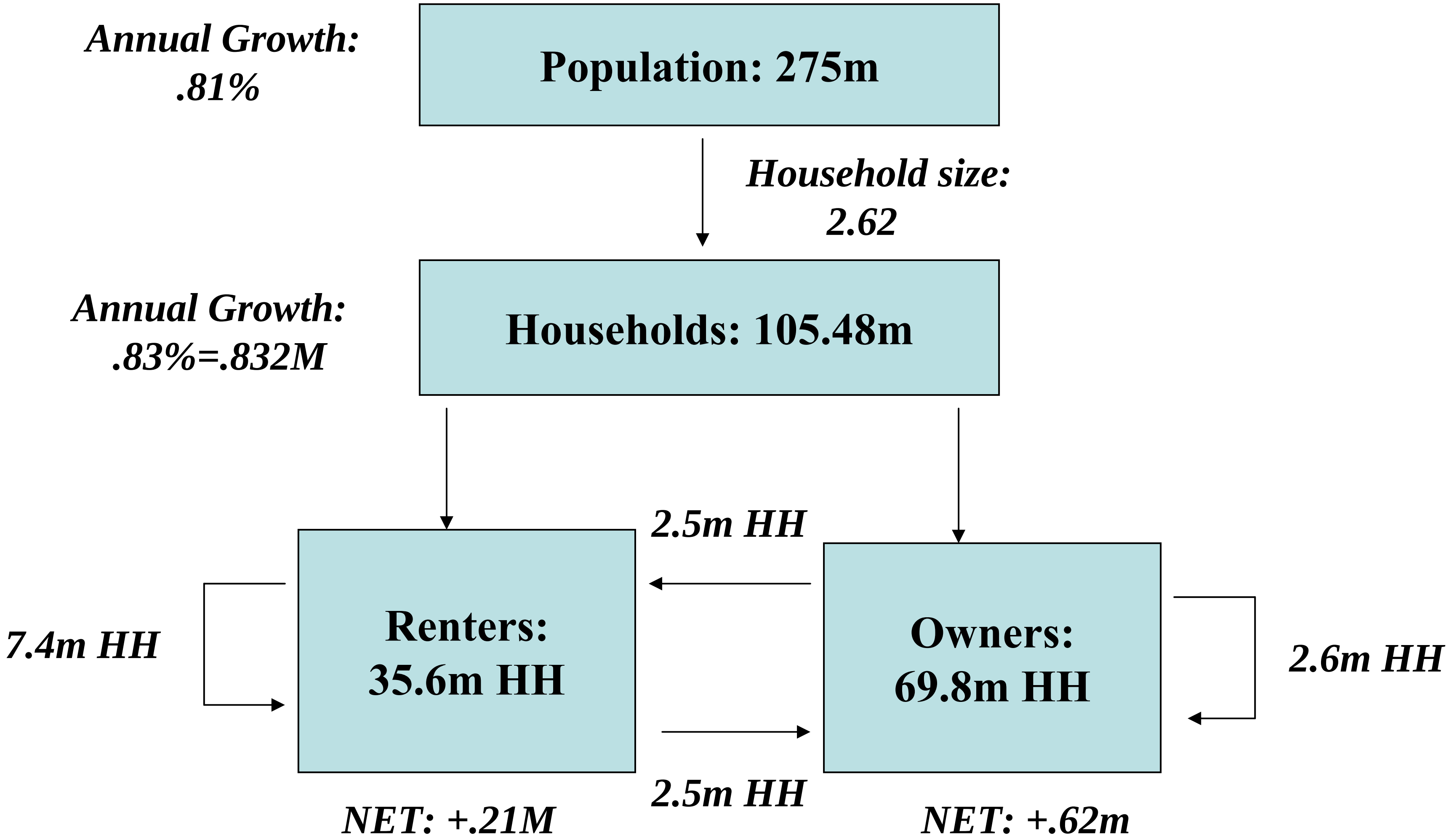
11.433J / 15.021J Real Estate Economics
Fall 2008

Week 9: Housing Markets

- Sales, mobility and turnover: the market for for housing services. **Gross** demand.
- Vacancy, sales time and prices: the “large” impact of small net changes.
- The **net** demand for housing.
- The full annual cost of housing ownership: consumption and investment motives.
- Housing demand “bubbles”.
- New Development and the behavior of housing supply.

Gross annual flows in the US housing market (2000)



As income increases so does housing expenditure: what is the income elasticity $(\partial E/E)/(\partial y/y)$?

Average Value of Home Owned by Married Couples As a Function of Income, 1989 AHS

	Age of Head of Household				
	With Children			Without Children	
Household Income	25-34	35-44	45-54	55-64	65+
Less than $20,000	43,822	70,817	65,407	72,928	81,514
$20,000 - $29,999	51,145	73,206	77,353	76,427	100,750
$30,000 - $39,999	61,964	75,588	77,720	87,030*	101,464*
$40,000 - $49,999	93,814	98,544	111,975	102,495*	113,643*
$50,000 - $74,999	109,679	122,282	114,804	117,287	152,532*
$75,000+	182,377	190,244	196,848	171,571	160,292*

adapted from DiPasquale and Wheaton (1996)

Values reported by home owners

*small sample size

Is there a housing consumption elasticity with respect to household size?

Average House Value for Homeowners by Income and Household Size for Households with Head Aged 35-44, 1989 AHS

	Household Size				
Income	1 Person	2 People	3-4 People	5+ People	All
Less than $25,000	52,506	51,438	69,840	57,516	60,648
$25,000 - $39,999	79,327	80,365	75,599	81,564	77,868
$40,000 - $59,999	113,421	106,365	104,897	107,873	106,247
$60,000 +	150,791	161,205	162,889	165,728	163,023
All	83,840	104,787	109,993	111,307	107,519

adapted from DiPasquale and Wheaton (1996)

Values reported by home owners

Housing Tenure: Younger households and poorer households are most likely to rent. Is renting a "lifestyle choice" or are some "constrained" to rent?

Homeownership Rates by Age and Income, 1990 CPS

	Income (thousands)					
Age of Head of Household	<20	20-29	30-39	40-49	50+	All Incomes
25-34	21.7%	37.3%	53.4%	58.9%	68.5%	44.3%
35-44	36.6	55.2	68.3	77.6	85.4	66.5
45-64	59.4	73.1	81.5	85.6	90.5	78.1
65+	67.5	84.9	87.6	89.6	91.7	75.5
All Ages	48.3	58.3	68.0	74.9	84.3	64.1

adapted from DiPasquale and Wheaton (1996)

Most households move because the current home or location they live in has become "inadequate".

Reasons for Moving, 1999*, AHS

	% of Total Responses**		
	Total	Owner	Renter
Housing related reasons	56.4	56.4	42.3
Job related reasons	23.6	15.1	24.3
Family changes (marriage, divorce, etc.)	22.6	14.1	16.2
Miscellaneous other	15.3	11.4	11.3
Displacement by government or private sector	5.2	2.7	5.4
Disaster loss (fire, flood, etc.)	0.6	0.3	0.5

* Reasons for moving cited by households who had moved within the last 12 months.
** Respondents could cite reasons in more than one category.

adapted from DiPasquale and Wheaton (1996)

Renters Move More: Lower Transaction costs, less maintenance… Older people move less: because they own, or do they own because they move less?

Mobility Rates* by Age and Tenure, 1989, AHS

	Tenure %		
Age	Owner	Renter	All
Under 25	24.6	56.8	49.9
24-34	18.7	44.6	33.4
34-44	8.5	32.8	16.7
45-54	5.7	28.4	11.3
55-64	4.0	19.6	7.2
65+	2.2	12.2	4.6
All	7.6	35.7	17.8

•Heads of household in each category who had moved withing the last 12 months, as a percent of total households per category.
•*adapted from DiPasquale and Wheaton (1996)*

Vacancy = a spell (length of time)

Rental:

Vacancy rate = Incidence rate x Duration

Incidence rate = % of units loosing tenant per month.

Duration = # months necessary to lease up

Owner:

Average Sales time = Vacant Inventory/ Sales (units/month)

[or # movers/month]

[Empirics: see Gabriel-Nothaft]

The relative role of Incidence and Duration: which changes most across time, across markets?

Metropolitan Area	*Time period*	*Vacancy rate*	*Incidence*	*Duration*		*Proportion continuously occupied*	*Sample size*
				Percent of period	*Months*		
New York City	1/87-6/88	2.3	34.1	6.6	0.9	72.3	1070
	1/90-6/91	2.7	41.4	6.4	0.8	68.4	1245
	1/93-6/94	3.6	30.9	11.7	1.5	74.5	1231
Los Angeles-Long Beach	1/87-6/88	4.6	44.9	10.1	1.3	64.1	1146
	1/90-6/91	5.7	48.8	11.7	1.5	59.5	1336
	1/93-6/94	9.9	57.1	17.4	2.3	53.0	1490
Chicago, IL-IN-WI	1/87-6/88	5.9	41.4	14.1	1.8	64.6	1284
	1/90-6/91	7.1	43.1	16.6	2.2	61.4	1191
	1/93-6/94	7.1	40.0	17.7	2.3	64.4	1208
Washington, DC-MD-VA	1/87-6/88	3.2	42.3	7.5	1.0	64.6	531
	1/90-6/91	7.8	51.1	15.2	2.0	59.0	542
	1/93-6/94	6.6	49.7	13.2	1.7	59.9	528
Houston, TX	1/87-6/88	20.4	74.8	27.3	3.5	41.2	567
	1/90-6/91	16.8	64.1	26.2	3.4	44.9	629
	1/93-6/94	12.0	61.9	19.4	2.5	49.0	599

Decomposition of Vacancy Rate into Incidence and Duration

Figure by MIT OpenCourseWare.

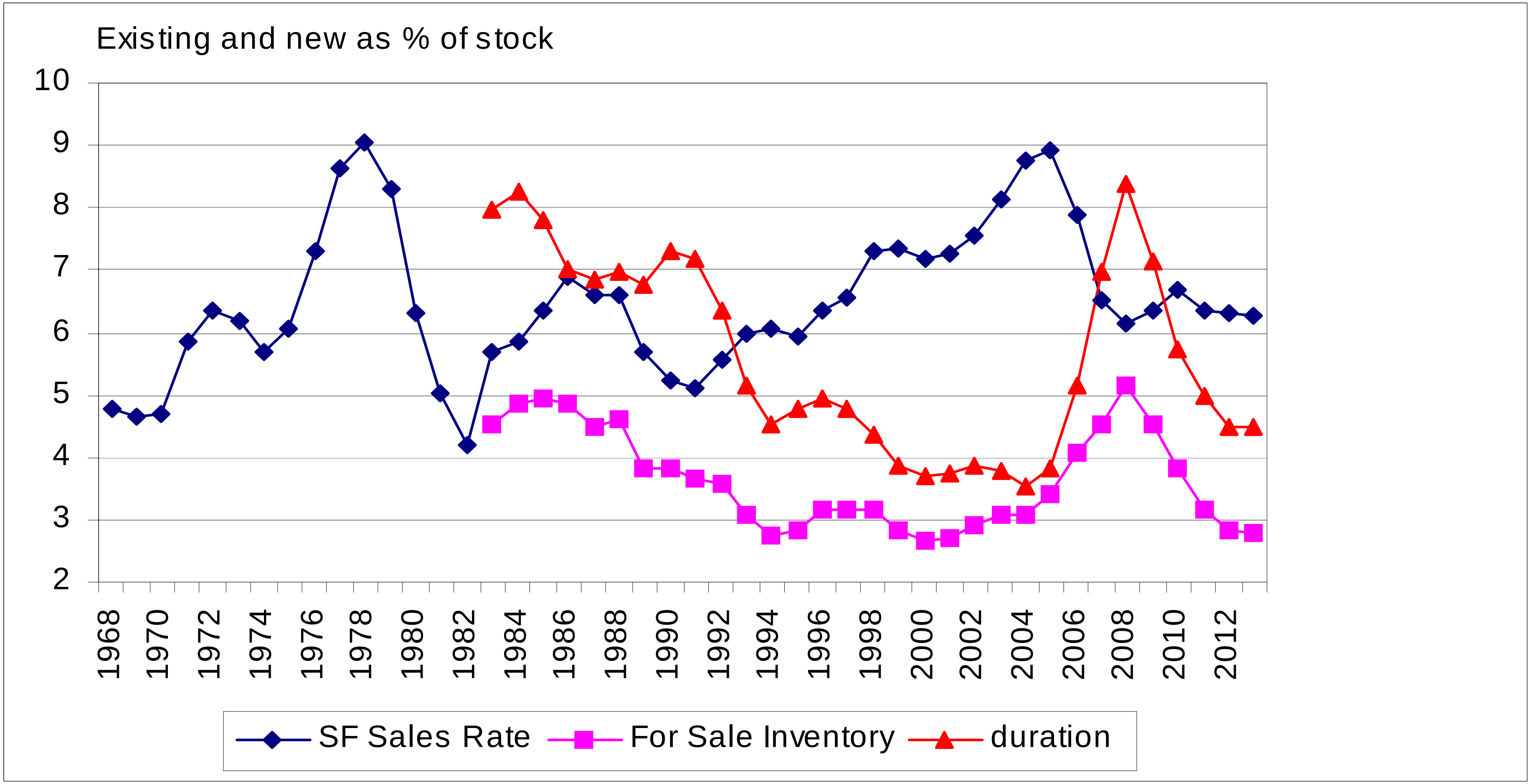
Are there "structural" differences in vacancy, mobility and sales time between markets?

Homeowner Vacancy and Mobility Rates by Metropolitan Area, 1989 AHS

	Vacancy Rate	Annual Mobility Rate Incidence	Ratio (years to sale) Duration
Minneapolis/St.Paul	0.6	8.9	0.067
Los Angeles	0.9	9.1	0.099
San Francisco	0.9	8.6	0.104
Detroit	1.0	6.9	0.145
Boston	1.0	5.5	0.181
Washington, D.C.	1.1	10.6	0.104
Philadelphia	1.2	5.8	0.208
Phoenix	2.8	12.0	0.234
Dallas	3.9	10.1	0.386

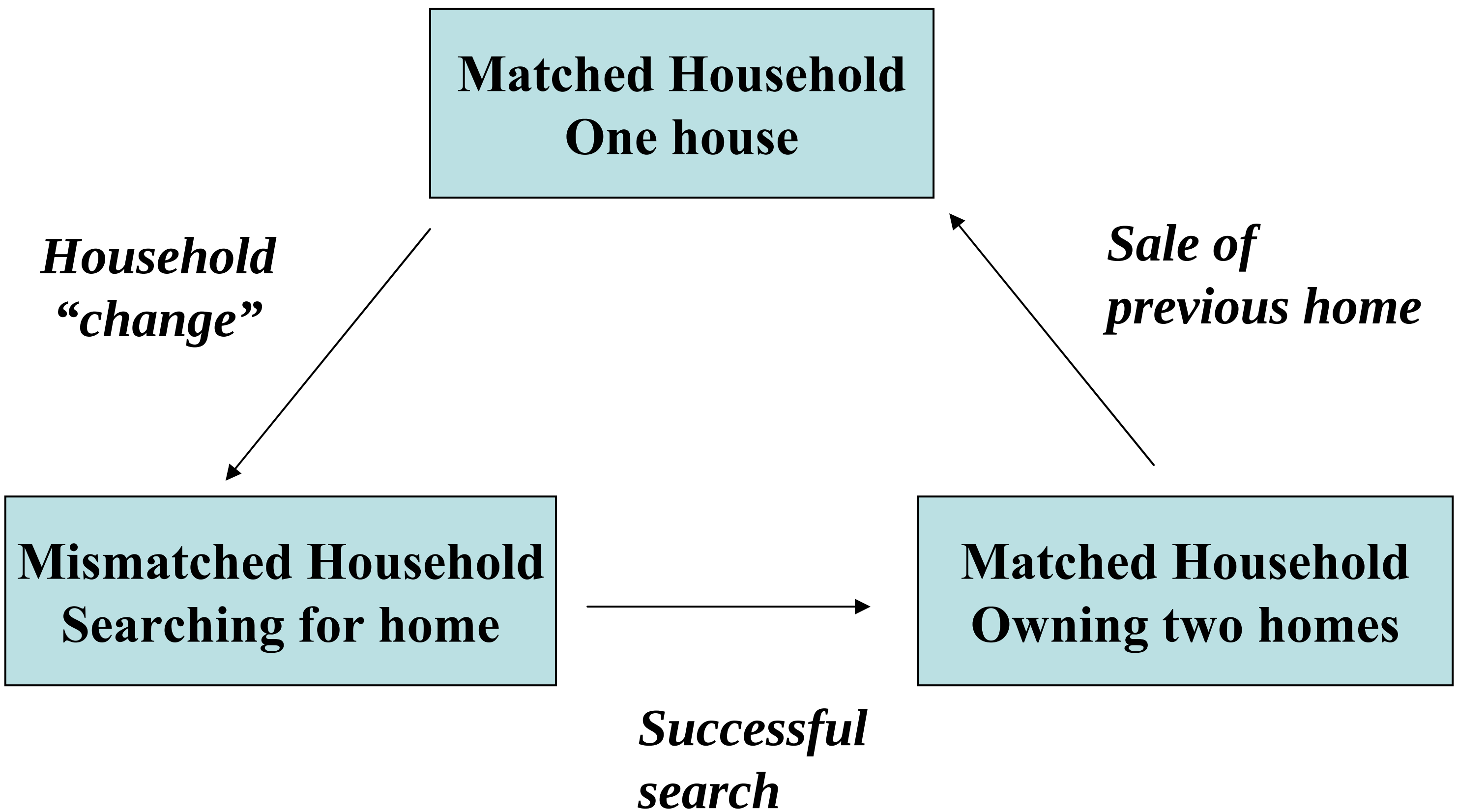
adapted from DiPasquale and Wheaton (1996)

US Single Family: Sales, Inventory, Sales time (Duration)



Source: NAR

How owners transition from one house to another: lateral moves or "churn"
The risk of owning two homes (bridge financing).
What happens when there is no such mechanism?



Buyer strategy: once new house found, will have to own a second home. Maximum Buyer Offer would be such that this cost negated the advantage of move to new house

L: expected sales time

i : interest rate, opportunity cost of time

iLP: holding cost of owning 2nd home during sale process at price P.

Buyer Max Offer (BMO):

BMO x iL = Net gain from moving.

BMO = Net gain/ iL

Seller strategy: What minimum (certain) price (SMA) would be *as* profitable as putting the house back on the market and eventually getting a price of P – but discounting that price by the expected sales time.

$$\text{Seller Min. Accept (SMA)} = P/\,(1+ iL)$$

Bargaining theory: Negotiated price lies between BMO and SMA, assuming that BMO>SMA

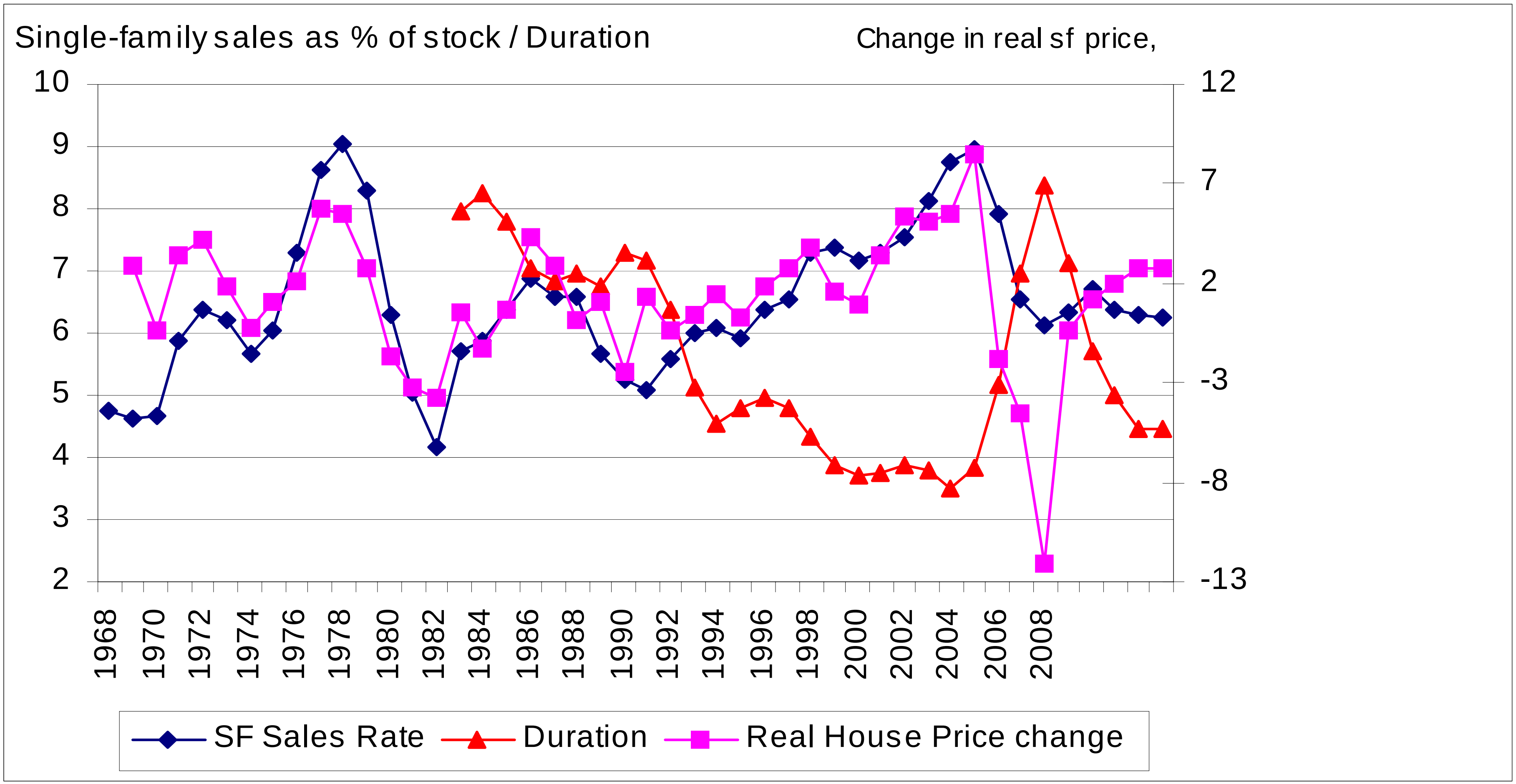
P = BMO - ½[BMO – SMA]

(Solving for P – which is also part of the formula for SMA)

$$= \frac{\text{Net Gain}}{iL} \times \frac{1 + iL}{1 + 2iL}$$

Outcome: price moves almost inversely to sales time: hence proportionately to sales and inverse to vacancy = a High elasticity

US Single Family Market: Prices move closely with Sales, Inverse to Duration



Source: NAR

Predicting Prices involves predicting Sales, Vacancy and Duration.

1). Sales are complicated: new households, marriages and divorces, lateral mobility, tenure changes..

2). Some evidence that sales are pro-cyclic: mobility is helped by income security, but much is un-researched.

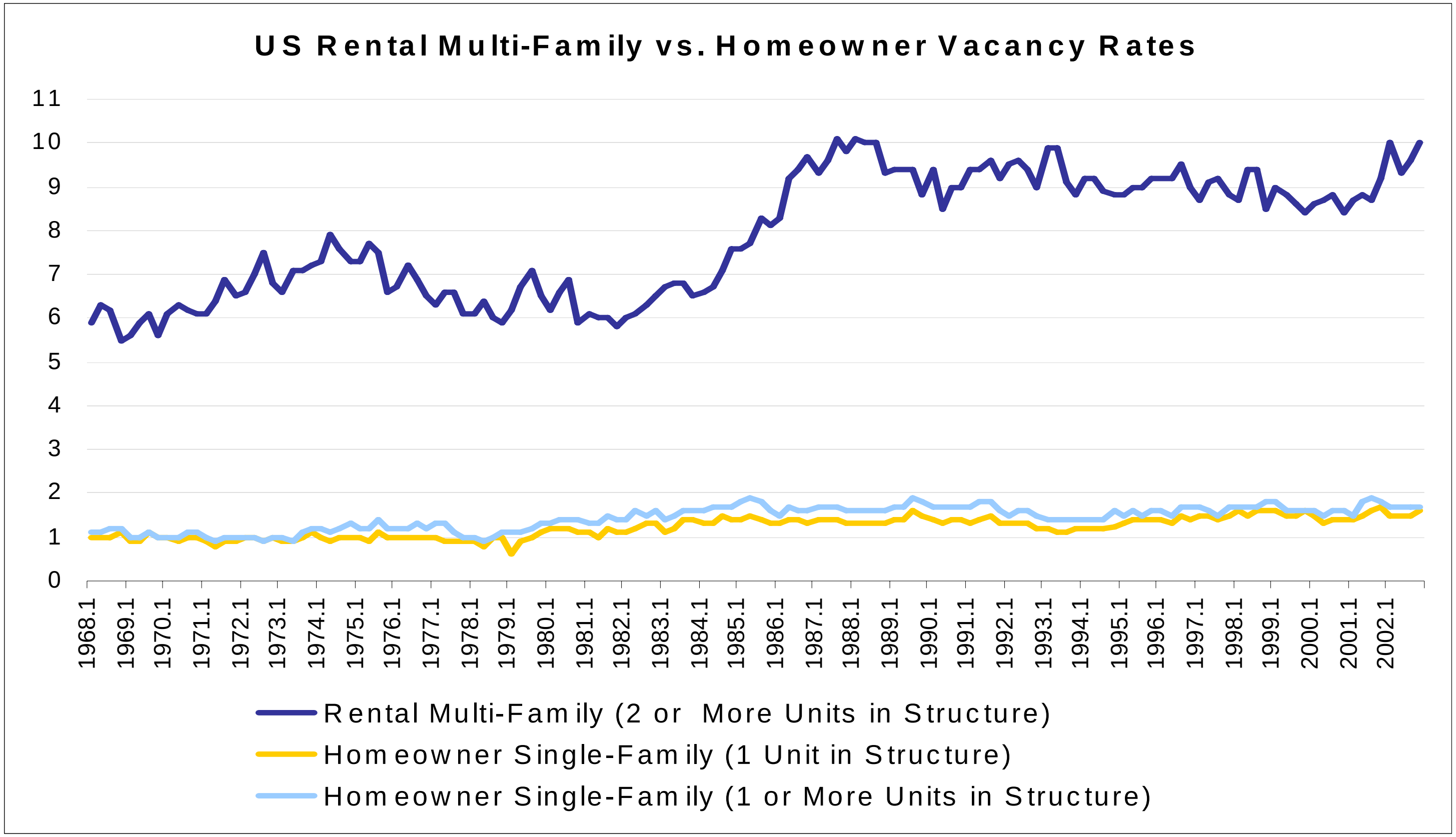
3). Vacancy is much easier = housing stock – occupied units (also called households)

4). Construction adds to the housing stock.

5). Changes in "*ex ante* demand" (growth in population, household split ups….) impact household formation and hence occupied units.

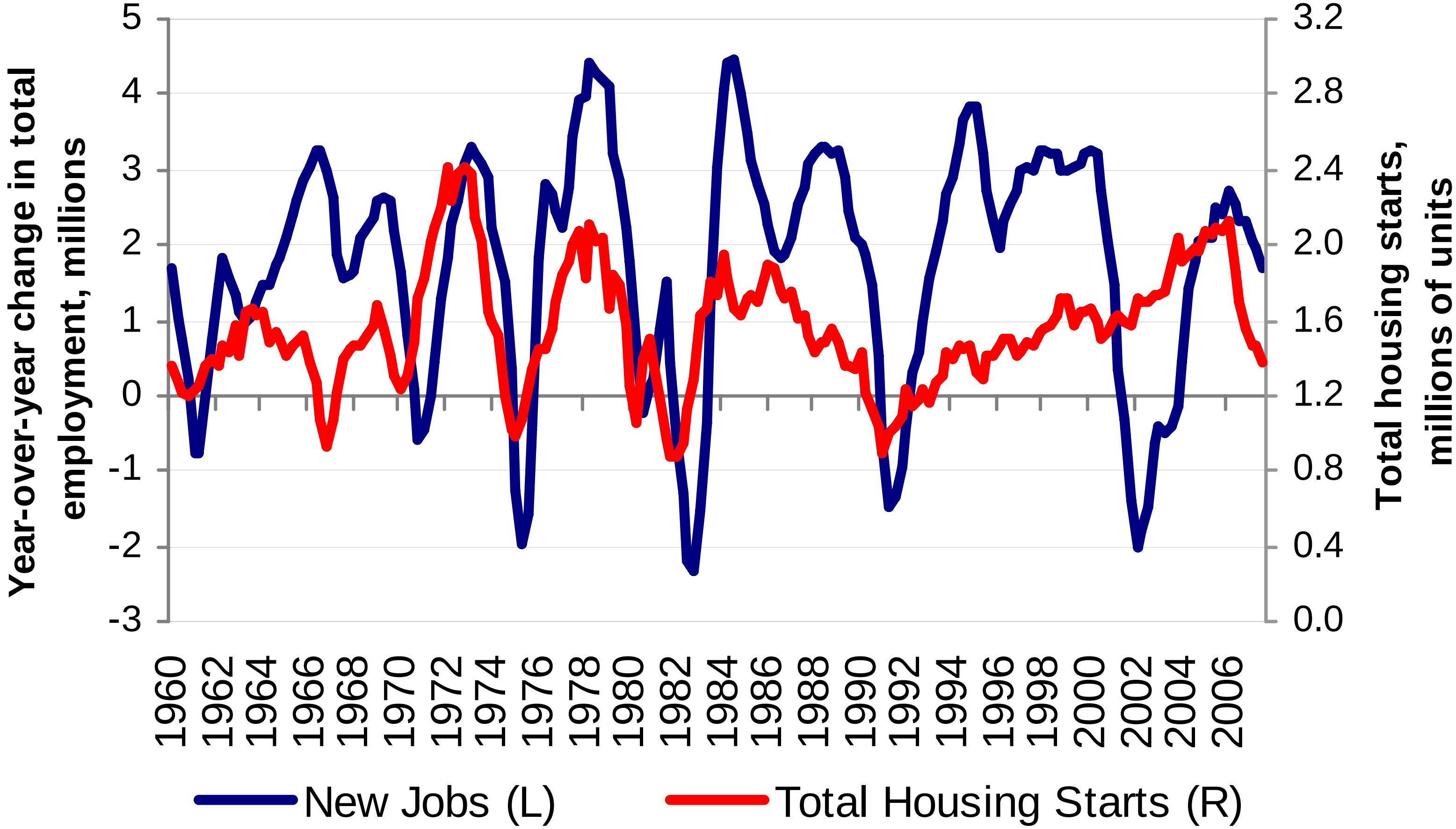
6). Households ("*ex post* demand") is different from "*exp ante* demand" which is the number of potential households.

Residential vacancy rates move remarkably little (in comparison to commercial. Supply seems quite disciplined relative to demand.



MIT Center for Real Estate

Vacancy moves little because of near Prefect Historic correlation between job growth (demand) and Housing Production – except for 2000-2006



Sources: BLS, BOC, TWR.

Theories of Vacancy and Prices (or rents).

1). If vacancy is always "constant", at some "structural" rate V*, prices must be adjusting quickly so that *ex ante* = *ex post* = stock(1-V*). Implication: *ex ante* and *ex post* "demand" are difficult to distinguish. This is the Theory of "structural" Vacancy

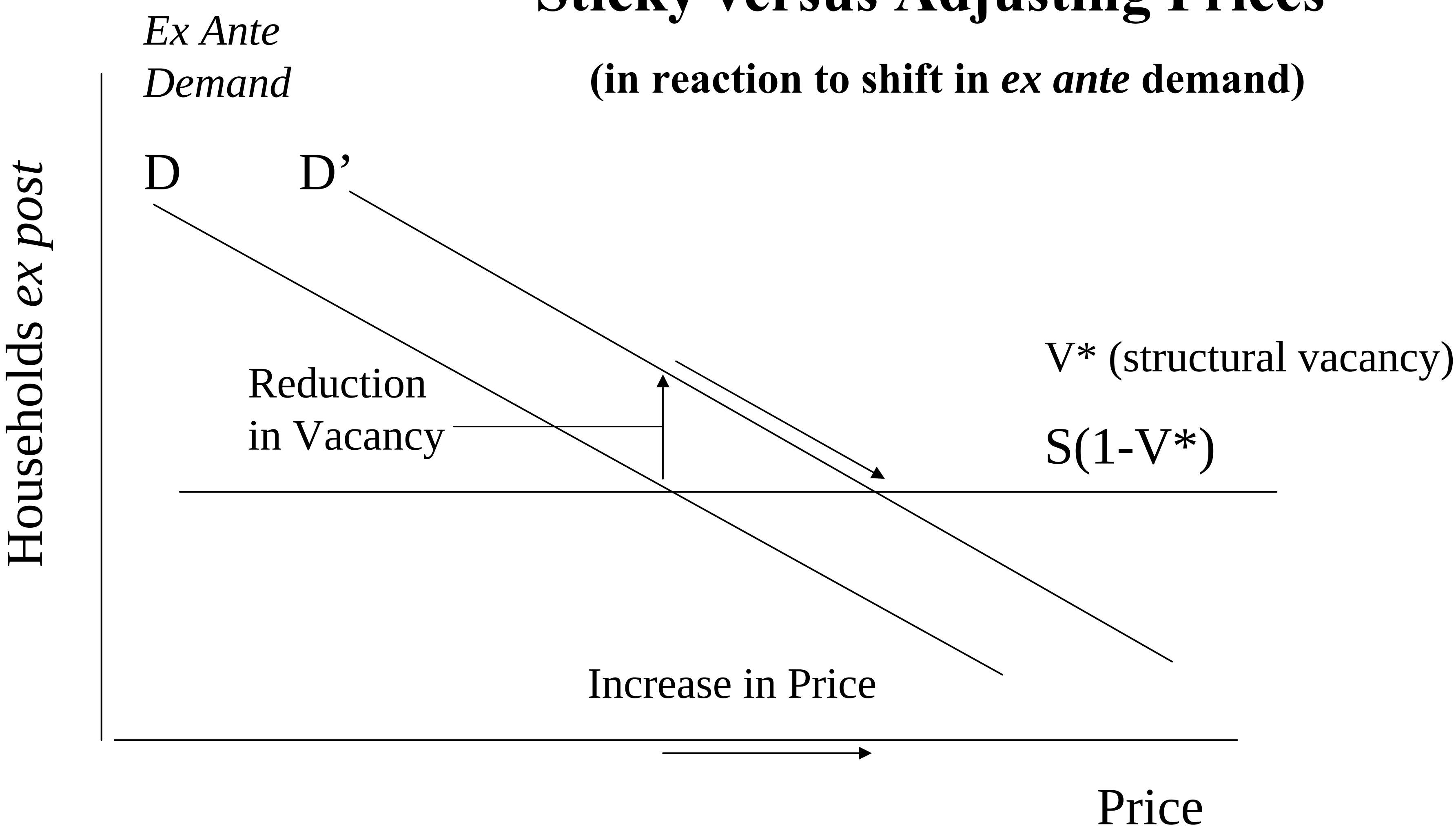
2). With large systematic vacancy movements, prices or rents must be "sticky" and not adjusting quickly. Implication: *ex ante* can be measured and distinguished from *ex post*. This characterizes commercial real estate (next).

3). What determines *ex ante* housing demand?

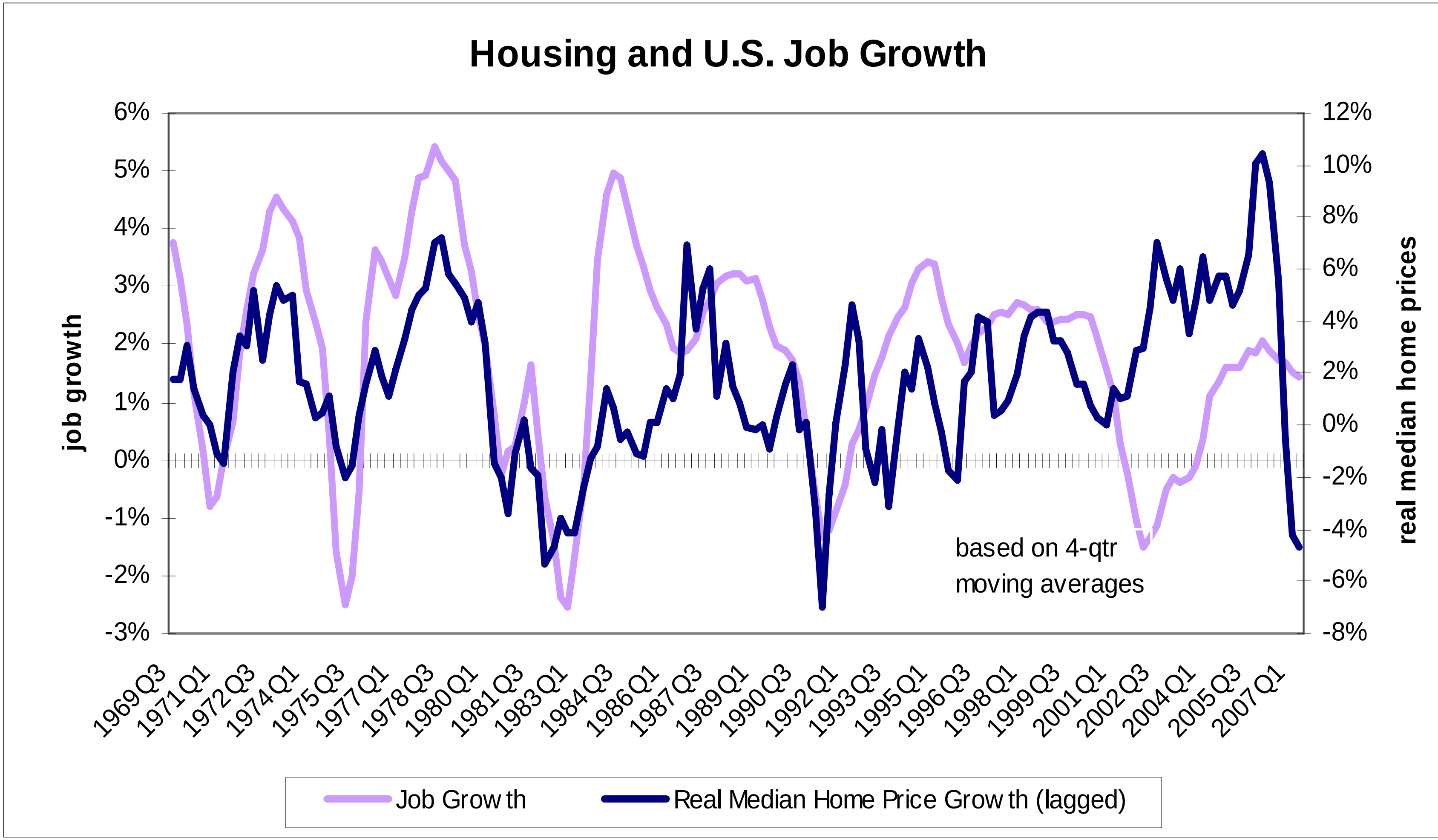
Demographics? Income?

Sticky versus Adjusting Prices

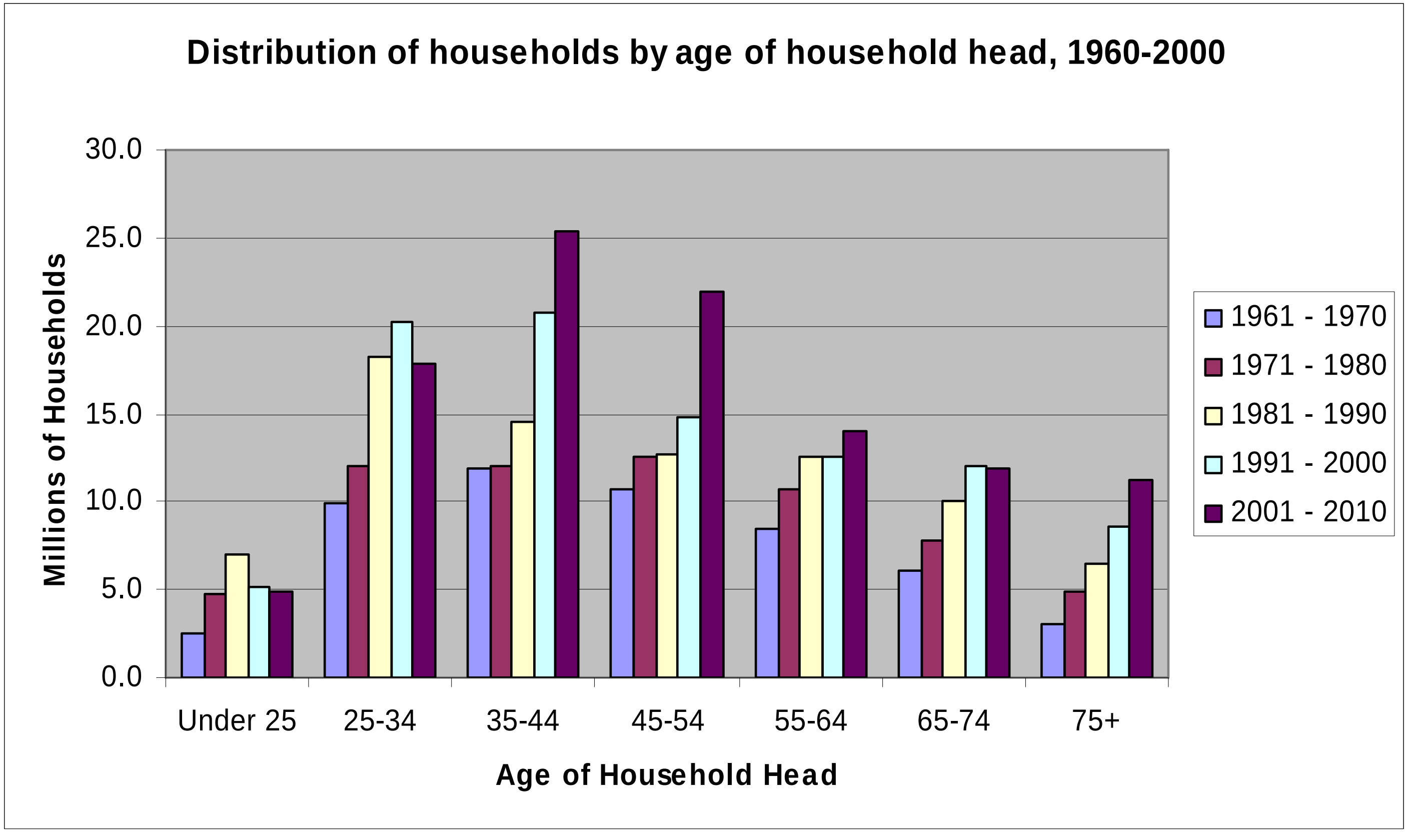
(in reaction to shift in *ex ante* demand)



Vacancy may be constant but House Prices move perfectly in response to ex ante demand changes (job growth) – except for 2000-2006



Ex Ante Demand: The Baby Boom makes its way through the age distribution: [see Eppli-Childs]



Household Structure matters as well.

Single rental propensity = 56%. Married rental propensity = 22%

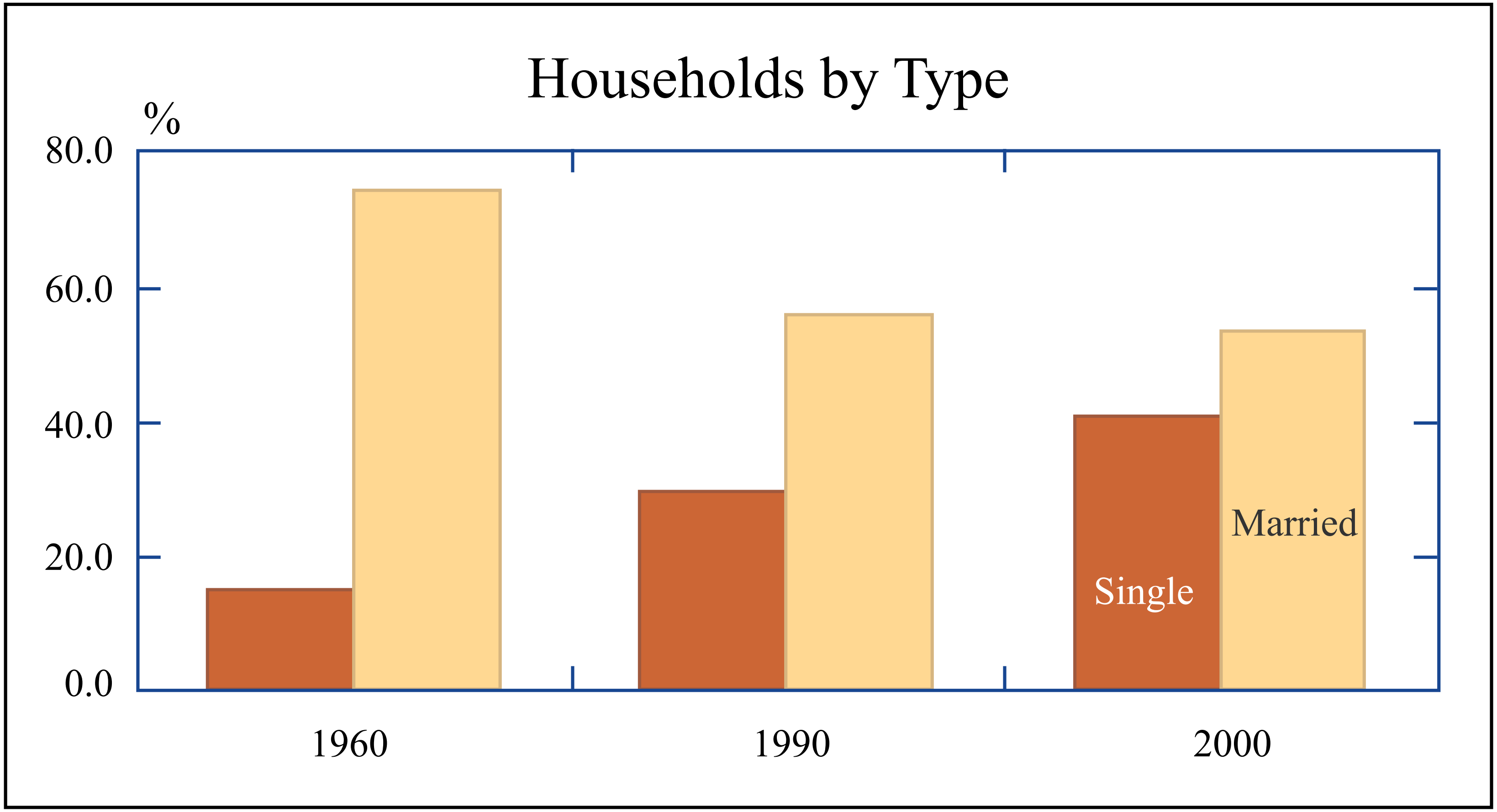


Figure by MIT OpenCourseWare.

The importance of correctly measuring "Price"

1). Prices versus Quantity versus Expenditure

P: price of the same thing over time

(OHHEO index)

Q: Physical quantity and quality of space (how to measure).

E = PQ: how much you spend

(NAR average price of house that sells)

2). For new houses (1.2m SFU annually)

$\Delta P/P = 4\%$, $\Delta Q/Q = 4\%$, $\Delta E/E = 8\%$ (1965-1990).

3). For all houses (6m Sales annually)

$\Delta P/P = 7\%$, $\Delta Q/Q = .5\%$, $\Delta E/E = 7.5\%$

$\Delta Q/Q > 0$: new homes better than old + remodeling

4). Measuring $\Delta E/E$ is easy, how to measure $\Delta P/P$?

5). Hedonic equation (again) with time variables for the period each home sells in [D_1=1 if sold in period 1, =0 otherwise]. The coefficients on these variables, β_i measure the price *level* in that period relative to the first period in the sample

$$P = [X_1^{\alpha 1} X_2^{\alpha 2} \ldots]\, e^{\beta 1D1+\beta 2D2+\ldots\ \beta TDT}$$

Estimation technique: convert to linear regression .

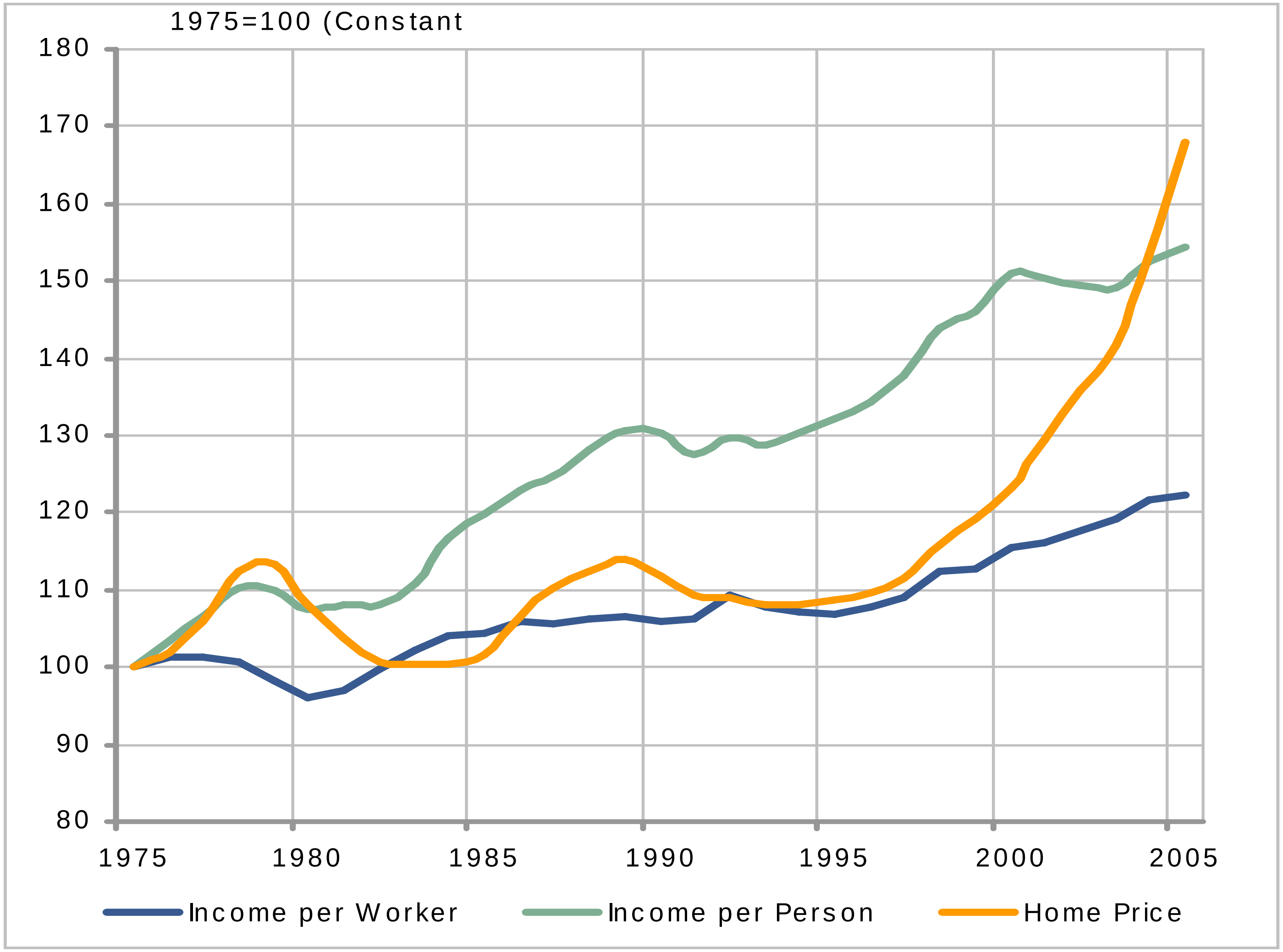
$$\log(P) = \alpha_1 \log(X_1) + \alpha_2 \log(X_2) + \ldots + \beta_1 D_1 + \beta_2 D_2 + \ldots\ \beta_T D_T$$

6). ***Repeat sale price index.*** Look only at homes that sell more than once over the time period. Dependent variable is price change between sale dates. Independent variable is again a set of dummy [0,1] variables for each period. Suppose an observation has the first sale in period i, the next was n periods earlier.

$$\log(P_i)-\log(P_{i-n}) = \sum_{t=1}^{T} \beta_t I_t$$

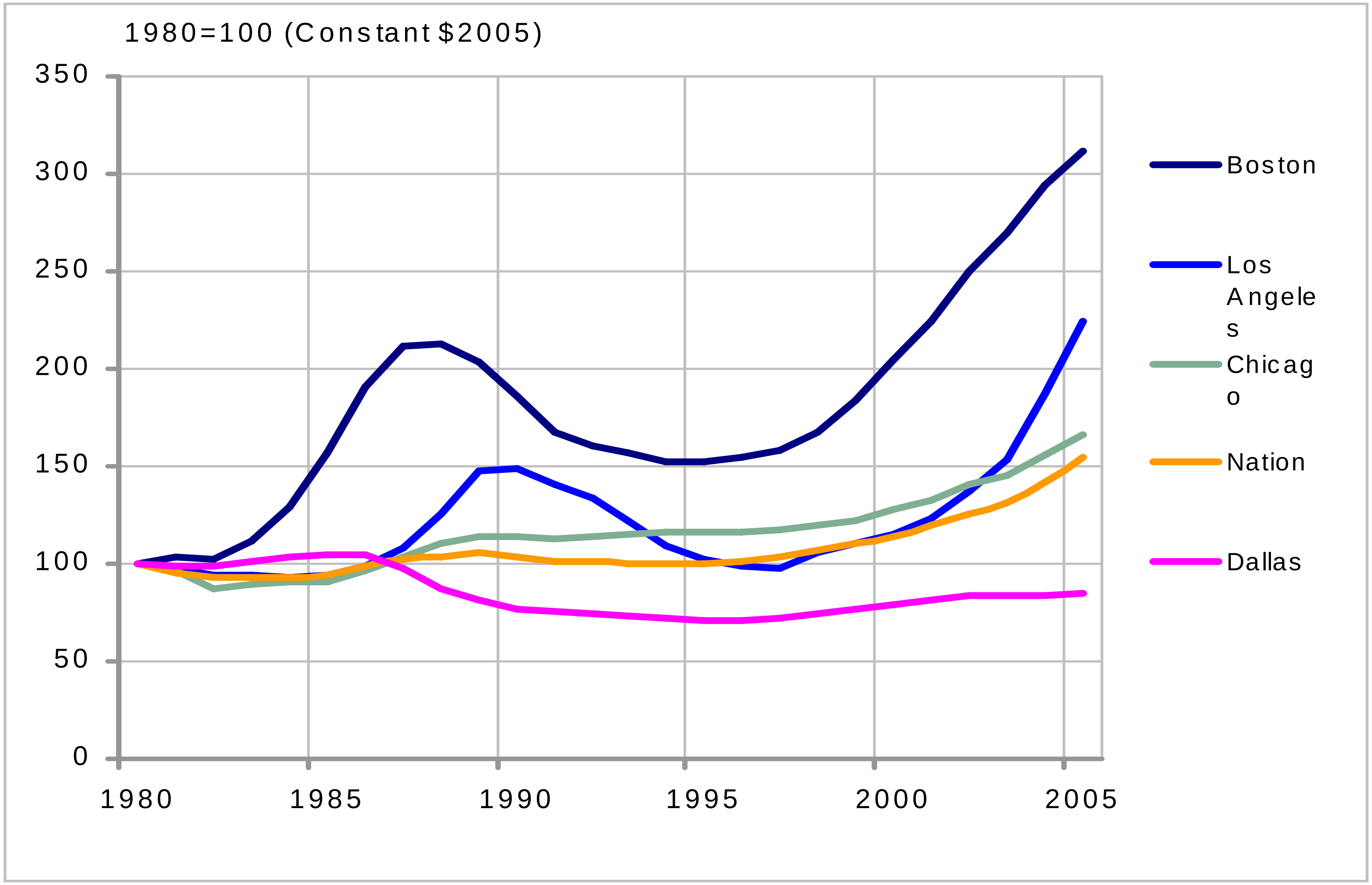
For this observation, I_t is zero for all years *except* for those in the the i to i-n interval. The coefficients β_t are then the *inflation rate in prices in that year*. Sources: OFHEO, CSW

US Average Housing prices (OFHEO): Price levels in line with income growth until 2001+



MIT Center for Real Estate

But the growth varies enormously by market. Demand depends not just on price levels but the "annual cost of owning"



7). What does it cost to own one unit measure of Q? This obviously influences how many measures you want.

8). Sometimes it can cost you nothing to own a home. [example: 100k property, 100% LTV, 8% interest, 6% appreciation, 25% marginal tax rate:

	Loan	After Tax Interest	appreciation	net
Year 1	100	6	6	0
Year 2	106	6.36	6.36	0
Year 3	112.36	6.72	6.72	0

9). Assumes that you use the additional borrowing each year to offset the interest you just paid. Also assumes no transaction costs [Fleet's instant Home Equity program].

10). At the end, you have no equity, but were able to enjoy extra consumption of 6% each year. [this is the choice of someone with a high “rate of time preference”]

11). Alternatively, you could not borrow, have 6% less consumption each period and at the end have housing equity to finance your retirement = saving through housing. [choice of someone with a low “rate of time preference”]. How do you finance retirement with housing equity? Reverse mortgage? Downsize? Sell and Rent?

12). The discounted value of these two strategies is identical, so the annual total cost (in either case) for 100k is :

$$u = 100k \times [\, i\,(1 - t) - \Delta P/P\,] \qquad t = \text{income tax rate}$$

14). IF the annual cost of owning Q "units" of housing quality (PQ=100k in previous example) is:

$$u = PQ\,[\, i\,(1- t) - \Delta P/P]$$

What is Impact of: P (level) – versus - $\Delta P/P$ (price appreciation)

15). And households are freely able to move and buy at different locations (different values of Q) within the market then should not the annual cost of owning one unit of Q (U=u/Q) be constant across locations? Then:

$$P = [\Delta P + U]/i(1-t)$$

16). Or Price levels for (comparable) housing should be positively correlation with price appreciation.

MIT Center for Real Estate

The cost of owning for 1st time homebuyers in the lowest marginal tax bracket. [deducting inflation is key]

Cost Components of Home Ownership

	1978	1980	1982	1984	1986	1988	1990
House Price (1990 dollars)	79666	$79,983	$75,602	$75,076	$76,069	$77,357	$73,706
Mortgage Rate	9.40%	12.53%	14.78%	12.00%	9.80%	9.01%	9.74%
Marginal Tax Rate	22%	21%	19%	18%	18%	15%	15%
Mortgage Amount	$63,733	$63,986	$60,481	$60,061	$60,855	$61,885	$58,965
Upfront Cash Required:							
Down mayment (20%)	$15,933	$15,997	$15,120	$15,015	$15,214	$15,471	$14,741
Closing Costs	+ $1358	$1,363	$1,288	$1,279	$1,296	$1,318	$1,256
Total:	$17,291	$17,359	$16,409	$16,295	$16,510	$16,790	$15,997
Annual Cash Costs:							
Mortgage Payment*	$6,375	$8,213	$9,049	$7,414	$6,301	$5,981	$6,076
*Plus Other Costs***	+ $3,214	$3,223	$3,268	$3,298	$3,212	$3,107	$2,988
Before-Tax Cash Costs	$9,589	$11,435	$12,318	$10,711	$9,513	$9,088	$9,064
Less Tax Savings	- $435	$979	$1,201	$899	$655	$266	$308
After-Tax Cash Costs	$9,155	$10,456	$11,117	$9,813	$8,848	$8,822	$8,756
Less Nominal Equity Buildup	- $8,393	$8,206	$3,810	$2,430	$2,705	$3,274	$1,815
Subtotal:	$761	$2,250	$7,307	$7,383	$6,143	$55,48	$6,940
Plus Opportunity Cost	+ $1,233	$1,742	$1,674	$1,490	$923	$1,103	$1,083
Total Annual Costs:	$1,995	$3,992	$8,981	$8,873	$7,067	$6,651	$8,024

*30-yr, fixed rate mortgage. ** Include insurance, maintenance, taxes, fuel, and utilities. *adapted from DiPasquale and Wheaton (1996)*

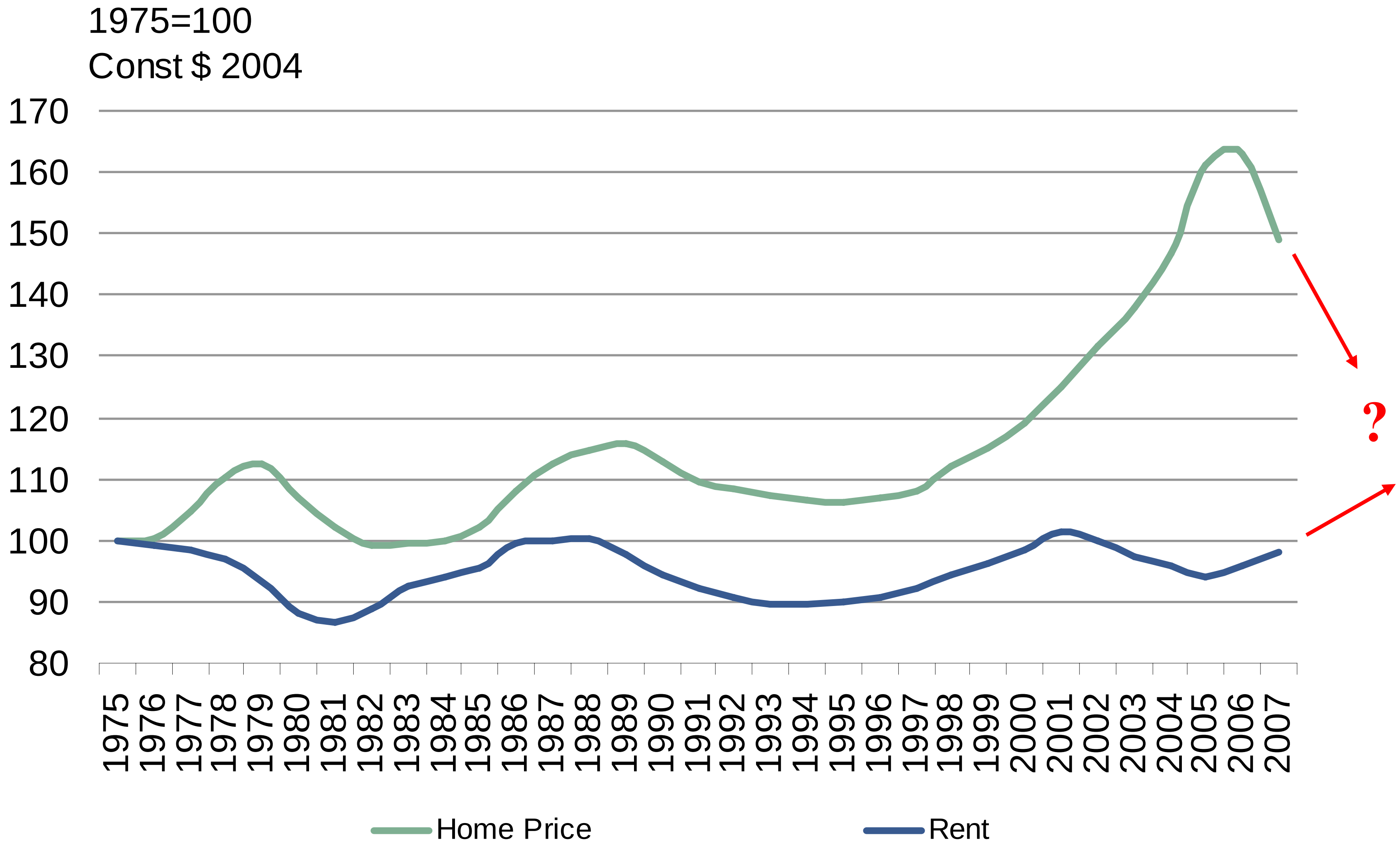
Are there Housing "Bubbles"?

- Bubble: Housing demand is rising-because prices are rising-because housing demand is rising! No reason to buy other than the fact that others are buying.

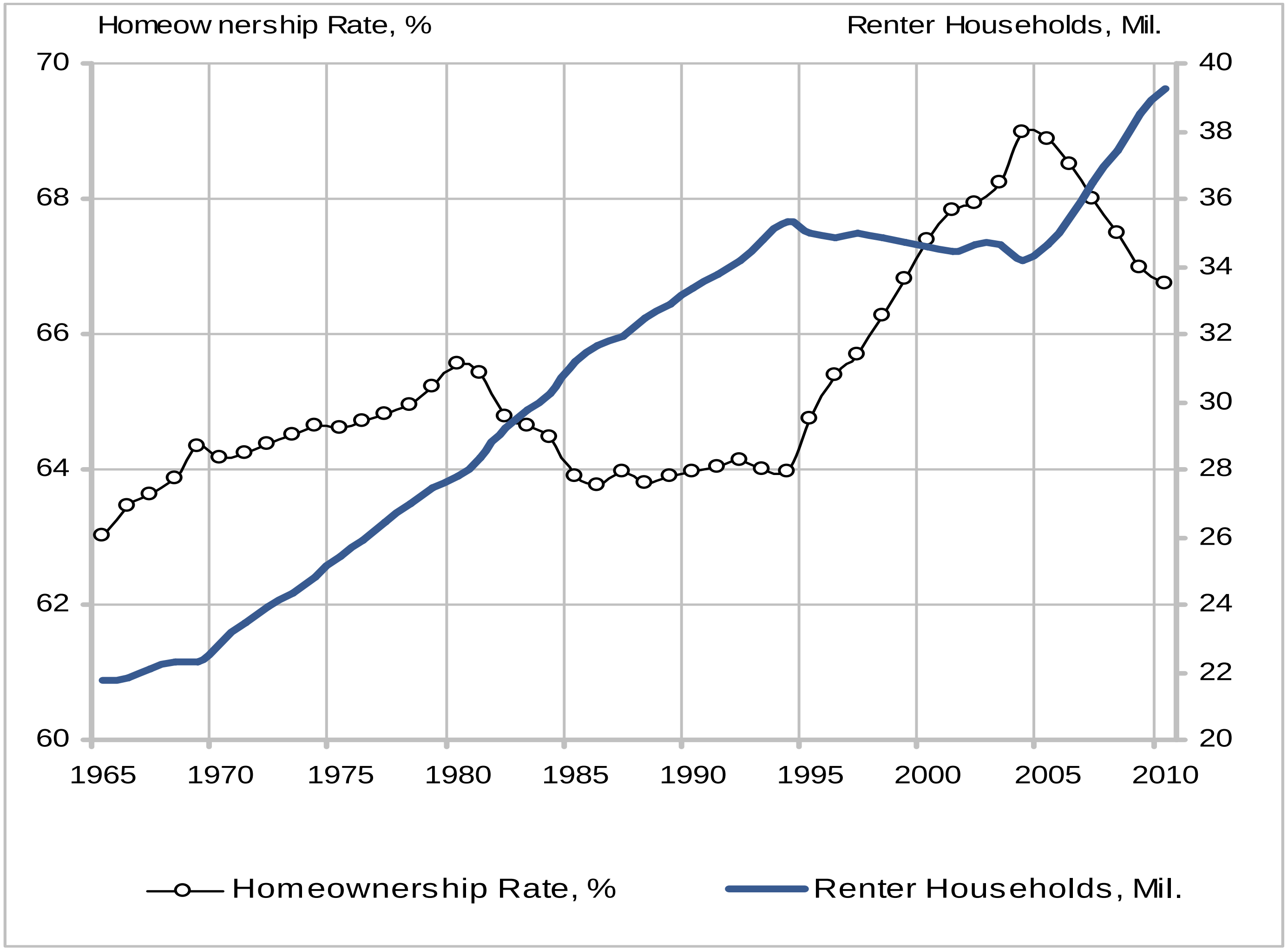
$$
\begin{array}{ccccc}
 & u & \Rightarrow & \text{Demand} & \Rightarrow \text{Vacancy} \\
 & \Uparrow & & & \Downarrow \\
\text{Expectations} & & \Leftarrow \text{Prices} & \Leftarrow & \text{Sales time}
\end{array}
$$

- Watch out if everything has "positive feedback" and is reinforcing everything else. What stops a bubble?
- Marginal buyers who are very sensitive to the price level and not just price inflation and the reduction in u.
- New supply, new supply, new supply!
- Were we in a price bubble from 2000-2006? Demographics, low interest rates and greater credit say make fundamental sense, but….

"Uncharted waters": restoring historic "P/R Balance" requires 20% price decline and 20% rent increase!

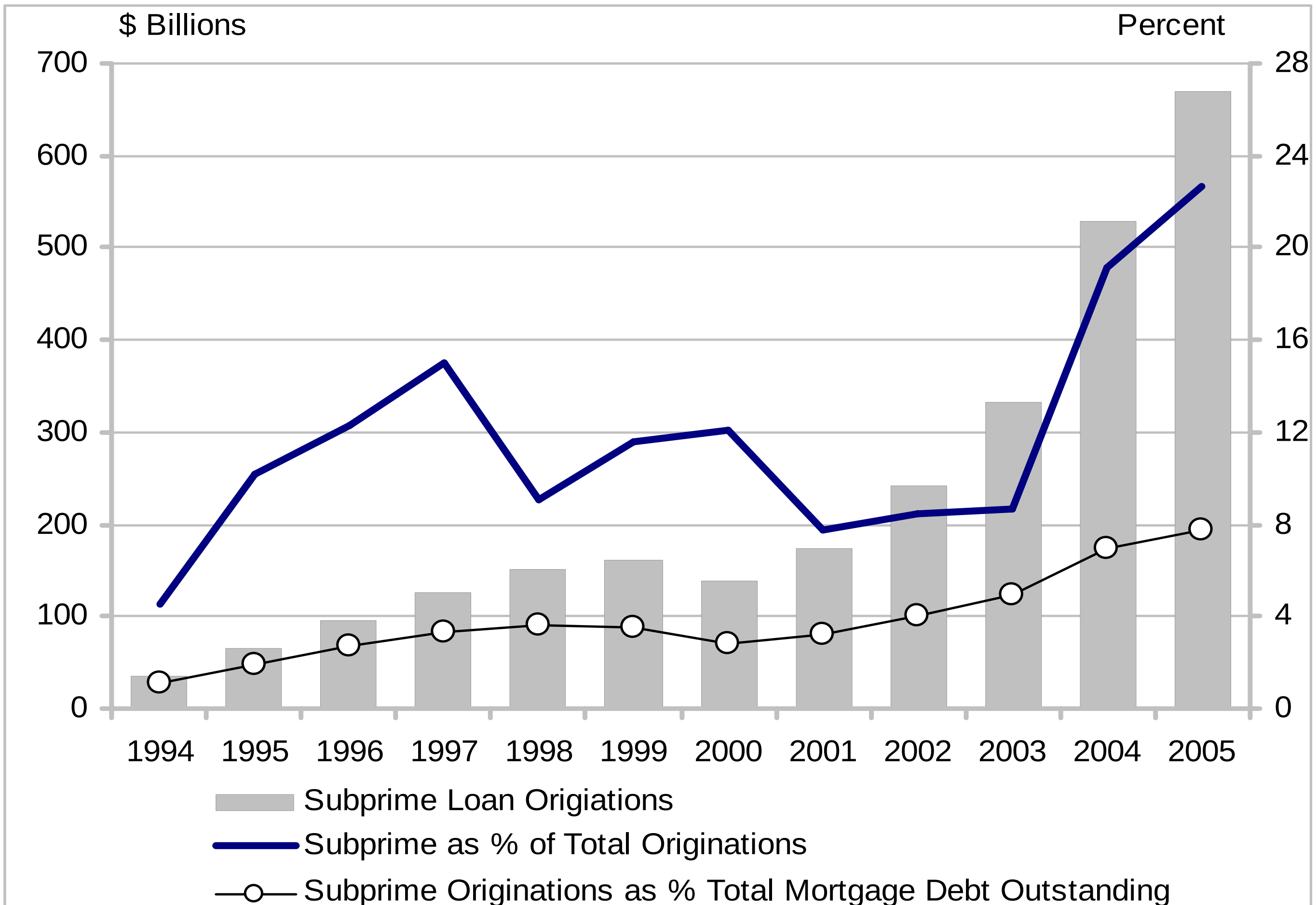


A totally unprecedented rise in Home ownership. Rising ownership share fueled house prices. Why did ownership soar?



MIT Center for Real Estate

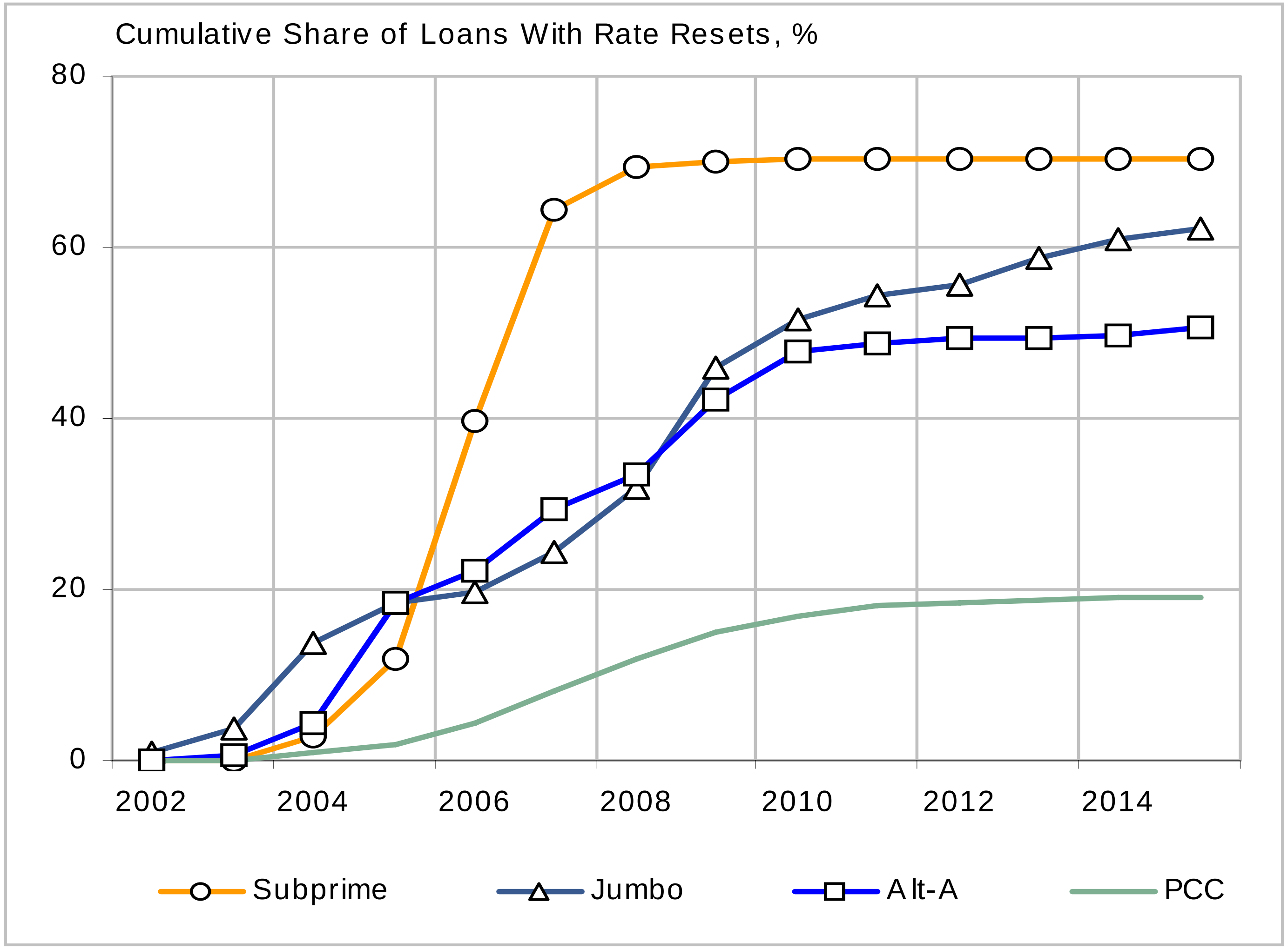
Credit "availability" matters as much as interest rates. Recent Subprime market offers credit to all.



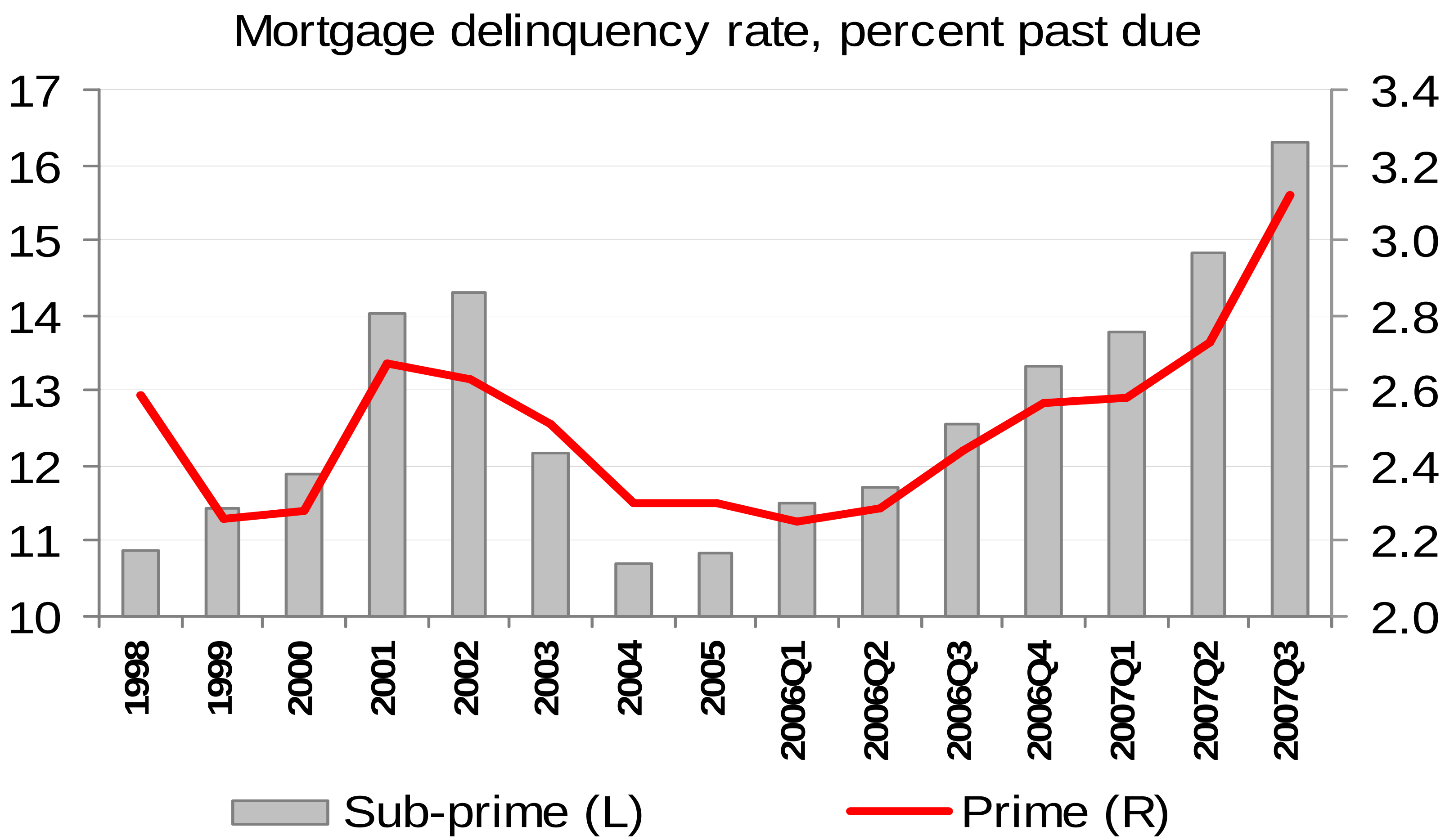
MIT Center for Real Estate

Subprime Market will implode!

[Wheaton, 2005]

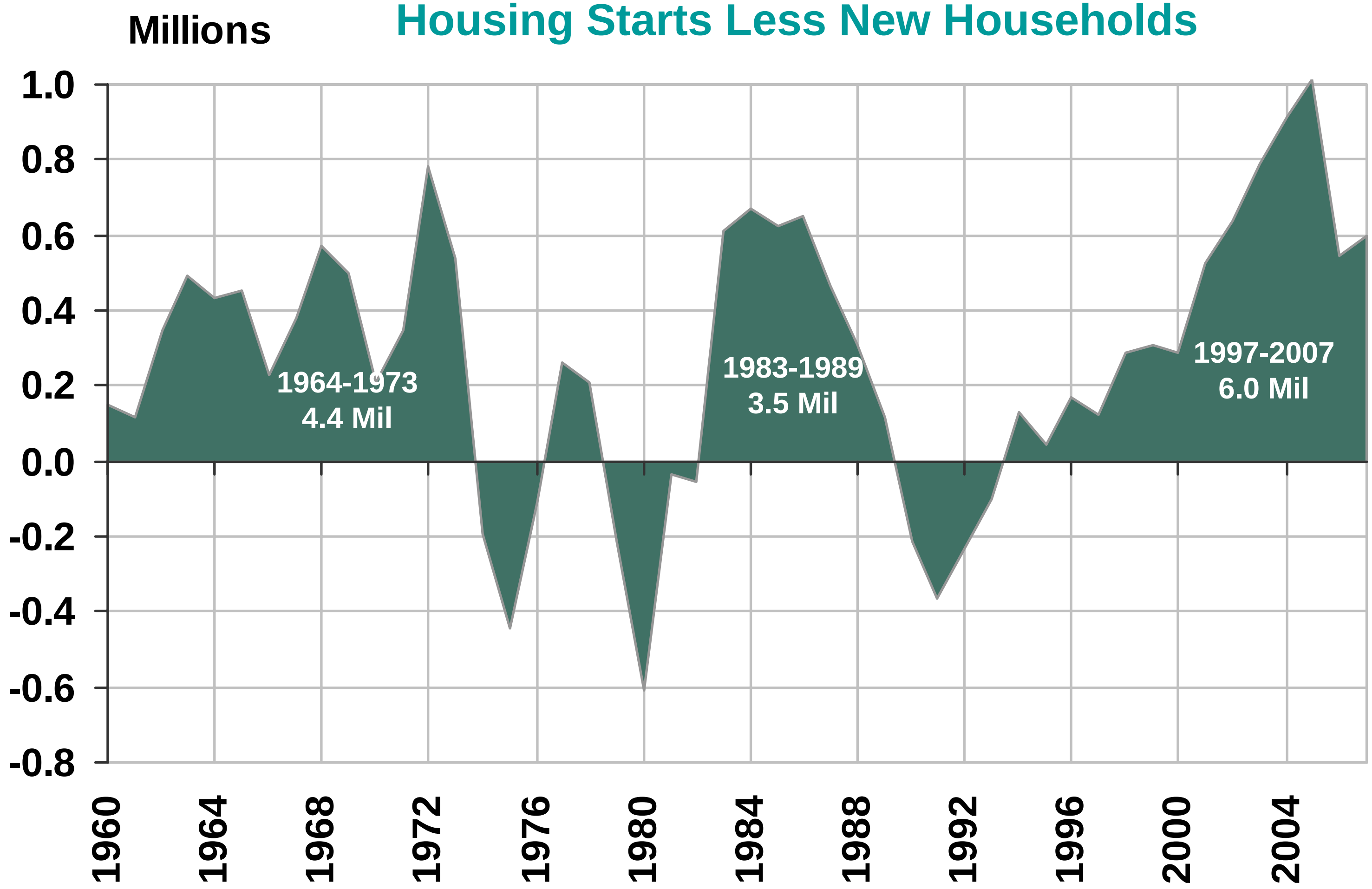


Mortgage Delinquencies and rising foreclosures mean a return to renting. How long will it continue?



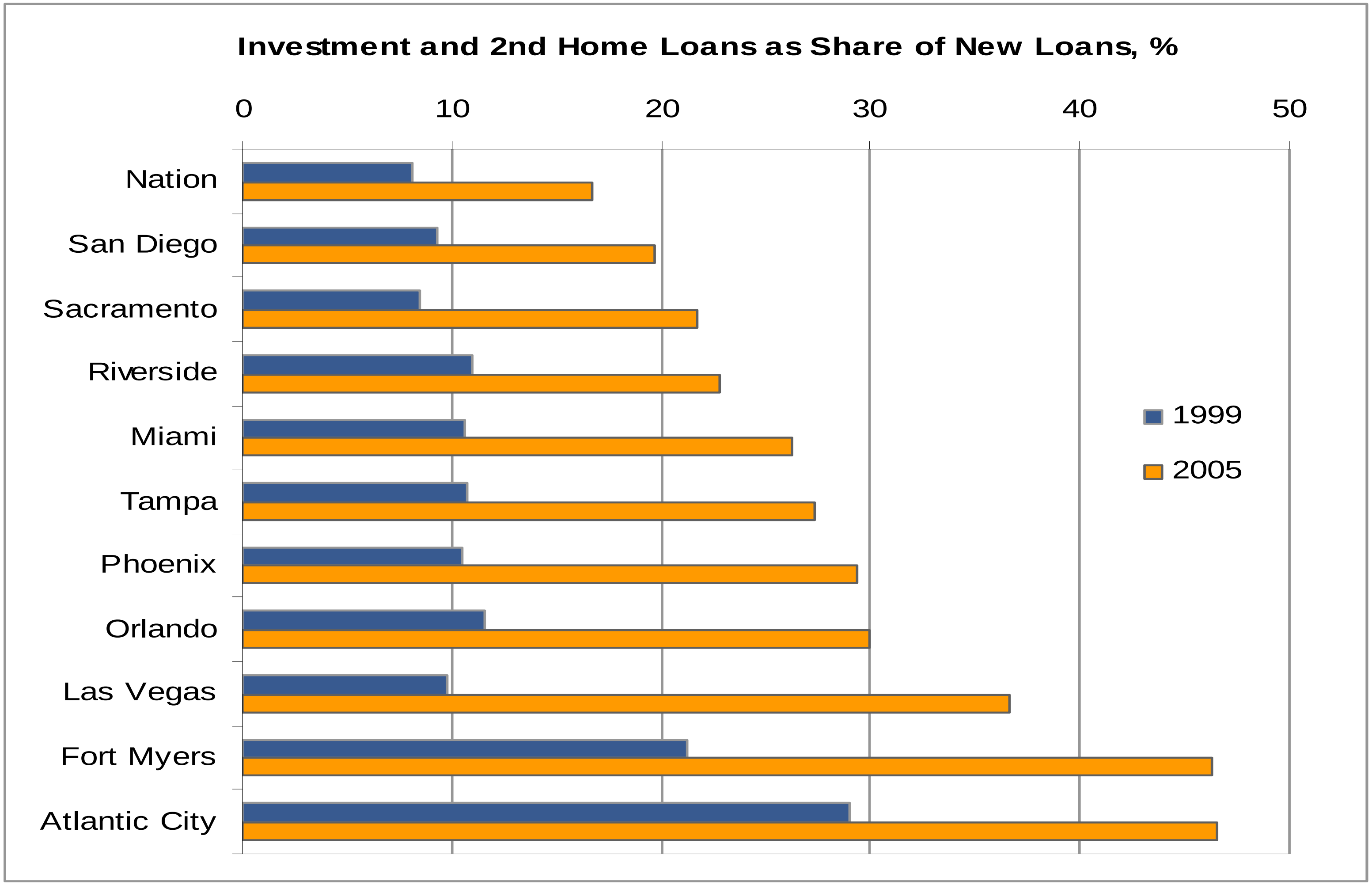
Source: MBA.

In addition, housing production has outstripped household formation by more than at any time previously



Sources: Bureau of the Census, Moody's Economy.com, Torto Wheaton Research.

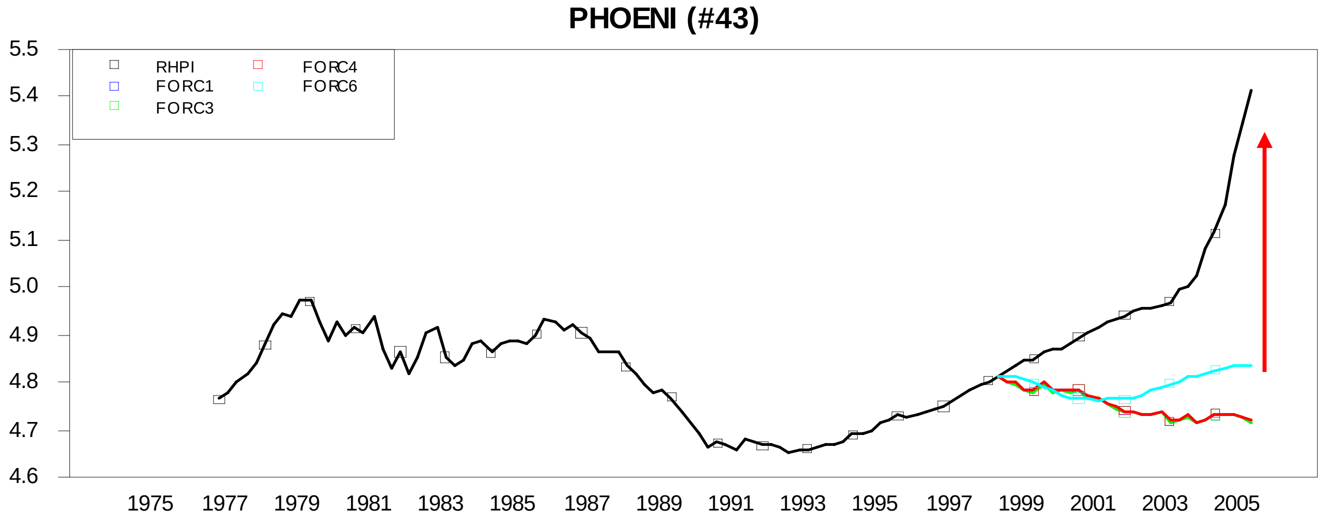
Individuals "Discover" Real Estate and Gobble up the Excess Supply as Investment and 2nd Homes

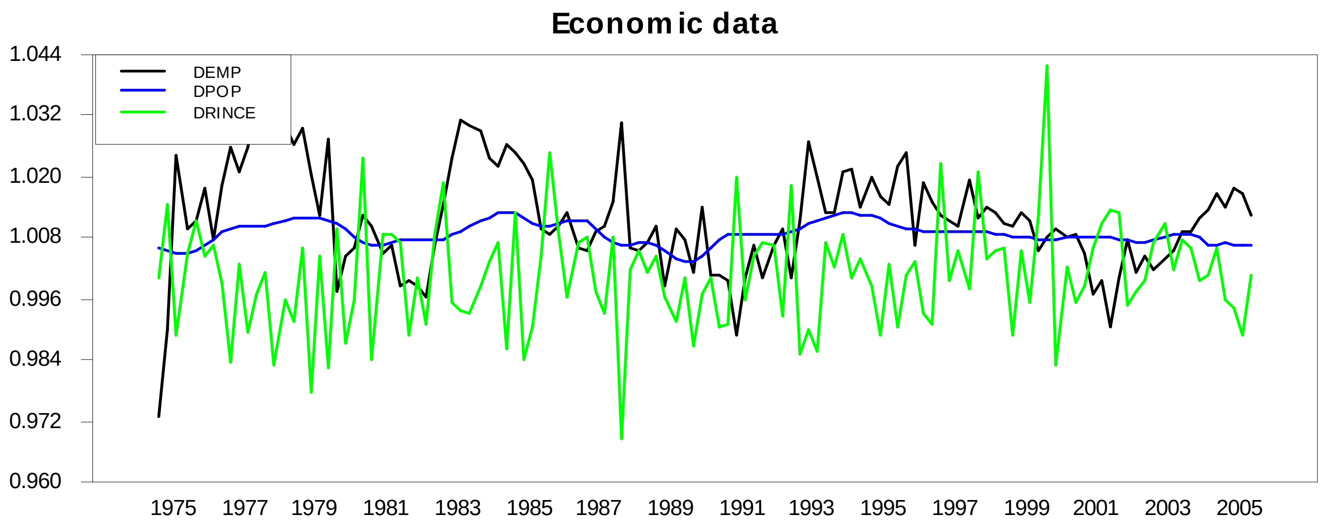


Source: Loan Performance, Torto Wheaton Research

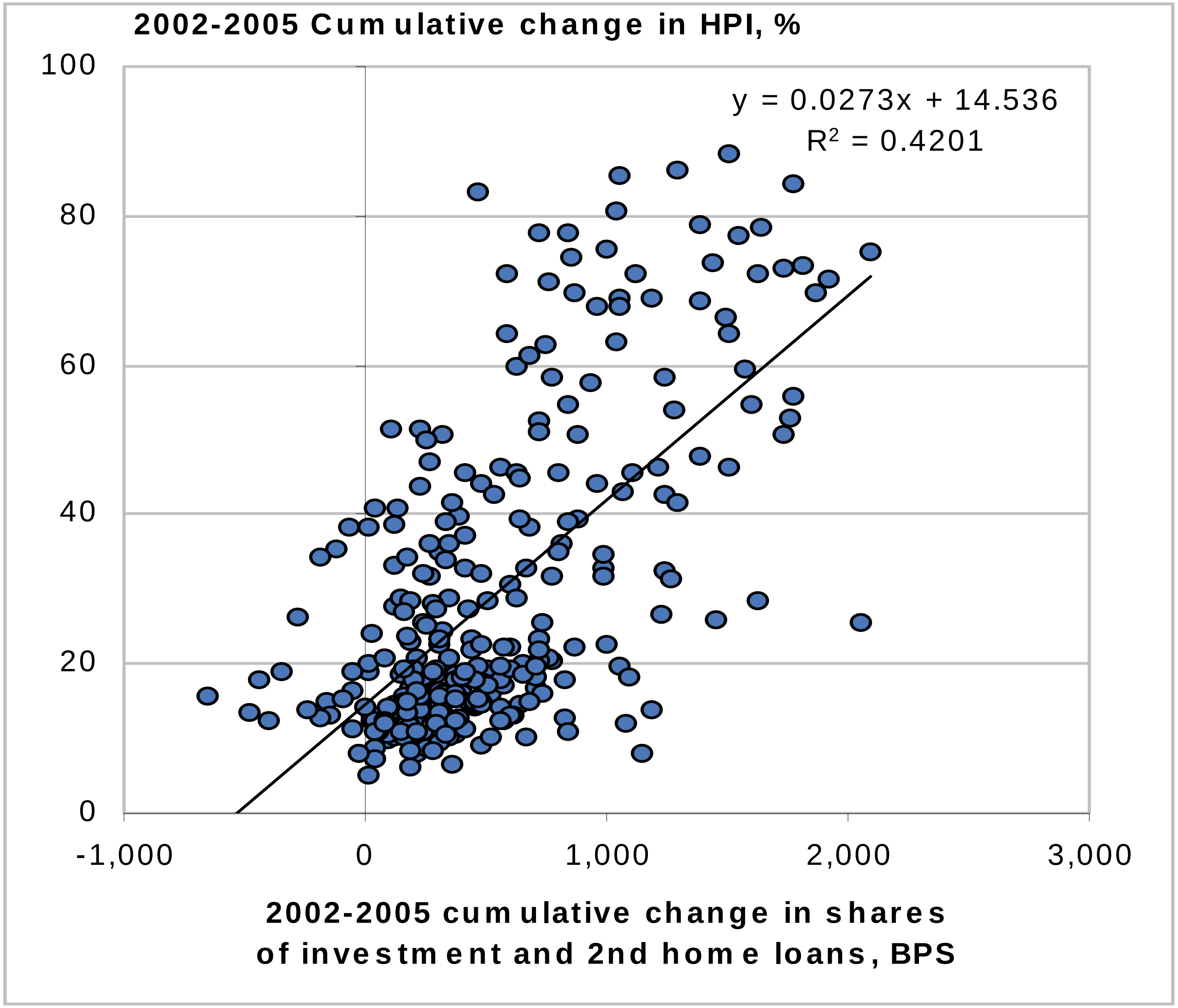
MIT Center for Real Estate

Phoenix Prices 1998-2006 cannot be explained by *Phoenix area* economic fundamentals





The simple statistics are suggestive: prices appreciate more where second home buying is on the rise.

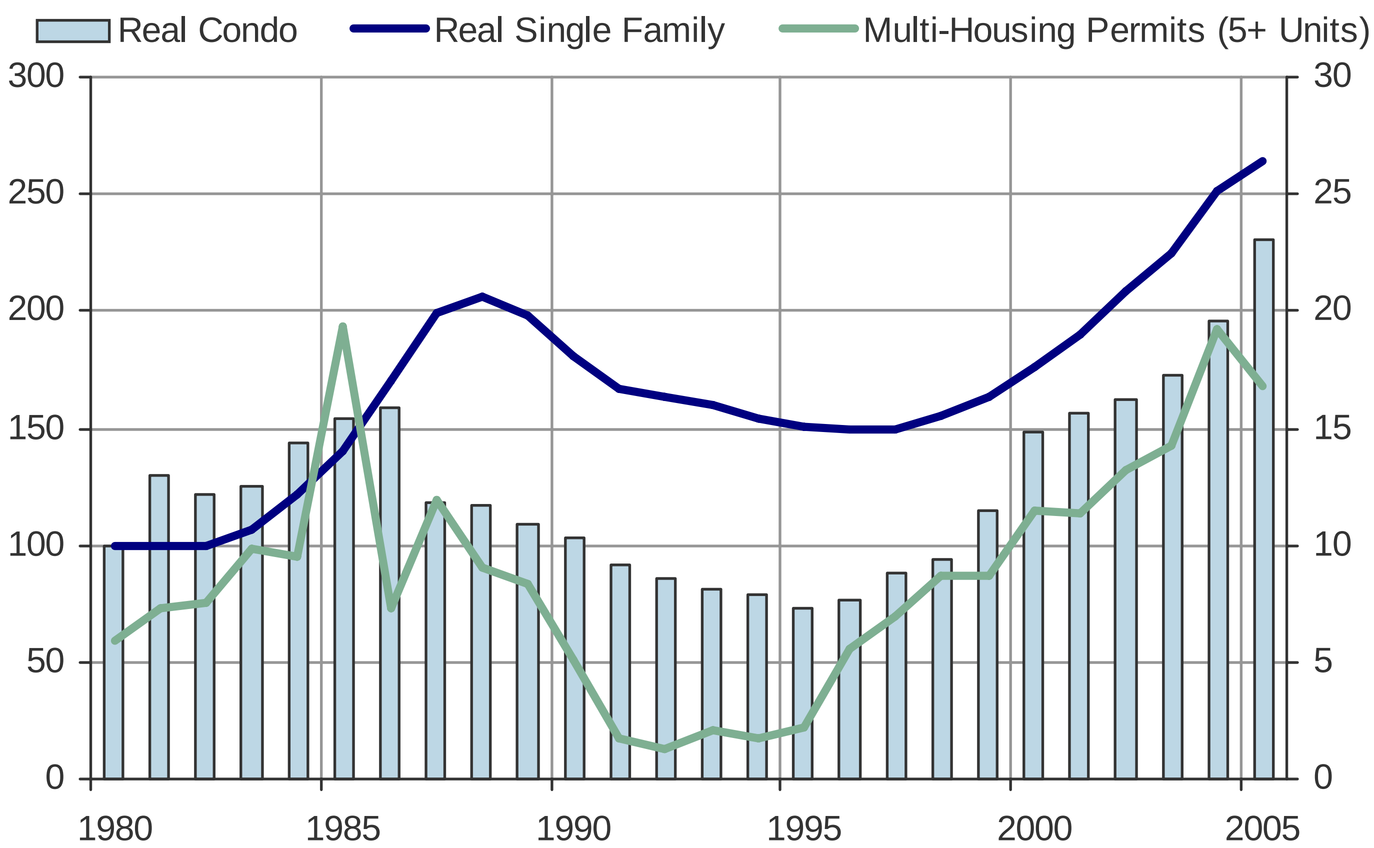


MIT Study: Investors/2nd Homes also are Prevalent in Center City Condo Markets

- **Study areas: Boston, Atlanta, Chicago, San Diego**
- **Survey of 47 new condo projects covering 11,000 units found 32-38% of *new sales* to "non-occupiers"**
- **Analysis of tax records showed 23-30% of *all city condo* tax bills sent to different address**
- **Largest non-occupier share in San Diego, lowest in Atlanta and Boston**

MIT Center for Real Estate

2nd homes contribute to the greater volatility of condos relative to Single Family Homes: NYC



Price stability requires a drop in duration, which requires a big reduction in the For Sale Inventory. Net flows into (+) and out (-) of the Inventory : history and a recovery scenario

	Average Annual Change, Ths.		
	2001-2005	2006-2007	2008-2010
Total households	1,100	1,200	1,200
Owner Households (-)	1,100	450	600
due to overall growth	700	800	800
due to changes in homeownership rate	400	-350	-200
Total completions	1,700	1,750	1,000
Completions for Sale (+)	1,450	1,500	700
Demolitions (-)	200	200	200
Net Conversions from Rent to Own (+)	200	100	-200
Non-Occupier Demand* (-)	200	200	200
Change in For Sale Inventory	**150**	**750**	**-500**

** Demand for 2nd homes and "investments" from domestic and foreign buyers.*

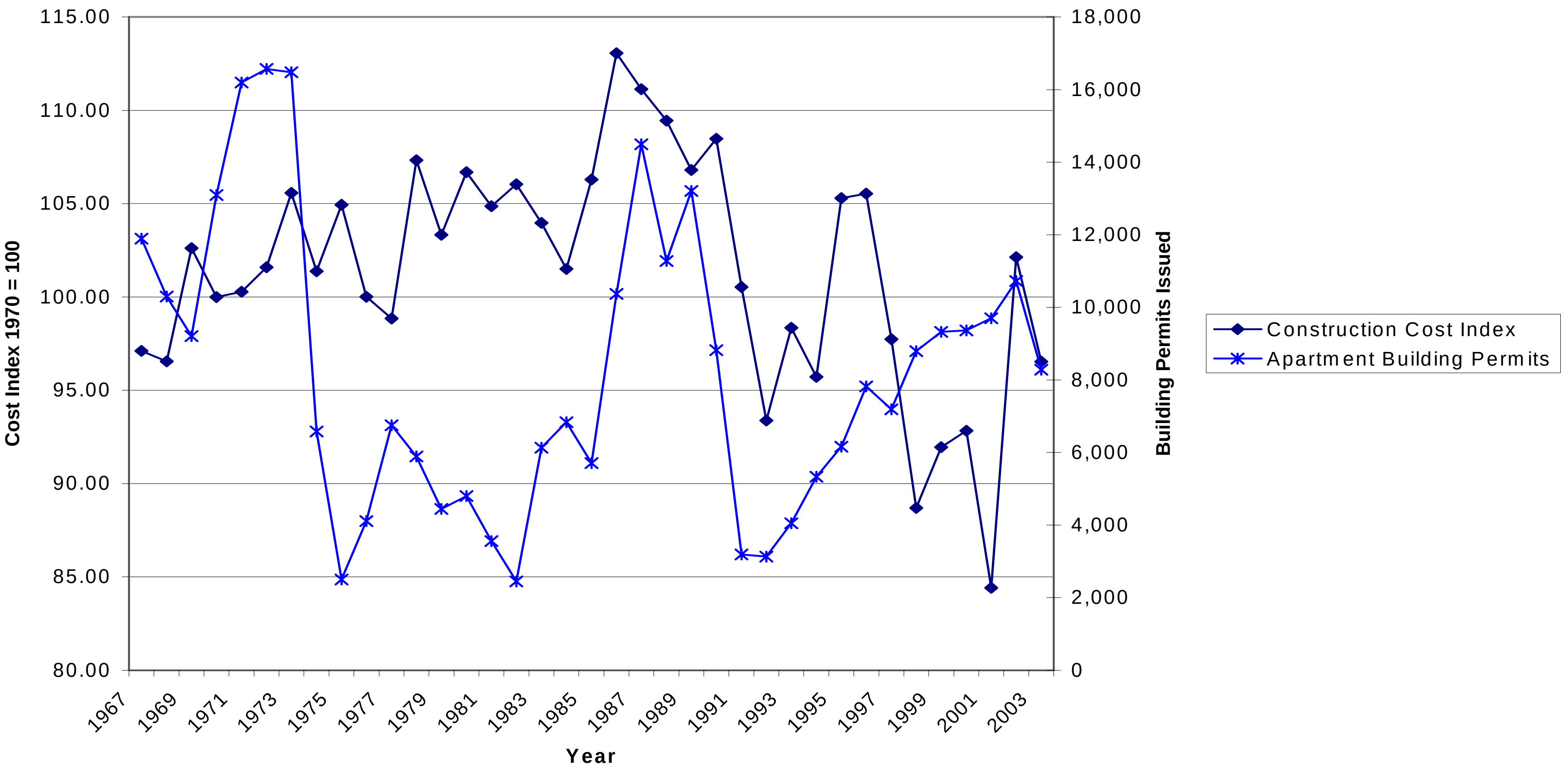
What we *do and don’t know* about Housing Supply!

- Do construction costs move with the “cycle” (i.e. does land really get all excess profits)?
- Why are construction costs so variable across the country (when many inputs are tradable)?
- How important is “time” or “delay” in adding to cost? More than just interest expense?
- How is the industry organized differently in fast as opposed to slow growing areas?
- Maintenance and Investment in existing structures.

MIT Center for Real Estate

Construction Costs: Declining gradually in constant $, and immune to the level of building activity

Figure 34:
Washington, DC Apartment Construction Real Cost Index vs New Apartment Supply



Housing construction during the cycle: Starts → Inventory → Completions

[Inventory of Units under construction, 1000s]

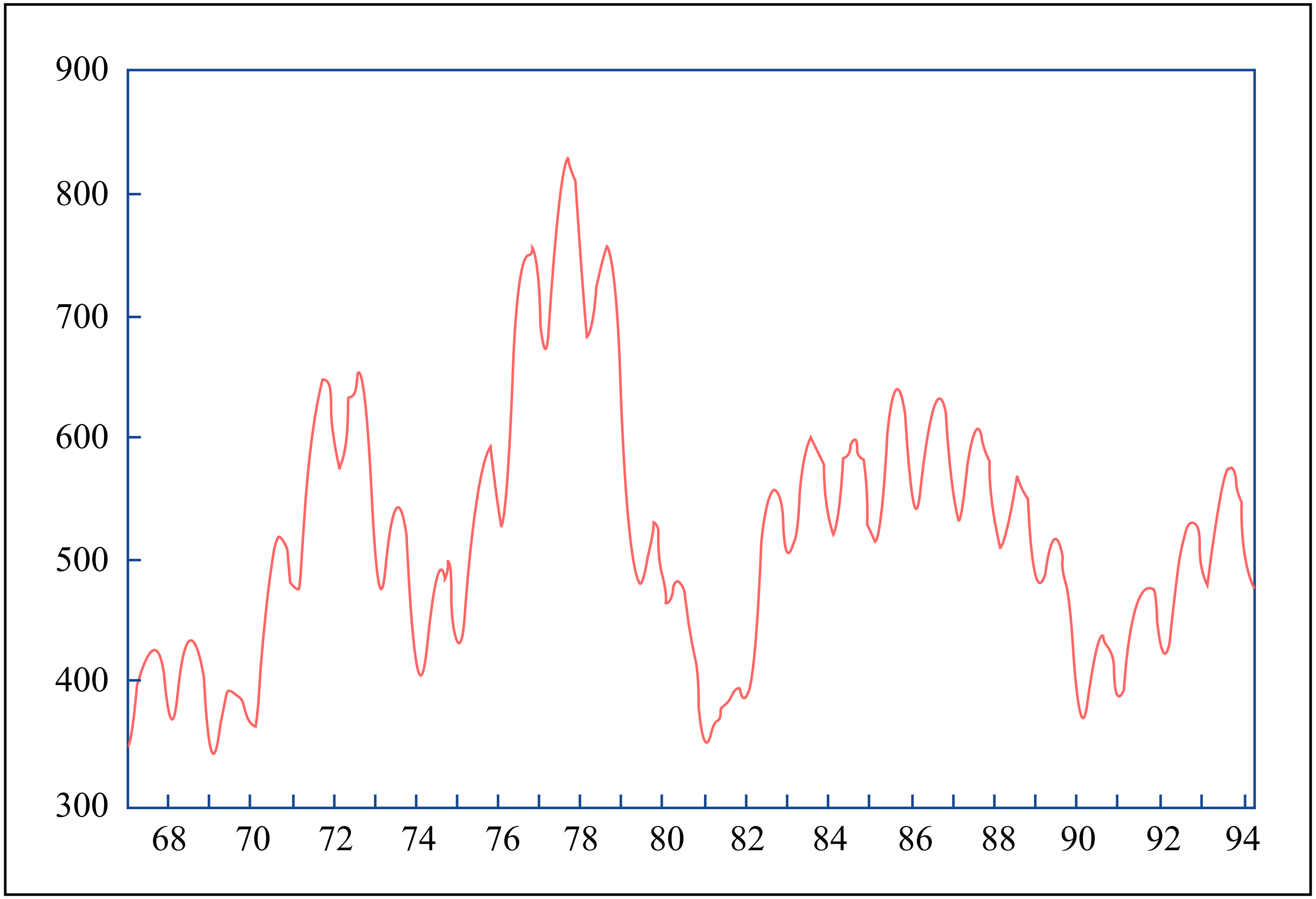


Figure by MIT OpenCourseWare.

What impacts the concentration of the Home Building Industry (T. Somerville)?

- Builders are "bigger" in high volume MSA markets (i.e. each builds more).
- Concentration (e.g. top 10 share) does not change as market volume and market size vary.
- Thus high volume markets do not have more, same size builders, but rather the same number of builders – each building more units.
- Equals = Monopolistic competition.
- Larger # of regulatory agencies (towns) leads to a greater number of smaller builders. Why?

Maintenance, Improvements, and expansions as "Supply"

- It is rational to let buildings eventually deteriorate. With discounting, the net benefits of maintenance decline over time.
- Major improvements, expansions constitute a huge annual market (30% as large as new development).
- Improvements are "rational" and are more likely to occur when housing is a "good investment" (i.e. low P and high expected **ΔP/P**).
- The Elderly improve less = another way of consuming your housing equity! (instead of a reverse mortgage)