

Constructing the Post-War Housing Boom

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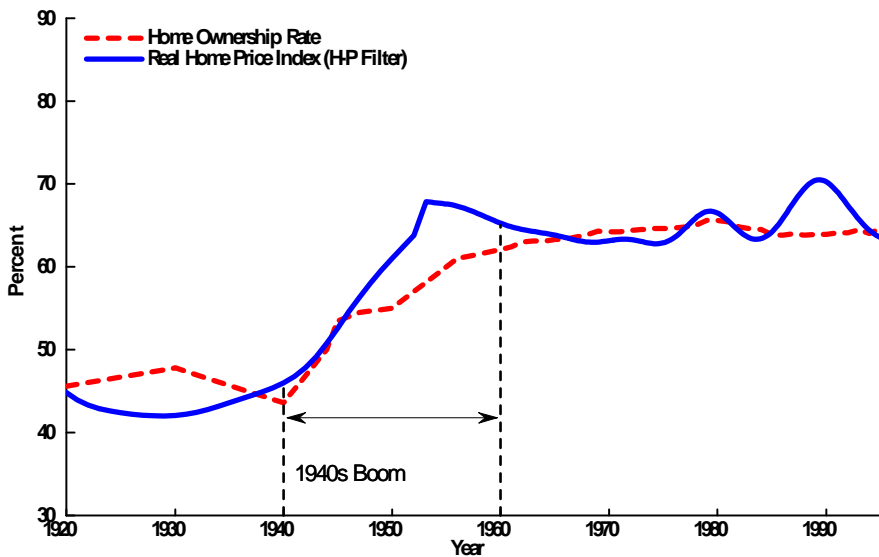
Carlos Garriga, FRB of St. Louis

Don Schlagenhauf, FRB of St. Louis

Interaction between Housing and the Economy, Humboldt
University, Germany

June 2015

Postwar Housing Boom 1940-60: Ownership and Prices



Source: Shiller HPA and U.S. Census

Objective

- ▶ **Objective:** Understanding the positive co-movement between home ownership and house prices in the postwar housing boom
- ▶ **Methodology:** Use a multi-sector equilibrium life-cycle model with housing tenure choice
- ▶ **Decomposition:** Identify the contribution of relevant factors
- ▶ **Limitation:** Focus on levels and not the transition

Literature: Focus ownership and little on prices

1. **Demographics factors:** Chevan (1989) estimates 50%
2. **Income Growth:** Kain (1983) and Katona (1964) accounts for most of it
3. **Government Regulation of Housing markets**
 - 3.1 Regulation of Housing Finance: Yearn (1976), Chambers, Garriga, and Schlagenhauf (2009) estimates 50%
 - 3.2 Assistance programs (VA): Feters (2010) estimates 10%
 - 3.3 Taxation: Rosen and Rosen (1980) estimates 25%

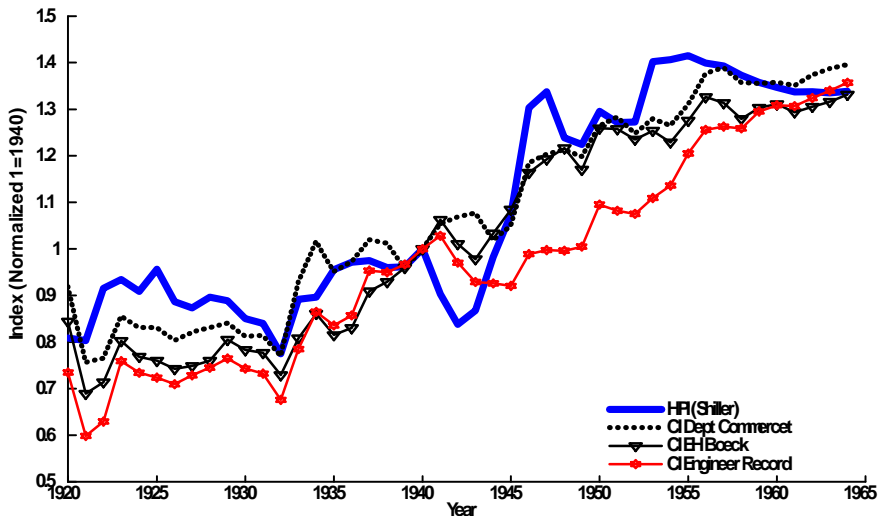
Summary Findings

- ▶ **Model performance:** The baseline economy rationalizes the co-movement in prices and ownership.
- ▶ **Main story:** The model identifies a relative sectorial productivity change of the goods sector over real estate as a key driver of the housing boom.
- ▶ **Decomposition:** Relative contribution of each factor

Contribution	Ownership (%)	House Prices (%)
Demographics	5-8	1-2
Income risk	12-57	0-1
Govn't Policy	3-4	0-14
Housing finance	5-7	1-1.5

I) Summary of Relevant Factors

1) House Prices and Construction Cost Indices

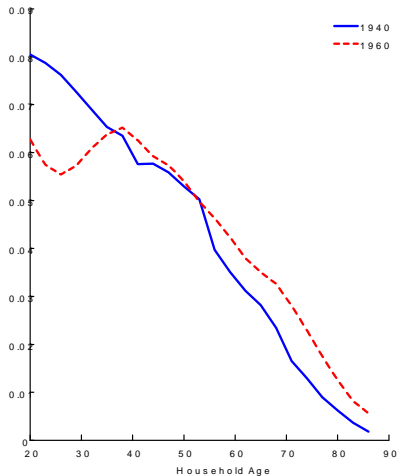


Source: Alfred, St. Louis Fed

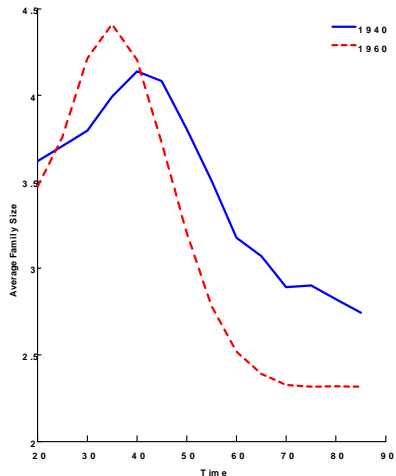
⇒ House prices are in-line with construction costs

2) Demographics

Population Shares



Family Size



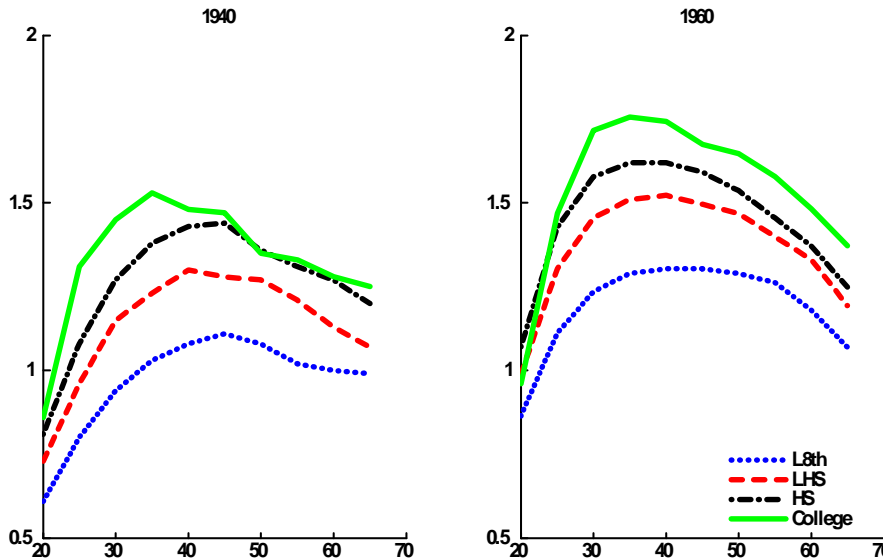
Standard Deviation of Income (Source: IPUMS)

2) Demographics: Actual and Hypothetical Ownership

Expression	Ownership Rate	Total Change
$\sum_{i \in I} \mu_{1940}^i \pi_{1940}^i$	44.53	
$\sum_{i \in I} \mu_{1960}^i \pi_{1960}^i$	65.57	21.04
$\sum_{i \in I} \mu_{1960}^i \pi_{1940}^i$	47.47	2.94
$\sum_{i \in I} \mu_{1940}^i \pi_{1960}^i$	62.13	17.60

Data Source: United States Public Use Microdata Samples (IPUMS)

3) Earning Profile by Education: 1940-60

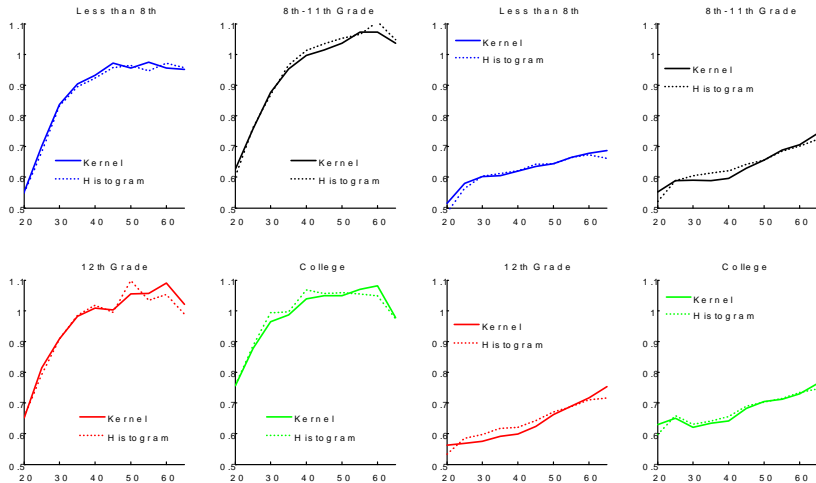


Source: IPUMS

3) Reduction Income Risk by Education: 1940-60

1940

1960

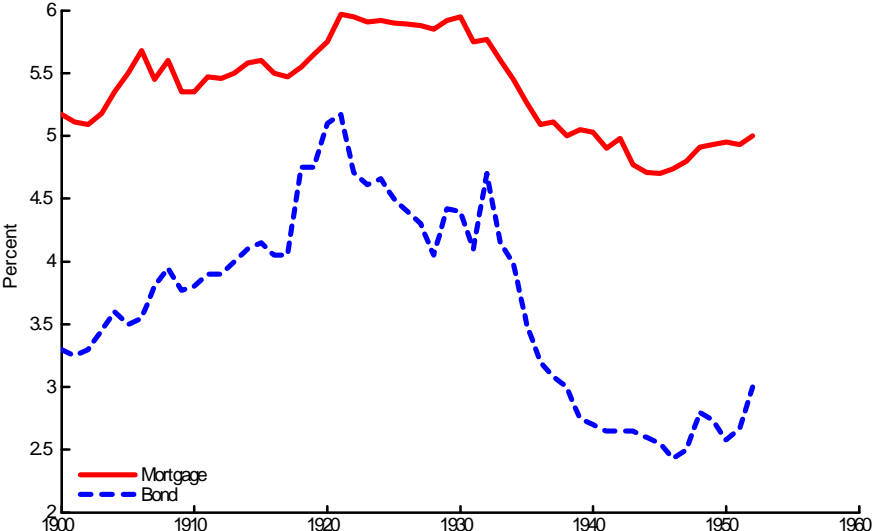


Standard Deviation of Income (Source: IPUMS)

4) Government Regulation of Housing Finance

- ▶ **Prior Great Depression:** The typical mortgage contract was characterized by
 - ▶ a maturity of less than ten years,
 - ▶ a loan-to-value ratio of about 50 percent,
 - ▶ interest only with a balloon payment at expiration
 - ▶ Regional credit markets
- ▶ **Post Great Depression (1940's Boom):** FHA introduces fixed rate mortgage
 - ▶ longer maturity 20 to 30 years
 - ▶ higher LVT ratio (i.e. 80 percent, or 100 percent VA)
 - ▶ constant repayment over length loan (self-amortizing)
 - ▶ National credit markets (↓ decline in mortgage rates)

4) Mortgage Market Regulation: Interest rates



Source: Grebler, Blank, and Winnick (1956)

4) Mortgage Market Regulation: Lending Conditions

Period	Mortgage Duration			Loan-to-Value Ratio		
	LI	Comm. Bank	S & L	LI	Comm.Bank	S & L
1920-24	6.4	2.8	11.1	47	50	58
1925-29	6.4	3.2	11.2	51	52	59
1930-34	7.4	2.9	11.1	51	52	60
1935-39	16.4	11.4	11.4	63	63	62
1940-44	21.1	13.1	13.1	78	69	69
1945-47	19.5	12.3	14.8	73	75	75

Source: Grebler, Blank, and Winnick(1956)

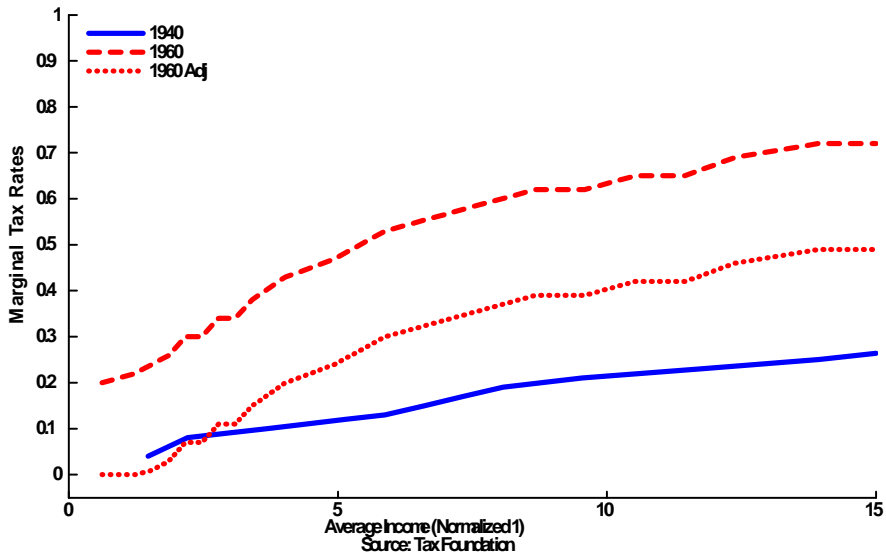
4) Mortgage Markets: Government Programs

Table 3: The Role of Government Mortgage Debt for Home Mortgages: 1935 to 1953 (in millions)

	FHA	VA	FHA+VA	Total Home Mortg	FHA&VA Home Mortg(%tot)
1936	203		203	15,615	1.3
1940	2349		2349	17,400	13.5
1945	4078	\$500	4578	18,534	24.7
1946	3692	2,600	6292	23,048	27.3
1948	5269	7,200	12469	33,251	37.5
1950	8563	10,300	18863	45,019	41.9
1952	10770	14,600	25370	58,188	43.6

Source: Grebler, Blank, and Winnick (1956)

5) Government Policy: Income Taxation



II) The Nature of the Co-movement of Ownership and House Prices: Simple Equilibrium Model

Environment

- ▶ Two sector model with housing
- ▶ Agents are heterogeneous in their labor ability $\varepsilon \in [\underline{\varepsilon}, \bar{\varepsilon}]$, and the distribution is uniform $\varepsilon \sim U(\underline{\varepsilon}, \bar{\varepsilon}) \equiv f(\varepsilon)$.
- ▶ Commodities: $c \in R_+$ and $h \in \{0, \bar{h}\}$. Renters consume zero housing and homeowners consume a positive amount.
- ▶ Preferences ($\gamma > 0$):

$$u(c, h) = c(\gamma + h),$$

- ▶ CRS goods sector and housing

$$C = z_c N_c,$$

$$H = z_h N_h.$$

Tenure Decision

The optimization problem for the consumer is

$$\begin{aligned}v(\varepsilon) &= \max_h \{u^{rent}(c, 0), u^{own}(c, \bar{h})\}, \\s.t. \quad c &= w\varepsilon - (p\bar{h} + \phi), \\c &= w\varepsilon\end{aligned}$$

The cut-off income ε^* for ownership is

$$\varepsilon^* \geq \frac{p}{w}(\gamma + \bar{h}) + \frac{\phi}{w\bar{h}}.$$

Determinants of ownership

1. House prices and wage income (p/w)
2. Minimum size of the house (\bar{h})
3. Transaction costs (ϕ)
4. Family size (γ)

Equilibrium Prices

Goods sector:

$$\max_{N_c} z_c N_c - w N_c,$$

$$w = z_g.$$

Housing sector:

$$\max_{N_h} p z_h N_h - w N_h,$$

$$p = \frac{z_c}{z_h}.$$

Equilibrium Homeownership

- ▶ Connection of key variables necessary to understand the co-movement

$$HOR = \int_{\underline{\varepsilon}^*}^{\bar{\varepsilon}} U(\underline{\varepsilon}, \bar{\varepsilon}) d\varepsilon = \frac{1}{\bar{\varepsilon} - \underline{\varepsilon}} \left[\bar{\varepsilon} - \left(\frac{(\gamma + \bar{h})}{z_h} + \frac{\phi}{z_c \bar{h}} \right) \right].$$

- ▶ Increases in the productivity of either sector generates increases the homeownership rate, but only one constellation works. Define

$$\Delta w = \frac{w'}{w} = \frac{z'_c}{z_c} = \Delta z_c.$$

$$\Delta p = \frac{z'_c}{z_c} \frac{z_h}{z'_h} = \frac{\Delta z_c}{\Delta z_h}.$$

Co-movement

The co-movement depends on the relative productivity change.

- ▶ **Symmetric productivity** ($\Delta z_c = \Delta z_h$):

$$\Delta HOR > 0$$

$$\Delta p = \frac{\Delta z_c}{\Delta z_h} = 0$$

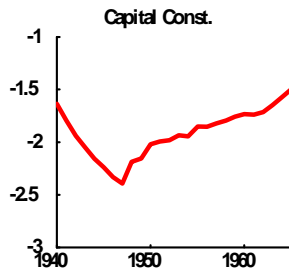
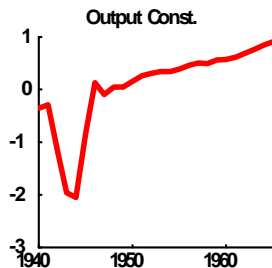
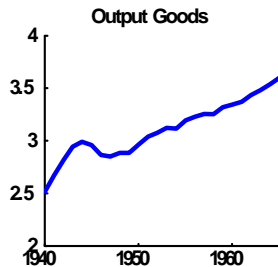
- ▶ **Asymmetric productivity** ($\Delta z_c \neq \Delta z_h \geq 0$):

$$\Delta HOR > 0$$

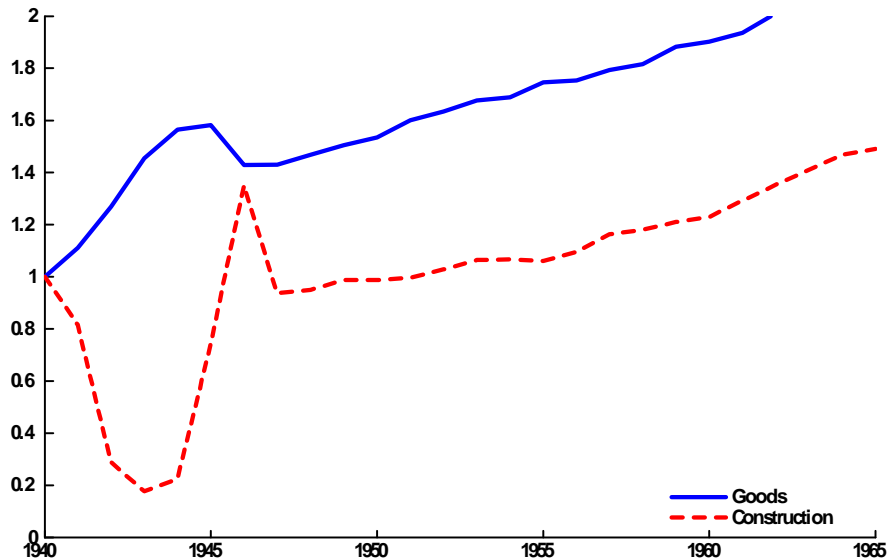
$$\Delta p = \frac{\Delta z_c}{\Delta z_h} > 0$$

only when $\Delta z_c > \Delta z \Rightarrow \Delta w > \Delta p$

Supportive Evidence: Sectorial Data



Supportive Evidence: Productivity Differences



III) Quantitative Analysis

Housing Model

- ▶ Multi-sector growth model (goods and housing)
- ▶ Life Cycle Households
 - ▶ Income risk, and uncertain life expectancy
 - ▶ Choices: Consumption, savings, housing purchase and mortgage choice
- ▶ Mortgage Brokers: Provide long-term lending contracts
- ▶ Government: Progressive income taxation, housing policy, and social security

Characteristics of Houses or Dwellings

- ▶ Lumpy with minimum size
- ▶ Consumption/Investment good
- ▶ Utility depends on consumption and housing services
- ▶ Rental market for housing services
- ▶ Depreciation depends on utilization
- ▶ Non-convex adjustment costs

Mapping the Model and the Data (I)

► **Preferences:**

$$u(c, d) = \frac{[\gamma c^{-\rho} + (1 - \gamma)d^{-\rho}]^{-\frac{1-\sigma}{\rho}}}{1 - \sigma}$$

► **Technologies:**

$$Y_c = z_c K_c^{0.3} N_c^{0.7}$$

$$Y_h = z_h K_h^{0.12} N_h^{0.88}$$

Model Fit: 1935-40

Home Ownership by Age (%)

	Data		Model
	1930	1940	1940
25-35	20.0	19.1	13.0
36-45	48.5	42.1	42.5
46-55	57.7	51.0	59.2
56-65	65.1	57.5	69.8
Total	48.1	42.7	43.5

Source: US. Census Bureau

Model Predictions 1960: Ownership and Prices

Data	1940	1960	Δ
Ownership Rate (%)	42.5	63.5	21.0
House Price Index	100	43.0	43.0%

Model			
Ownership Rate (%)	43.5	64.5	21.0
House Prices	100	140.4	40.4

Model Predictions 1960: Ownership by Age

Model Prediction for Homeownership Rate 1940-60

	Data (%) Difference	Model (%) Difference
25-35	37.1	32.1
36-45	26.0	23.8
46-55	18.5	14.5
56-65	11.8	15.7
Total	21.0	21.0

Source: US. Census Bureau

Model Mortgage Choice

Housing Finance (%)

Statistics	Model 1940	Model 1960
Homeownership rate	43.5	64.5
No Mortgage (%)	39.0	
Mortgage loan (%)	61.0	
Share balloon (5 year)	100.0	10.9
Share FRM (20 year)	0.0	89.1

The Importance of Productivity

Importance of Relative Productivity Change

Model: 1960	(HR)	(p^h)	\hat{HR}	$\% \Delta p^h$
$\Delta z_c > \Delta z_h$	64.5	140.2	21.5	40.2
$\Delta z_c = \Delta z_h$	53.5	106.4	10.2	6.4
$\Delta z_h = \Delta z_c$	74.7	111.6	31.4	11.6

Decomposition

Contribution	Ownership (%)	House Prices (%)
Demographics	5-8	1-2
Income risk	12-57	0-0.51
Govn't Policy	3-4	0-14
Housing finance	5-7	1-1.5

Conclusions

- ▶ The goal is to understand the driving forces in the postwar housing boom.
- ▶ We use a heterogeneous general equilibrium model to measure the relative importance of prominently mentioned factors.
- ▶ The models suggests all factors play a significant role
 - ▶ **House prices:** Productivity is essential for house prices, the demand components account around 5-8
 - ▶ **Ownership:** Income, demographics, and government intervention in housing finance play are significant