Interest Rates and Fundamental Fluctuations in Home Values

Albert Saiz

Focus

Changes in the user cost of capital driven by lower interest/mortgage rates and financial innovations (risk premium on real estate investments)

Without a doubt, these have been the main factor used to explain evolution of housing prices during the boom

Real Estate Valuation

Gordon valuation model (Poterba, 1984)

$$V = \frac{r}{i - g}$$

Cap rate method (income comparables)

$$V = \frac{r}{c}$$

Comparables

Agenda

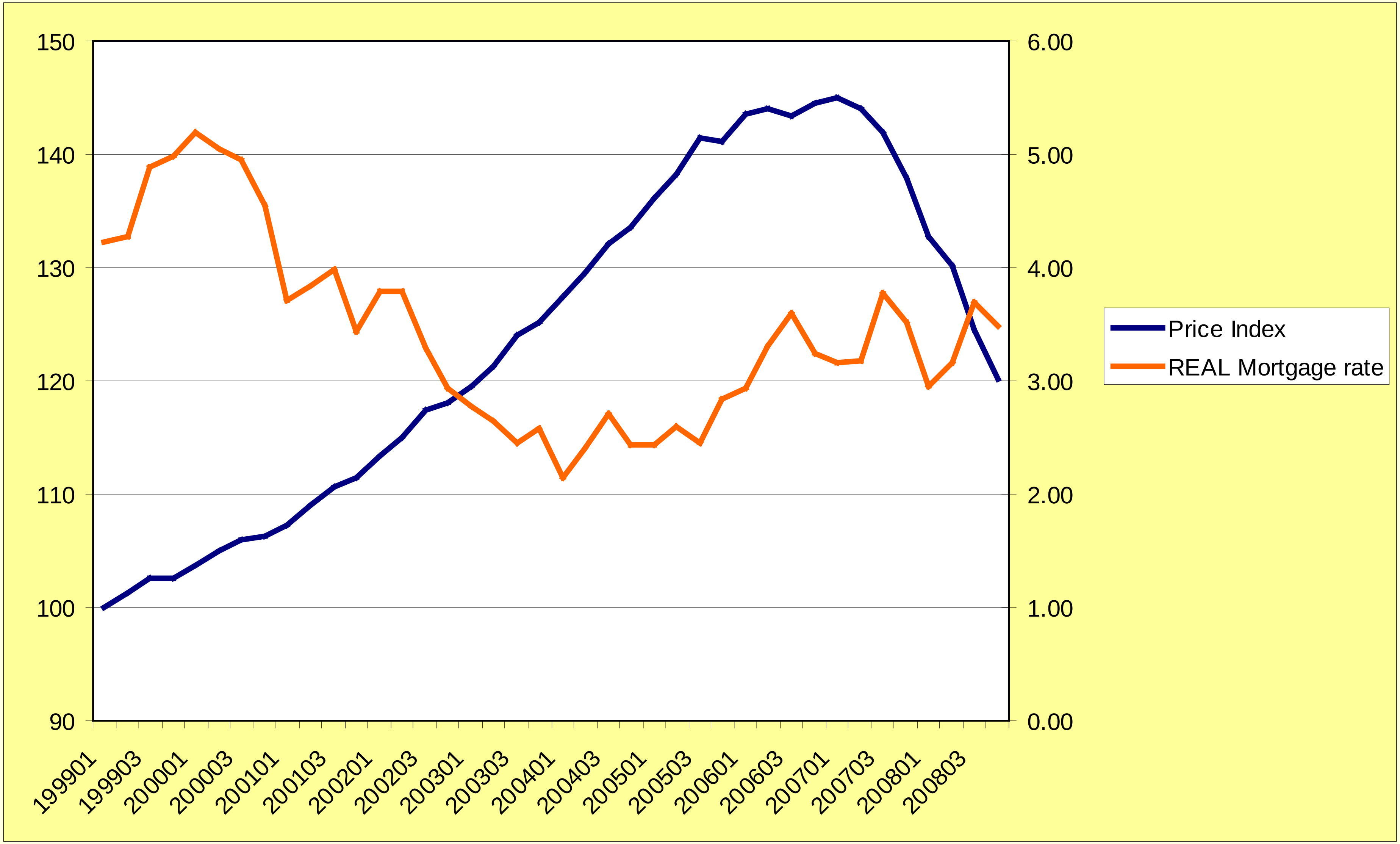
Combine the urban economics model (Alonso-Muth-Mills) with the asset pricing (Poterba, 1984) approaches

Study impact of changes in user cost of capital

Examine the roles of:

- Replacement costs
- Housing/land Supply elasticity
- Demand for space
- Rent endogeneity
- Heterogeneity in rents

Parsimony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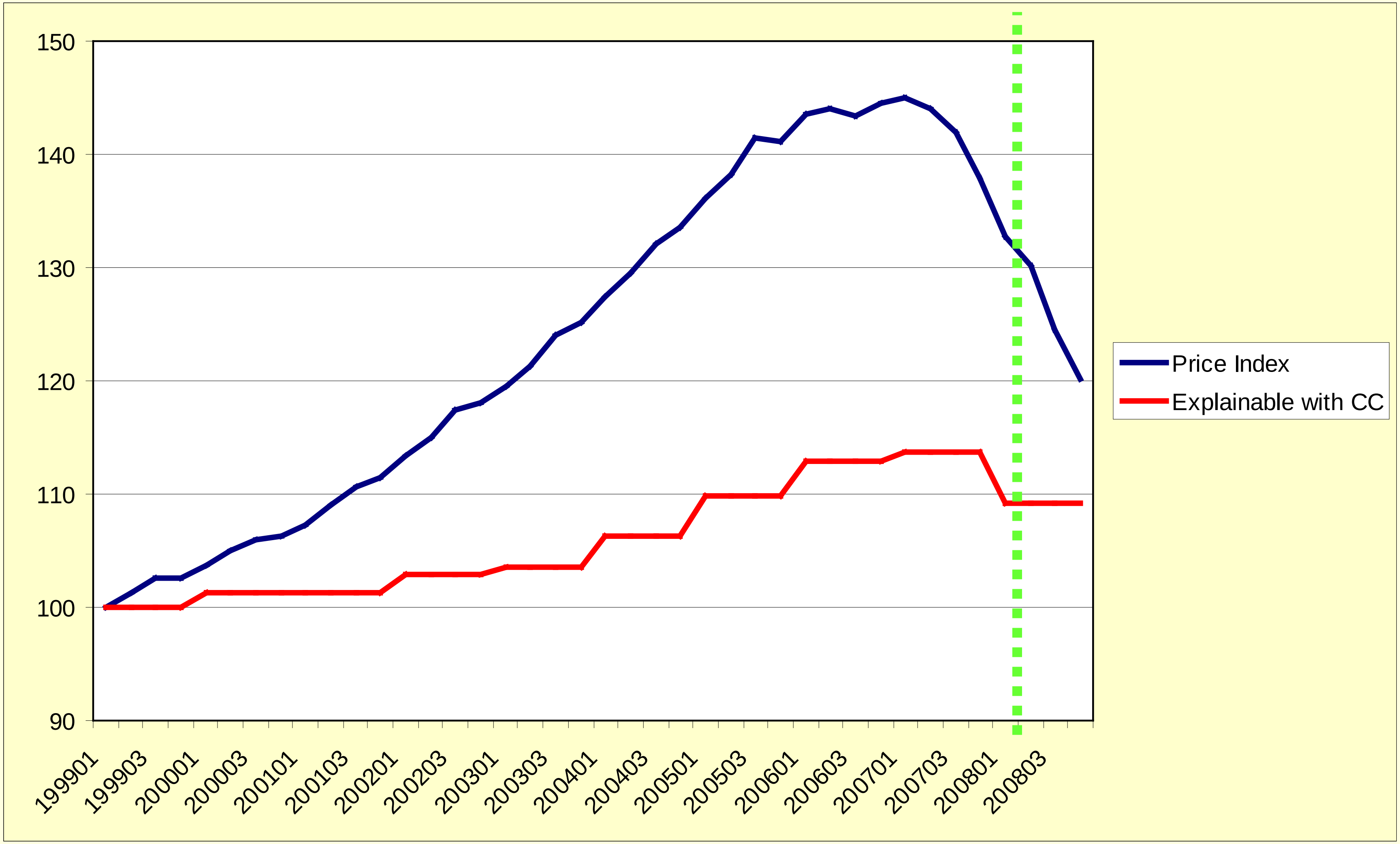
REAL Mortgage rate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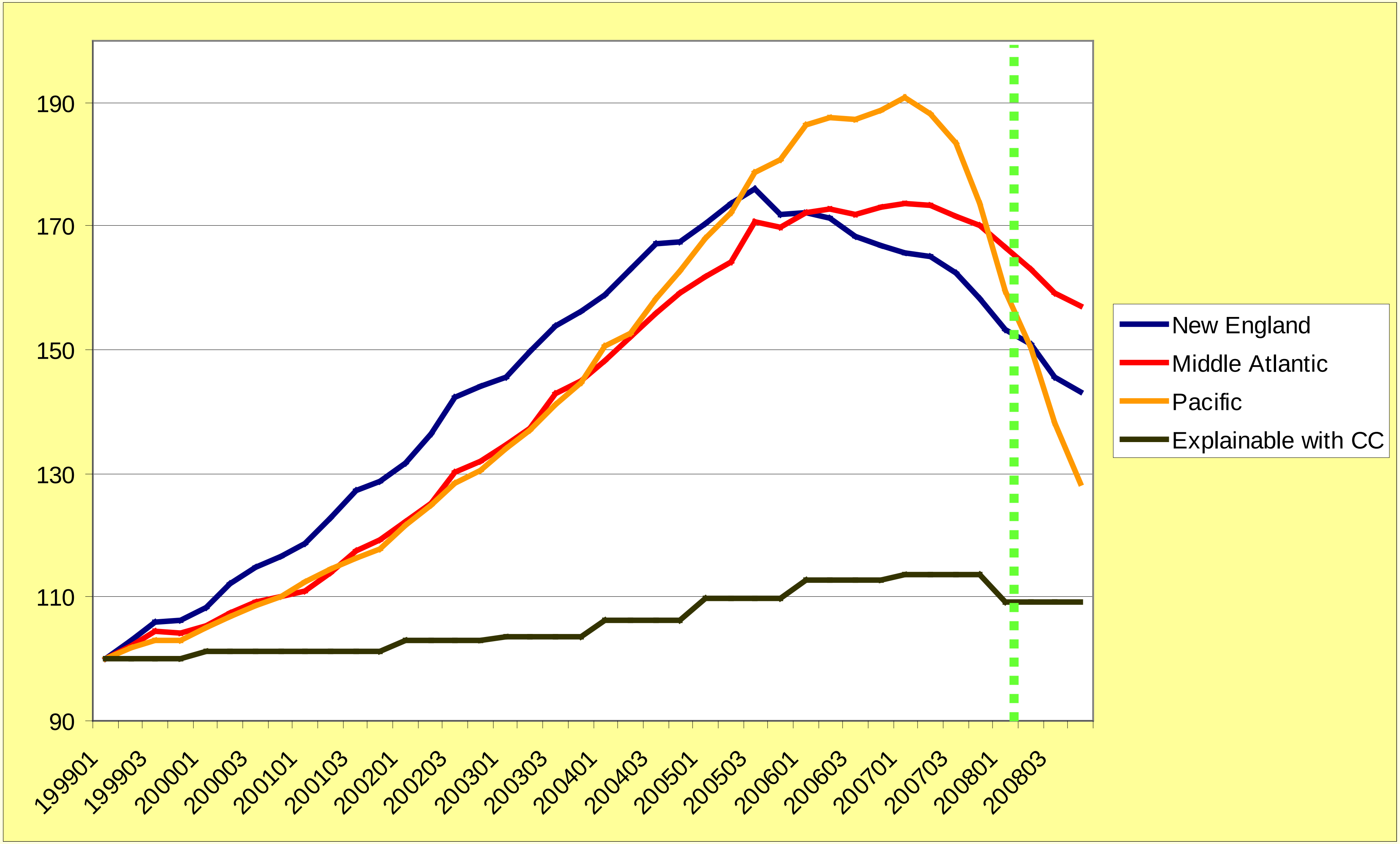
Price Index
Explainable with CC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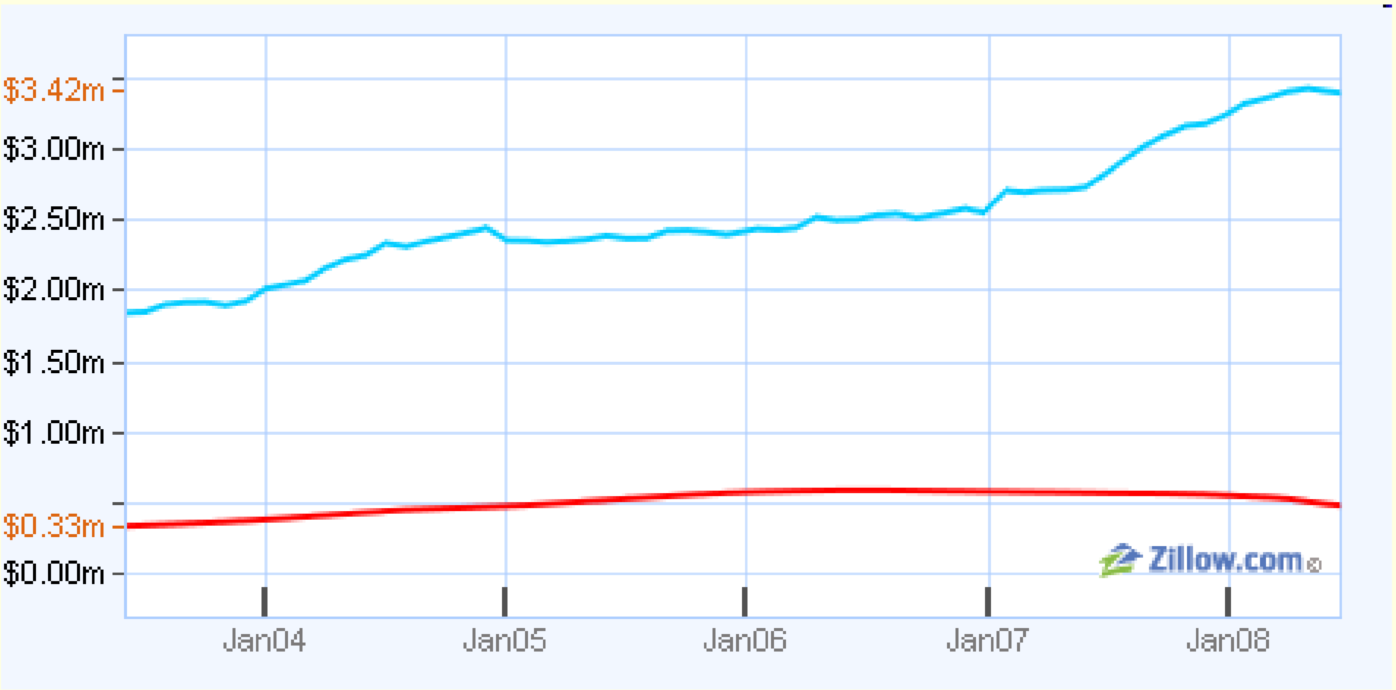
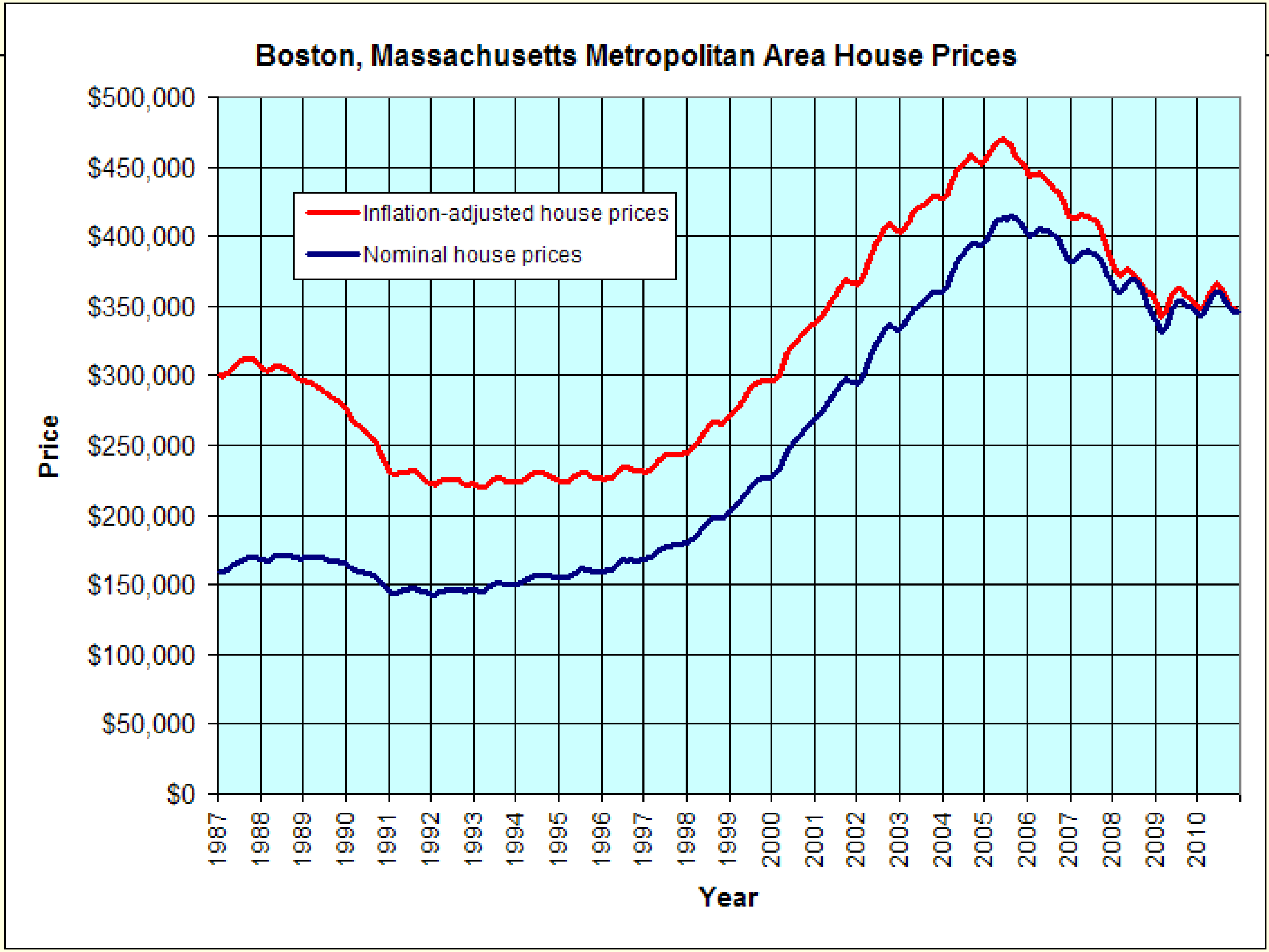
Pacific
Explainable with CC

*Beverly Hills **(Zip Code 90210):** from Matt Kahn*





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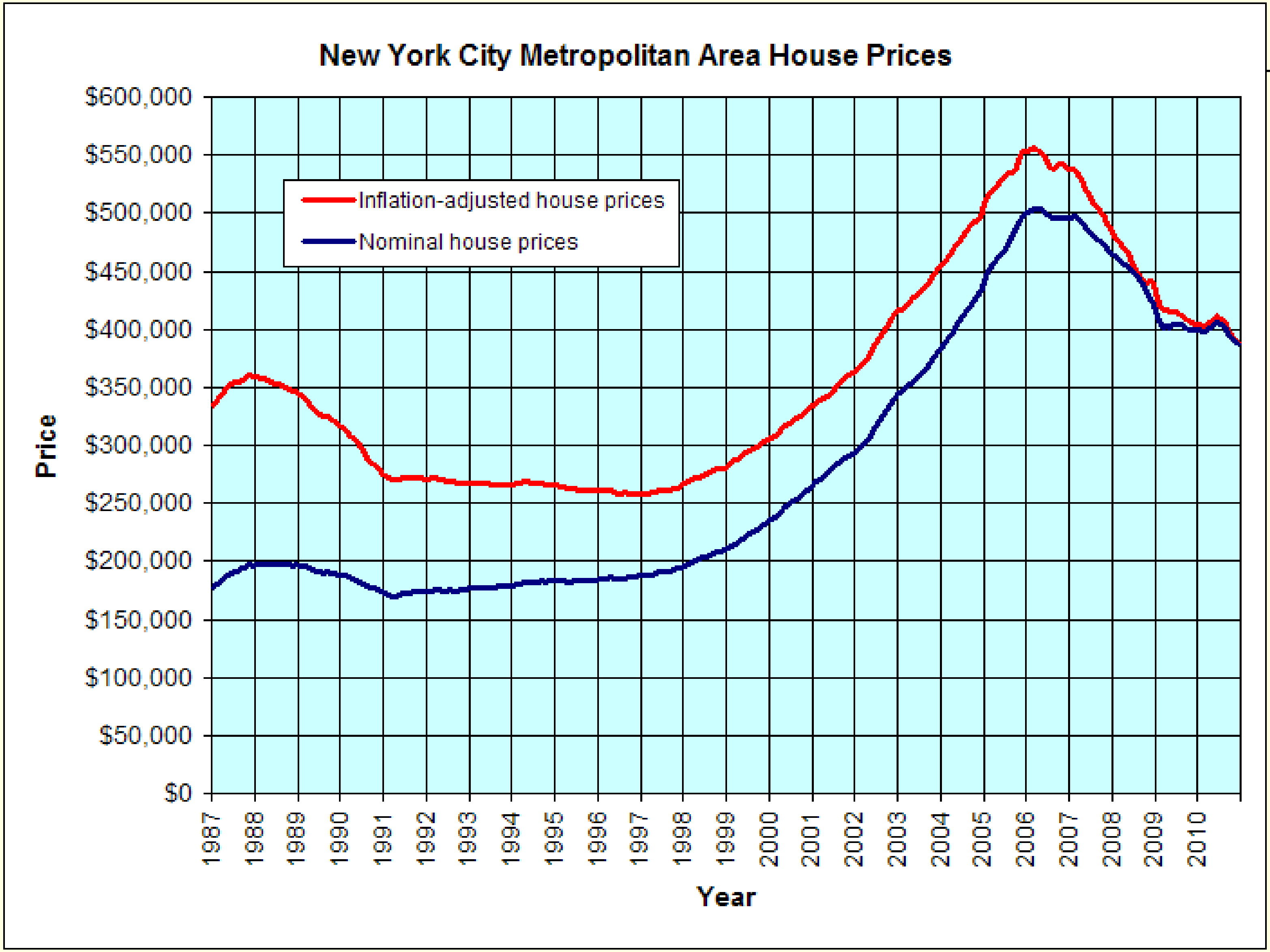

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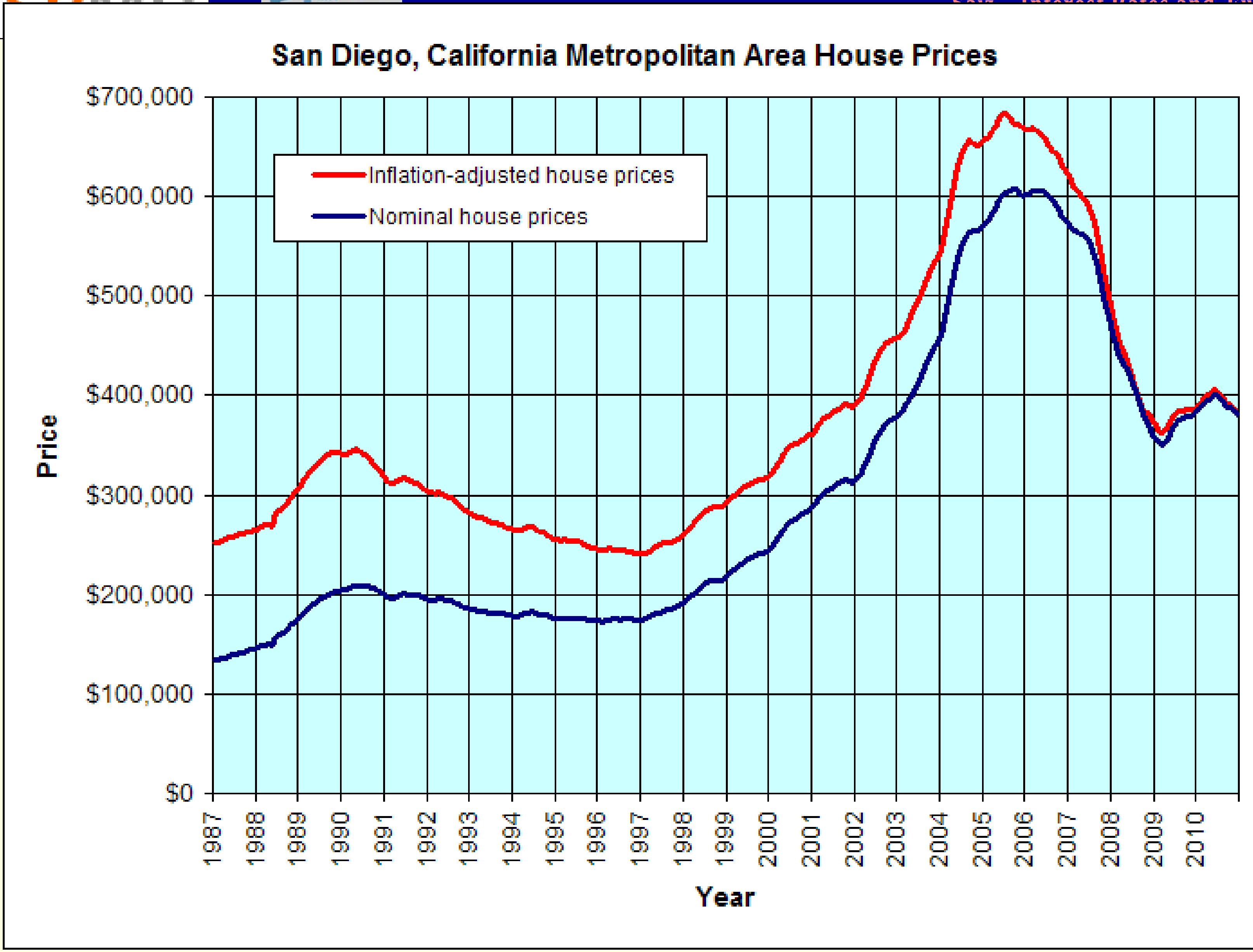

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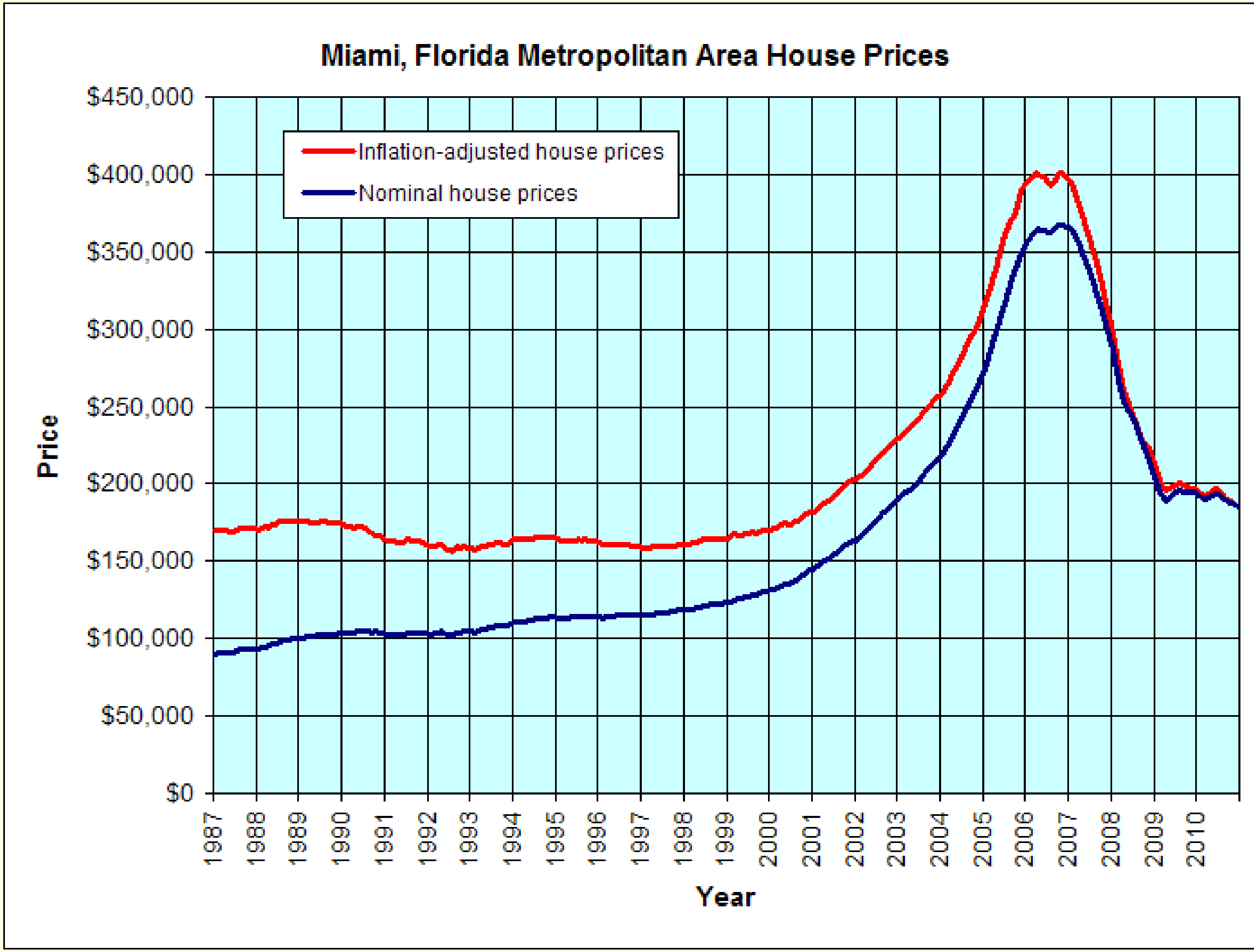

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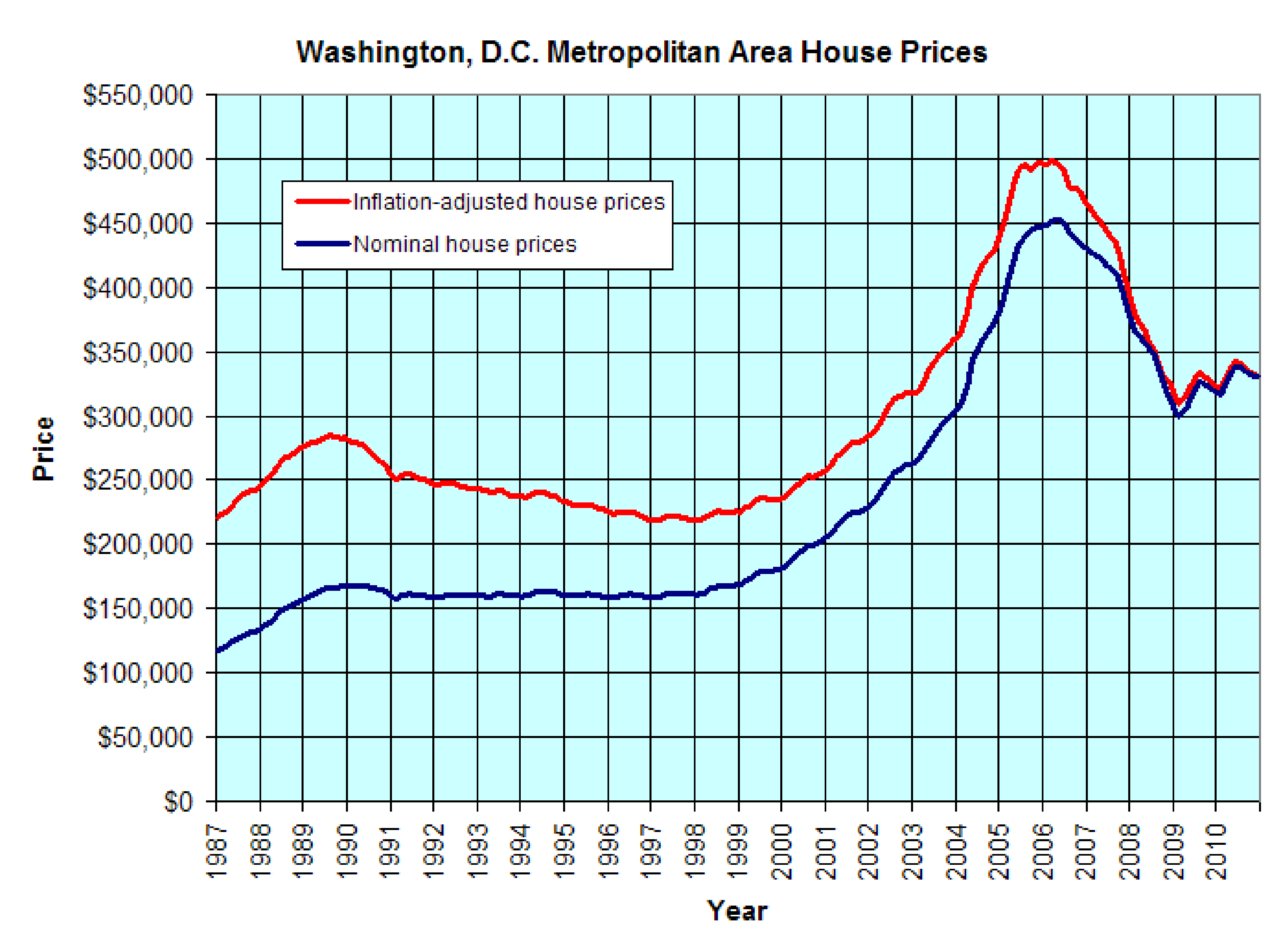
Washington, D.C. Metropolitan Area House Prices
Inflation-adjusted house prices
Nominal house prices
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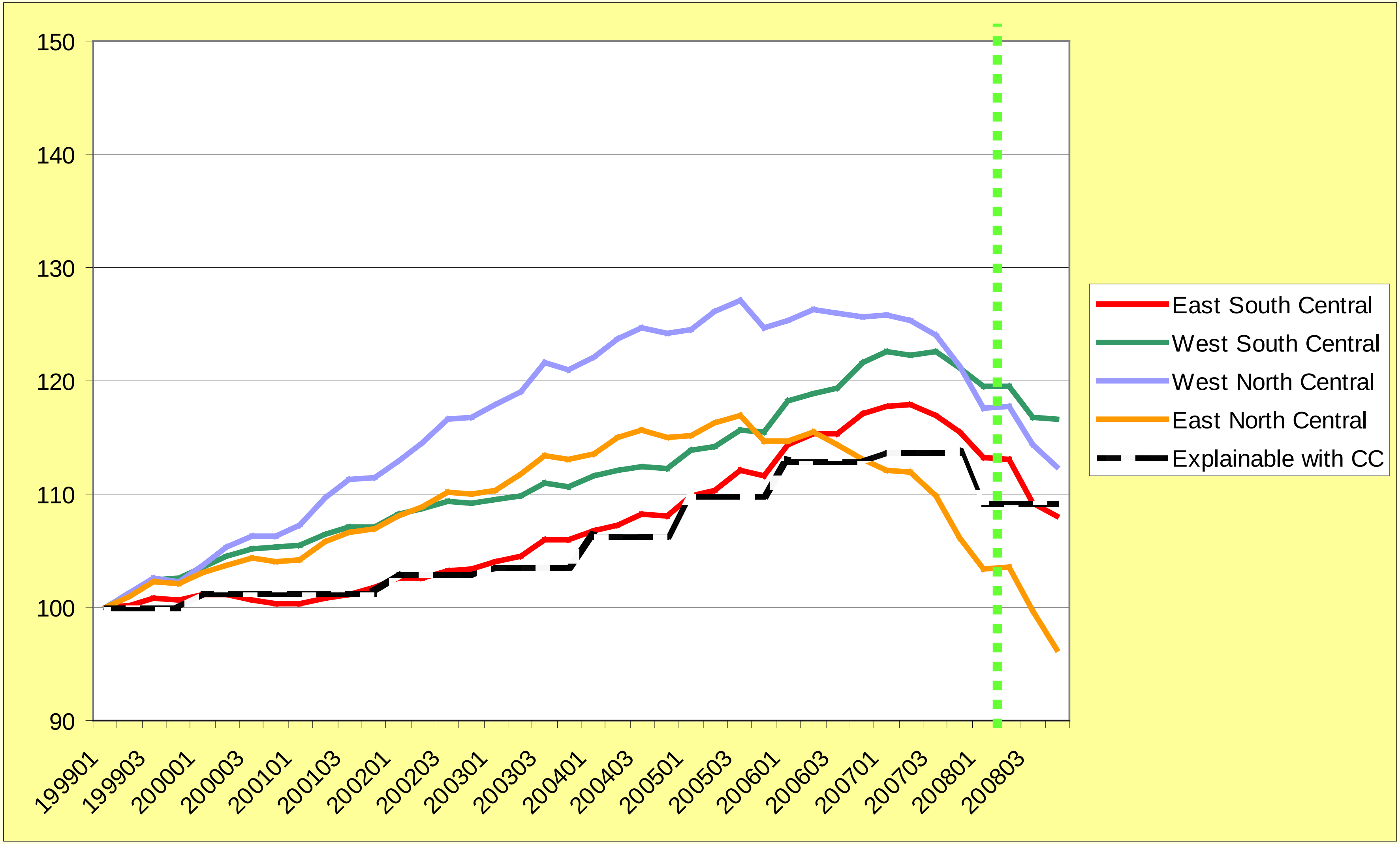
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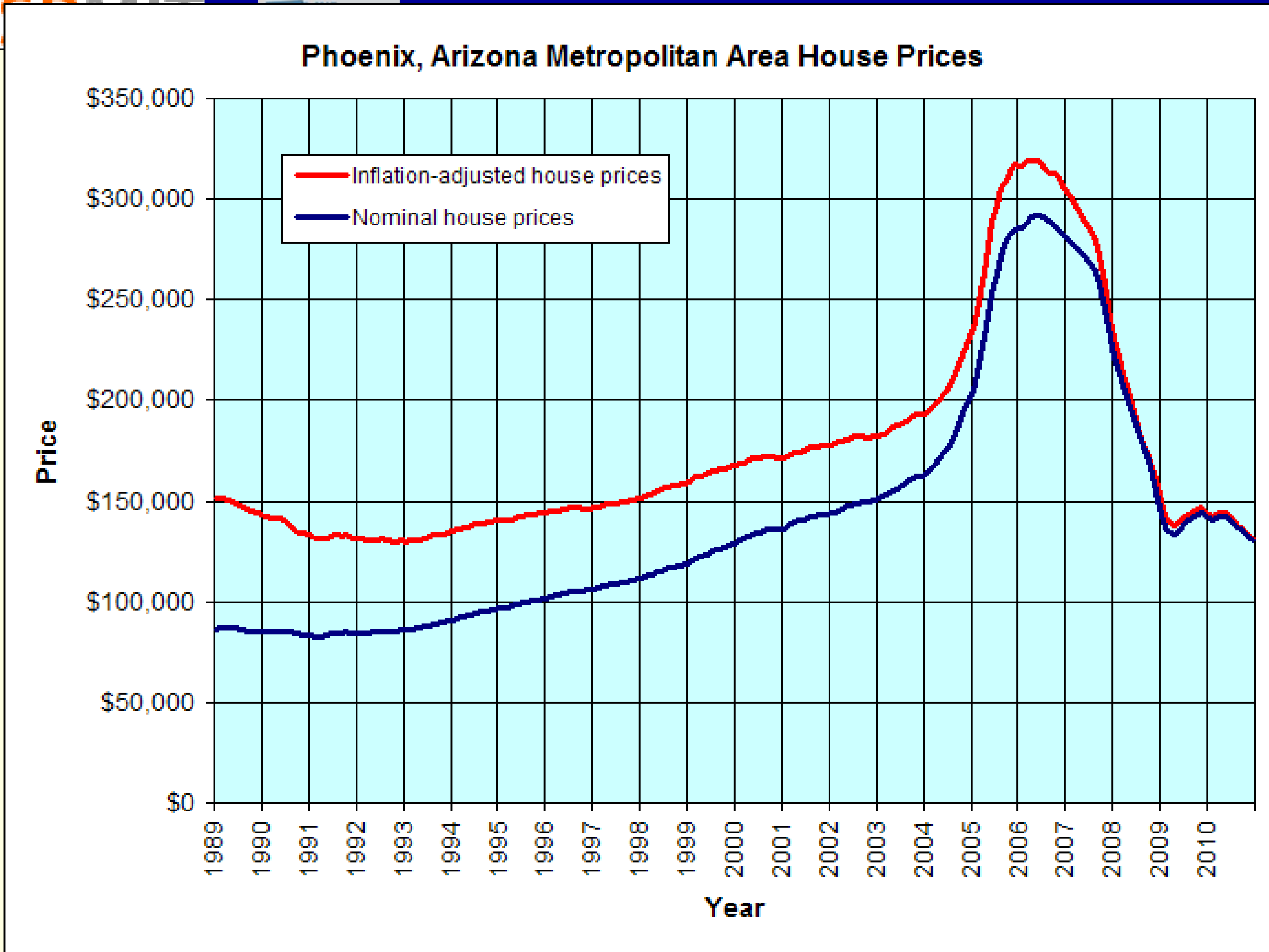

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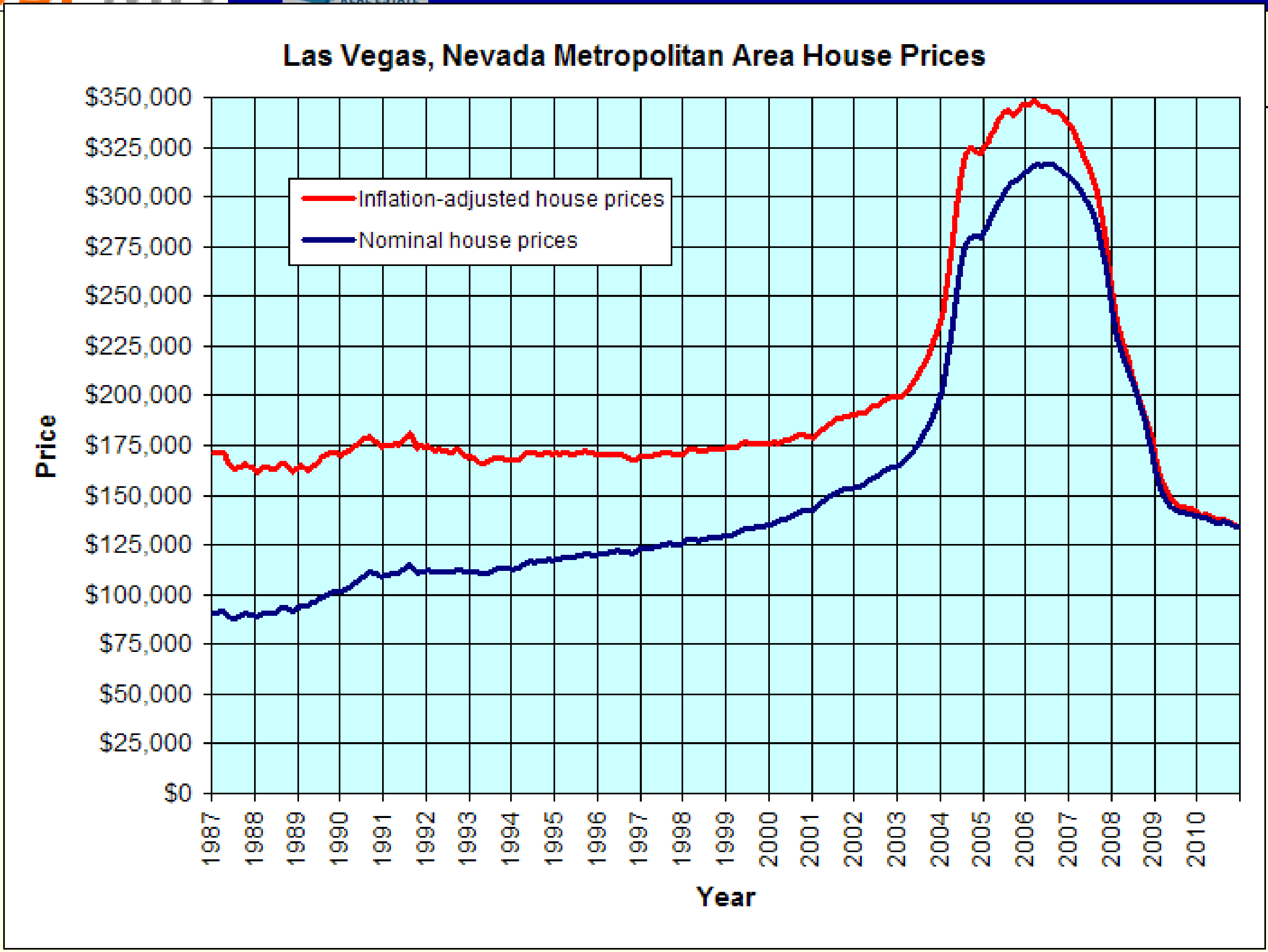

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The Model

Most parsimonious AMM that captures main issues

Owner-renter assumption

In this paper I conceptually and conventionally assume everyone is a renter

Arbitrage between buyers: landlords versus owner-occupiers

Can think of owners as leasing property to themselves

Consumer Utility

$$U(C_k, d, h) = w_k - tD + \frac{h^{1-\mu'}}{1-\mu'} - rh$$

$$h = \left(\frac{1}{r}\right)^{\mu}$$

$$\mu = \frac{1}{\mu'}$$

Rental Price of a Housing Unit

$$\frac{dr}{dD} = -\frac{t}{h} = -tr^{\mu}$$

$$r(D) = \left[(1-\mu)\left[C_1 - tD\right]\right]^{\frac{1}{1-\mu}}$$

The Fundamental Rental Arbitrage Condition

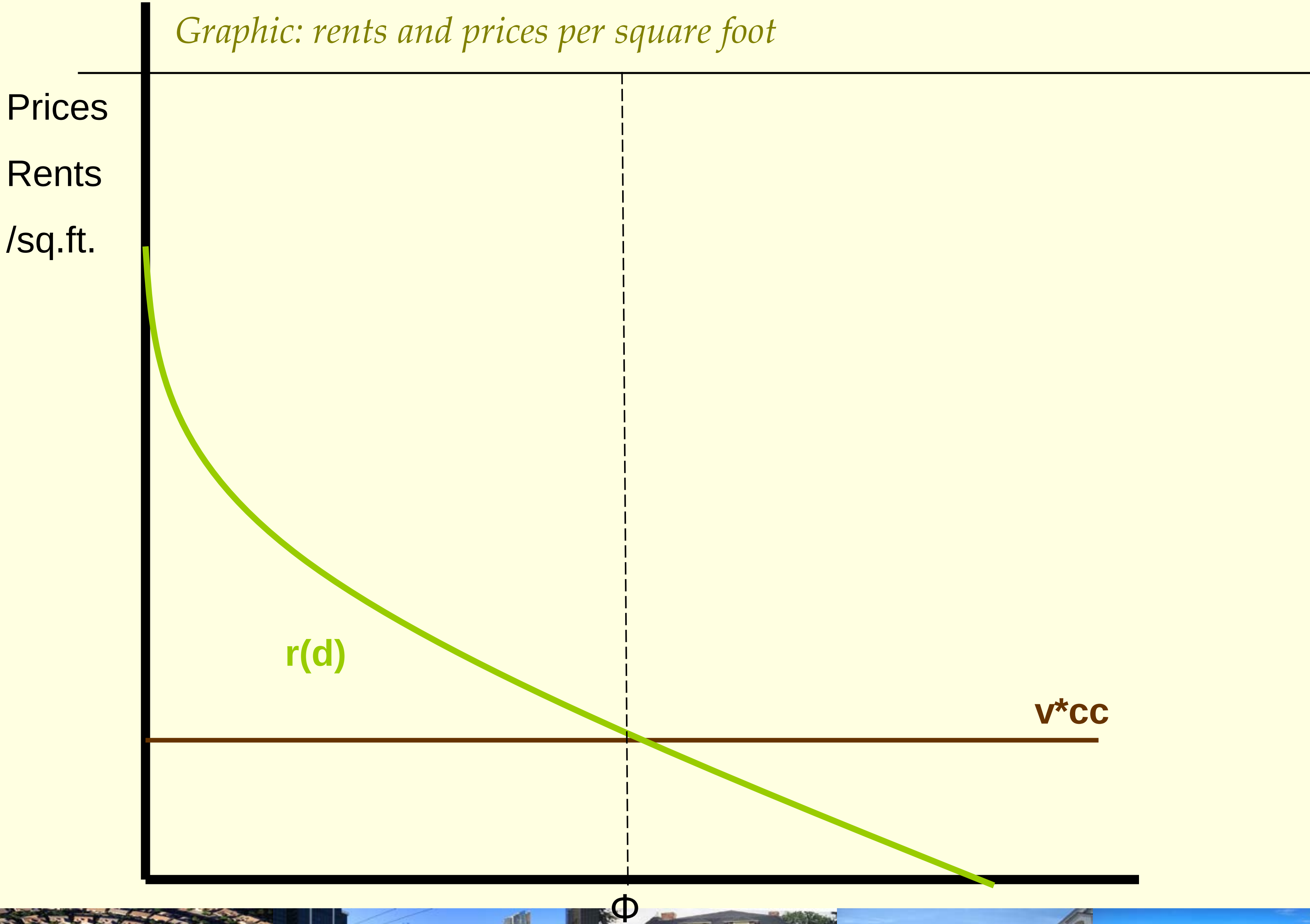
$$r(\Phi) = v \cdot cc$$

$$r(D) = \left[1 + \frac{(1-\mu)t(\Phi - D)}{[v \cdot cc]^{1-\mu}}\right]^{\frac{1}{1-\mu}} v \cdot cc$$

Ricardian markup

Leasing cost of structure

Graphic: rents and prices per square foot



Growth

Utility at border

$$V(\Phi) = w_k - t\Phi - \frac{[vcc]^{1-\mu}}{1-\mu}$$

Utility at exurbs:

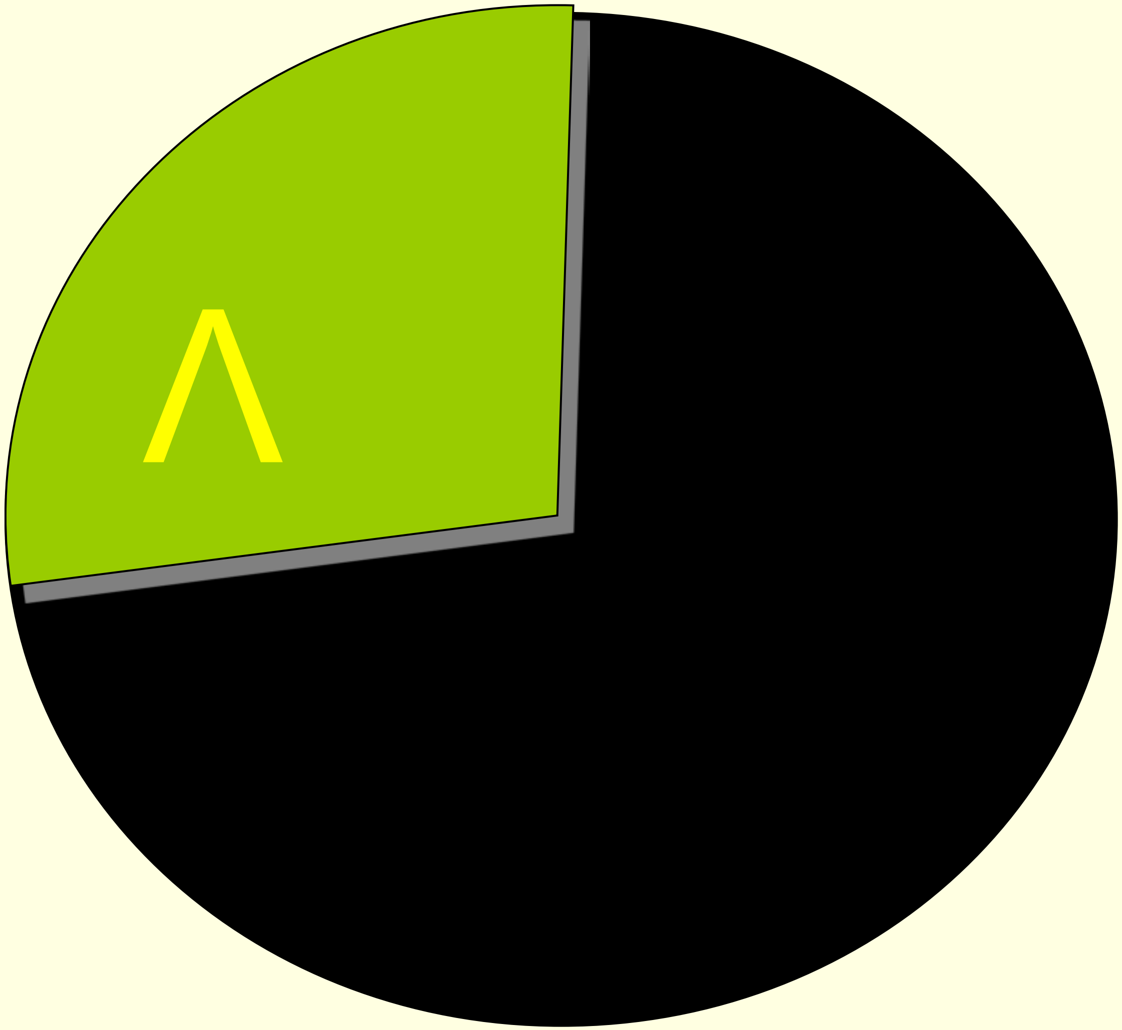
$$V(Exurb) = \underline{w} - \frac{[vcc]^{1-\mu}}{1-\mu}$$

$$\Phi = \frac{w_k - \underline{w}}{t}$$

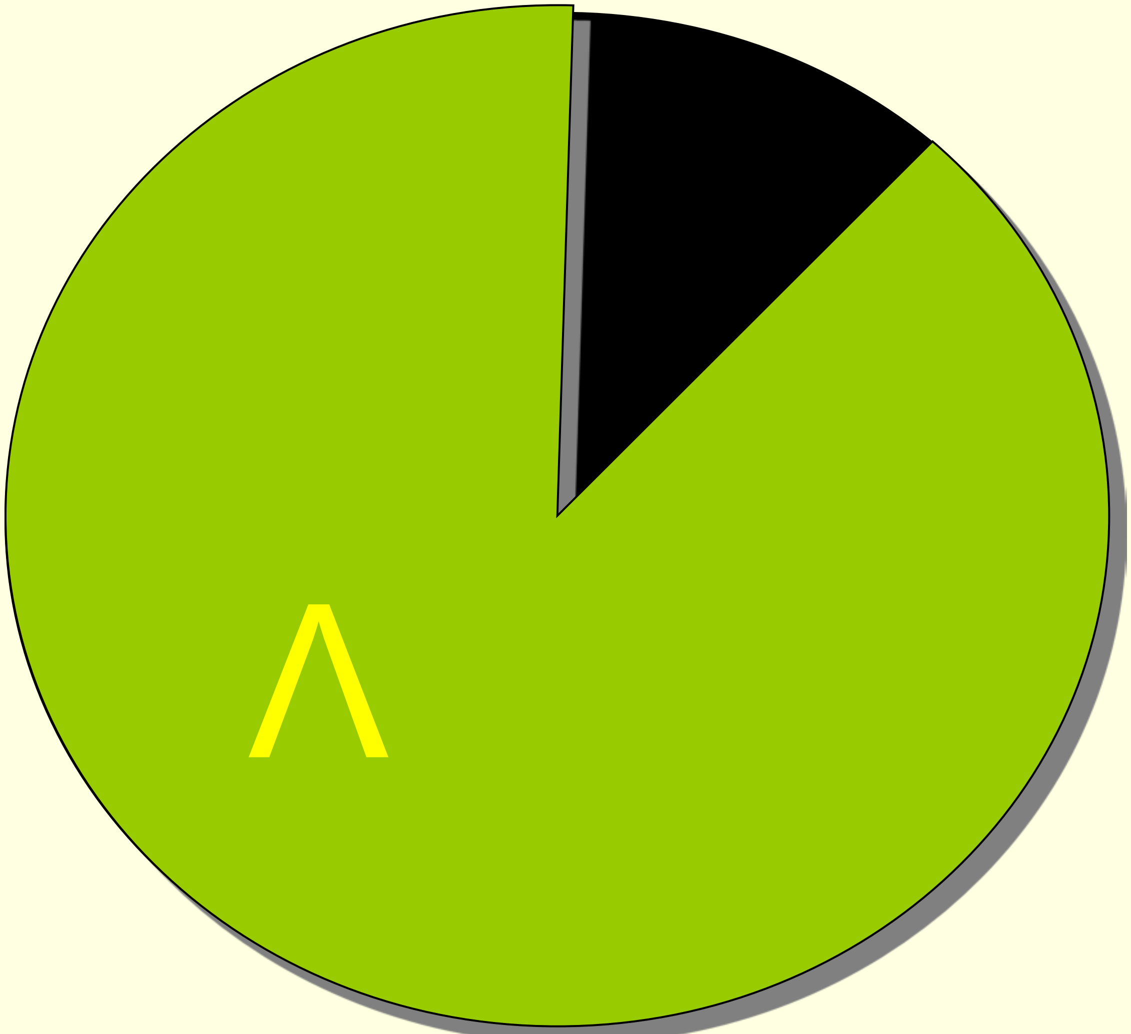
And posit:

$$w_k(\tau)$$

Radius and Population: Inelastic Land Supply



Radius and Population: Elastic Land Supply



Housing Asset Pricing Equation: Theory

At any point in time, asset market arbitrage for home-owner (can think of this as natural tendency)

Main arbitrage formula in housing markets (Poterba, 1984)

- **τ stands for time (e.g. 2015)**
- **d stands for distance to employment/amenities**

$$v \cdot p(\tau, d) = \mathring{p}(\tau, d) + r(\tau, d)$$

- **With** $v = \delta + k + (1-\theta)i - \theta\pi$ **being the user cost of the capital invested (frozen) into housing**
- **The formula simply reads: the annual cost to the owner has to be equal to the annual benefit (capital appreciation plus rent)**

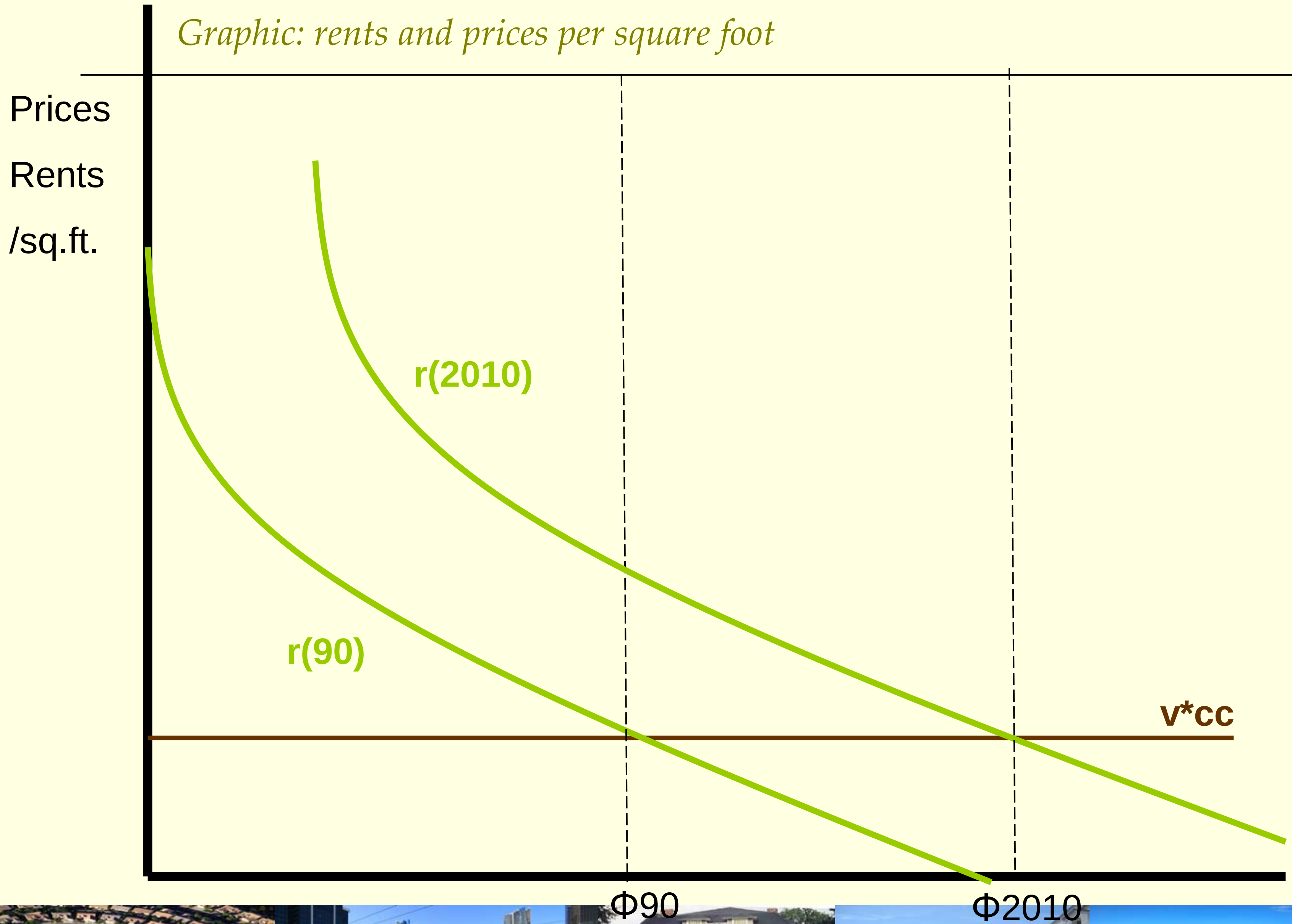
- **The previous differential equation can be solved if we have an expected rental-equivalent growth "temporal path" for every period and distance : r(τ,d)**

- **In fact, the path of rental (use value) growth is quite predictable in most markets**

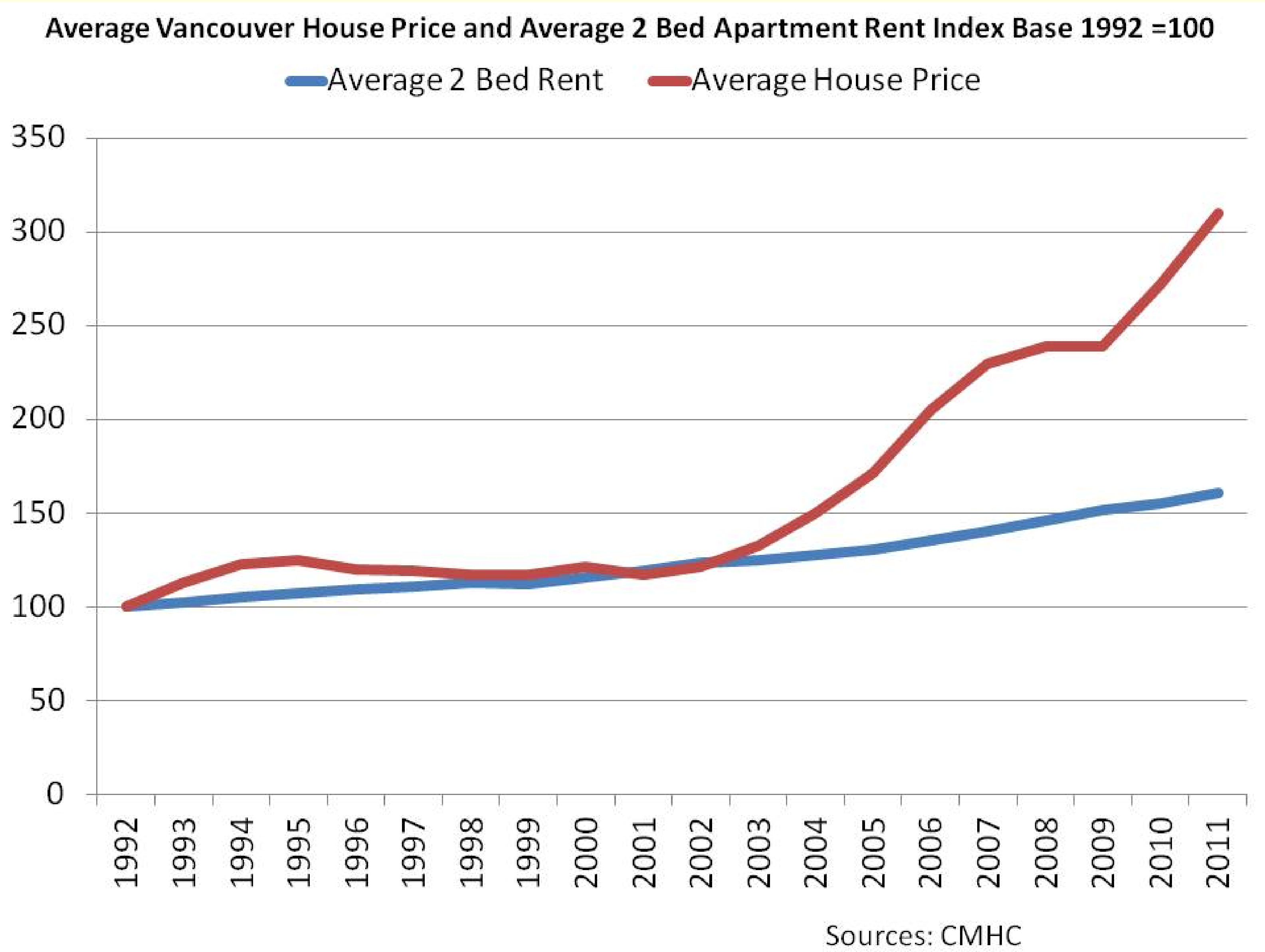
- **As discussed in economics part of the class, rental growth quite predictable by economic, demographic, and consumption trends**

- **These trends are quite persistent**

Graphic: rents and prices per square foot



Vancouver, Canada



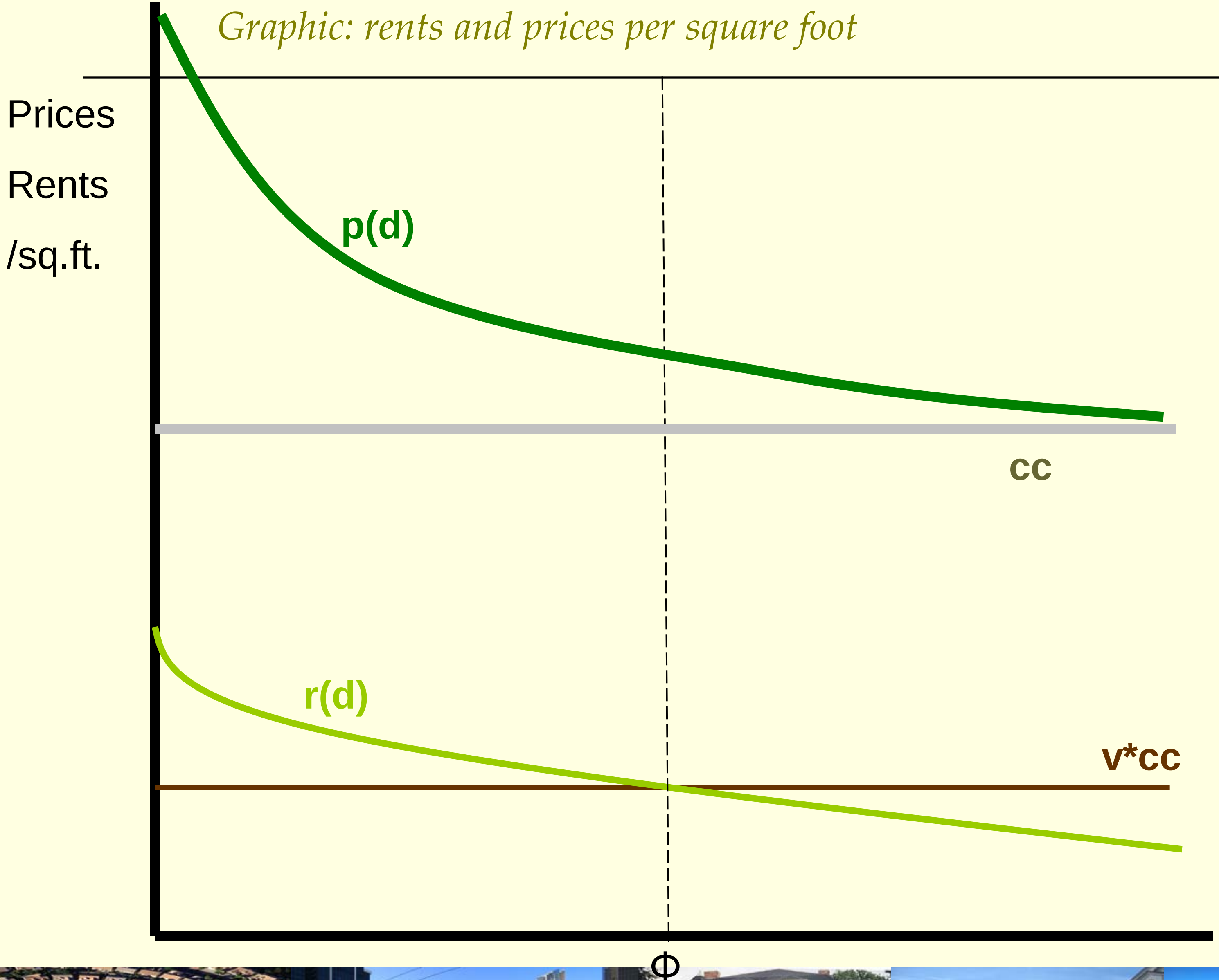
Capitalization of Rents

$$p(\tau=0,D)=\int_0^{\infty} r(\tau,D)\cdot e^{-v\tau}\cdot d\tau=\int_0^{\infty}\left[1+\frac{(1-\mu)t(\Phi(\tau)-D)}{[v\cdot cc]^{1-\mu}}\right]^{\frac{1}{1-\mu}} v\cdot cc\cdot e^{-v\tau}\cdot d\tau$$

An exponential growth rate can be rationalized for 1 ‘representative’ location:

$$p(\tau=0,\widetilde{D})=\left(\frac{v}{v-g}\right)\left[1+\frac{(1-\mu)t(\Phi-\widetilde{D})}{[v\cdot cc]^{1-\mu}}\right]^{\frac{1}{1-\mu}} cc$$

Graphic: rents and prices per square foot



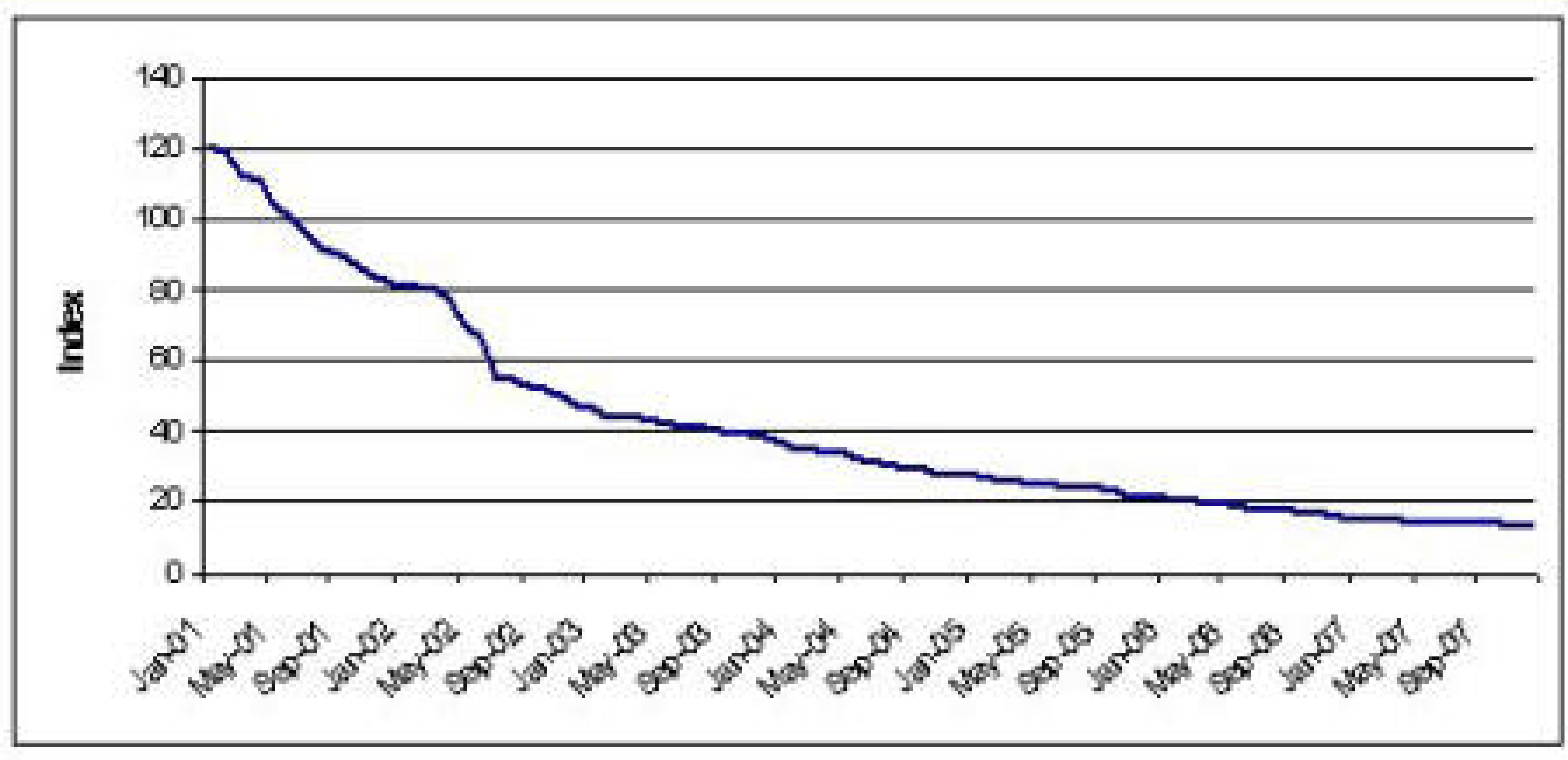
Changes in User Cost in the AMM Model

- **In the short to medium run I will assume that population is not mobile. Note that there are four main effects of changes in *v*:**
- **Decrease in structural user rents**
- **Increase in demand for space and larger homes: land rents increase everywhere**
- **Structure-intensive locations more attractive: land rents decrease in central locations**
- **Discounting effect in price equation: applicable only to land**

Other Manufactured Durables

Other Manufactured Durables

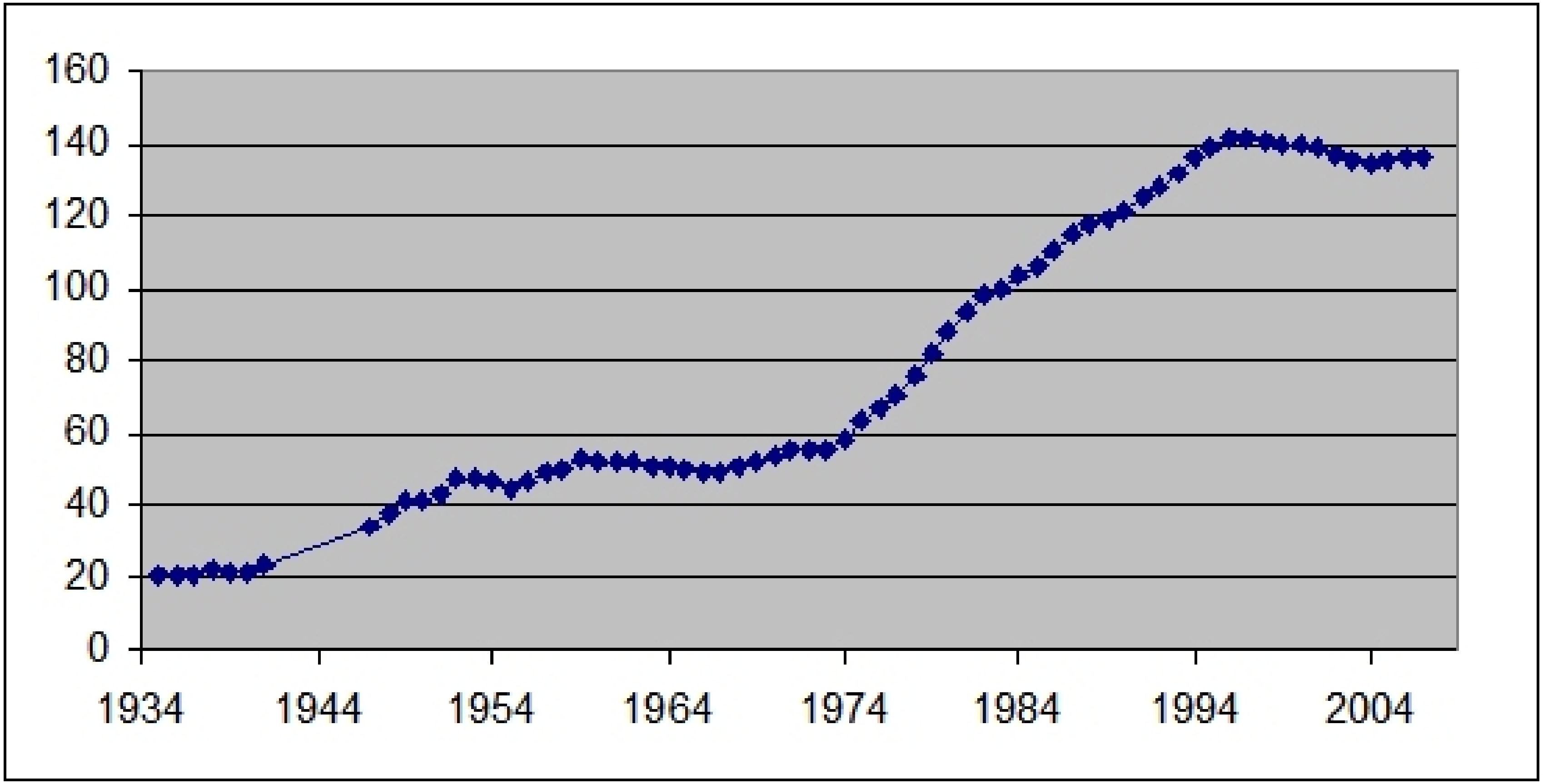
Computer Price Index, consumer, monthly (index, 2001=100)



Leasing cost with decreasing interest rates?

Other Manufactured Durables

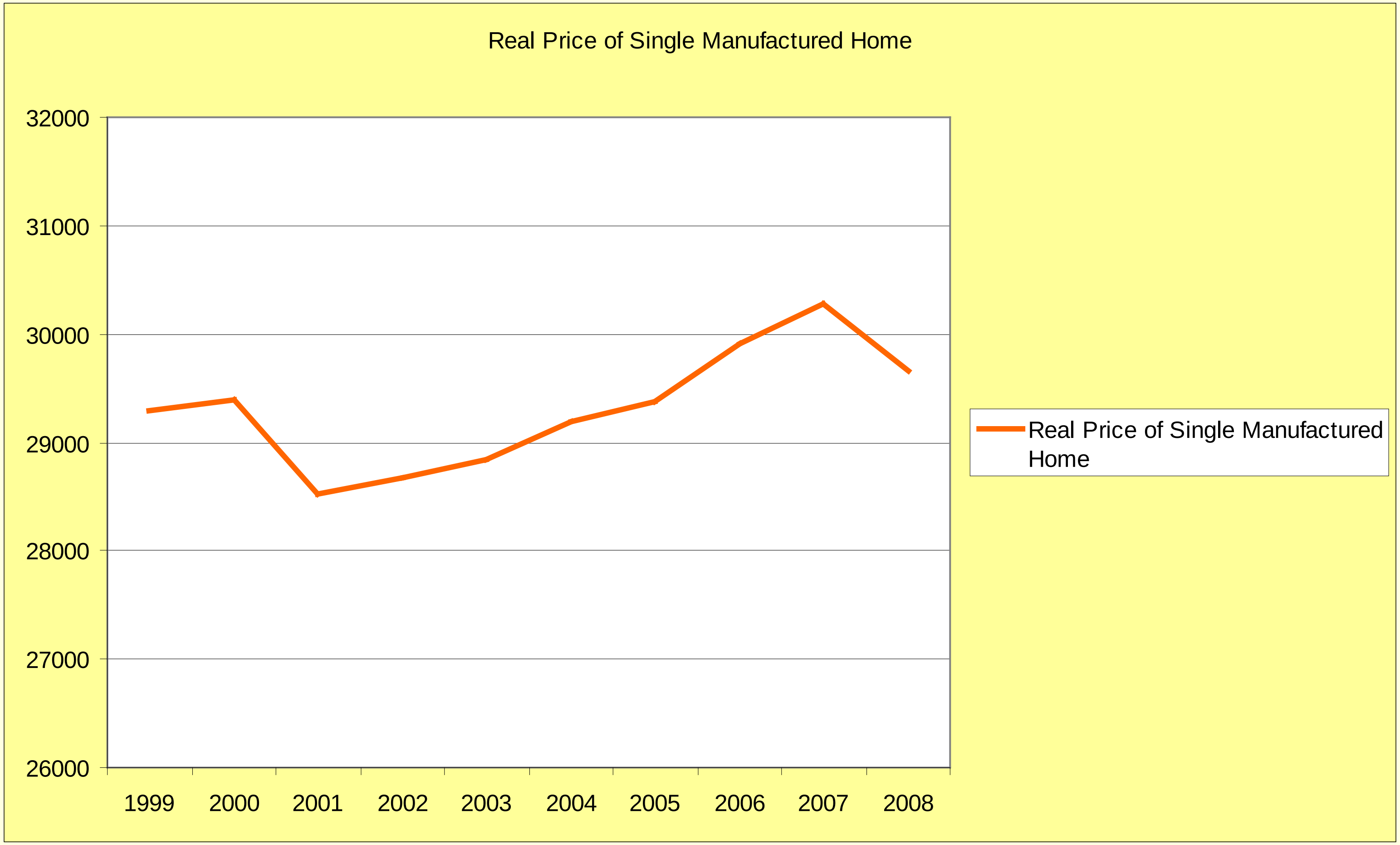
Consumer Price Index: New Cars



Leasing Costs?

Manufactured Homes

Evolution of Home Prices: Manufactured Single



Financing/leasing a mobile home

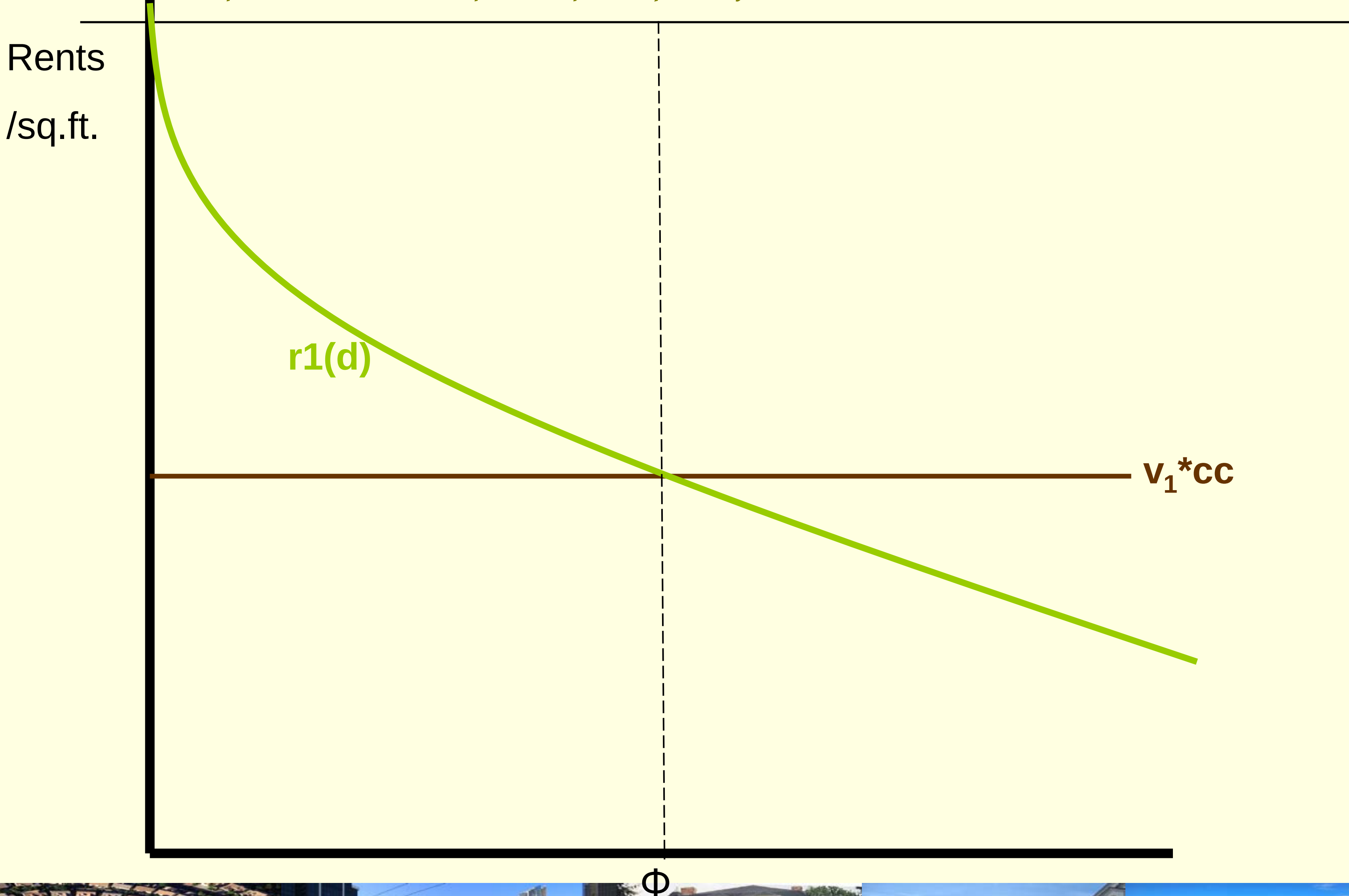
Buy a 30,000 mobile structure:

Mortgage rate 8%:
Annual payment 2,641

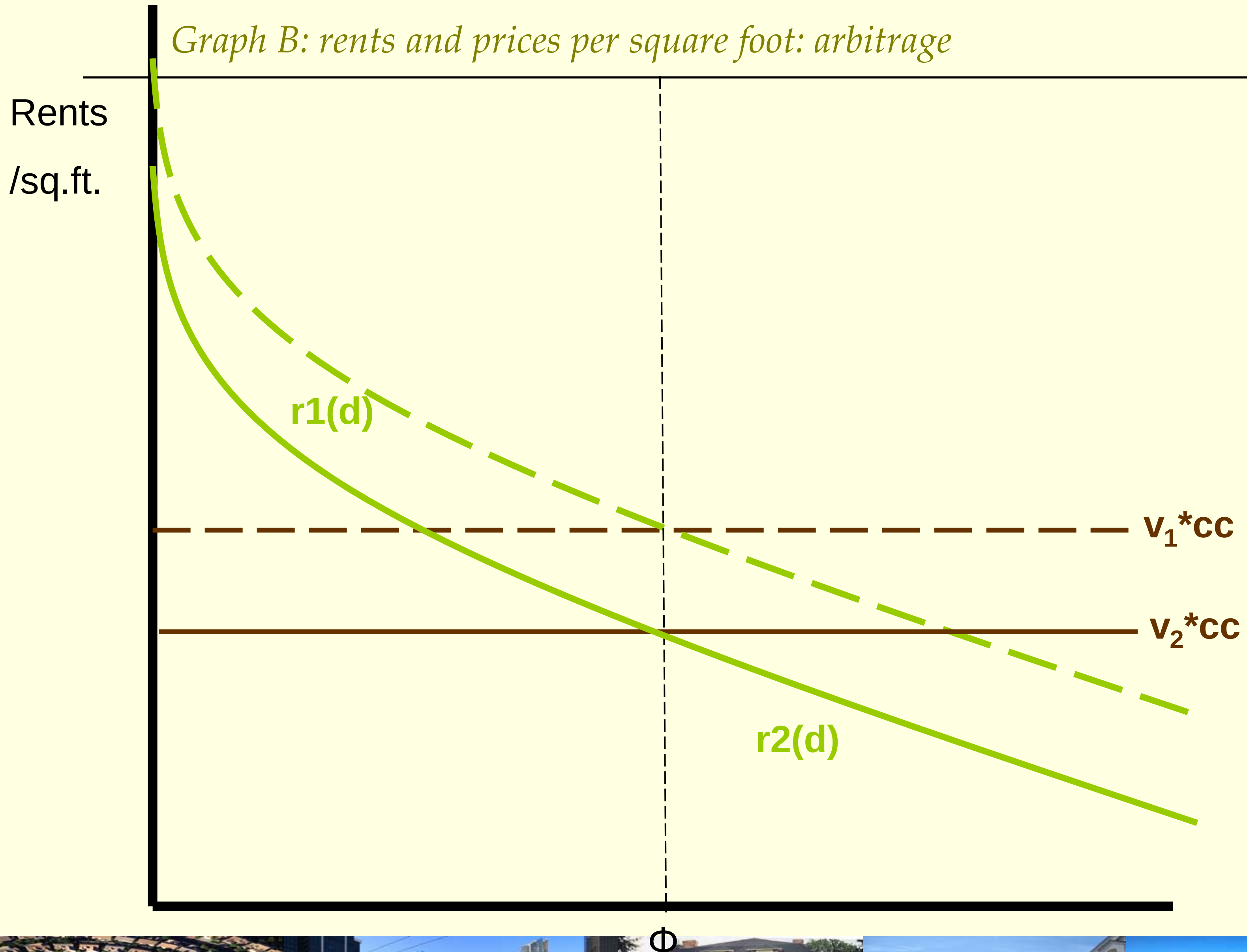
Mortgage Rate 6%
Annual Payment 2,158

20% percent cheaper (v*cc)

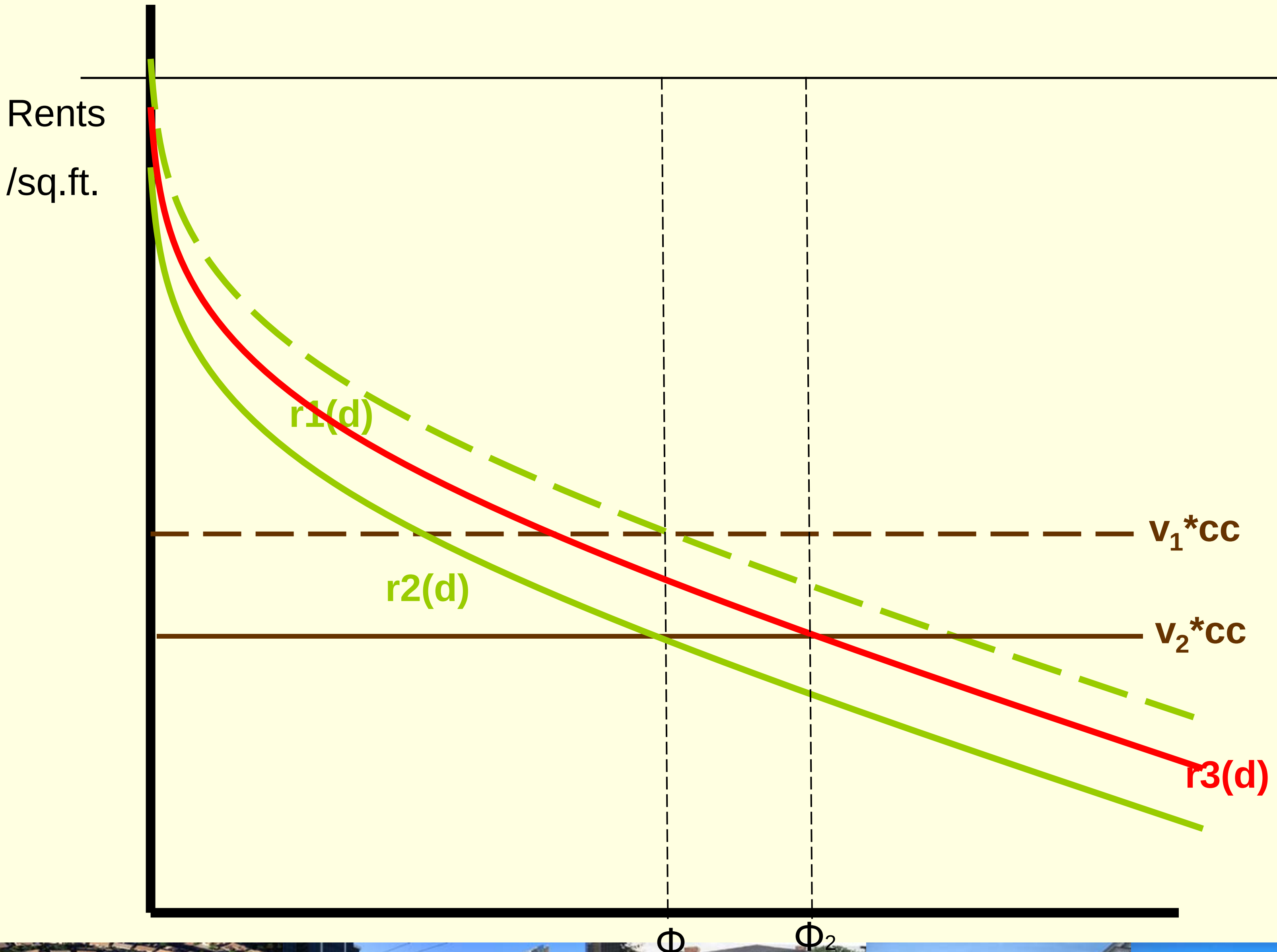
Graph A: rents and prices per square foot



Graph B: rents and prices per square foot: arbitrage



Graph C: rents and prices per square foot: land is complementary to structural demand



Graph D: compensate central locations for low structural intensity

Notional Rents are Endogenous to User Costs

$$\frac{dr(D)}{dv}\frac{v}{r(D)} = \sigma^{S}_{\tilde{r}} \cdot \frac{h(\Phi)}{h(D)}\left(1 - \frac{\mu}{\varepsilon^{S}}\right)$$

Structural Share on Rents

(versus land)

Relative Size at Edge

Demand Supply of Space (Land)

Housing Values and Changes in User Cost

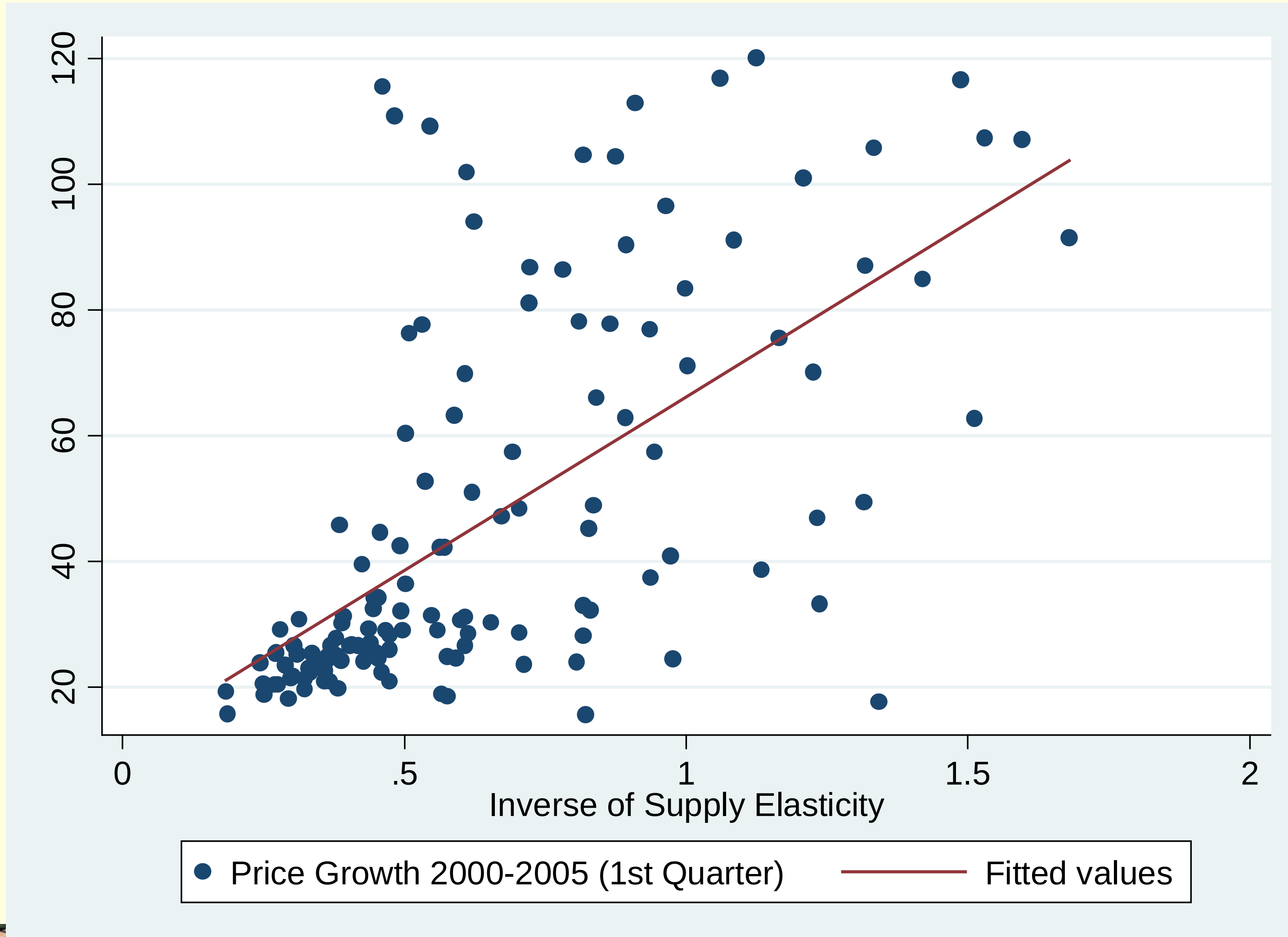
$$\frac{dp(\widetilde{D})}{dv}\frac{v}{p(\widetilde{D})} = \left(\frac{v}{v-g}\right)\left[\sigma_{\widetilde{p}}^{S}\cdot\frac{h\left(\Phi\right)}{h(\widetilde{D})}\left(1-\frac{\mu}{\varepsilon^{S}}\right)-1\right]$$

Main takeaways

- **Rents should decline with lower user costs: proportionally more in areas where land is not valuable**
- **Demand for space goes up**
- **Land rents go up generally… but less in land-intensive locations**
- **Rental payments may go down, but less so in elastic supply areas**
- **Land values should go up unambiguously, but** structure values should not change!
- **Final increase in home values depends on:**
    - Land shares (discounting effect + increase in land rents)
    - Supply elasticity (impact of increased demand on land rental payments)

Empirics: Boom, Elasticity and Land Shares

Price Growth During the Boom and Supply Elasticity



Price Growth During the Boom and Land Shares

Real Estate Boom and Fundamentals

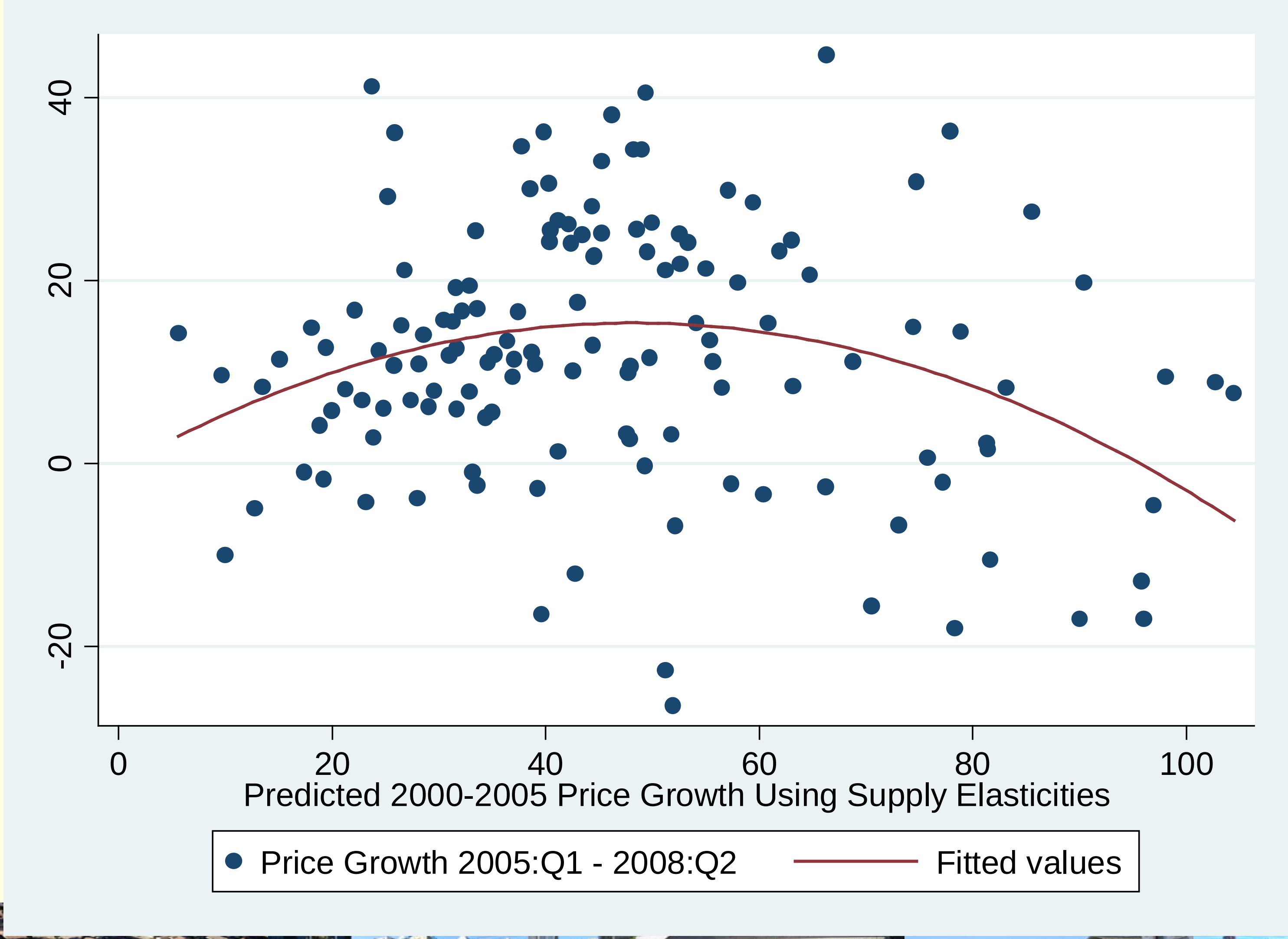
	Price Growth 2000-2005 (1st Quarter)			
Inverse of Supply Elasticity	31.445	26.013	32.138	22.349
	(6.605)***	(5.549)***	(6.556)***	(6.418)***
Land Share in 1990	85.802	99.675	104.469	65.224
	(14.574)***	(14.654)***	(17.572)***	(15.150)***
Log Price 2000 - Log Price 1970			-18.631	
			(9.993)*	
Middle Atlantic				-1.535
				(20.037)
East North Central				-10.304
				(20.207)
West North Central				-5.673
				(20.979)
South Atlantic				2.53
				(19.732)
East South Central				-17.299
				(20.722)
West South Central				-17.963
				(20.631)
Mountain				-14.237
				(20.117)
Pacific				14.931
				(19.594)
Observations	137	137	137	137
R-squared	0.52	0.6	0.53	0.62

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

"Expected" Growth and Bust

"Expected" Growth and Subsequent Bust

"Expected" Growth and Subsequent Bust



Unexplained Growth and Bust

Unexplained Growth and Subsequent Bust

Unexplained Growth and Subsequent Bust

Conclusions

Under the null of common shocks to the user cost of housing capital:

- Rents on structure should fall
- Land rents should increase in most locations…
- … but less so in land-intensive areas
- Aggregate rents should decrease, specially with low land values
- Rental payments should decrease with inelastic demand
- Rents endogenous and contingent: P/R ratios not useful
- Land Rental payments should increase more with inelastic supply
- Land prices should increase: discounting + rental growth
- Construction value should not change
- Home values should go up more in areas with high land ratios

More or less what happened… deviations are being largely eliminated