

Winners and Losers in Housing Markets

Nobuhiro Kiyotaki, Alex Michaelides and Kalin Nikolov

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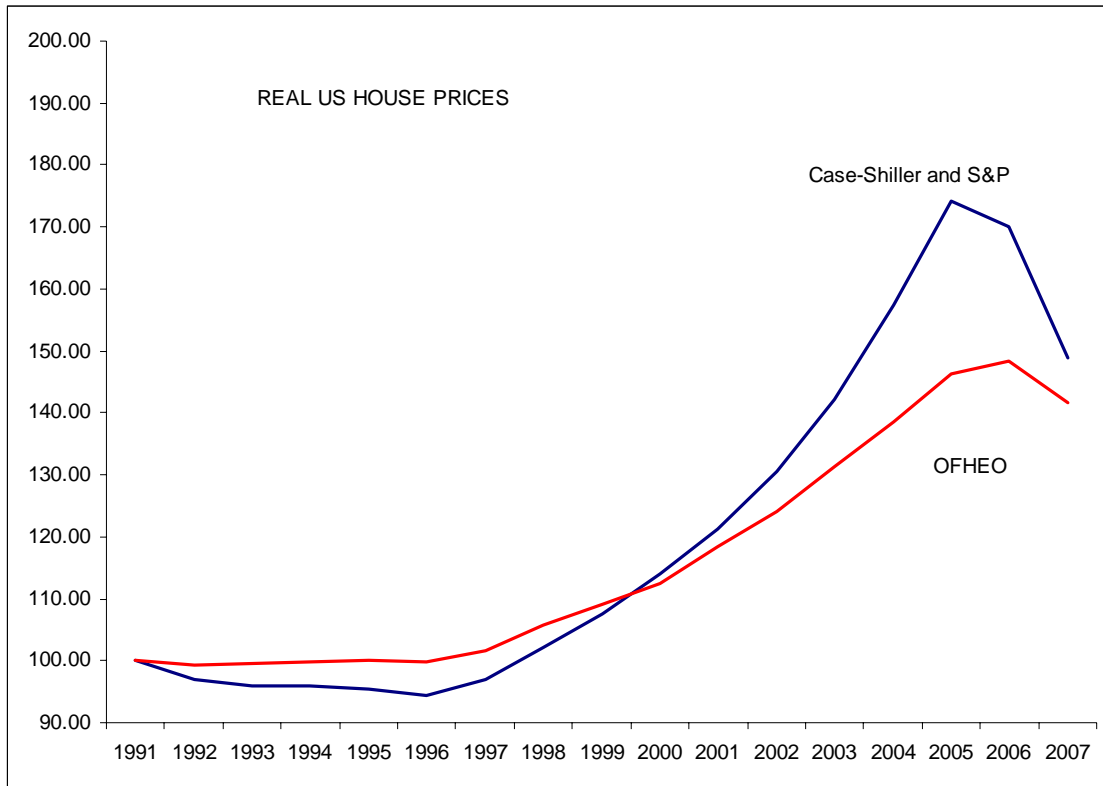
1 Questions

To what extent are movements of housing prices consistent with fundamentals?

How does the life-cycle of consumption and home-ownership depend upon the economic environment?

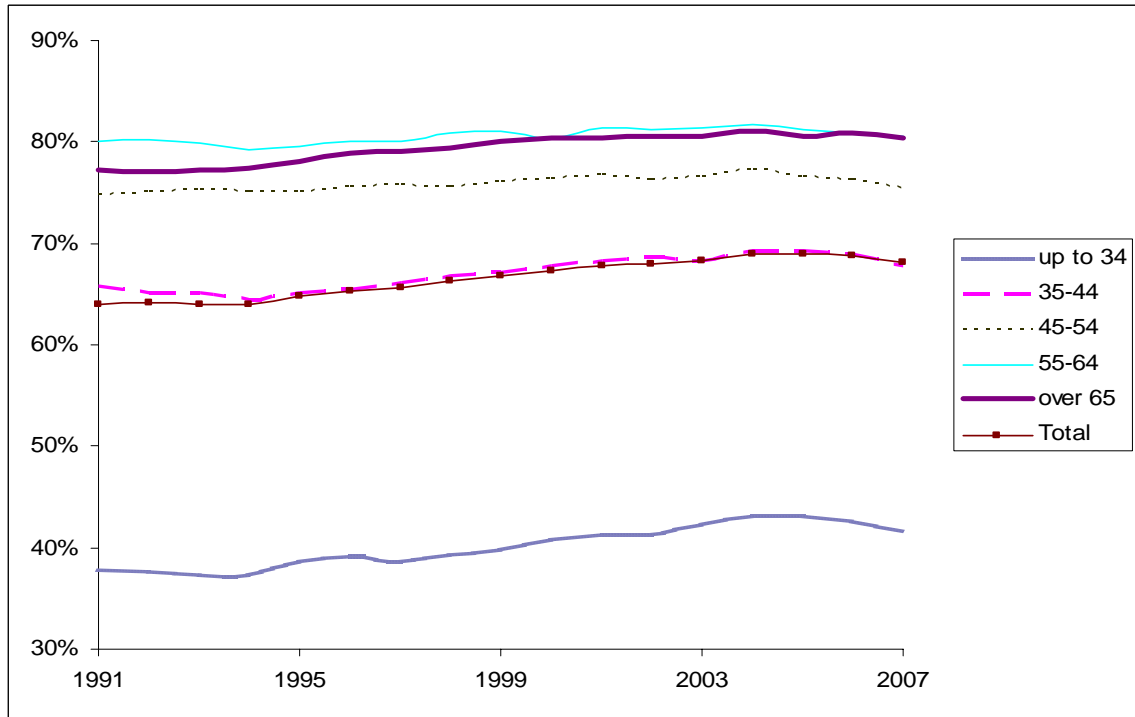
Who gains and who loses in housing markets from a particular change of the fundamentals?

Figure 2: US real housing price index: 1991 = 100



Notes: OFHEO is the purchase-only equally weighted house price index produced by the Office of Federal Housing Enterprise Oversight. Case-Shiller is the value-weighted house price index jointly produced by S&P and Case-Shiller. Both indices are deflated by the US CPI for urban consumers.

Figure 1: US home-ownership rates (total and by age group) for 1991 – 2007



Source: <http://www.census.gov/hhes/www/housing/hvs/historic/index.html>

Two Constraints

1) Supply of land is limited

Residential and commercial property consists of capital and land

→ Property value depends on the expected productivity growth rate and the interest rate

2) Enforcement of contracts is limited

Households enjoy an owner-occupied house more than a rented house

Households face a collateral constraint

→ Young and poor rent, rich and old own

2 Model

Output is produced from labor and productive tangible assets

$$Y_t = F(A_t N_t, Z_{Yt}) = (A_t N_t)^{1-\eta} Z_{Yt}^\eta$$

Capital and land form tangible assets (tangibles)

$$Z_t = K_t^\gamma L^{1-\gamma}$$

Tangibles can be used either as productive tangibles (offices and factories) or houses:

$$Z_t = Z_{Yt} + \int_0^{\bar{N}_t} h_t(i) di$$

where $h_t(i)$ is housing used by household i in period t

Representative firm owns and controls total land and capital, and issues equity to finance investment I_t

$$K_t = \lambda K_{t-1} + I_t$$

Let q_t be the equity price before investment, and p_t be the equity price after investment

The rate of return:
$$R_t = \frac{q_{t+1}}{p_t - r_t}$$

We assume the number of equities equals the stock of tangibles
→ the equity price equals the price of tangibles

The firm maximizes the expected present value of net cash flow from production

Continuum of workers with population size of N_t :

High productivity workers

$\uparrow \delta^m$

$\searrow 1 - \omega$

$1 - \sigma$

Medium productivity workers \rightarrow Retirees \longrightarrow Dead

$G_N - \omega$

$\uparrow \delta^l$

\nearrow

\longrightarrow Low Productivity workers

Household preferences

$$E_0 \left[\sum_{t=0}^{\infty} \beta^t u(c_t, (\mathbf{1} - \psi I(\text{rent}))h_t) \right]$$

where

$$u(c, h) = \left[\left(\frac{c}{\alpha} \right)^{\alpha} \left(\frac{h}{\mathbf{1} - \alpha} \right)^{1-\alpha} \right]^{1-\rho} / (\mathbf{1} - \rho)$$

Limited contract enforcement

Tenant cannot precommit to take proper care of rented house
→ landlords limit the freedom of the tenants → utility discount for tenants

Potential hold-up between the owners of land and building → must own capital and land together → only asset traded is share of tangibles (liquid “home equity”)

Borrowers may default \rightarrow only owner-occupier can borrow (issue outside equity) up to collateral fraction:

$$s_t \geq \theta h_t : \text{ for an owner-occupier}$$

$$s_t \geq 0 : \text{ for a tenant}$$

Flow-of-funds constraint for a worker

$$c_t + r_t h_t + p_t s_t = (1 - \tau) w_t \varepsilon_t + r_t s_t + q_t s_{t-1}$$

For a retiree

$$c_t + r_t h_t + p_t s_t = b_t + r_t s_t + (q_t / \sigma) s_{t-1}$$

The representative foreigner

$$C_t^* + p_t S_t^* = r_t S_t^* + q_t S_{t-1}^*$$

We consider two cases:

Closed economy:

$$S_t^* = C_t^* = 0$$

Small open economy:

$$R_t = \frac{q_{t+1}}{p_t - r_t} = R_t^*$$

Market clearing

Labor

$$N_t = \int_0^{\bar{N}_t} n_t(i) di = \varepsilon^l N_t^l + \varepsilon^m N_t^m + \varepsilon^h N_t^h = N_t^l + N_t^m + N_t^h$$

Goods

$$Y_t = I_t + \int_0^{\bar{N}_t} c_t(i) di + C_t^*$$

Use of tangibles

$$Z_t = Z_{Yt} + \int_0^{\bar{N}_t} h_t(i) di$$

Shares of tangibles

$$Z_t = S_t^* + \int_0^{\bar{N}_t} s_t(i) di$$

3 Features of Equilibrium

Steady state growth rate of aggregate output

$$\begin{aligned}\frac{Y_{t+1}}{Y_t} &= \frac{C_{t+1}}{C_t} = \frac{I_{t+1}}{I_t} = \frac{K_{t+1}}{K_t} = G_Y \\ &= (G_A G_N)^{(1-\eta)/(1-\gamma\eta)} < G_A G_N, \text{ if } G_A G_N > 1\end{aligned}$$

Steady state growth rate of aggregate tangibles

$$\frac{Z_{t+1}}{Z_t} = \frac{Z_{Yt+1}}{Z_{Yt}} = G_Z = G_Y^\gamma < G_Y$$

$$G_r = \frac{r_{t+1}}{r_t} = \frac{p_{t+1}}{p_t} = \frac{G_Y}{G_Z} = G_Y^{1-\gamma} > 1$$

Land scarcity makes rental and house price growth rates an increasing function of the growth rate of workers in efficiency units

Baseline parameter values: Pick fraction of utility loss from renting $\psi = 0.057$ to generate around 36% tenants and $\beta = 0.953$ to have value of tangibles to output equal to 3.3

Other parameters are consistent with US. macro/micro studies:

Share of productive tangibles in output $\eta = 0.258$, share of non-durable goods in consumption $\alpha = 0.8$, fraction of house that needs downpayment $\theta = 0.2$, share of capital in tangibles $\gamma = 0.9$, ratio of retirement benefit to pretax average wage $b/w = 0.4$, labor productivity growth $G_A = 1.02$, population growth rate $G_N = 1.01$

Figure 3A: Policy functions for a low productivity household

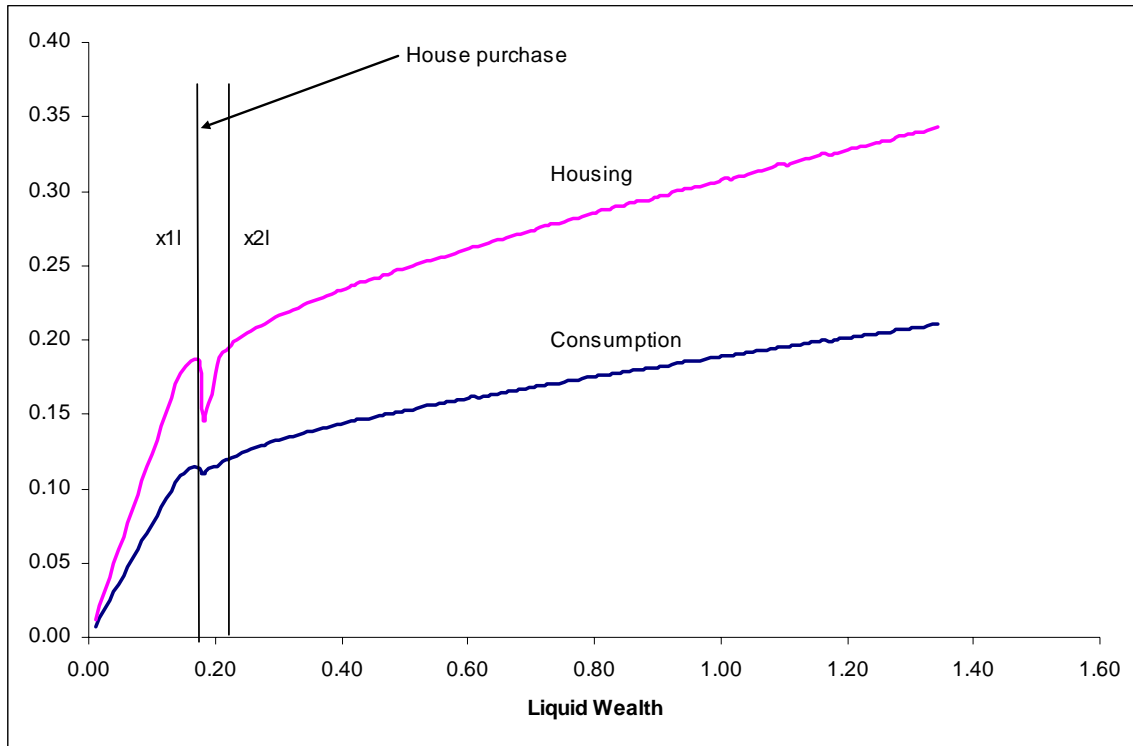


Figure 3B: Evolution of saving for a low productivity household

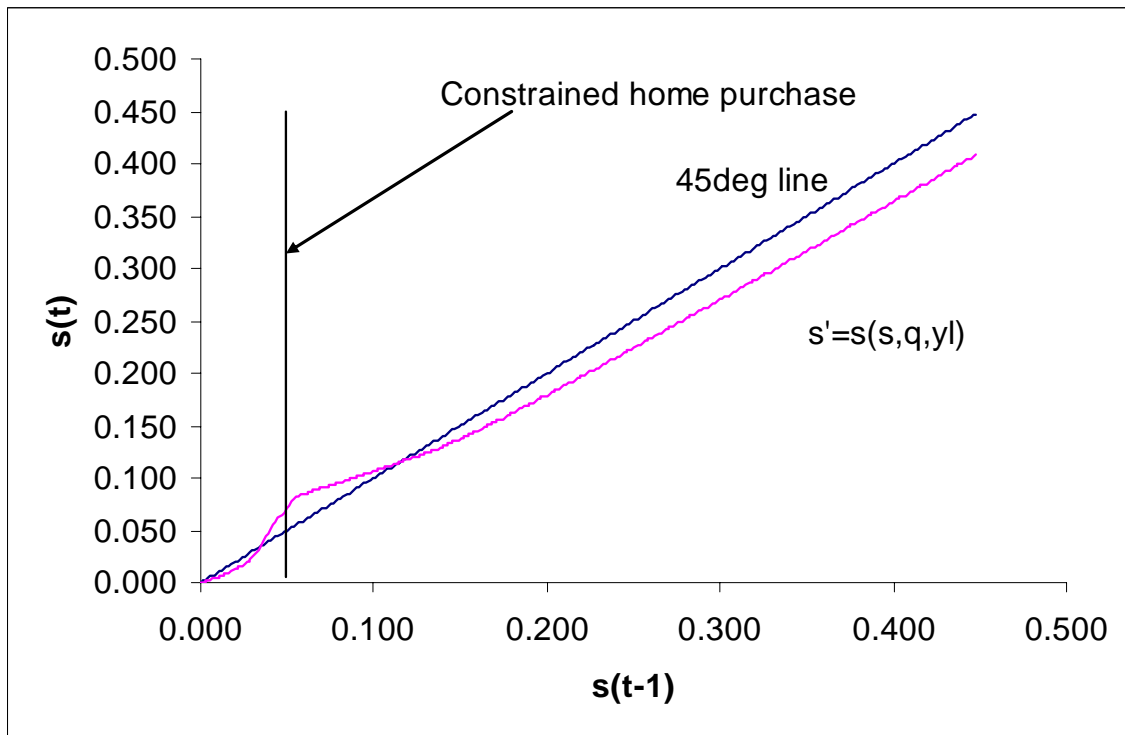
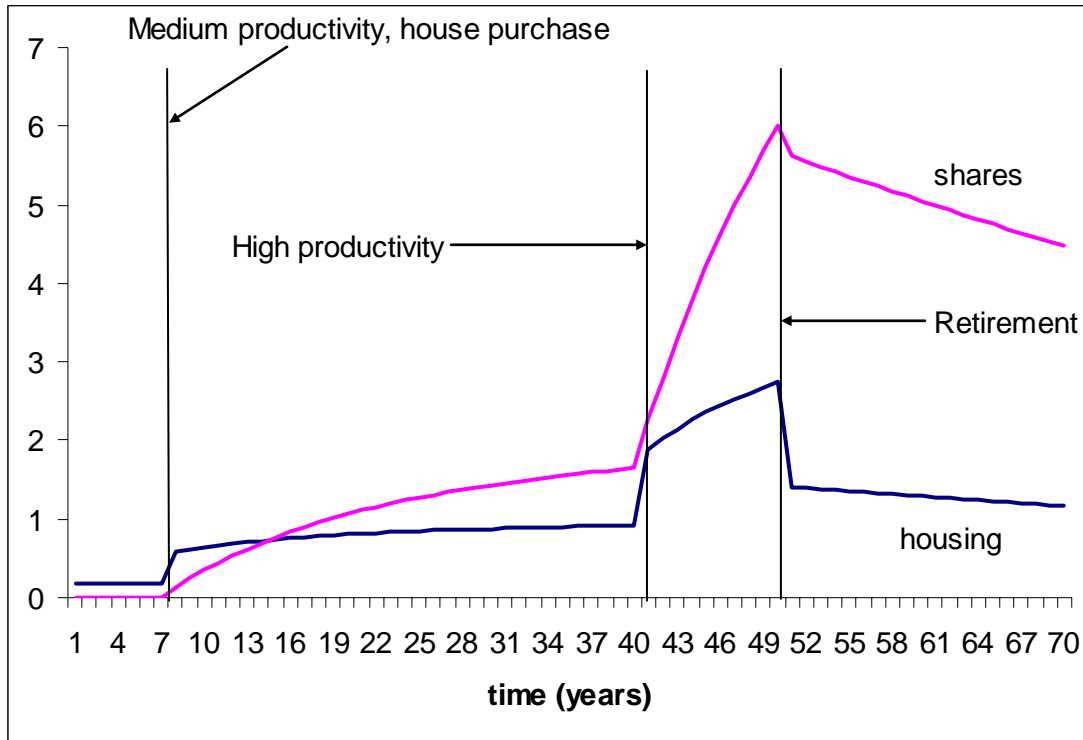


Figure 6: An example life time



Features of steady state

Tenants - 36%, Constrained - 12.8% of population

Price-rental ratio of housing - 8.6,

Value of housing to wages - 2.4

Real rate of returns on share in terms of output - 6.7%

Share of land in property income: $\gamma = 0.9 \rightarrow \gamma = 0.78$

Price-rental ratio: 8.6 \rightarrow 11.0

(Higher growth in rental rates and lower effective depreciation)

Perfect Foresight Transitions of small open economy:

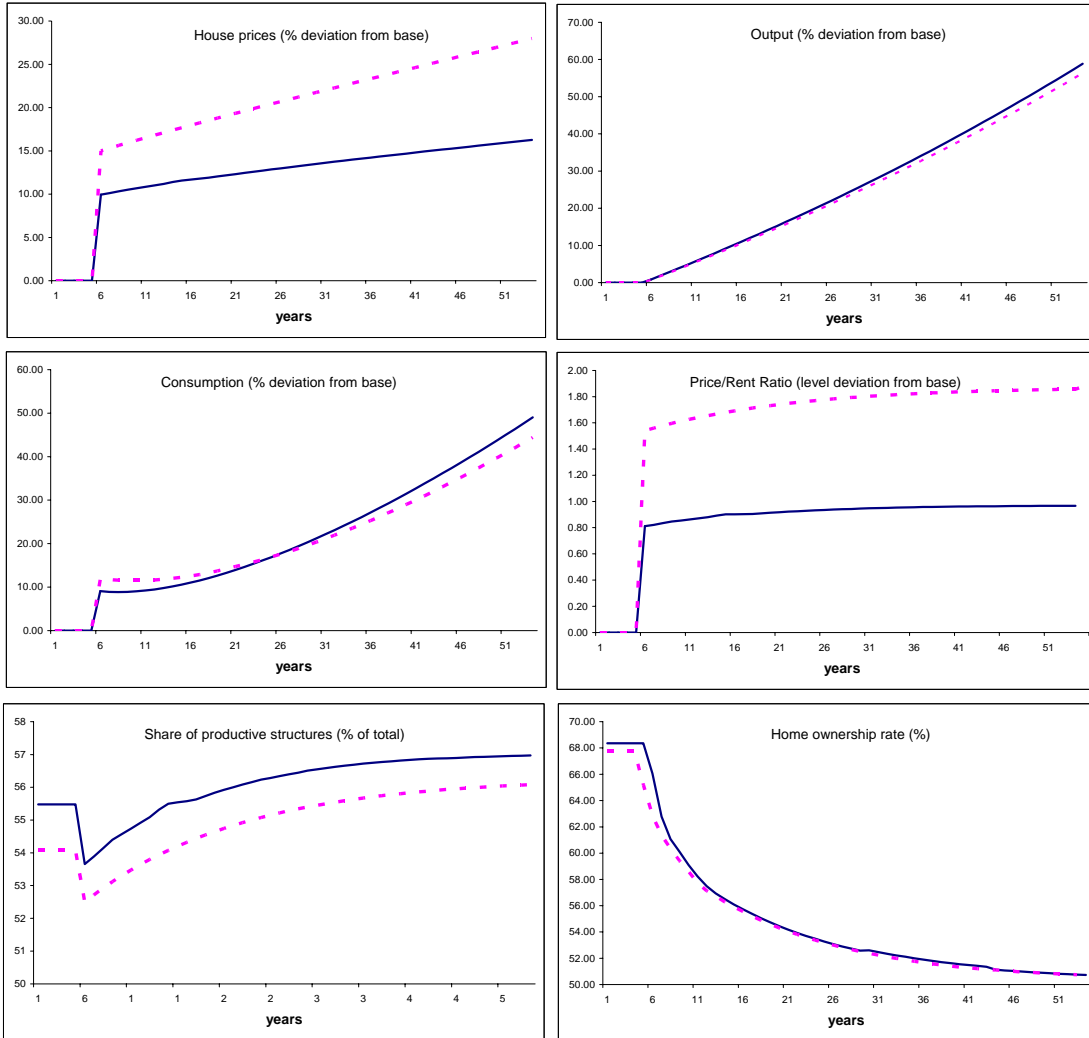
Change in wealth for group I_g :

$$\text{average of } \left(\frac{[w_n \epsilon^{j(i)} + q_n \tilde{s}_{-1}(i)]}{[w_o \epsilon^{j(i)} + q_o \tilde{s}_{-1}(i)]} - \mathbf{1} \right) \text{ for all } i \in I_g$$

Change in welfare for group I_g :

$$\text{average of } \left[\left(\frac{V_n^{j(i)}([w_n \epsilon^{j(i)} + q_n \tilde{s}_{-1}(i)])}{V_o^{j(i)}([w_o \epsilon^{j(i)} + q_o \tilde{s}_{-1}(i)])} \right)^{\frac{1}{1-\rho}} - \mathbf{1} \right] \text{ for all } i \in I_g$$

Figure 7
 Transition Dynamics from a 1% increase in labor productivity growth
 (solid line: $\gamma=0.9$, dotted line: $\gamma=0.78$)



Welfare Effects of 1% higher productivity growth rate

	$\gamma = 0.9$	$\gamma = 0.78$
A. Certainty Expenditure Equivalent (%)		
Tenant Workers	8.7	9.6
Constrained Homeowner Workers	9.0	9.9
Unconstrained Homeowner Workers	9.8	11.4
Retirees	8.3	10.5
B. Wealth Change (%)		
Tenant Workers	0.5	0.7
Constrained Homeowner Workers	2.3	4.3
Unconstrained Homeowner Workers	8.2	12.3
Retirees	6.5	10.5

Figure 8
 Transition Dynamics from a 1% decrease in the world real interest rate
 (solid line: $\gamma=0.9$, dotted line: $\gamma=0.78$)

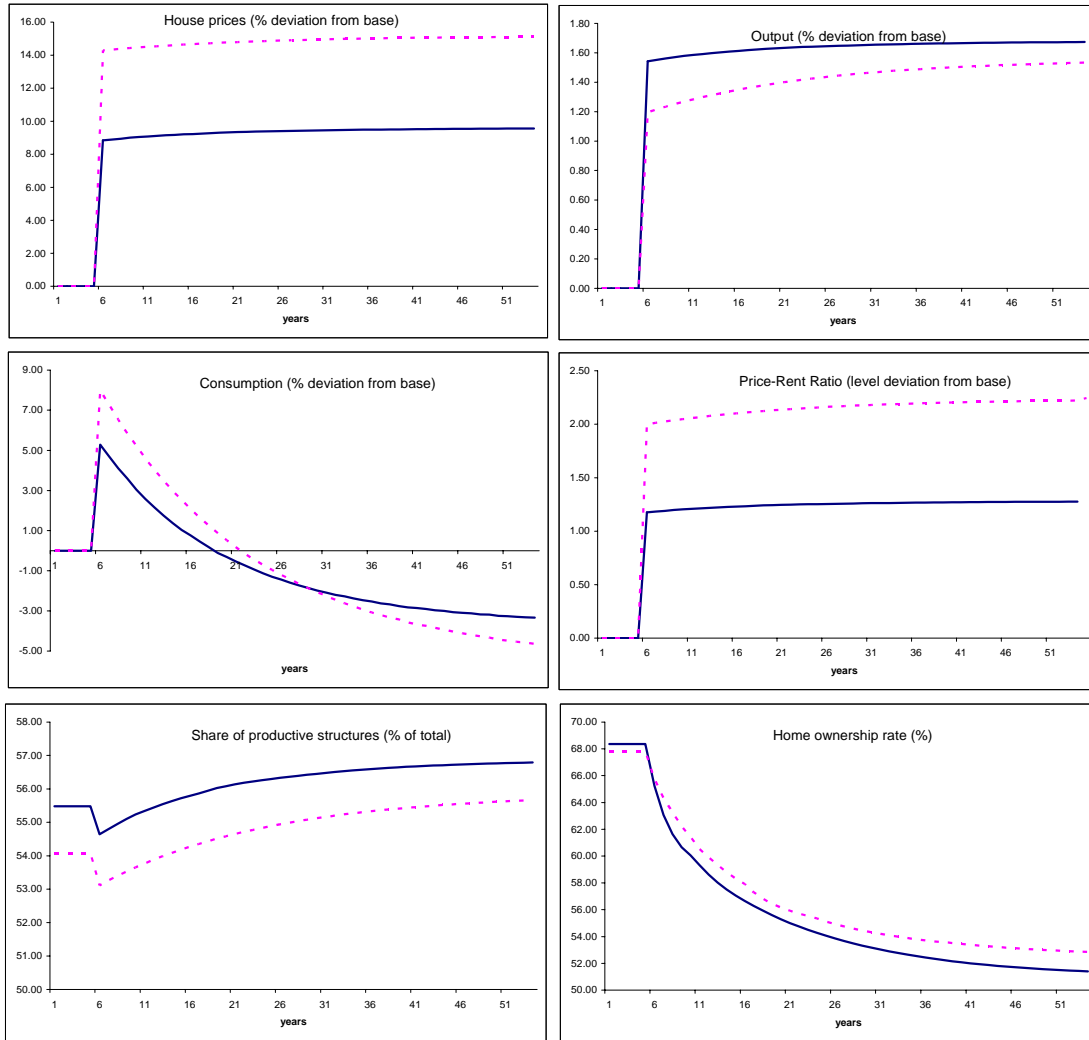


Figure 9: US - model versus data since 1991

Welfare Effects of 1% lower world interest rate

	$\gamma = 0.9$	$\gamma = 0.78$
A. Certainty Expenditure Equivalent		
Tenant Workers	1.3	0.9
Constrained Homeowner Workers	1.3	1.0
Unconstrained Homeowner Workers	-0.1	0.4
Retirees	1.6	3.5
B. Wealth Change		
Tenant Workers	0.4	0.9
Constrained Homeowner Workers	2.0	4.7
Unconstrained Homeowner Workers	8.3	13.6
Retirees	6.6	16.1

Lower collateral from 20% to 10%

Large effects on homeownership rate: 64% → 83%

Very small effects on house prices and production

(The affected households are poor and the rented houses can be converted to owner-occupied houses)

A Scenario for House Price Changes?

1% higher productivity growth rate + 1% lower interest rate
+ 10% lower downpayment

Figure 9: US - model versus data since 1991

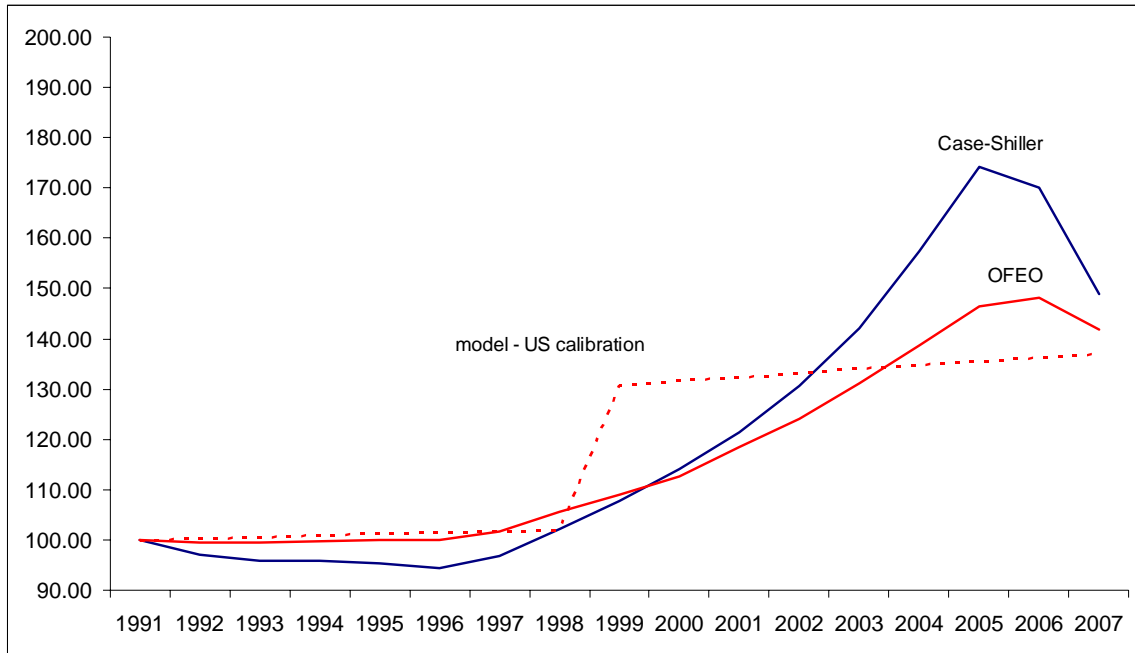


Figure 10: Aggregate home ownership rates since 1991: model versus data

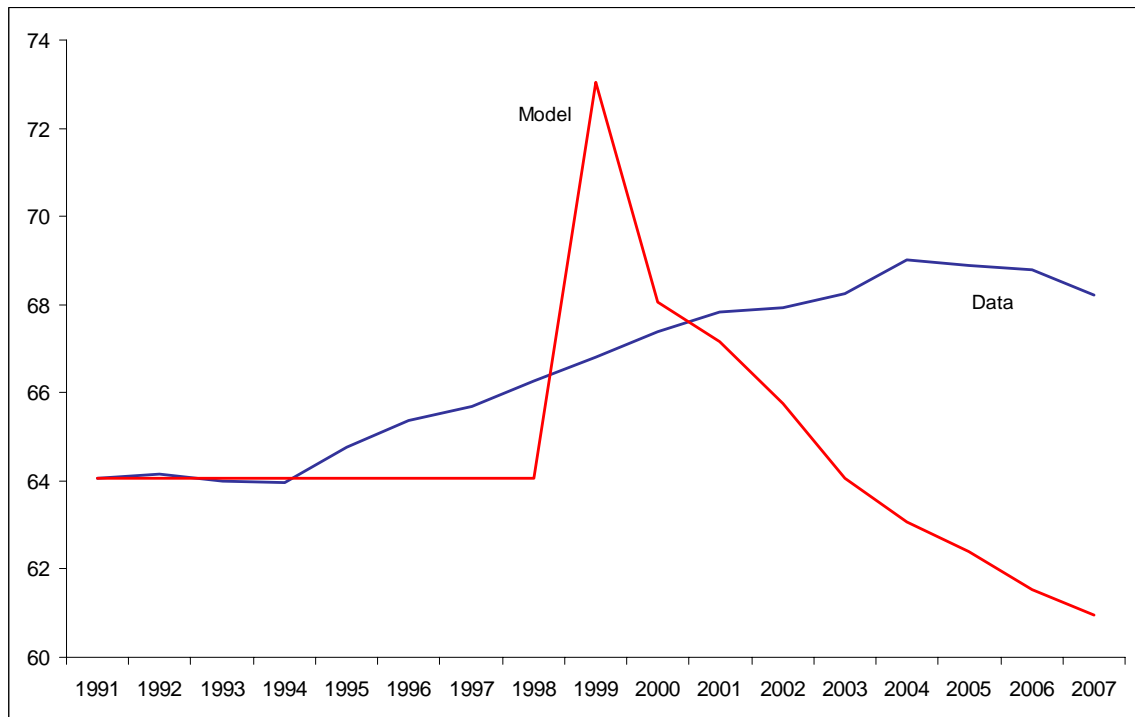


Figure 11: UK – model versus data since 1991

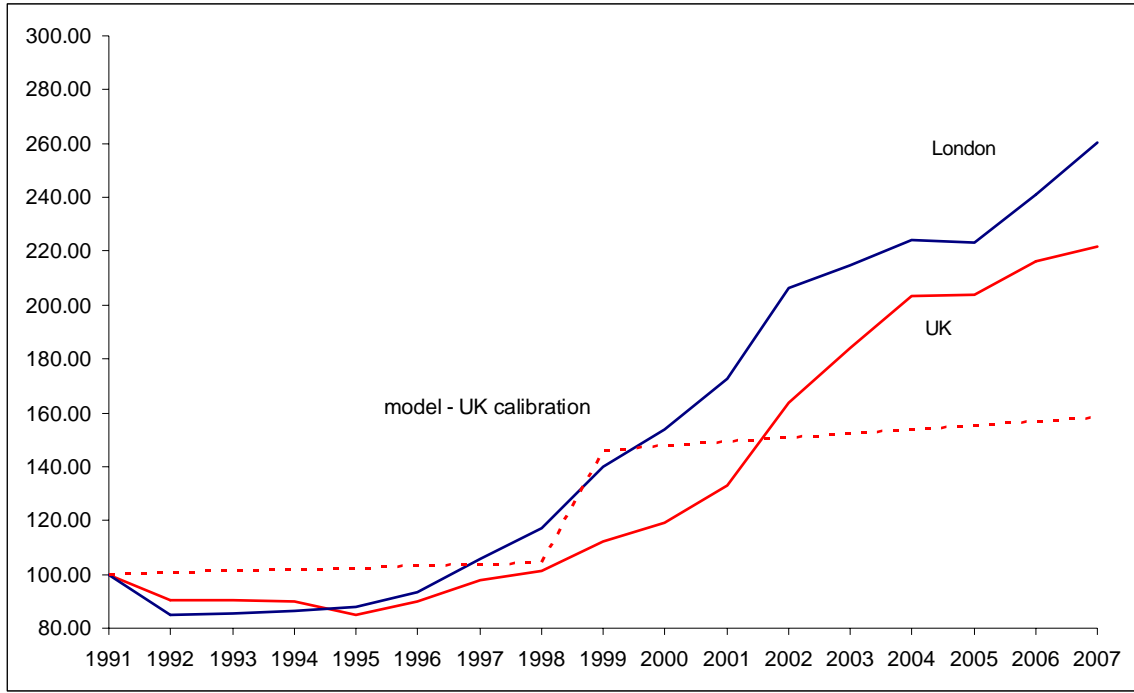
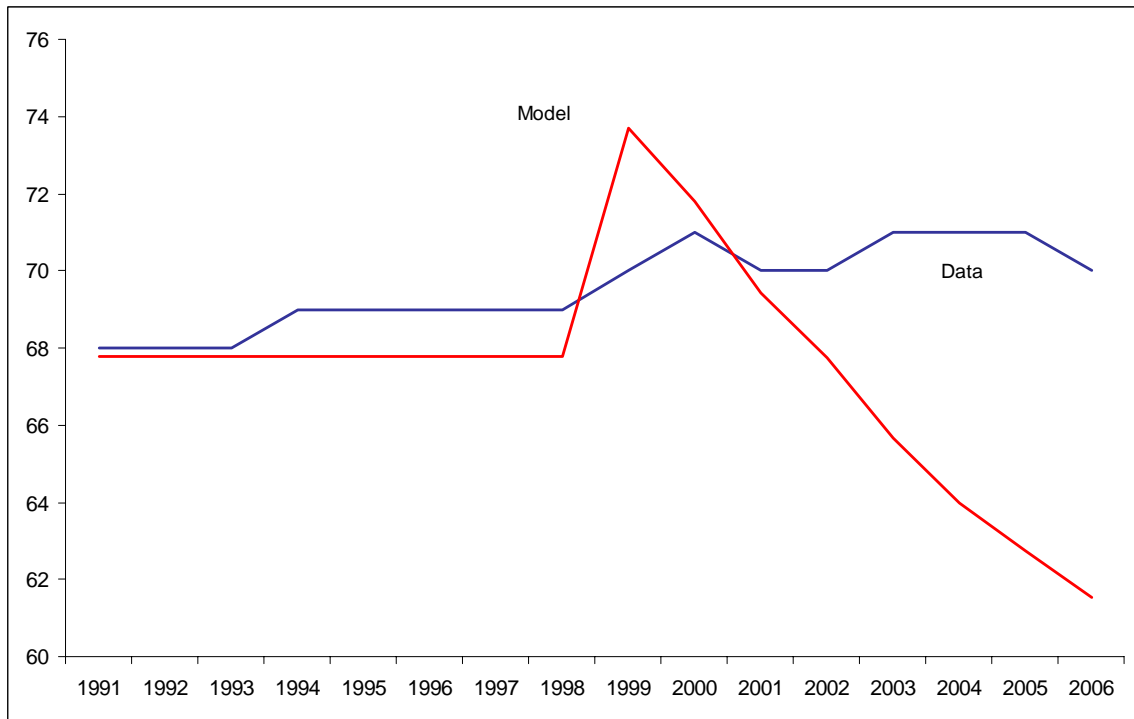


Figure 12: UK: Aggregate home ownership rates since 1991: model versus data



Conclusions

- With larger share of land in production, higher house price-rental ratio, lower homeownership, and higher volatility of house prices
- Limited impact of collateral constraint on prices but strong effect on homeownership
- Households on average gain from a permanent increase in the productivity growth rate and lose from a decrease in the interest rate
- Higher productivity growth and a lower interest rate redistribute wealth from net buyers to net sellers