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

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

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ABSTRACT

The largest 20th-century increase in U.S. home ownership occurred between 1940 and 1960, associated largely with declining age at first ownership. I shed light on the contribution of coincident government mortgage market interventions by examining home loan benefits granted under the World War II and Korean War GI Bills. The impact of veterans' housing benefits on home ownership is positive for young men, and declines with age. Veterans' benefits increased aggregate home ownership rates primarily by shifting purchase earlier in life, explaining 7.4 percent of the overall 1940-60 increase and 25 percent of the increase for affected cohorts. A rough extrapolation suggests that broader changes in mortgage terms may explain 40 percent of the 1940-60 increase.

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1 Introduction

The primary focus of federal housing policy over the last eighty years has been intervention in mortgage markets. In 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 sheds light on the role of these mortgage market interventions – and by extension, on the role of changes in mortgage terms more broadly – by providing estimates of the contribution of the VA home loan program to increased rates of home ownership. Past work, such as Jackson (1985), Green and Wachter (2005), and Vigdor (2006), has discussed the potential role of the FHA

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

²The specific type of intervention discussed here – mortgage insurance and guarantees – remains central to housing policy. For example, at the end of Fiscal Year 2011, the amount of outstanding principal guaranteed by the Federal Housing Administration was \$1.097 trillion (U.S. Department of Housing and Urban Development, 2011). Policies meant to encourage home ownership are often based on the argument that it has social benefits; Haurin, Dietz and Weinberg (2003) provide a review of the academic literature on this issue. I do not take up this question here, but the potential for such spillovers is one motivation for examining whether, and how, these programs affect home ownership.

³Figure 2 depicts the changing age structure of ownership in the United States over the 20th century. Explaining the change in the age profile of ownership has not been the direct focus of earlier research, but Aaron (1972) discusses the particularly large increases in home ownership for younger age groups over this period, Chevan (1989) shows that the age at which the median individual in a cohort became a home owner fell, 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.

and VA in explaining the observed changes in housing markets over the 20th century.^{4,5} 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 housing became more important during World War II as marginal tax rates rose (Aaron, 1972; Rosen and Rosen, 1980; Rosen, Rosen and Holtz-Eakin, 1984). Rising real incomes and savings rates during World War II and afterwards may have increased demand for housing (Chevan, 1989; Chambers, Garriga and Schlagenhaut, 2011); increased rates of family formation after the war may have done so as well.⁶ Decreased transportation costs in the postwar era (Baum-Snow, 2007) may have increased home ownership by lowering the cost of suburban residence.⁷ 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, for which we lack rigorous quantitative estimates.

My empirical design attempts to hold these other factors constant, and, motivated by the increased concavity of the age-home ownership profile, allows the estimated effects of terms on home finance to vary with a person's age.⁸ 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.⁹ 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

⁴An older literature focused on the effects of federal loan insurance on the supply of credit and the volume of residential construction: examples include Break (1961), Grebler (1960), and Klamann (1961).

⁵A 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.

⁶For detailed data series on savings rates, see Carter et al., eds (2006).

⁷This 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).

⁸As discussed in Section 3, heterogeneity of effects by age is a prediction of a standard life-cycle model of tenure choice, in which relaxing liquidity constraints may primarily serve to induce earlier home purchase.

⁹Note 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.

Bound and Turner (2002). The probability of military service by date of birth fell steeply with the declines in inductions 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.¹⁰ 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 each Census 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 effects of easier housing finance that 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.¹¹

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

¹⁰This 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.

¹¹It 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 4.

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 ownership change little after controlling for income and education 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 estimates to calculate a counterfactual age-ownership profile in 1960, which can be used to assess the contribution of VA home loan benefits to the overall increase in home ownership from 1940 to 1960.¹² 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. Hence, these estimates are likely to be a lower bound on the impact of the VA program. Moreover, they also serve as a lower bound on the overall impact of changes in home finance in the mid-century rise in home ownership: a rough calculation suggests that broader trends in mortgage terms may explain about 40 percent of the 1940-1960 increase.

This paper provides a rigorous empirical link between the aggregate mid-century increase in

¹²Of course 1940 need not be the base year – the counterfactual 1960 age profile can be compared to any Census year.

home ownership, the transformation in the age structure of ownership, and contemporaneous changes in mortgage terms that may have relaxed liquidity constraints. In addition to shedding new light on the role of interventions in mortgage 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; Yamashita does not examine the Korean War break, which is what allows estimation of a counterfactual 1960 age profile here.¹³ In a study of population loss from central cities in the postwar period, Boustan and Shertzer (forthcoming) investigate the impact of World War II veteran status on suburban residence (although not home ownership). As noted above, Vigdor (2006) also examines the VA home loan program, but focuses primarily on whether it affected house prices: in doing so he provides an estimate of the effect of VA eligibility on home ownership as of 1970, based on direct comparisons of veterans to non-veterans. I compare his findings to my own for 1960 below.

2 Background

2.1 Trends in housing tenure and mortgage terms 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.¹⁴ 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

¹³I became aware of Yamashita's unpublished work after completing the main analysis and a draft of this paper. In addition to differences in implementation and my examination of the Korean War break, I do more to rule out direct effects of military service as a driving factor. Yamashita offers a discussion of the effects of the program by race, which I do not examine here.

¹⁴The 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).

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.¹⁵ By this measure, the increase in home ownership was also most striking from 1940 to 1960, increasing from 27 to 53 percent.¹⁶

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 1980.¹⁷ 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.¹⁸ A natural interpretation is that the increase in ownership in the 1940's and 1950's largely represented earlier purchases among individuals who would have otherwise purchased later in life.

¹⁵Individual-level data on home ownership come from 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 arrangements in 1950.

¹⁶Aggregate trends in individual-level living arrangements are shown in Appendix Figure A3.1.

¹⁷For 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.

¹⁸Conditioning 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.

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.¹⁹ 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 in the stock of 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 well-known feature of VA loans is that they were often available with no down-payment: between one-fifth and one-third of the stock of VA loans in each Census year from 1950 to 1970 had LTV’s of 100 percent or more.

Lower down-payments were accompanied by lengthening loan maturities. Maturities lengthened in all sectors of the market. As a result, monthly payments remained more or less stable as loan-to-value ratios increased. The median term was similar for VA and FHA loans, while conventional loans had substantially shorter maturities. Government-insured mortgages also typically had lower interest rates than conventional loans, due in part to interest rate ceilings on government loans: VA interest rates, for example, were initially capped at 4 percent.

2.2 The VA home loan guaranty program

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. The main VA home loan program, under Section 501, was not a loan directly from the

¹⁹Figures 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 entirely representative of the population of loans in the 1920’s, so these figures should be interpreted with some caution. 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).

government, but rather a guarantee to lenders against losses on home loans that had been approved by the VA, up to a specified amount.²⁰ The guarantee eliminated much of the risk to the lender, allowing easier terms for borrowers. Eligibility for this loan guarantee was one of several benefits extended to veterans, with the broad aim of speeding readjustment to civilian life.²¹ 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.²²

In order to scale the effects of VA-eligibility on home ownership that I discuss below, it is useful to clarify the size of the financial advantage conferred by the program. My discussion emphasizes differences in down-payments between VA and alternative terms. Interest rates were typically slightly lower for VA loans, which tended to attenuate the increase in monthly payments when down-payments were reduced, holding the loan term constant. But based on the terms actually observed for different loan types, VA loans may not have had the lowest monthly payments.²³

Herzog and Earley (1970) provide data on terms for VA and FHA loans originated in each year from 1946 to 1967, giving some indication as to how much eligibility would have relaxed liquidity constraints for veterans at different points in time. I present some of their data in Appendix

²⁰If 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. As of 1945, the guarantee was limited to 50 percent of the outstanding loan amount at any point in the life of the loan, up to a maximum of \$4,000, but the limit was relaxed in later years.

²¹The following discussion of the VA home loan program follows ORC Macro (2004) and Aaron (1972).

²²Active-duty servicemembers were made eligible under the Veterans' Housing Amendments Act of 1976.

²³Consider, for example, purchasing a \$7,500 house in 1950 under VA and FHA loan terms. (The median self-reported value of one-unit owner-occupied structures in 1950 was \$7,354. Median house values reported in this section come from <http://www.census.gov/hhes/www/housing/census/historic/values.html>.) Using the median terms given in Table 1, a 20-year VA loan with a 10 percent down-payment and 4 percent interest rate, used to purchase a \$7,500 house, 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. (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.)

Table A3.1. Over the 1950's, average loan-to-value ratios for VA loans typically exceeded those for FHA loans by about 5 to 10 percentage points. For loans originated in 1960, the average LTV for VA loans was slightly over 95 percent and that for FHA slightly under 91 percent.²⁴ On average, by 1960 those who borrowed under the VA program were probably riskier than FHA borrowers,²⁵ so the differences in average terms are likely to understate the gap between the terms the same individual would receive under the VA and the FHA. To a first approximation, then, it seems reasonable to scale the 1960 results by supposing that VA eligibility would have reduced the required down-payment by about 10 percentage points. Between 1960 and 1970, LTV's rose for both VA and FHA loans, but the difference between them remained similar. By 1967, LTV's for VA loans averaged about 97.5 percent and for FHA loans about 93 percent. Hence, in terms of down-payment requirements, a veteran's alternative option improved over the 1960's, although not by a great deal.²⁶

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.²⁷

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

²⁴The data in Herzog and Earley (1970) separate loans for new and existing houses; I weight these by the share of VA and FHA loans for each type, using data from Federal Home Loan Bank Board (1961).

²⁵In 1960, FHA borrowers had incomes 25 to 30 percent higher than the median nonfarm family income, while VA borrowers had incomes only about 9 percent higher than the median (Herzog and Earley, 1970).

²⁶An alternative scaling that incorporates other terms of the loan is to take the difference in present discounted values of loans with the average VA and average FHA terms. Doing so with the 1960 average terms (VA: 95 percent LTV, 5.25 percent interest rate, 27-year maturity; FHA: 91 percent LTV, 5.75 percent interest rate, 27-year maturity) for the median house – \$11,900 in 1960 USD; \$58,600 in 2000 USD – gives a difference of about \$2900 in 2000 USD, using a discount rate of 4 percent.

²⁷These 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.

veteran population.²⁸ 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 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), for example, 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

The theoretical literature embedding tenure choice in life-cycle models (e.g., Artle and Varaiya (1978)) clarifies the impact of a reduction in down-payments on home ownership rates of different age groups. This literature typically assumes that all individuals prefer to own, either because of 'pride of ownership,' or because favorable tax treatment or the elimination of agency problems 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

²⁸The following estimates are based on the tabulations in Appendix E of Hammond (1980).

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. It is also possible that under a high down-payment regime some individuals never choose to reduce their consumption enough to purchase a home, so that a reduction in down-payments may shift them from never owning into owning at some point. Hence, it is not obvious theoretically that the only effect of easier finance would be to shift purchase earlier.

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.²⁹ In Appendix 2, I present a simple model of asset accumulation and tenure choice, and calibrate it using characteristics of the 1960 housing market. For the ages I examine and the differences between VA and alternative terms, this calibration suggests that I should find larger effects at younger ages.

4 Effects of 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 sample 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.

²⁹Ortalo-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.

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 3, which shows the share of men in the 1960 Census who reported being veterans of the World War II or Korean War periods.³⁰ 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 each break would have some marginal date of birth at which the probability of military service exhibits a discrete shift, to which a regression discontinuity design could be applied directly. As is evident in Figure 3, however, at the national level the decline occurred rapidly but not at a single marginal date of birth. As I discuss in section 4.3, the absence of a national cutoff was due in part to local variation in the implementation of the draft; even if states or localities followed draft rules with marginal dates of birth, to the extent that these marginal dates are different, the national series will show more continuity of service levels by birth cohort. I lack the data to exploit this local variation fully, but explore it as a robustness check below.³¹

The main estimates, in the spirit of a regression discontinuity design, address heterogeneity in age by estimating local polynomial regressions at each break. Without a single marginal date of birth for military service at the national level, determining a specific cutoff at which to estimate a discontinuity is a challenge in implementing this approach. I do so using structural break estimation techniques in the ‘break’ sample, as described below. Given the cutoffs estimated in the break

³⁰As 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 A3.2 shows the share of the same cohorts that reported being veterans of any conflict in the later Census years.

³¹This discussion has focused on variation in the share veteran by birth cohort primarily relating to the propensity to be drafted, rather than the propensity to volunteer. There may have been some men who would have volunteered under a ‘high’ military manpower need regime but not under a ‘low’ one, inducing discontinuous variation in volunteering rates. To the extent that this is the case, these men are included among the ‘compliers,’ but the estimates can still be regarded as causal.

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.

The pilot bandwidth for the analysis is three years on either side of each break.³² 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:³³

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

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, $\mathbf{1}(yqob_{it} < c)$ indicates that he was born before the cutoff, $\mathbf{1}(yqob_{it} > c)$ indicates birth after the cutoff, and $(yqob_{it} - c)$ represents the time in quarters 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.³⁴

To determine the cutoffs, I apply the structural break estimation techniques used in, for example,

³²A 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 A3.2.

³³The t subscripts indicate that coefficients are allowed to vary by Census year, and that individuals are not necessarily followed over time.

³⁴Another issue is 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.

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.

4.2 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.

Table 3 presents estimates of equation (1), and Figure 3 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: 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.

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 44 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.

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, statistically indistinguishable from zero, and significantly different from the 1960 coefficients. A natural interpretation of this finding is that the VA program did not induce home ownership among individuals who never would have purchased otherwise, but rather increased aggregate home ownership rates by shifting home purchase earlier in life.

A useful aspect of this empirical setting is that there is an alternative test for heterogeneity of effects by age, which is to compare the World War II and Korean War estimates within a single Census year. Doing so is helpful to the extent that convergence at the cutoffs over time could have been associated with improvements in terms on non-VA loans over the 1960's. Table 1 suggests

³⁵The use of educational deferments during the Korean War somewhat complicates interpretation of the IV estimates at the Korean War break, but if there is a bias, it is likely to be negative rather than positive. 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.

³⁶The 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.

that VA loans were still available on easier terms than FHA loans in 1970, but at a level different from earlier years, which could have driven convergence even in the absence of heterogeneity by age. But comparing the results for 1960 in columns (3) and (6) of Table 3, estimates of the veteran effect for the younger men at the Korean War break are larger in both percent and 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.³⁷ Moreover, the estimates at the two ages in 1960 can be used to assess whether or not the fade-out by age 36, as suggested by the 1970 results, is reasonable. As I discuss in Section 6, a linear extrapolation of the percent effects from 1960 suggests that I should not observe effects of the VA program by age 36.³⁸

4.3 Robustness

Given the absence of a national date-of-birth cutoff for the draft, it is useful to show robustness of the main results to alternative ways of exploiting the variation in military service across birth cohorts. A first alternative that removes some cohorts with ‘intermediate’ levels of treatment is to 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. Doing so has little effect on the World War II estimate – it increases to 13.6 percentage points (an effect of 31 percent relative to a predicted probability of ownership for comparable non-veterans of 44 percent), and remains significant at the 10 percent level. 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 significant at the 1 percent level. A full set of results are shown in Appendix Table A3.4.

³⁷Just 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.

³⁸To the extent that these estimates overstate the true speed of fade-out of the effects by age in 1960, the estimates of the impact of veterans’ benefits on the aggregate rate of home ownership, presented below, are likely to be an understatement of their true effect.

A second alternative is to estimate a ‘cohort-trend’ model similar to that used in much of the previous literature on the GI Bill.³⁹ This approach rests on the assumption that within the range of cohorts included in the sample, the share of each cohort that served in the military was driven by military manpower needs and not by other between-cohort differences. 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

$$\bar{y}_{ct} = \alpha_t + \beta_t \bar{V}_{ct} + \gamma_t(c) + \lambda'_t \mathbf{X}_{ct} + \varepsilon_{ct} \quad (2)$$

where c indexes cohorts, \bar{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 over all 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 narrow windows around the two periods of decline.⁴⁰

I present estimates of the cohort-trend model of equation (2) in Table 4.⁴¹ With controls, the cohort-trend model gives estimates of 15 percentage points at the World War II break and 19 percentage points at the Korean War break.⁴² The Korean War estimates are significant at the

³⁹Examples 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.

⁴⁰Following 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.

⁴¹Estimates over a wider bandwidth and with alternative specifications of the underlying trend are shown in Appendix Table A3.3.

⁴²Note that the World War II and Korean War veteran shares are not entered separately in equation (2). 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

5 percent level using conventional standard errors; 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 1980.⁴³

A final alternative 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 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 4 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.⁴⁴ I apply the structural break technique 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

effect was smaller than 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.

⁴³In 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 above.

⁴⁴Other 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 shown at the end of Appendix 3.

for both the break search and analysis, I treat these results as supplementary.

Re-centered local linear specifications present further evidence supporting the main estimates. Figure 5 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. These correspond to 36 and 67 percent increases relative to comparable non-veterans at the World War II and Korean War breaks, respectively. The 1960 breaks also give an estimate of 15 percentage points at the World War II break in 1960 (a 35 percent increase), and 10 percentage points at the Korean War break (a 38 percent increase). All of the estimates of the veteran effect on home ownership in 1960 are statistically significant at conventional levels.

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, however, 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,⁴⁵ 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 that the World War II GI Bill was largely compensatory in its effects, making up for the large disruptive 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

⁴⁵Studying the Vietnam draft, Malamud and Wozniak (forthcoming) suggest that one channel through which education may increase mobility is through attending college in a different state.

groups makes an application of the RD framework somewhat more problematic.⁴⁶ Nevertheless, I test for discontinuities in the log of total personal income, conditional on positive income, using the same approach as the main estimates in Section 4.2. I present the estimates in Table 6.⁴⁷ There is little evidence based on these specifications that income could be driving the results for the World War II break: I find a negative estimate, not significant at conventional levels. For the Korean War break, the estimate suggests higher income for veterans, although it is worth noting that the estimate declines 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 could be due to increased income or other effects of educational benefits, in columns (4) and (5) of Table 6 I re-estimate the main specification adding log income and college completion as right-hand-side variables. Controlling for these leads to a small increase in the estimate at the World War II break and a small decrease in the estimate 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.⁴⁸

⁴⁶Indeed, a cross-validation procedure suggests using a shorter bandwidth for income than for home ownership.

⁴⁷As 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.

⁴⁸Dillingham (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

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 about veteran status, I report only reduced form estimates for 1920, but I report both reduced form and IV estimates for 1930.⁴⁹

The upper panel of Figure 6 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 1897.⁵⁰ A cross-validation procedure applied to both the first 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 6 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

(1945).

⁴⁹As shall be seen, the reduced form results in 1920 show little that would merit a two-sample IV procedure.

⁵⁰In 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 .

non-veterans suggests that in periods when VA loans became more appealing to suppliers of funds, and 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 7, 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 Klamann (1961) and the Veterans Administration itself (e.g., U.S. Veterans Administration (1948)), was that they were driven in large part by lenders' willingness to supply loans on VA terms. In particular, the interest rate ceiling on VA loans discussed in Section 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.⁵¹ 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.⁵² As a result, non-VA loans did not exhibit the same degree of year-to-year volatility over this period that VA loans did.⁵³ The lower panel of Figure 7 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

⁵¹Grebler (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.

⁵²In 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%.

⁵³Conventional loans did exhibit more pronounced seasonality than VA loans did, probably for reasons having to do with the institutional structure of the market: see Klamann (1961), page 123.

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.⁵⁴ The top panel of Figure 8 shows the difference between the average LTV for VA loans and that for FHA loans originated in each year for existing homes, 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. 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.⁵⁵ 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.⁵⁶

From the middle panel of Figure 8, 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 were more likely to purchase than those without veterans in each year.⁵⁷ But the difference was greater in years when the top and bottom panels would sug-

⁵⁴Potentially amplifying this tendency were explicit minimum downpayment requirements for VA loans from late 1950 until April 1953 and from July 1955 to April 1958. These requirements were around 4 percent in the earlier period (lower for less expensive and higher for more expensive houses) and 2 percent in the later period. Minimum downpayments were raised for FHA loans in both periods as well. Grebler (1960), Klamann (1961), and Herzog and Earley (1970) provide details.

⁵⁵The 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.

⁵⁶Unfortunately 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.

⁵⁷In this figure I exclude spending units with Korean War veterans, to de-emphasize any effects driven by purchase

gest 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.

6 Discussion: Aggregate effects

What role did veterans' housing benefits, and changes in mortgage terms more generally, play in the mid-century increase in home ownership? I address these broader questions by using the estimates provided above to predict the counterfactual home ownership rate at each age in 1960 in the absence of veterans' service and benefits. Since, as I have argued, the positive effects of veteran status on home ownership seem to be driven primarily by housing benefits, in this section I will refer to them more simply as the effects of housing benefits. In addition to assuming homogeneity of treatment effects at a given age, the calculations in this section also 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, and find suggestive evidence that extrapolating from the partial equilibrium estimates could understate the effect of the VA program.

immediately after a veteran's return from war. Including them leads to no obvious difference in the graph.

6.1 How much of the time series can the VA explain?

As a first step, I focus on the specific ages to which the estimates apply directly. The main estimate of the effect of veteran status at the World War II break, in Table 3, is 13 percentage points. In 1960, 69 percent of 32-year-old men were benefits-eligible veterans. These figures imply that home ownership would have been about 9 percentage points lower in the absence of housing benefits, about 26 percent of the 1940-60 change for 32-year old men (from 19 to 53 percent). Of 26-year-old men in 1960, 44 percent were eligible veterans; the main estimate of the effect of veteran status for these men is 18 percentage points. The same calculation suggests that the home ownership rate for 26-year-old men would have been about 8 percentage points lower in the absence of housing benefits, about 40 percent of the increase from 1940 to 1960 (from 9 to 29 percent).

To estimate how much lower the overall rate of home ownership would have been in the absence of veterans' housing benefits, I must extrapolate from the effects I estimate directly to the effects at other ages. Given only two points, I assume a linear decline in the percent effect with age. Doing so yields the counterfactual age-home ownership profile illustrated in Figure 9, in which I also show a counterfactual profile under the case in which all men were treated. The assumption of linearly declining effects in percent terms implies a zero effect of the VA at ages 36 and above, so both profiles are the same as the actual one for ages 36 and above (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. Hence, the counterfactual profile with none eligible for benefits is the same as the actual profile for ages 22 and below. Note that the two counterfactual age profiles provide some indication of how much earlier veterans entered home ownership because they were veterans. The profile in which no one is eligible crosses the 50 percent mark at about age 34; the profile in which all are eligible does so at about age 29. A comparison suggests that VA benefits, had they been extended to all, would have lowered the age at which the median individual was a home owner by about five years.

The results imply 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 $\sum_{g=23}^{35} w_{g60} \hat{\beta}_g \text{Pr}(\text{vet})_{g60}$, 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. This amount is about 7.4 percent of the overall 1940 to 1960 increase from 27 to 53 percent. A similar calculation shows that the VA can explain about 25 percent of the 1940-60 increase for the ‘affected’ ages (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, given the five-year difference in age at first ownership described above, 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. This calculation suggests that the home ownership rate would have been about 1.6 percentage points lower in the absence of the VA, reasonably close to my point estimate of 1.9 percentage points.⁵⁸ Using instead the share first

⁵⁸The 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

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.

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 buyers, as suggested by Shiller (2005) and Vigdor (2006), and hence that the estimates above could 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. It was noted above that federal lending programs may have led to a more general relaxation of mortgage terms; they may have also had positive spillovers in the housing market by encouraging the construction of large-scale housing developments.⁵⁹ 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

of population).

⁵⁹Saulnier et al. (1958), for example, argued that federal insurance programs such as the FHA and VA encouraged these projects, and that “[l]arge projects...have made possible the application of methods of production organization that have doubtless lowered costs in the building industry.”

presence of veterans, non-veterans were less likely to own their homes.⁶⁰ A regression discontinuity framework, as used above, is of little use here. The approach I take instead 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.⁶¹

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) non-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 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.⁶² Columns (2) and (4) control for

⁶⁰It 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.

⁶¹A 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.

⁶²The 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,

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.⁶³ 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 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

the share of men aged 18 to 45 (or 18 to 35, 18 to 55, or 18 to 65) gives qualitatively similar estimates.

⁶³This appears to be driven largely by the variables correlated with 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.

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.

6.3 How much of the time series can broader changes in mortgage terms explain?

As discussed in Section 2, housing benefits extended to veterans were merely one factor in a far broader change in mortgage terms in the mid-20th century. The estimate of the overall impact of the VA is surely a lower bound for the broader effects of finance, but it is not straightforward to extrapolate from the estimates to the effects of these broader changes. However, I can use the estimates of the effect of the VA to validate an alternative approach.

The 1960 Survey of Consumer Finances, the structure of which was similar to the earlier years discussed above, asked respondents about home ownership, the dollar value of their home and of their equity in the home, the dollar amount of their liquid assets, and the value of their other assets; further details are provided in the data appendix. With 'representative' loan-to-value ratios in the 50 to 60 percent range in the 1920's (as in Table 1), a rough pass at this broader question is to ask what share of the population were home owners in 1960 but would have lacked the assets to make a 40 to 50 percent down-payment on their home. The results suggest if all had needed to make a 40 percent downpayment on their house, the home ownership rate would have been about 7.77 percentage points lower (with a 95 percent confidence interval of 6.81 to 8.74 percentage points). If all had needed to make a 50 percent downpayment, home ownership would have been lower by 11 percentage points (with a 95 percent confidence interval of 9.91 to 12.16 percentage points). By way of comparison, 11 percentage points is a little over 40 percent of the overall increase from 1940 to 1960 and about 46 percent of the increase from 1920 to 1960 (which may be the more relevant comparison, given that the low home ownership rate of 1940 was partly associated with the aftermath of the Great Depression).

Such a calculation ignores many complicating factors, of course, but applying this method to estimate how much lower home ownership would have been in the absence of the VA provides some measure of reassurance. In particular, it suggests that requiring everyone to be able to make a 10 percent downpayment on their own home – roughly the average for FHA loans originated in 1960 and a reasonable no-VA counterfactual – would have lowered the overall home ownership rate by 1.7 percentage points (with a 95 percent confidence interval of about 1.2 to 2.2 percentage points), reassuringly close to the estimate above of 1.9 percentage points.

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 steep declines 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 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 that relaxing borrowing constraints should have the largest effects on younger individuals. Other veterans' benefits and service itself appear not to explain the observed differences, leaving veterans' housing benefits as the most likely explanation for the effect of veteran status.

The estimates suggest that in the absence of the VA, the rate of home ownership would have been about 1.9 percentage points lower in 1960. 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. These estimates serve as a lower bound for

the impact of broader changes in mortgage terms over this period: a rough calculation suggests that these changes may explain 40 percent of the overall change from 1940 to 1960.

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.

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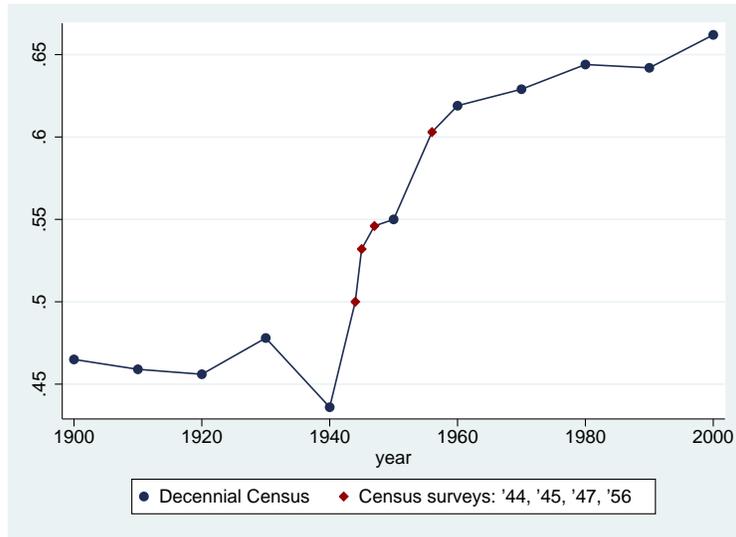
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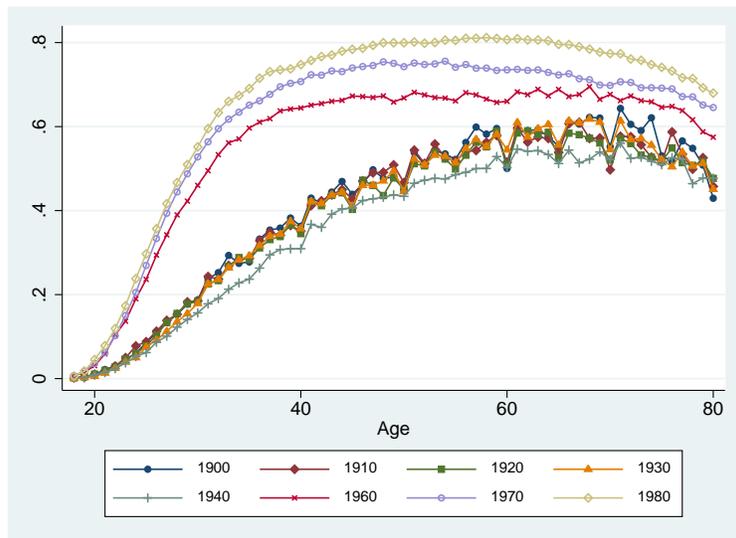
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Figure 1: Rate of owner-occupancy over the 20th century



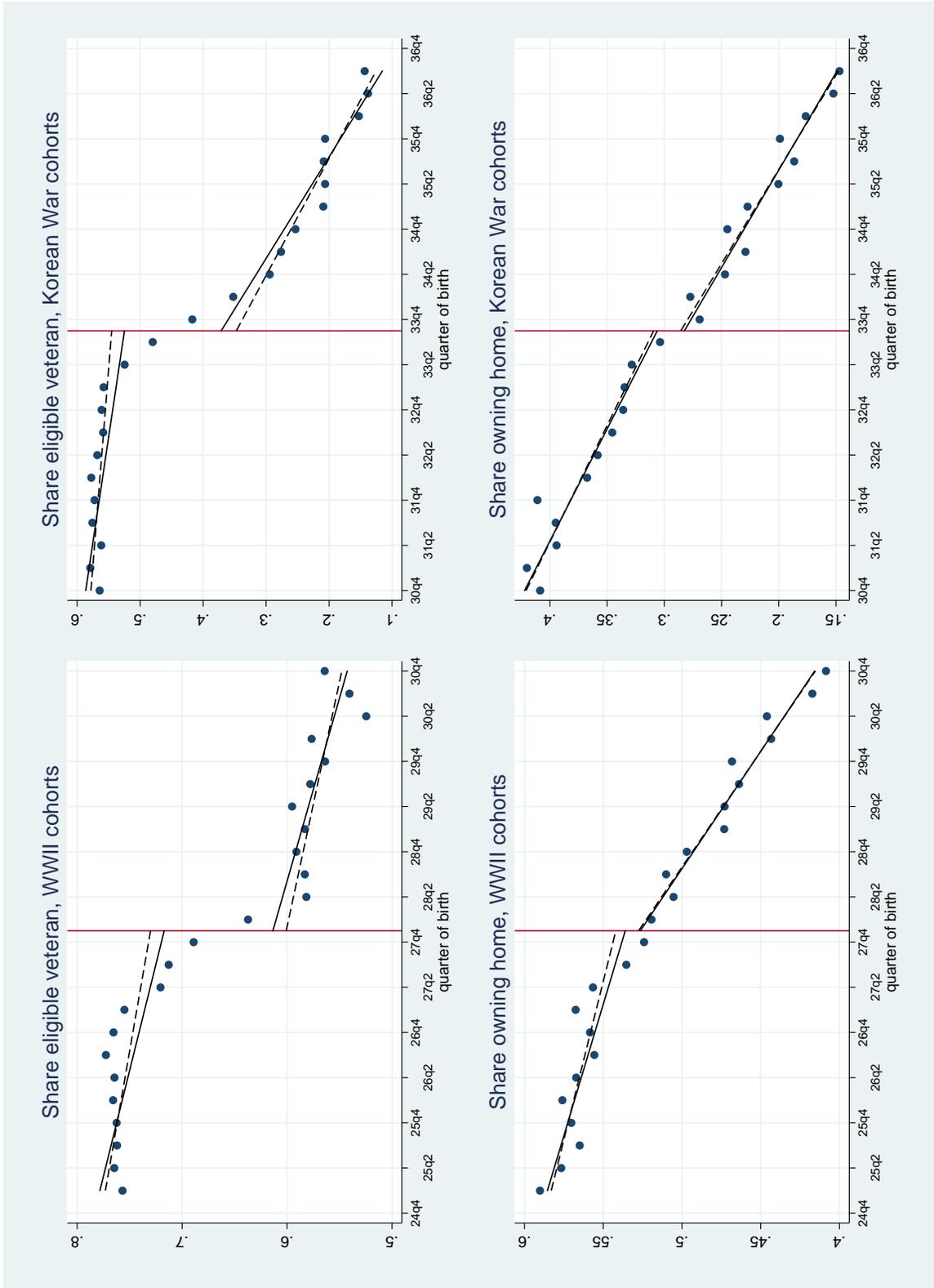
Notes: Figure shows share of occupied dwelling units that are owner-occupied. See text for sources.

Figure 2: Home ownership by age, 1900-1980



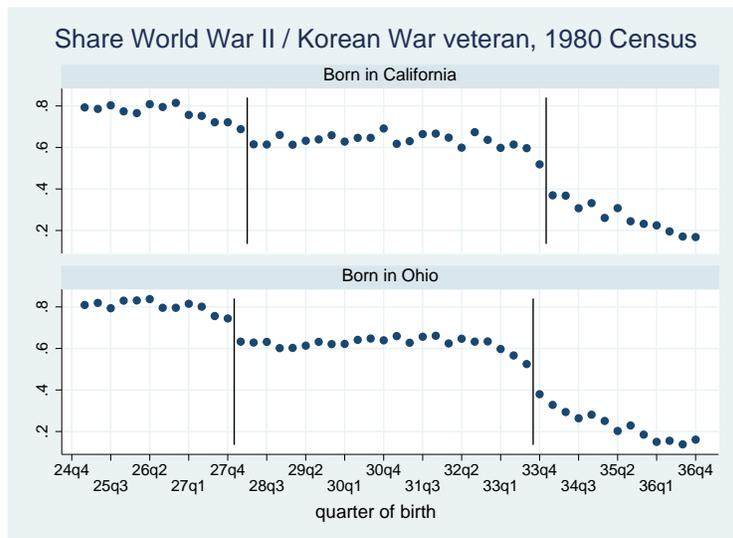
Notes: Figure shows share of men of each age from 18 to 80 who are home owners in each Census year. Lower lines are 1900-1940, upper lines are 1960-1980. Data are from Ruggles et al. (2008). For definitions, see text.

Figure 3: Estimated trends and discontinuities in veteran status and home ownership in 1960



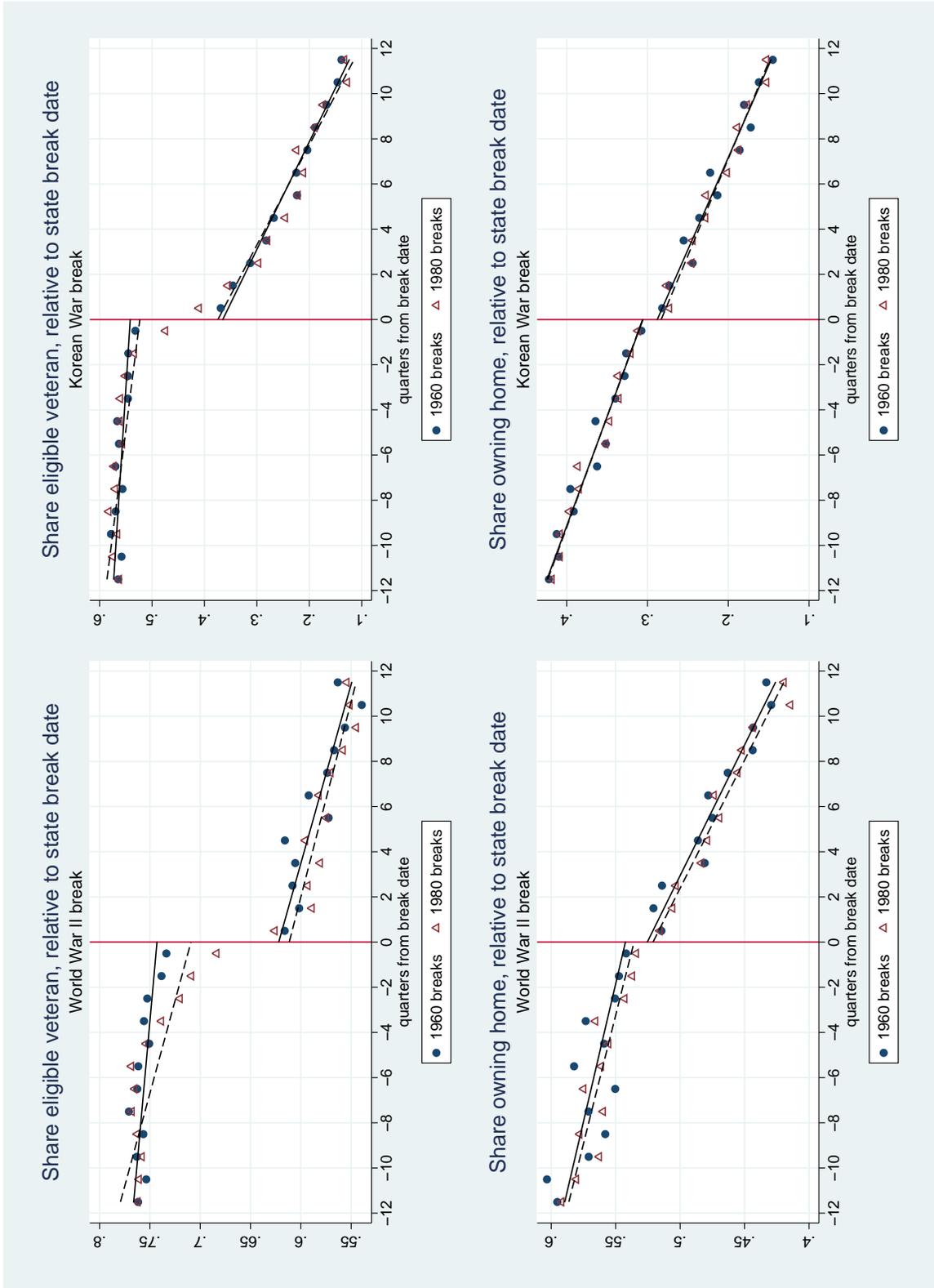
Notes: Top panels show share of each birth cohort that reported being a veteran of the World War II or Korean War period in the 1960 Census. Bottom panels show share of each cohort owning home. Solid and dashed lines show linear fits that estimate the regression function at the boundary point. Solid lines are estimated using all cohorts; dashed lines are estimated excluding the two cohorts on either side of the indicated threshold, as discussed in Section 4.3.

Figure 4: Illustration of first-stage break search in 1980 Census



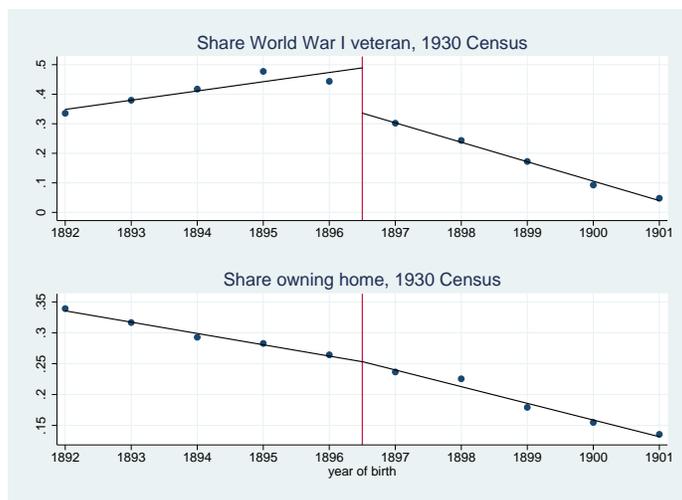
Notes: Circles show share of each quarter-of-birth cohort in each state reporting being a veteran with service during the World War II or Korean War periods. Vertical lines show location of estimated break in probability of service for each state.

Figure 5: Re-centered trends and discontinuities in veteran status and home ownership in 1960



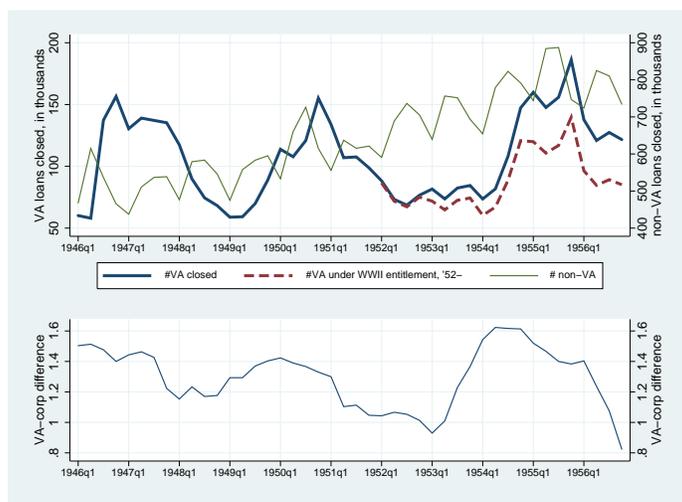
Notes: Top panels show share of each birth cohort that reported being a veteran of the World War II or Korean War period in the 1960 Census, relative to estimated state-level breaks in probability of veteran status. '1960 breaks' are those estimated on the full 1960 sample, and '1980 breaks' are those 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 6: Estimated trends in veteran status and home ownership, 1930 Census



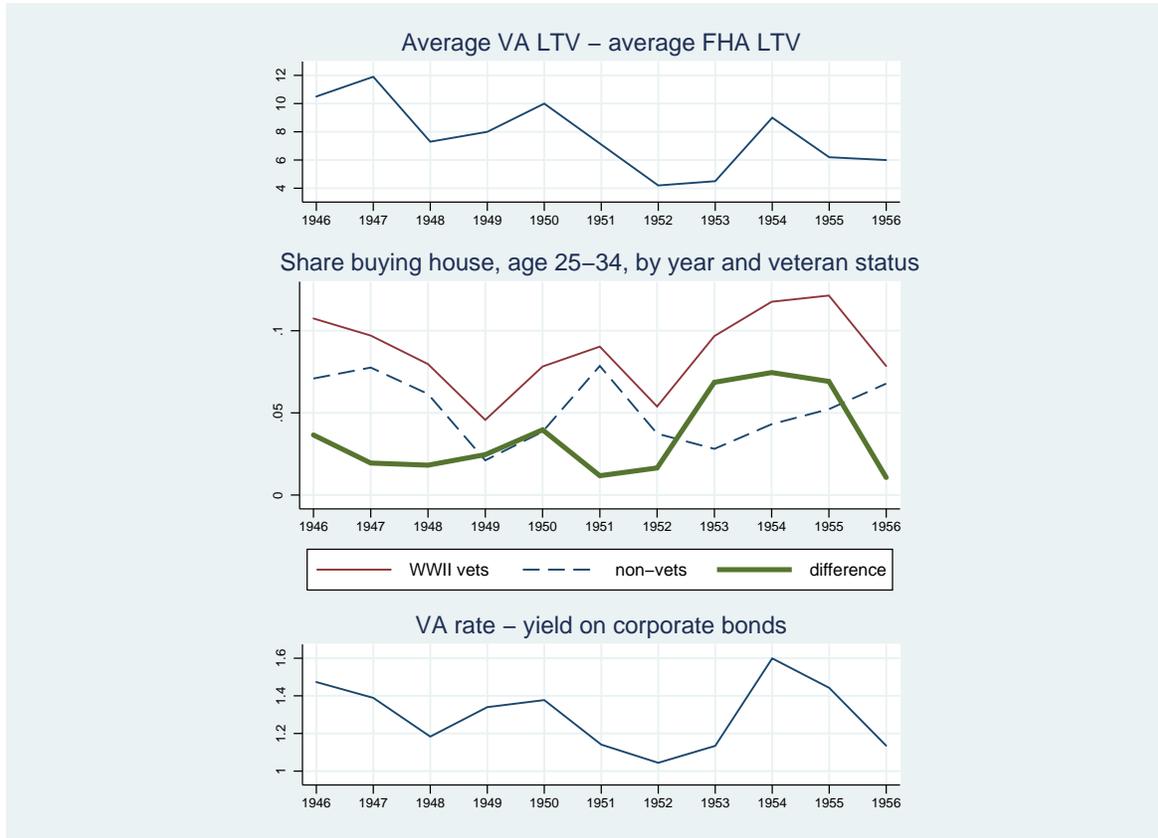
Notes: Upper panel shows share of men of each 'year of birth' reporting being a veteran of World War I in the 1930 Census, lower panel shows share of men owning homes. Year of birth is calculated as (1929-reported age). Vertical line indicates estimated location of 'break,' as described in Section 5.

Figure 7: Number of VA loans closed by quarter and difference between VA and alternative yields



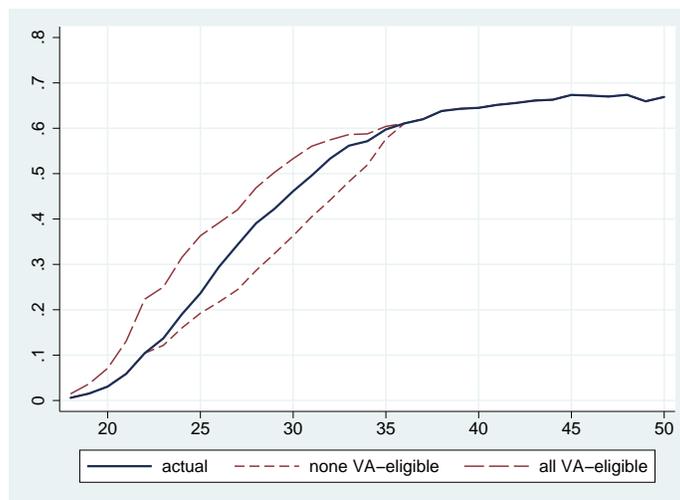
Notes: Figure shows number of VA and non-VA loans closed each quarter, the estimated number closed under the World War II entitlement for 1952 onwards, and the difference between the maximum VA interest rate and yields on AAA-rated corporate bonds. Data on number of VA loans from Housing and Home Finance 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/macroeconomy/contents/chapter13.html>.

Figure 8: 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 7.

Figure 9: Observed and counterfactual age-ownership profiles, 1960



Notes: Figure shows actual 1960 age-home ownership profile, as calculated above. Counterfactual lines show predicted home ownership if none or all men were eligible for VA benefits.

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
<i>N</i>	21464	59085	58482	18552	53181	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.

Table 3: Local linear estimates of effect of veteran status on home ownership

	(1)	(2)	(3)	(4)	(5)	(6)
	first stage	World War II reduced form	IV	first stage	Korean War reduced form	IV
1960	0.107 (0.008)***	0.014 (0.008)*	0.129 (0.075)*	0.159 (0.008)***	0.028 (0.008)***	0.177 (0.049)***
<i>N</i>	63882	63882	63882	56901	56901	56901
1970	0.107 (0.004)***	-0.002 (0.004)	-0.022 (0.041)	0.065 (0.005)***	-0.004 (0.005)	-0.064 (0.075)
<i>N</i>	175263	175263	175263	162057	162057	162057
1980	0.119 (0.004)***	-0.005 (0.004)	-0.044 (0.033)	0.072 (0.005)***	-0.003 (0.004)	-0.039 (0.058)
<i>N</i>	174867	174867	174867	165032	165032	165032

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

	(1)	(2)	(3)	(4)
	World War II break 1926-29	World War II break 1926-29	Korean War break 1932-35	Korean War break 1932-35
1960	0.063 (0.086) [0.090]	0.145 (0.132) [0.195]	0.157 (0.068)** [0.065]**	0.191 (0.081)** [0.122]
1970	0.002 (0.064) [0.066]	-0.036 (0.075) [0.098]	-0.006 (0.09) [0.085]	-0.105 (0.042)** [0.057]
1980	-0.070 (0.063) [0.086]	-0.102 (0.094) [0.126]	-0.004 (0.064) [0.094]	-0.030 (0.066) [0.107]
Controls	No	Yes	No	Yes
<i>N</i>	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 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 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)***
<i>N</i>	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)
<i>N</i>	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)
<i>N</i>	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)**
<i>N</i>	63794	63794	63794	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)
<i>N</i>	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)
<i>N</i>	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: Estimates of veteran status on 1960 income, and on ownership conditional on income

Dependent variable	(1) Income	(2) Owns home	(3) Owns home	(4) Owns home	(5) Owns home
World War II	-0.153 (0.109)	0.129 (0.075)*	0.117 (0.076)	0.145 (0.072)**	0.147 (0.073)**
<i>N</i>	62463	63882	62463	62463	62463
Korean War	0.140 (0.080)*	0.177 (0.049)***	0.164 (0.050)***	0.145 (0.049)***	0.141 (0.050)***
<i>N</i>	55219	56901	55219	55219	55219
Additional controls				ln(inc)	ln(inc), college
Sample	inc>0	all	inc>0	inc>0	inc>0

Notes: Columns (1) shows estimates of the impact of veteran status on the log of total personal income in 1960, conditional on positive income, for each break. Columns (2) repeats estimates shown in Table 3 above. Columns (3) shows estimates in sample with positive income. Columns (4) and (5) show estimates of veteran status on home ownership controlling for log income and an indicator for college completion. Heteroskedasticity-robust standard errors are shown in parentheses. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

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)	
<i>N</i>		78089	
1930	0.153	-0.0002	-0.001
Mean ownership: 0.250	(0.007)***	(0.006)	(0.042)
<i>N</i>	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

	(1)	(2)
Dependent variable	bought house	bought house
	last year	last year
Mean over period	0.073	0.074
Vet*difference	0.081 (0.040)**	0.073 (0.038)*
Korea vets in sample	No	Yes
<i>N</i>	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 (0.315)	0.791 (0.463)*	0.078 (0.220)	0.794 (0.389)**
<i>N</i>	60215	60215	189158	189158
Panel B. Nonveterans aged 23-29				
Share men 18+ WWII vets	0.060 (0.365)	0.874 (0.430)**	-0.283 (0.319)	0.750 (0.365)**
Share men 18+ KW vets	-0.779 (0.991)	-0.429 (1.189)	0.744 (0.913)	-0.733 (0.921)
<i>N</i>	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. Panel 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 Sections 5.3 and 6.3, 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, in addition to these restrictions I also drop men whose veteran status was allocated; in the 1960 sample I also drop men for whom total personal income was allocated.

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.

Section 6 uses the entire sample from the 1960 survey. Spending units are defined similarly in that year. I calculate the value of a spending unit's liquid assets, home equity, and other assets as a share of its home value and calculate the share of spending units that owned a home in 1960 for which this proportion was (for example) less than 40 percent. As mentioned in the text, the 1960 survey reports dollar values for the value of the spending unit's home and for their equity in the home, as well as the dollar value of their liquid assets. Included in my measure of their assets is an estimate of the value of their stocks. The value of stock ownership is reported only in bins; I use the midpoint of each bin (and \$25,000 for the top code, which corresponded to a value of \$25,000 and above). The survey also contains information on the value of real estate that the unit owns other than the home, but not information on the value of their equity in it. The values are similarly reported in bins, for which I use the midpoints and the top code in a similar manner. Assuming that the spending unit has 100 percent equity in its non-home real estate would lower the estimates of reductions in home ownership slightly. The reduction in home ownership associated with a 10 percent downpayment would be 1.55 percentage points instead of 1.68 percentage points; the estimate for a 40 percent downpayment would be a reduction of 6.86 percentage points instead of 7.77 percentage points; and the estimate for a 50 percent downpayment would be a reduction of 9.52 percentage points instead of 11.04 percentage points.

Appendix 2: Tenure choice model and calibration

A simple model of asset accumulation and tenure choice, calibrated using characteristics of housing markets in 1960, clarifies the predictions of the life-cycle tenure choice framework at the ages I examine in the empirical analysis. 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 ϕPH_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

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

subject to

$$y_t = C_t + RH_R + s_t \text{ for } t < T \quad (3)$$

$$y_t = C_t + \phi PH_O \text{ for } t \geq T \quad (4)$$

$$\int_0^T e^{\rho[T-t]} s_t dt = \delta PH_O \quad (5)$$

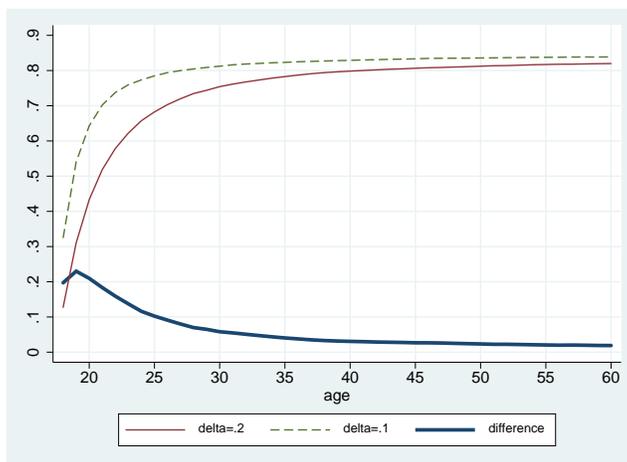
$$s_t \geq 0 \quad \forall t. \quad (6)$$

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 A2.1, shown for down-payments of 10 and 20 percent, confirm that reductions in down-payments are likely to have especially large effects on younger individuals.⁶⁴ 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.

Figure A2.1: Simulated home ownership profiles for 10% and 20% down-payments

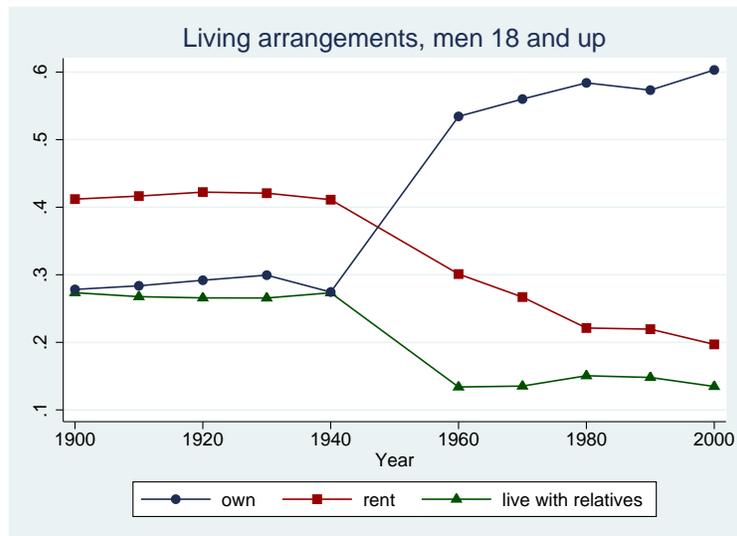


Notes: Figure shows home ownership rates by age calculated in the simulation described in Section 3, for down-payments of 10% ($\delta = .1$) and 20% ($\delta = .2$). Heavy line shows difference between home ownership in low down-payment and high down-payment regime at each age.

⁶⁴These terms correspond roughly to the median terms on the stock of VA and FHA mortgages in 1960. Since VA loans originated in 1960 had even lower down-payments, it is even more likely that in the analysis I should observe larger effects at younger ages.

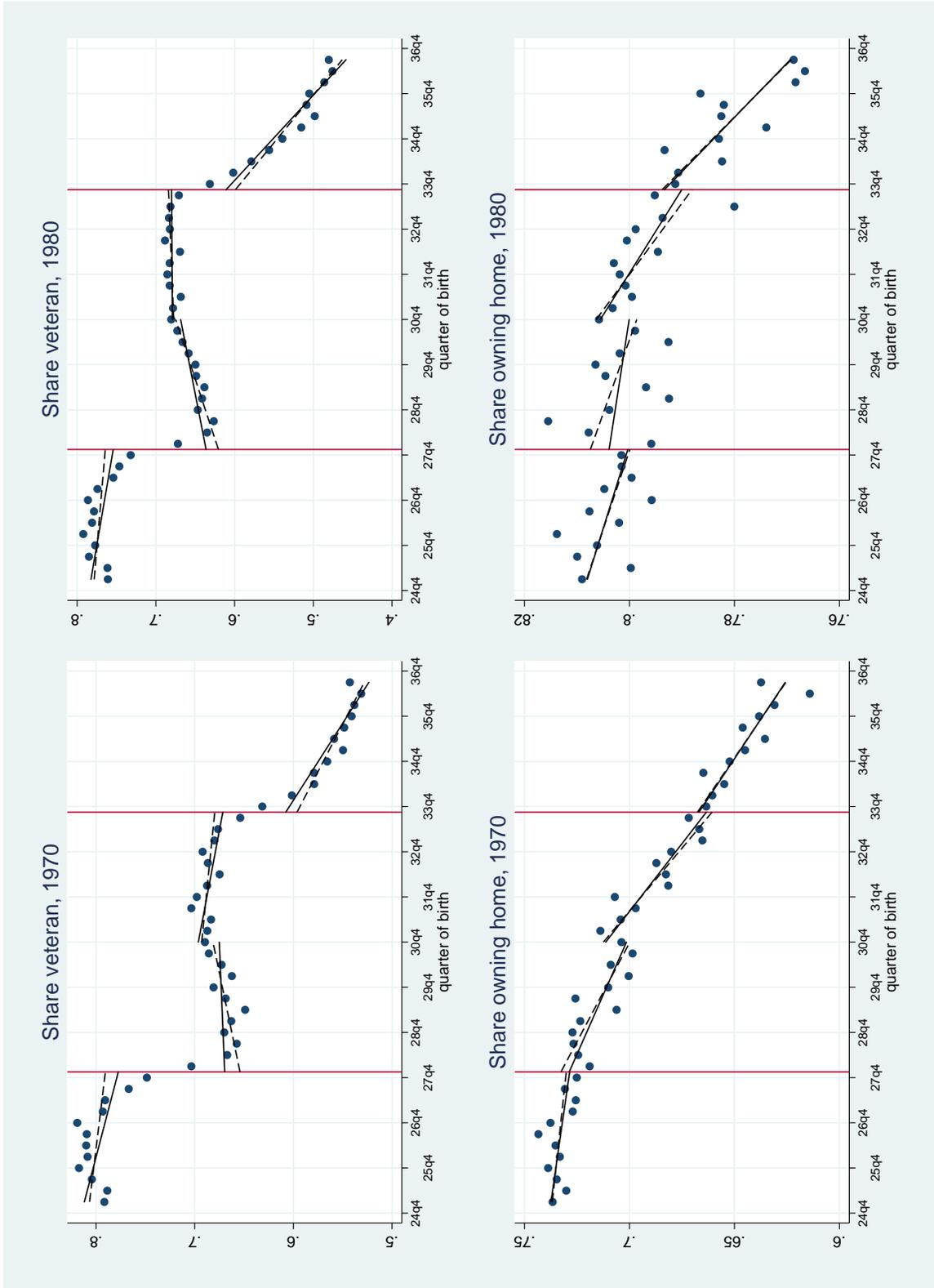
Appendix 3: Additional Tables and Figures

Figure A3.1: 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 A3.2: 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 A3.1: Trends in home mortgage loan-to-value ratios, 1946-67

	New Homes				Existing Homes			
	Conventional (median)	FHA (average)	VA (average)	VA-FHA (difference)	Conventional (median)	FHA (average)	VA (average)	VA-FHA (difference)
1946		84.1	92.7	8.6		78.6	89.1	10.5
1947		81.2	90.7	9.5		77.3	89.2	11.9
1948		80.1	84.5	4.4		76.5	83.8	7.3
1949		83.6	86.5	2.9		76.6	84.6	8
1950	64.6	85	91.9	6.9	64.6	76.4	86.4	10
1951	63.6	82.5	89.6	7.1	63.6	73.6	80.7	7.1
1952	64.1	80.4	86.9	6.5	64.1	76.1	80.3	4.2
1953	63.9	82.9	88.8	5.9	63.9	77.5	82	4.5
1954	65.2	82.2	92.6	10.4	65.2	77.8	86.8	9
1955	67.9	85	94.5	9.5	67.9	82.2	88.4	6.2
1956	67.9	83.2	93.1	9.9	67.9	80.3	86.3	6
1957	67.3	82.3	92.2	9.9	67.3	82.5	85.8	3.3
1958	68.9	88.7	94.3	5.6	68.9	88.1	87.4	-0.7
1959	71.1	91	96.7	5.7	71.1	89.7	89	-0.7
1960	72	91.4	96.8	5.4	72	90.5	90.7	0.2
1961	73.1	92.2	97.7	5.5	73.1	91.4	92.5	1.1
1962	75.1	92.7	97.8	5.1	75.1	92.1	94.9	2.8
1963	75.6	92.7	97.6	4.9	75.6	92.5	95.8	3.3
1964	76.1	92.9	97.6	4.7	76.1	92.8	96.2	3.4
1965	75.3	92.7	97.2	4.5	75.3	92.7	96.2	3.5
1966	74.5	92.7	97.3	4.6	74.5	93	96.8	3.8
1967	75.2	92.4	97.5	5.1	75.2	93	97.6	4.6

Notes: Data reproduced from Table 2 of Herzog and Earley (1970). Loan-to-value ratios for FHA and VA are average loan-to-value ratios of new loans for each year. Conventional LTV's are estimated median loan-to-purchase-price ratios for conventional loans made by savings and loan associations.

Table A3.2: 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	0.159	0.028	0.177
(baseline)	(0.008)***	(0.008)*	(0.075)*	(0.008)***	(0.008)***	(0.049)***
<i>N</i>	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)***
<i>N</i>	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)**
<i>N</i>	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)**
<i>N</i>	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)***
<i>N</i>	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)*
<i>N</i>	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)
<i>N</i>	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)
<i>N</i>	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. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

Table A3.3: 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 (0.027)*** [0.029]***	0.322 (0.025)*** [0.024]***	0.063 (0.086) [0.090]	0.145 (0.132) [0.195]	0.157 (0.068)** [0.065]**	0.191 (0.081)** [0.122]
1970	0.070 (0.061) [0.058]	0.026 (0.067) [0.065]	0.002 (0.064) [0.066]	-0.036 (0.075) [0.098]	-0.006 (0.09) [0.085]	-0.105 (0.042)** [0.057]
1980	0.071 (0.020)*** [0.024]***	0.049 (0.023)** [0.028]*	-0.070 (0.063) [0.086]	-0.102 (0.094) [0.126]	-0.004 (0.064) [0.094]	-0.030 (0.066) [0.107]
Panel B. Quadratic cohort trend						
1960	0.069 (0.032)** [0.032]**	0.136 (0.032)*** [0.033]***	0.089 (0.084) [0.089]	0.127 (0.143) [0.269]	0.158 (0.070)** [0.073]*	0.197 (0.091)* [0.135]
1970	-0.011 (0.029) [0.029]	-0.039 (0.024) [0.022]	0.005 (0.069) [0.072]	-0.035 (0.081) [0.133]	-0.011 (0.094) [0.091]	-0.112 (0.046)** [0.063]
1980	0.022 (0.019) [0.026]	-0.015 (0.020) [0.028]	-0.102 (0.064) [0.081]	-0.089 (0.084) [0.151]	0.035 (0.074) [0.109]	-0.024 (0.075) [0.141]
Controls	No	Yes	No	Yes	No	Yes
<i>N</i>	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 A3.4: 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)***
<i>N</i>	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)
<i>N</i>	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)
<i>N</i>	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)***
<i>N</i>	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)
<i>N</i>	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)
<i>N</i>	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 A3.5: Robustness check: estimates of veteran status on 1960 income, and on ownership conditional on income

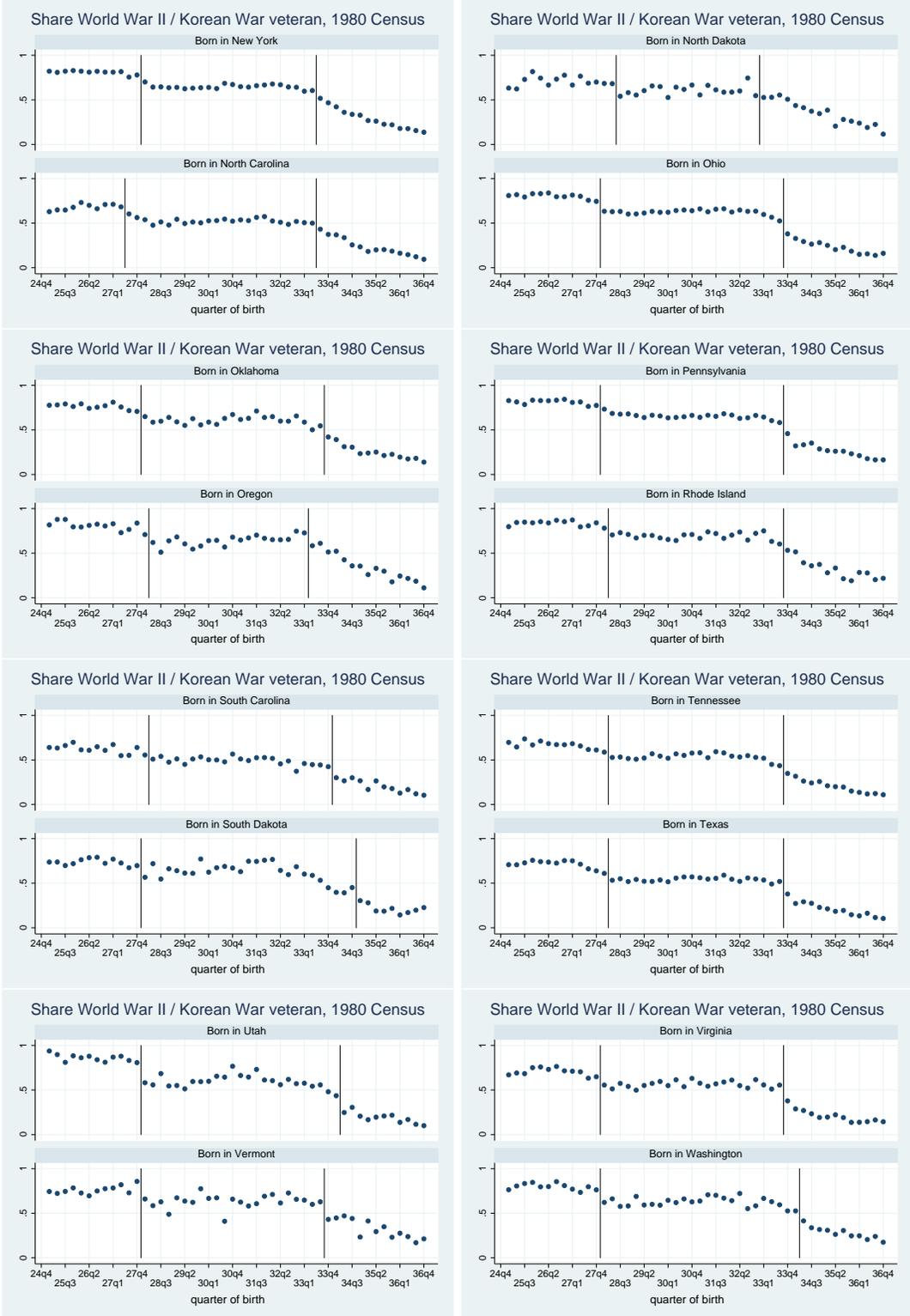
Dependent variable	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)			
	Income	base	Income	base	Owns home	base	Owns home	base	Income	base	Owns home	base	Owns home	base	Owns home	base		
cohort-trend	-0.189		0.145	0.136	0.195	0.166	0.191	0.183	0.166	0.191	0.183	0.166	0.191	0.183	0.166	0.191	0.183	
	(0.178)		(0.132)	(0.134)	(0.139)	(0.122)	(0.081)**	(0.078)**	(0.122)	(0.081)**	(0.078)**	(0.081)**	(0.078)**	(0.081)**	(0.078)**	(0.081)**	(0.078)**	(0.088)**
unrecentered (all cohorts)	-0.153		0.129	0.117	0.145	0.140	0.177	0.164	0.140	0.177	0.164	0.140	0.177	0.164	0.140	0.177	0.164	0.145
	(0.109)		(0.075)*	(0.076)	(0.072)**	(0.080)*	(0.049)***	(0.050)***	(0.080)*	(0.049)***	(0.050)***	(0.049)***	(0.050)***	(0.049)***	(0.050)***	(0.049)***	(0.050)***	(0.049)***
unrecentered (2-cohort window)	-0.129		0.136	0.122	0.146	0.201	0.130	0.119	0.201	0.130	0.119	0.201	0.130	0.119	0.201	0.130	0.119	0.091
	(0.102)		(0.072)*	(0.072)*	(0.069)**	(0.074)***	(0.045)***	(0.046)***	(0.074)***	(0.045)***	(0.046)***	(0.074)***	(0.045)***	(0.046)***	(0.074)***	(0.045)***	(0.046)***	(0.045)***
recentered (1980 breaks)	-0.080		0.152	0.145	0.159	0.137	0.152	0.140	0.137	0.152	0.140	0.137	0.152	0.140	0.137	0.152	0.140	0.121
	(0.113)		(0.080)*	(0.080)*	(0.077)**	(0.083)*	(0.051)***	(0.052)***	(0.083)*	(0.051)***	(0.052)***	(0.083)*	(0.051)***	(0.052)***	(0.083)*	(0.051)***	(0.052)***	(0.051)**
recentered (1960 breaks)	0.057		0.150	0.143	0.133	0.090	0.096	0.083	0.090	0.096	0.083	0.090	0.096	0.083	0.090	0.096	0.083	0.070
	(0.092)		(0.064)**	(0.065)**	(0.063)**	(0.069)	(0.043)**	(0.043)*	(0.069)	(0.043)**	(0.043)*	(0.069)	(0.043)**	(0.043)*	(0.069)	(0.043)**	(0.043)*	(0.042)*
Controls	base	base	base	base	base, ln(inc)	base	base, ln(inc)	base	base, ln(inc)	base, ln(inc)								
Sample	inc>0	all	inc>0	inc>0	inc>0	inc>0	all	inc>0	inc>0	all	inc>0	all	inc>0	inc>0	inc>0	inc>0	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. ***: $p < .01$, **: $p < .05$, *: $p < .1$.

State-specific breaks estimated in 1980 break sample









Appendix 4: 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 A4.1, 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 (forthcoming) 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.

For 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 A4.1: 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 (0.251)	0.126 (0.192)	-0.053 (0.048)	0.090 (0.037)**	0.034 (0.097)	0.134 (0.109)	0.058 (0.082)	0.075 (0.055)	0.050 (0.071)	0.007 (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	-0.190 (0.157)	0.055 (0.269)	-0.0004 (0.018)	0.001 (0.030)	-0.123 (0.062)**	0.045 (0.101)	0.033 (0.089)	-0.039 (0.139)	0.030 (0.056)	-0.025 (0.101)
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	-0.199 (0.145)	-0.306 (0.252)	0.005 (0.010)	0.005 (0.016)	-0.026 (0.063)	-0.076 (0.106)	-0.010 (0.046)	0.003 (0.082)	0.057 (0.040)	0.003 (0.069)
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. ***: $p < .01$, **: $p < .05$, *: $p < .1$.