How do mortgage subsidies affect home ownership?
Evidence from the mid-century GI Bills

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Wellesley College and NBER

August 2012
Owner-occupancy over the century

Rate of owner-occupancy, 1900–2000

**Notes:** Rate of owner-occupancy is share of occupied dwellings owner-occupied. Sources: Decennial Census, Monthly Report on the Labor Force, National Housing Inventory.

**Individual-level ownership**
Owner-occupancy over the century

Rate of owner-occupancy, 1900–2000

Notes: Rate of owner-occupancy is share of occupied dwellings owner-occupied. Sources: Decennial Census, Monthly Report on the Labor Force, National Housing Inventory.
Home ownership by age

Home ownership by age, 1900–1980

Notes: See Figure 2 in paper. Source: IPUMS.
Home ownership by age

Notes: See Figure 2 in paper. Source: IPUMS.
Overview

- How has government intervention in housing finance influenced rates of home ownership?
  - Large national interventions in US beginning in 1930’s / 40’s
  - Coincided with sharp increase in ownership, 1940-1960
- Empirical study complicated by other coincident changes
- This paper:
  - Uses variation in eligibility for veterans’ home loan benefits, which allowed borrowing on easier terms
  - Emphasizes effects of finance interventions that vary with age: primary effect may be to shift purchase earlier in life
Specific questions and approach

- What was the effect of eligibility for home loan benefits on home ownership, at different ages and points in time?
  - Use steep declines in probability of military service by birth cohort, for WWII and Korea
  - In complementary analyses, ask if effects can be explained solely by non-housing benefits or direct effects of service
- How did veterans’ benefits affect aggregate ownership?
- How did broader changes in terms affect ownership?
Preview of results

- Effects of service and benefits on home ownership
  - Consistent with effects that diminish with age
    - For men 26 years old in 1960: 18 p.p. (∼80%)
    - For men 32 years old in 1960: 13 p.p. (∼30%)
  - Estimates from 1970, 1980 suggest no significant positive effect at older ages (36 and older)
  - In other words: shifted purchase earlier in life
- Not driven by non-housing benefits or direct effects of service
- Aggregate effects: share of 1940-60 increase due to VA
  - ∼7.4 percent of increase in home ownership overall
  - ∼25 percent of increase for individuals 35 and under
  - GE: results unlikely to be driven by crowd-out of nonveterans
- Broader changes in mortgage terms may explain ∼40 percent
Background

Effects of service and benefits on ownership

Alternative explanations

Aggregate effects and other trends
Background on VA home loans

- Main program was a guarantee to lender against losses on VA-approved loans, up to a specified amount
- Initially authorized by World War II and Korean War GI Bills
  - If began service after 1/31/55: Cold War GI Bill (passed 1966)
- Easier terms than other types of loans
  - For WWII / Korean War GI Bills, no premium
  - Loan-to-value up to 100%
  - Interest rates lower (and capped at 4-4.5% over 40’s and 50’s)
## Changes in loan terms

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BoE: median house in 1950
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BoE: median house in 1950
Use of VA home loans

- 1946-60: ~12% of total number of loans, 16% of volume
- 1977 SoV: of ~17 million living WWII and Korean War vets,
  - ~6.3 million had used VA loan
  - ~5.5 million had used VA loan for first home
- Of those in 1977 SoV using VA loan for first home:
  - 61% said they couldn’t have bought a home without VA loan
  - 6% said they would have purchased less expensive house
  - 30% said they could have purchased home anyway
  - (Remainder: multiple answers or no answer)
1. Background

2. Effects of service and benefits on ownership

3. Alternative explanations

4. Aggregate effects and other trends
Empirical strategy and data

- Exploit declines in military manpower needs in 1945 and 1953
- Induced large declines in probability of military service by DOB
- Idea: estimate between-cohort differences in housing / other outcomes, scale by differences in probability of military service
  - Bound/Turner (2002); Page (2006); Bedard/Deschênes (2006)
- Data for analysis: IPUMS (Ruggles et al., 2009)
  - 1960 1% sample
  - Three 1970 1% Form 2 samples
  - 3% sample from 1980 5% State sample
    (use remaining 1980 microdata for break search)
- Sample: men born in US, 1925-1936
Share 1960-eligible veteran by birth cohort

Source: 1960 IPUMS.

Share veteran of any period
Why not perfectly discontinuous? One reason:

Notes: means and estimated breaks from 1980 “break sample.” Source: 1980 IPUMS.
Exploiting variation in probability of military service

Similar results across different approaches

- **Main estimates: local linear regression**
  - In the spirit of a regression discontinuity design
  - Estimate at specific age (‘break’) by extrapolation
  - Challenge: not perfectly sharp, need to choose ‘break’

- **Robustness:**
  - Cohort-trend model
    - No ‘break’; regress share owning on share veteran at birth-cohort level, controlling for underlying trend
    - For heterogeneous TE by age: narrow windows around declines
  - Drop cohorts immediately around break
  - Recentered version of local linear regression
Share 1960-eligible veteran by birth cohort

Source: 1980 IPUMS ("break sample").
Share 1960-eligible veteran by birth cohort

Source: 1980 IPUMS ("break sample").
Local linear specification

Share World War II / Korean War veteran, 1960 Census

Source: 1960 IPUMS.
Local linear specification

- Specification: individual $i$ in year $t \in \{1960, 1970, 1980\}$
  
  $y_{it} = \alpha_t + \beta_t \mathbf{1}(yqob_i < c) + \gamma_t(yqob_i - c)(yqob_i < c) + \delta_t(yqob_i - c)(yqob_i > c) + \lambda_t'X_i + \epsilon_{it}$

- Cross-validation criterion: 12-quarter bandwidth
  
  - Also check sensitivity to shorter bandwidths

- Controls: fixed effects for season (quarter) of birth, race (white/non-white), state of birth
  
  - For recentered specifications, also control for age in quarters

- For un-recentered: also show results excluding cohorts immediately around each break
Share eligible veteran, Korean War cohorts
Share eligible veteran, relative to state break date

Korean War break

quarters from break date

1960 breaks 1980 breaks

1.0 0.8 0.6 0.4 0.2 0.0

1.0 0.8 0.6 0.4 0.2 0.0
Share owning home, WWII cohorts
Share owning home, relative to state break date

World War II break

quarters from break date

1960 breaks

1980 breaks

1960 breaks

1980 breaks
Share owning home, Korean War cohorts

quarter of birth

quarter of birth
Share owning home, relative to state break date

Korean War break

quarters from break date

-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12

1960 breaks 1980 breaks

-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12

1960 breaks 1980 breaks
### Estimates of effect of service and benefits on home ownership

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<th>Korean War</th>
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<td>1st stage</td>
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<tr>
<td>1960</td>
<td>0.107</td>
<td>0.014</td>
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<td>(0.008)</td>
<td>(0.008)</td>
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<td>1970</td>
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<td>1980</td>
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- **Controls**: Yes
- **DOB cutoff**: Jan 1, 1928

Notes: See Table 4 in paper.
### Estimates of effect of service and benefits on home ownership

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<td>0.107</td>
<td>0.129</td>
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<tr>
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<td>(0.008)</td>
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<td>1970</td>
<td>0.107</td>
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<td>(0.004)</td>
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<td>(0.004)</td>
<td>(0.033)</td>
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- Controls: Yes
- DOB cutoff: Jan 1, 1928

Notes: See Table 4 in paper.
### Results with alternative approaches

**Estimates of veteran status in 1960: alternative specifications**

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<td><strong>Main estimates</strong></td>
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<td>(un-recentered, all cohorts)</td>
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<td>(0.049)</td>
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<td><strong>Cohort trend</strong></td>
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<td>0.191</td>
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<td>(WWII: '26-'29, KW: '32-'35)</td>
<td>(0.132)</td>
<td>(0.081)</td>
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<td><strong>Un-recentered</strong></td>
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<td>(excluding 2 cohorts)</td>
<td>(0.072)</td>
<td>(0.045)</td>
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<td><strong>Recentered</strong></td>
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<td>(1980 breaks)</td>
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<td><strong>Recentered</strong></td>
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<tr>
<td>(1960 breaks)</td>
<td>(0.064)</td>
<td>(0.043)</td>
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Main estimates: summary

- Effects of service and benefits on home ownership
  - Consistent with effects that diminish with age
  - For men 26 years old in 1960: 18 p.p. (≈ 80%)
  - For men 32 years old in 1960: 13 p.p. (≈ 30%)
  - Estimates from 1970, 1980 suggest no significant positive effect at older ages (36 and older)
1. Background

2. Effects of service and benefits on ownership

3. Alternative explanations

4. Aggregate effects and other trends
Other channels for veteran status to influence home ownership?

- Non-housing veterans’ benefits (e.g., education)
  - Higher income
  - Delayed purchase during education
- Direct effects of service
  - Disruption: separation from civilian life
  - ‘Growing up fast’
Education and other benefits

- Education benefits of GI Bill well-known
  - Yet largely compensatory (Stanley, 2003)
  - Also lower high school completion among WWII cohorts
  - I find no evidence for more education at Korea break in 1960

- Other benefits as well: e.g., job training, business loans

- With caveats, can take income as one summary measure
  - Find no evidence for higher income at WWII break
  - Weak evidence of higher income at Korea break in 1960
  - No evidence of higher income at Korea break in 1970, 1980

- 1960 ownership results robust to controlling for income
Impact of veteran status on home ownership, controlling for income (IV)

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Direct effects of service

Two approaches to assessing importance of ‘growing up fast’

- Test for effects of WWI service
  - No national housing benefits after WWI
  - Note: state benefits, bonus
- Examine timing of use of VA loans
  - Observers at the time noted swings in ‘availability’ of benefit
  - Did veterans’ rates of home purchase respond?
Direct effects of service

- One setting to estimate service effects: WWI vets
- No national home loan benefits, but national bonus and state benefits likely increased home ownership
- Follow same approach as in main estimates
  - First-stage break search in 1930
  - Individual at estimated break was 23 in 1920, 33 in 1930
  - Cross-validation: 5-year bandwidth
Share World War I veteran, 1930 Census
Share owning home, 1930 Census

The graph shows the share of people owning homes based on their year of birth. The data points indicate a decreasing trend in the share of home ownership as the year of birth increases. The year of birth ranges from 1892 to 1901, and the share owning home is measured along the y-axis, ranging from 0.15 to 0.35.
<table>
<thead>
<tr>
<th>dependent variable</th>
<th>(1) veteran owns home reduced form</th>
<th>(2) owns home reduced form</th>
<th>(3) owns home IV</th>
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<tr>
<td>1920</td>
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<td>mean ownership: 0.037</td>
<td>0.001</td>
<td>(0.003)</td>
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<td>1930</td>
<td>0.153</td>
<td>-0.0002</td>
<td>-0.001</td>
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<tr>
<td>mean ownership: 0.250</td>
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<td>(0.006)</td>
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<td>Bandwidth</td>
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Notes: See Table 7 in paper. Data: 1920 and 1930 IPUMS.
Direct effects of service

- Examine timing of use of VA loans
  - Observers at the time noted swings in ‘availability’ of benefit
  - Did veterans’ rates of home purchase respond?
Examining timing of purchase

- VA loans closed, in thousands
- Non-VA loans closed, in thousands
- #VA closed
- #VA under WWII entitlement, '52–
- # non-VA

Graph showing trends from 1946q1 to 1956q1.
Examining timing of purchase
Examining timing of purchase

- VA loans closed, in thousands
- VA under WWII entitlement, '52-
- Non-VA loans closed, in thousands
- VA-corp difference

VA rate and alternative yields
Examining timing of purchase

Graph showing trends in VA loans closed and non-VA loans closed over time.

- **#VA closed**
- **# VA under WWII entitlement, '52-**
- **# non-VA**

The graph illustrates the number of VA and non-VA loans closed from 1946q1 to 1956q1, with a focus on the differences in trends between VA and non-VA loans.
Share buying house, age 25–34, by year and veteran status

- WW II vets
- Non–vets
- Difference

VA–corp diff

Share buying house, age 25–34, by year and veteran status
Share buying house, age 25–34, by year and veteran status

- Red line: WWII vets
- Blue dashed line: non-vets
- Green line: difference

The graph shows the share of young men buying houses from 1946 to 1956, divided by veteran status. The difference between WWII veterans and non-veterans is also depicted.
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<td>0.074</td>
<td>0.075</td>
</tr>
<tr>
<td>Vet*difference</td>
<td>0.081</td>
<td>0.073</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>Korea vets in sample</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>6510</td>
<td>6865</td>
</tr>
</tbody>
</table>

Notes: See Table 8 in paper. Data: Survey of Consumer Finances, 1947-57.
Potential confounds

- Non-housing veterans’ benefits (e.g., education)
  - But education benefits largely compensatory
  - No evidence for higher education at Korea break in 1960
  - No evidence for higher income in 1960 at WWII break
  - Ownership results robust to controlling for income

- Direct effects of service
  - If ‘service effect’ comparable to WWI, unlikely to explain
  - WWII veterans’ rates of purchase responded to ‘availability’
Background

Effects of service and benefits on ownership

Alternative explanations

Aggregate effects and other trends
Rough calculation of effect on home ownership

- What share of 1940-60 increase can be attributed to VA?
- Previous estimate: 20% of 1940-70 increase (Vigdor, 2006)
  - Based on comparing vets to non-vets directly
- Start by assuming no price effects of VA program, homogeneous treatment effects within birth cohort
- For a single age: \( \hat{\beta}_{g60} Pr(\text{vet})_{g60}/[Pr(\text{own})_{g60} − Pr(\text{own})_{g40}] \)
  - WWII break (32 in 1960): 26% of change (from .19 to .52)
  - Korea break (26 in 1960): 39% of change (from .09 to .29)
Rough calculation of effect on home ownership

- Extrapolate from these ages for aggregate calculation
- Assume linear decline in percent effect on ownership
- Linear decline implies no effect on men 36 and above
- Overall effect: \( \sum_{g=23}^{35} w_g 60 \hat{\beta}_g \Pr(\text{vet})_{g60} \)
Observed and counterfactual age–ownership profiles, 1960
Observed and counterfactual age–ownership profiles, 1960

- Observed
- None VA–eligible
- All VA–eligible
Rough calculation of effect on home ownership

- Calculation implies ownership for men 18+ would have been 1.9 percentage points lower in 1960 in absence of VA
  - Very close to prediction using SoV survey data on year of first purchase and necessity of VA loan (~1.6 p.p. lower in 1960)

- This is 7.4% of overall change from 27 to 53 percent
- 25% of change for ‘affected’ ages (ages 23-35)
Just crowd-out of non-veterans?

- To the extent that VA affected non-veterans, use of ‘partial equilibrium’ estimate may over- or understate aggregate effect
  - Shiller (2005), Vigdor (2006): VA may have increased prices
  - Spillover effects could also have been positive on net
Focus on concern that estimates reflect crowd-out

- Implication: all else equal, markets with more veterans should have lower non-veteran home ownership rates
- Attempt to exploit ‘idiosyncratic’ variation in WWII mobilization rates (Acemoglu et al., 2004) by controlling for ‘economic’ and ‘non-economic’ factors affecting mobilization
- In cross section (1960) and panel (1940, 1960), ask whether non-veterans less likely to own in states with more veterans
<table>
<thead>
<tr>
<th>Panel</th>
<th>Sample</th>
<th>Share men 18+ WWII or KW vets</th>
<th>Share men 18+ KW vets</th>
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</thead>
<tbody>
<tr>
<td>Panel A. Nonveterans aged 23-35</td>
<td>Cross-section (1)</td>
<td>0.791 (0.463)</td>
<td>-0.429 (1.189)</td>
</tr>
<tr>
<td></td>
<td>Panel (2)</td>
<td>0.794 (0.389)</td>
<td>-0.733 (0.921)</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>60215</td>
<td>189158</td>
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<tr>
<td>Panel B. Nonveterans aged 23-29</td>
<td>Cross-section (1)</td>
<td>0.874 (0.430)</td>
<td>-0.750 (0.365)</td>
</tr>
<tr>
<td></td>
<td>Panel (2)</td>
<td>0.750 (0.365)</td>
<td>-0.733 (0.921)</td>
</tr>
<tr>
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<td>40524</td>
<td>114194</td>
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</tbody>
</table>

Controls
- Individual age, race, state of birth: Yes, Yes
- 1940 State characteristics: Yes, Yes
- Census division FE / trends: Yes, Yes
### Panel A. Nonveterans aged 23-35

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<th>Share men 18+ WWII or KW vets</th>
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<th>60215</th>
<th>189158</th>
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</table>

### Panel B. Nonveterans aged 23-29

<table>
<thead>
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<th>Share men 18+ WWII vets</th>
<th>0.874</th>
<th>0.750</th>
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<tbody>
<tr>
<td>(0.430)</td>
<td>(0.365)</td>
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<th>Share men 18+ KW vets</th>
<th>-0.429</th>
<th>-0.733</th>
</tr>
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<tbody>
<tr>
<td>(1.189)</td>
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<thead>
<tr>
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<th>40524</th>
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<table>
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<tr>
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<th>Yes</th>
<th>Yes</th>
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<tbody>
<tr>
<td>1940 State characteristics</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Census division FE / trends</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Broader change in mortgage terms

- Common loan-to-value ratio circa 1920’s: 50 percent. What if all loans in 1960 required down-payment of 50 percent?
- 1960 Survey of Consumer Finances has information on home value, home equity, and value of other assets
- What share of owners had asset value ≤ x% of home value?
  - Reasonable no-VA counterfactual: 10% (FHA 1960 average)
    - Lowers home ownership by 1.7 p.p.: similar to main estimates
    - So this calculation may not be too unreasonable
  - If required 50% down-payment (rough cut at 1920’s terms)
    - ~40% of 1940-1960 increase
    - ~46% of 1920-1960 increase
Conclusion

How do mortgage subsidies affect home ownership?

- Emphasize effects of financial intervention vary with age
  - Primary effect may be to shift purchase earlier in life

- Evidence from eligibility for VA loans in postwar period
  - Large effects in 1960 at ages 26 and 32
    - 26 years old in 1960: 18 p.p. (80%)
    - 32 years old in 1960: 13 p.p. (30%)

- No large positive effect at older ages (36 and above)
- Do not appear to be driven by service or other benefits
- Differences do not appear to reflect crowd-out of non-vets
- Extrapolation: VA may explain $\sim 7.4\%$ of overall 1940-60 increase, 25% of increase for affected ages

- BoE for broader change in mortgage terms: $\sim 40\%$ of increase
Further work

- How did these changes relate to family formation?
- What drove the increase from 1940 to 1945?
<table>
<thead>
<tr>
<th>Background</th>
<th>Effects of service and benefits on ownership</th>
<th>Alternative explanations</th>
<th>Aggregate effects and other trends</th>
</tr>
</thead>
</table>

Background

Effects of service and benefits on ownership

Alternative explanations

Aggregate effects and other trends
Home ownership at the individual level

Living arrangements, men 18 and up

Year
1900 1920 1940 1960 1980 2000

own rent live with relatives

Return
Home ownership at the ‘spending unit’ level, 1947-60

Living arrangements of SU’s by age, SCF, 1947–60

- Own
- Rent
- Live with relatives

Return
Approximate down payments and monthly payments

Median house value in 1950: $7,354 (∼$44,600 in 2000 dollars)
At 1950 median terms for conventional, FHA, VA:

- **Conventional (∼40% dp, 5% interest, 11 year term)**
  - $2942 down payment, $43.53 monthly payment

- **FHA (∼20% dp, 4.5% interest, 20 year term)**
  - $1471 down payment, $37.22 monthly payment

- **VA (∼10% dp, 4% interest, 20 year term)**
  - $735 down payment, $40.11 monthly payment
  (with 20% down payment: $35.65 monthly payment)
Share veteran by birth cohort

Source: 1960 IPUMS.
Share veteran, 1970

quarter of birth

Share veteran, 1970

Return to reduced form
1960 Un-recentered specifications: alternative bandwidths

<table>
<thead>
<tr>
<th></th>
<th>WWII</th>
<th>Korean War</th>
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<tbody>
<tr>
<td></td>
<td>1st stage</td>
<td>RF</td>
</tr>
<tr>
<td>12 quarters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(baseline)</td>
<td>0.107</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>10 quarters</td>
<td>0.097</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>8 quarters</td>
<td>0.090</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>6 quarters</td>
<td>0.080</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.012)</td>
</tr>
</tbody>
</table>
VA rate and alternative yields

- VA interest rate
- Corporate bonds, highest rating
- Long-term US bonds
3.233 million WWII/KW veterans used VA loan for first home, said they could not have bought a home otherwise (1977 SoV)

26% of WWII/KW veterans using VA for first home bought between 1955 and 1960 (1979 SoV)
  - Assume roughly this share of 3.23m bought '55-'60
  - Why 1955: age profile suggests home ownership 5 years earlier

97.2% of WWII/KW veterans were US-born (1960 Census)

51,125,748 US-born men 18 and above in 1960 (1960 Census)

\[
\frac{3,233,000 \times 0.26 \times 0.972}{51,125,748} \approx 0.016
\]