbing' means that the dwelling unit has running hot and cold water, a flush toilet, and a bathtub or shower within the structure, as explained in Ruggles et al. (2008)). Conditional on home ownership, self-reported house value was also positively associated with veteran status, although it is of course difficult to interpret this relationship given the discontinuities in home ownership at the two breaks. Turning to locational outcomes, veteran status at both breaks was positively associated with living in a suburb in 1960 (a coefficient of 0.058 at the World War II break, and 0.075 at the Korean War break). Boustan and Shertzer (2010) use a slightly different empirical design to estimate the effect of World War II veteran status on the probability of living in a central city, conditional on living in a metropolitan area; despite the difference in empirical design and the estimated parameter, my estimate is in line with theirs. Finally, as a measure of migration I test whether veteran status is associated with differences in the probability of living in one's state of birth. I find no statistically significant differences, although the point estimate at the World War II break is positive and of meaningful magnitude.

Fort the most part, the estimates decline in magnitude in 1970 and 1980. An exception is the estimate for house value at the World War II break in 1970, which is negative and statistically significant; such a relationship is not evident in 1980.

Table A3.1: Local linear estimates of effect of veteran status on other housing outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Number of rooms		Complete plumbing		ln(house value)		Lives in suburb		Lives in state of birth	
	WWII	KW	WWII	KW	WWII	KW	WWII	KW	WWII	KW
1960	0.367	0.126	-0.053	0.090	0.034	0.134	0.058	0.075	0.050	0.007
	(0.251)	(0.192)	(0.048)	(0.037)**	(0.098)	(0.109)	(0.082)	(0.055)	(0.071)	(0.051)
sample mean	5.000	4.475	0.883	0.864	36336	31562	0.365	0.333	0.657	0.658
N	63882	56901	62224	53858	28106	13607	52412	46357	63814	56819
1970	-0.160	0.022	-0.0003	0.0003	-0.103	0.019	0.026	-0.016	0.025	-0.010
	(0.133)	(0.111)	(0.015)	(0.012)	(0.052)**	(0.042)	(0.072)	(0.058)	(0.046)	(0.040)
sample mean	5.799	5.660	0.960	0.961	45785	45103	0.442	0.437	0.578	0.569
N	175263	162057	172960	159431	108778	93894	49319	45782	115965	107543
1980	-0.184	-0.133	0.005	0.002	-0.024	-0.032	-0.009	0.001	0.053	0.001
	(0.133)	(0.109)	(0.009)	(0.007)	(0.059)	(0.045)	(0.043)	(0.035)	(0.037)	(0.030)
sample mean	5.996	6.153	0.987	0.988	61652	64516	0.484	0.491	0.609	0.599
N	174867	165032	173463	163696	110165	103924	125224	116973	174867	165032
Sample	all		not in group quarters		home owners		suburban status known		state of birth, residence known	

Notes: Table shows estimated effect of veteran status on the specified outcome, for the corresponding sample. 'Number of rooms' is set to zero for those living in group quarters. 'Complete plumbing' indicates running hot and cold water. Means given for ln(house value) are mean level of self-reported house value, in 1980 dollars (adjusted using CPI). Heteroskedasticity-robust standard errors shown in parentheses. ***: $p < .01$, **: $p < .05$, *: $p < .1$.