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11.433J / 15.021J Real Estate Economics  
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# Week 10: Commercial Markets

- Tracking markets with data: absorption, vacancy, rent, completions and construction.
- Office space: economic sectors, rental elasticity, technology and the workplace.
- Industrial space: inventories, manufacturing, R&D.
- Retail space: centers versus stand-alones, sales, income, obsolescence.
- Hotels: Is there more than GDP?



## Some Market Accounting Fundamentals

$v_t$ : Vacancy Rate (vs “availability rate”)

$S_t$ : Stock of Space

$C_t$ : Construction starts of new space

$Ab_t$ : net absorption of space

$L_t$ : Average lease term

$N_t$ : Average Renewal rate

$$Ab_t = (1 - v_t)S_t - (1 - v_{t-1})S_{t-1}$$

$$S_t = S_{t-1} + C_{t-n}$$

$$\text{Gross Abs} = S_t (1 - N_t) / L_t$$

$$\text{Average Lease up time} = v_t / [(1 - N_t) / L_t]$$

# A lease Rent index: Average, Repeat, Hedonic Rent (CB Vouchers) (average annual\$/sqft over lease term)

$$\log(R) = \alpha_0 + \alpha_1 \text{SQFT} + \alpha_2 \text{GROSS1} + \alpha_3 \text{GROSS2} + \alpha_4 \text{TERM} + \alpha_5 \text{HIGH} \\ + \alpha_6 \text{NEW1} + \alpha_7 \text{NEW2} + \sum_{i=1979}^{1991} \beta_i D_i + \sum_{j=1}^n \delta_j S_j \quad (1)$$

Variable	Denver	Cincinnati	Houston	San Francisco	Washington
Constant	1.8153	2.0887	2.0700	2.4211	2.2169
Square Feet	1.08e-06 <sup>1</sup>	3.35e-07 <sup>1</sup>	-8.42e-07	-4.57e-06	-1.03e-07 <sup>1</sup>
G1	0.0952	0.0993	0.0574	0.0172 <sup>1</sup>	0.1420
G2	0.0728	0.0315 <sup>1</sup>	0.0316 <sup>1</sup>	0.0633	0.1177 <sup>1</sup>
Term	0.0290	0.0196	0.0203	0.0260	0.0120
High	0.1048	0.1293	0.0586	0.1119	0.0361
Dummy 1979	-0.0681 <sup>1</sup>	na	0.0082 <sup>1</sup>	na	na
Dummy 1980	0.2860	na	0.1290	0.0790 <sup>1</sup>	na
Dummy 1981	0.4775	na	0.3480	0.3664	0.0684 <sup>1</sup>
Dummy 1982	0.5992	0.0468 <sup>1</sup>	0.3925	0.4847	0.1872
Dummy 1983	0.5468	0.1305	0.3300	0.4193	0.2176
Dummy 1984	0.5394	0.1385	0.1995	0.4879	0.3996
Dummy 1985	0.5402	0.1128	0.1646	0.4525	0.4113
Dummy 1986	0.3556	0.1378	0.1314	0.3408	0.4422



## Lease (Rent) Fundamentals:

- An Efficient forward market implies:

$$R^{t,n} = R^{t,n-m} + R^{t+n-m,m}$$

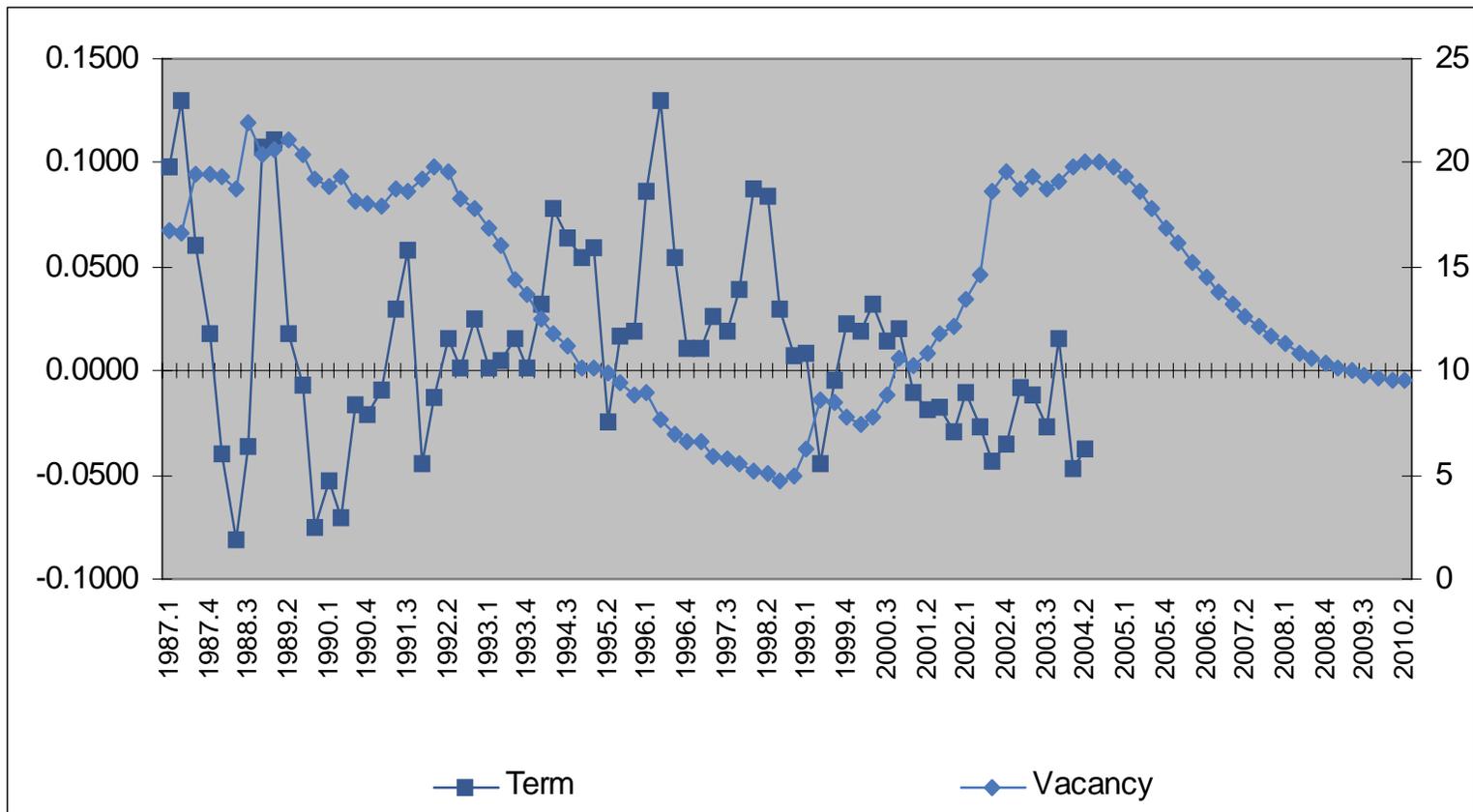
[The first superscript designates the date for which occupancy begins, the second the lease term]

or: the difference between a three year lease and a 5 year lease signed today equals a forward commitment (three years hence) for a 2 year lease.

- Hence if the market is expected to improve, longer lease terms command a higher average rent and vice-versa.
- How to test the efficiency theory?



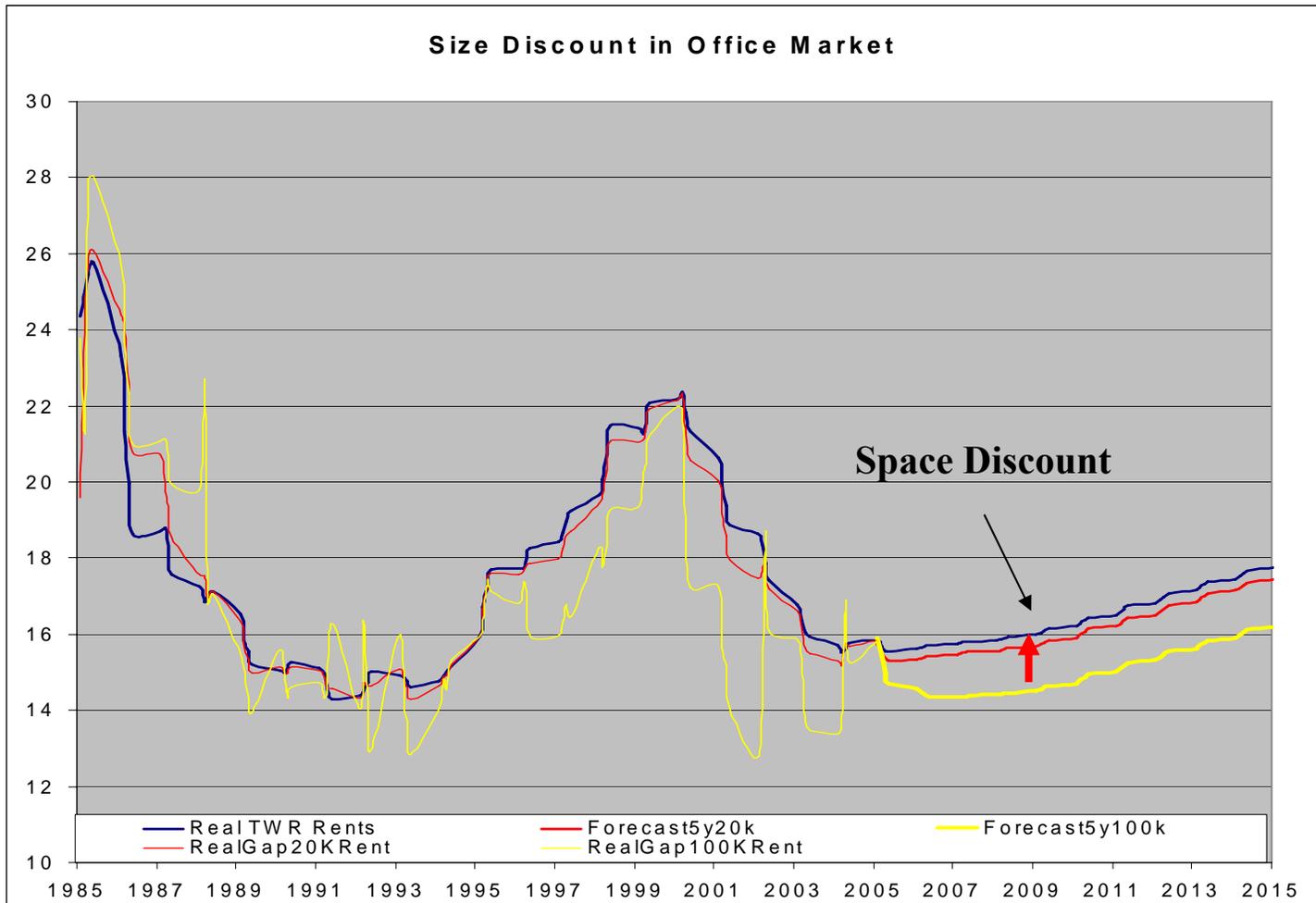
For the last 25 years, on average lease rent is 2%+ higher for each year longer in Term. But yearly, this varies inversely with market vacancy. Why? (Minneapolis Data)





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In Most Markets large blocks of space rent for less than small! Why isn't the whole worth more than the sum of the parts?



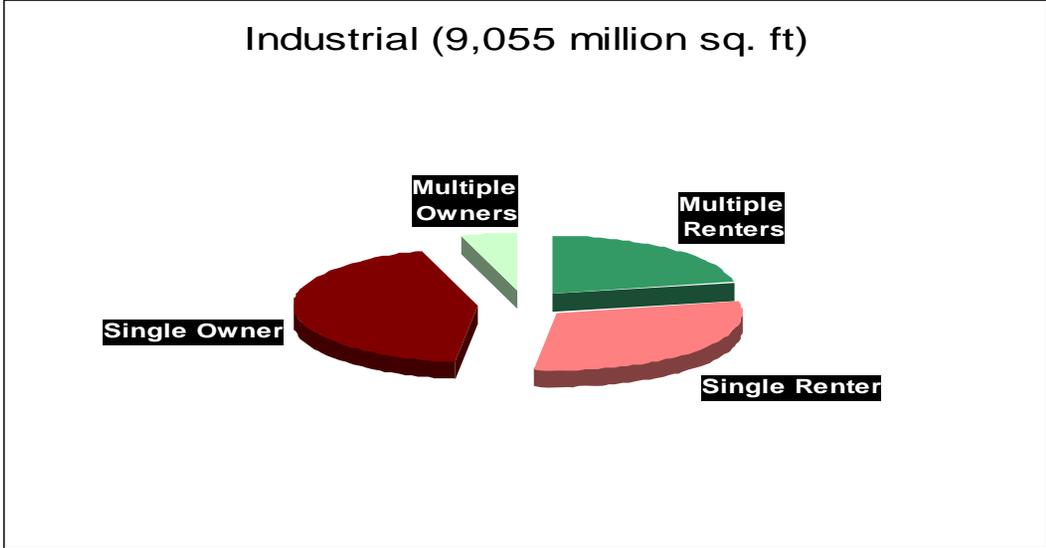
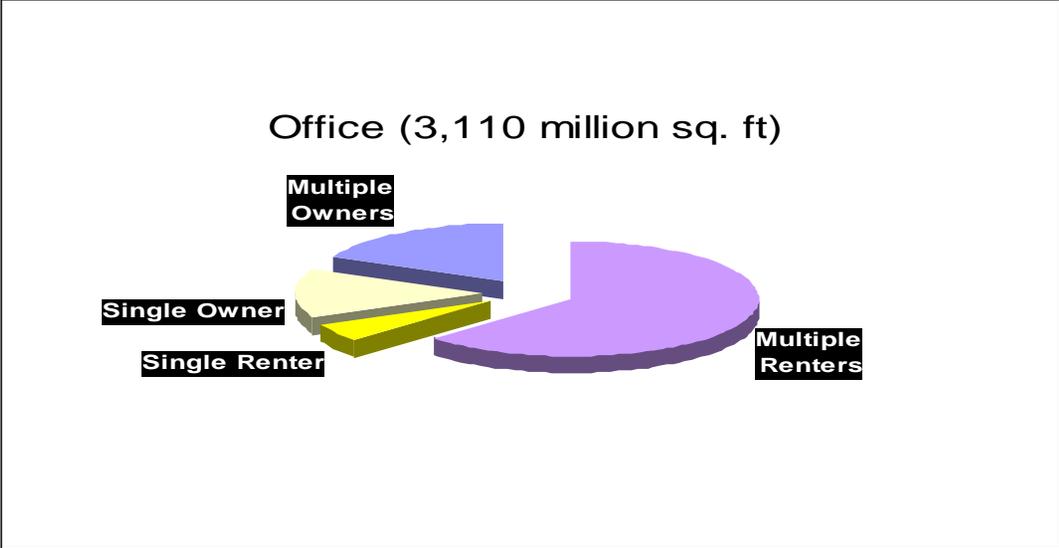


# Lease - versus – Own?

- Tax implication? Leases are deductions, as are debt payments.
- Accounting implications? Only ownership shows on the balance sheet (*loophole*).
- Corporate *Prestige*. But you can easily purchase the naming rights to a building.
- Firm Specific Capital. Facility has little other use, and so developer would charge higher lease payments since residual value is zero. Holdup issue.
- Expansion and other options.[see: Benjamin, et.al.]
- Correlation between firm's business and local real estate market.
- If your corporate cost of capital is  $I_c$ , how is  $I_c P \gg R$ ?



**Office and Industrial Space Usage in square feet by Tenure, 1991 (50 metro areas CBRE)**





# **The North American Industry Classification System**

## **(NAICS) & Office Employment**

11 Agriculture, Forestry, Fishing, and Hunting

21 Mining

22 Utilities

23 Construction

31-33 Manufacturing

42 Wholesale Trade

44-45 Retail Trade

48-49 Transportation and Warehousing

51 Information

52 Finance and Insurance

53 Real Estate and Rental and Leasing

54 Professional, Scientific and Technical Services

55 Management of Companies and Enterprises

56 Administrative and Support and Waste Management and Remediation Services

61 Educational Services

62 Health Care and Social Assistance

71 Arts, Entertainment and Recreation

72 Accommodation and Food Services

81 Other Services (except Public Administration)

92 Public Administration

# Office Space usage by SIC

## Office Employment\* in Dallas and Chicago, 1989

Standard Industrial Classification (SIC)	Dallas		Chicago	
	Total (thousands)	Office (thousands)	Total (thousands)	Office (thousands)
Manufacturing	184.7	16.2	499.1	49.4
Mining	17.4	10.3	1.3	0.6
Construction	47.5	0.6	93.8	0.4
Transportation, Communication, and Utilities (TCU)	92.4	7.1	148.5	6.2
Trade	287.9	28.1	613.6	51.1
Finance, Insurance, and Real Estate (FIRE)	122.9	122.9	246.0	246.0
Services	314.8	105.8**	730.2	227.0
Total Private	1067.6	291.0	2332.5	580.7

*adapted from DiPasquale and Wheaton (1996)*

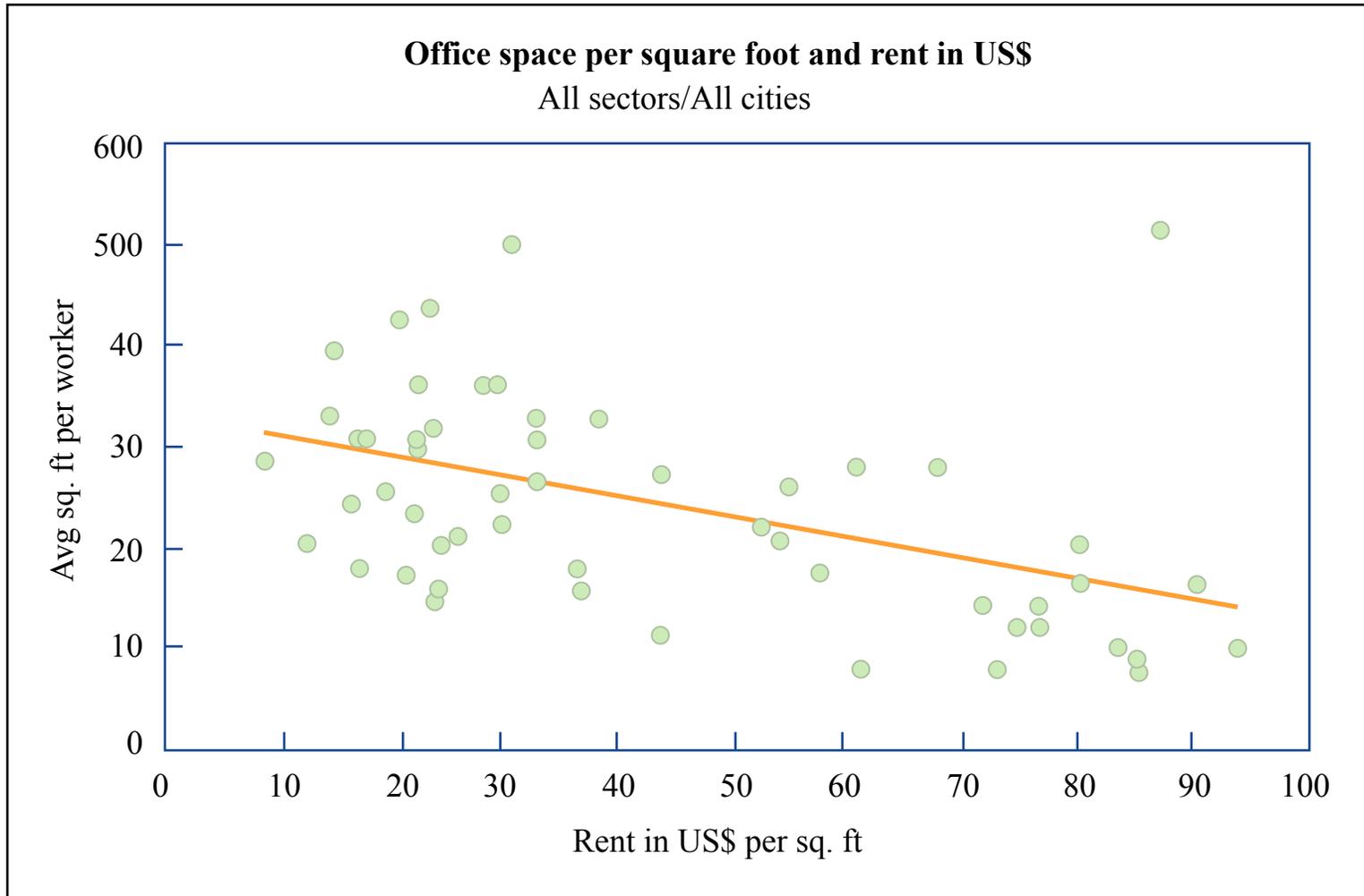
\* Those employees occupying separate office space from on-site manufacturing

\*\* includes advertising, computer and data processing, credit reporting, mailing and reproduction, legal and social services, membership organizations, engineering and management services.



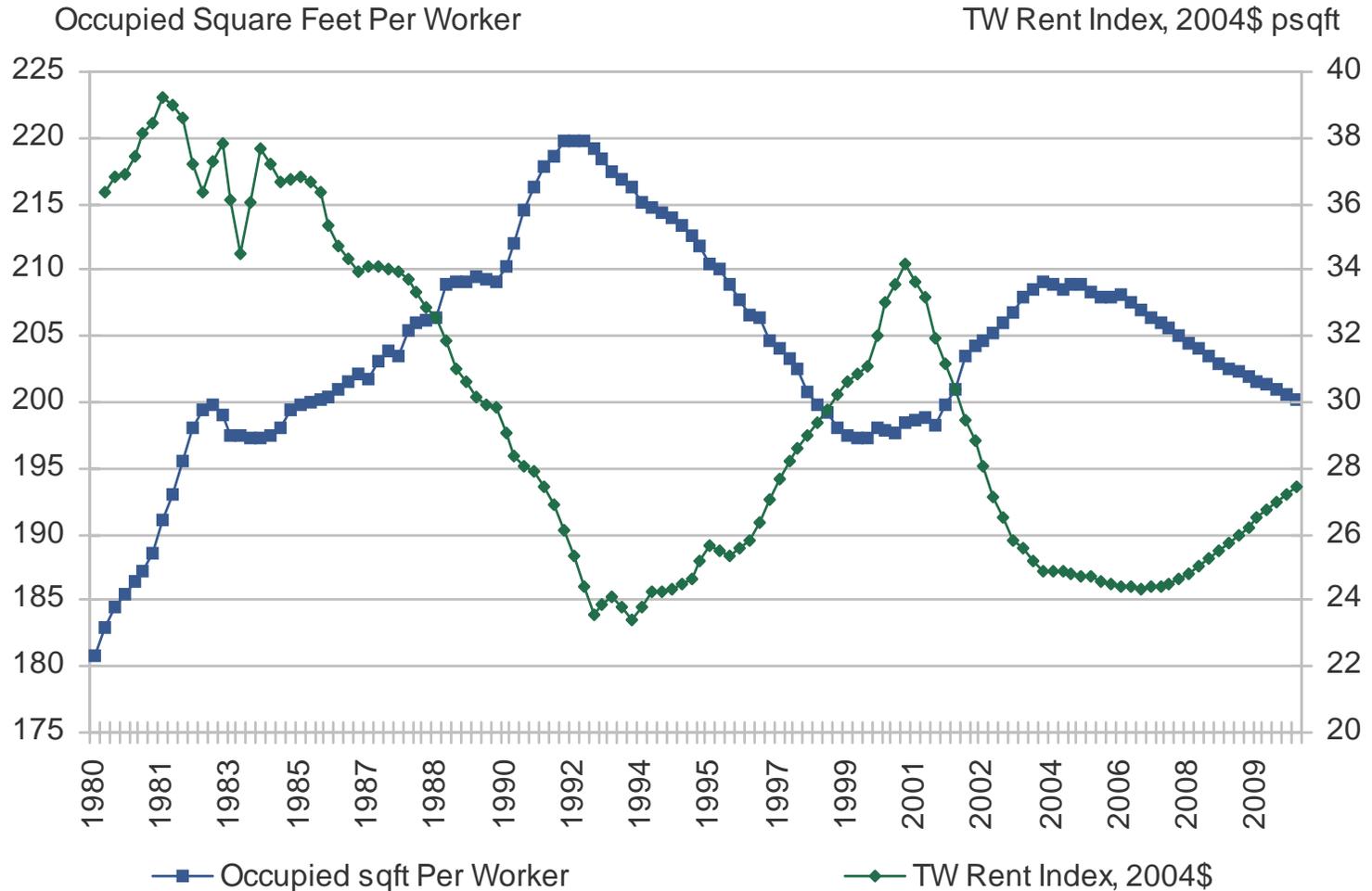
# Rental Elasticity of Office Space Demand

[see also: Hakfoort and Lie]





# Square feet/worker. Changes in professional Occupation ratio: Rental cost of occupancy, technology?





## Impact of Technology: Breakdown of Workers at Home (x1000)

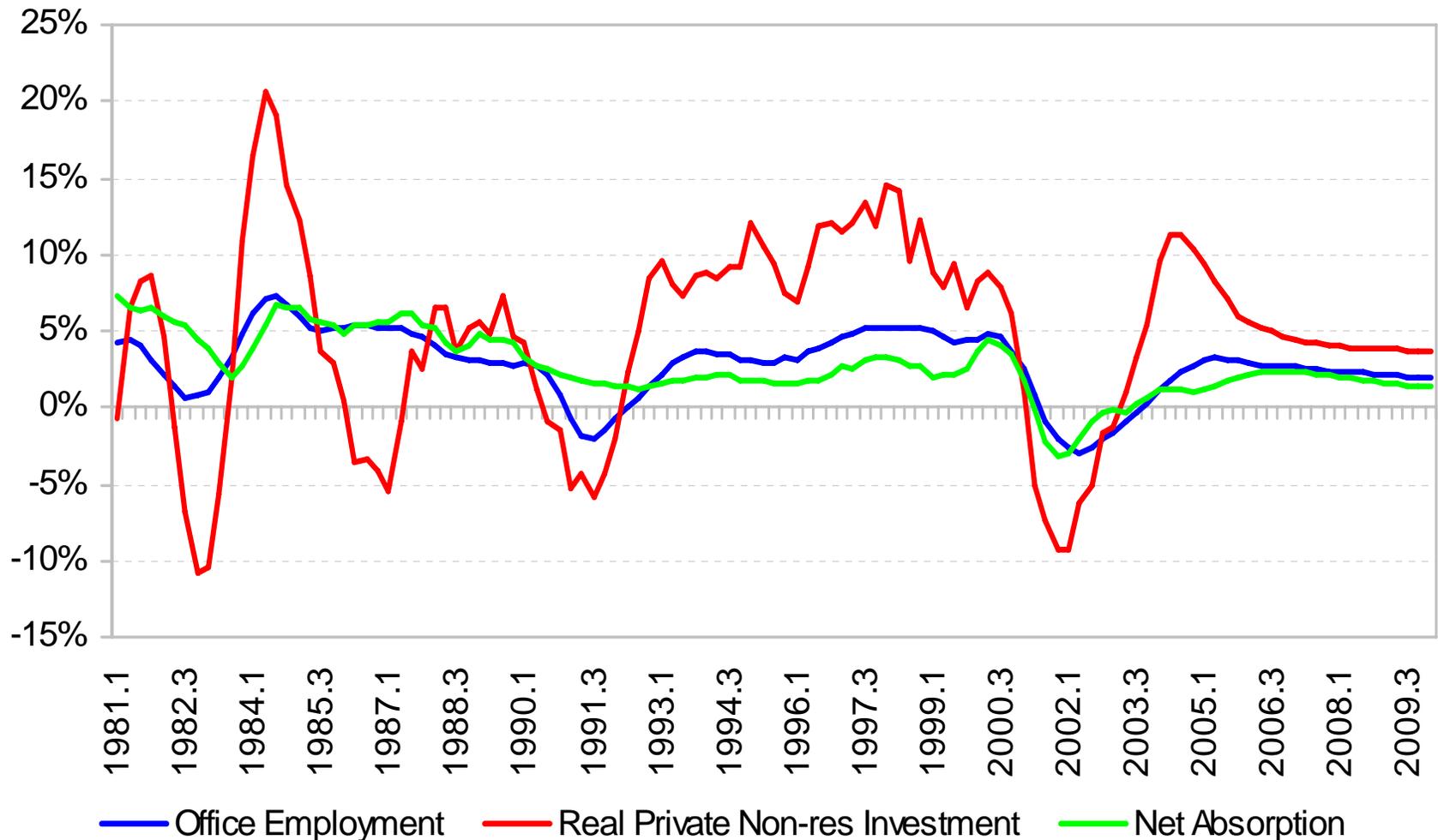
	1991	1997	Growth (%)
Total at Home	19,967	21,478	7.57
Paid	7,432	10,116	36.11
35 Hours or More	1,070	1,791	67.38
Full-time, not self-employed	94	583	520.21

Source: Bureau of Labor Statistics, Torto Wheaton Research



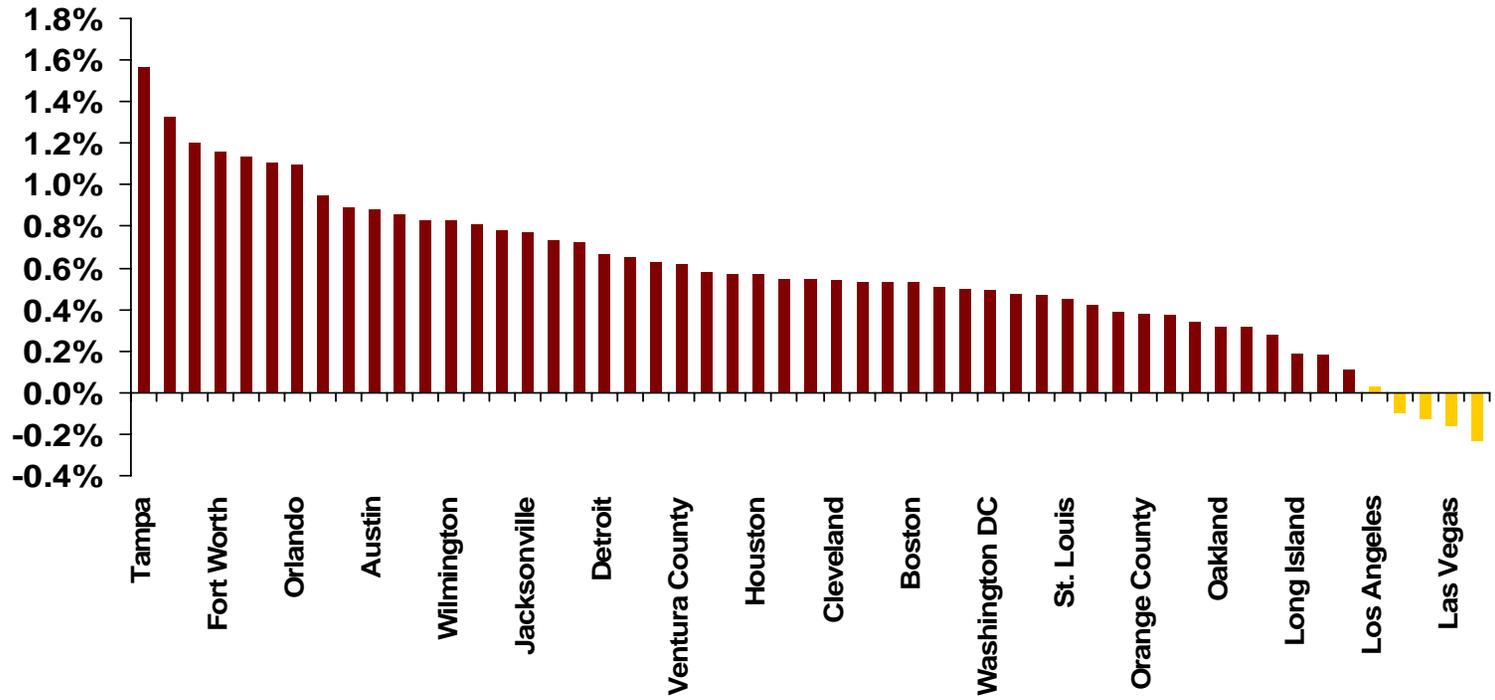
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# Investment, Office Employment and Office Net Absorption (1981-2009): bricks vs clicks





# How to Explain the recent Absorption Deficit Across Markets (1992 q1 to 1999 q4)





## Across Markets, Deficit Explained by Numerous Factors (dependent variable: office job growth – absorption)

Multiple R	0.73304
R Square	0.53735
Adjusted R Square	0.48814
Standard Error	0.00268
Observations	53

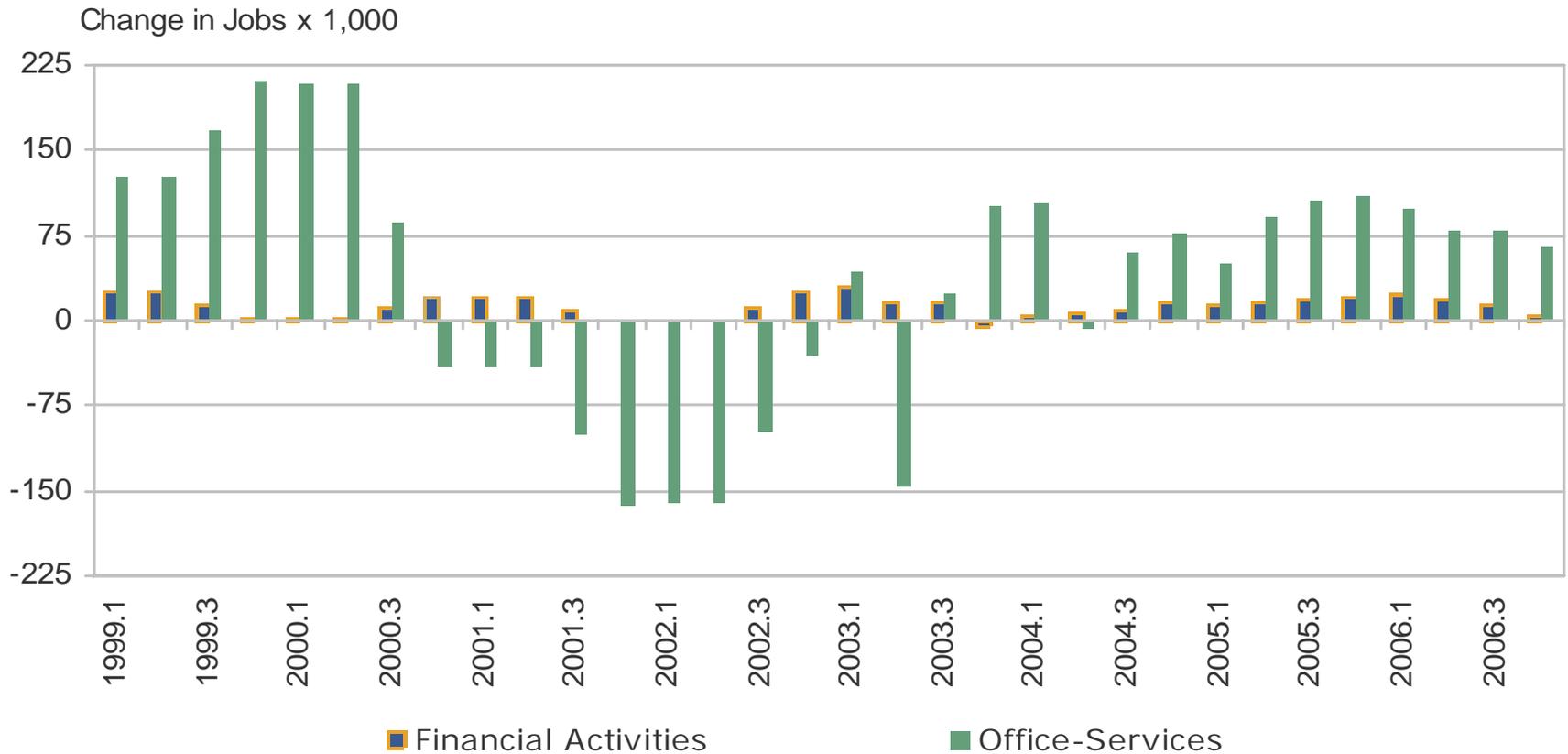
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	0.00532573	0.00255	2.09023
% of 1999 Single-Tenant Stock less % 1992 Single-Tenant Stock	0.05573823	0.02557	2.17969
% of New Office Using Service jobs from 92to99 that Were B&P	0.01157904	0.00286	4.04977
1999.4 Multi-Tenant Office Stock	-0.00000001	0.00000	-1.38736
FIRE Employment as % of all Office Employment 1999.4	-0.01309827	0.00583	-2.24851
Average quarterly TW Rent growth (1999.4\$) 1992.1 to 1999.4	0.27158579	0.06570	4.13370

Variable	Observations
% of 1999 Single-Tenant Stock less % 1992 Single-Tenant Stock	Essentially Part of the Intercept
% of New Office Using Service jobs from 92to99 that Were B&P	More B&P Employment, Bigger Deficit
1999.4 Multi-Tenant Office Stock	Weak Evidence that Deficit is Smaller in Larger Markets
FIRE Employment as % of all Office Employment 1999.4	Smaller Deficit in Markets With FIRE Concentration
Average quarterly TW Rent growth (1999.4\$) 1992.1 to 1999.4	The Demand for Space is Sensitive to Rental Growth



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# Office Tenant Base: Increasingly Smaller Service Companies, Less Large Financial Companies



## Industrial Space Occupancy by SIC and Building Use (CBRE, 1991)

### Industrial Tenants, 1991

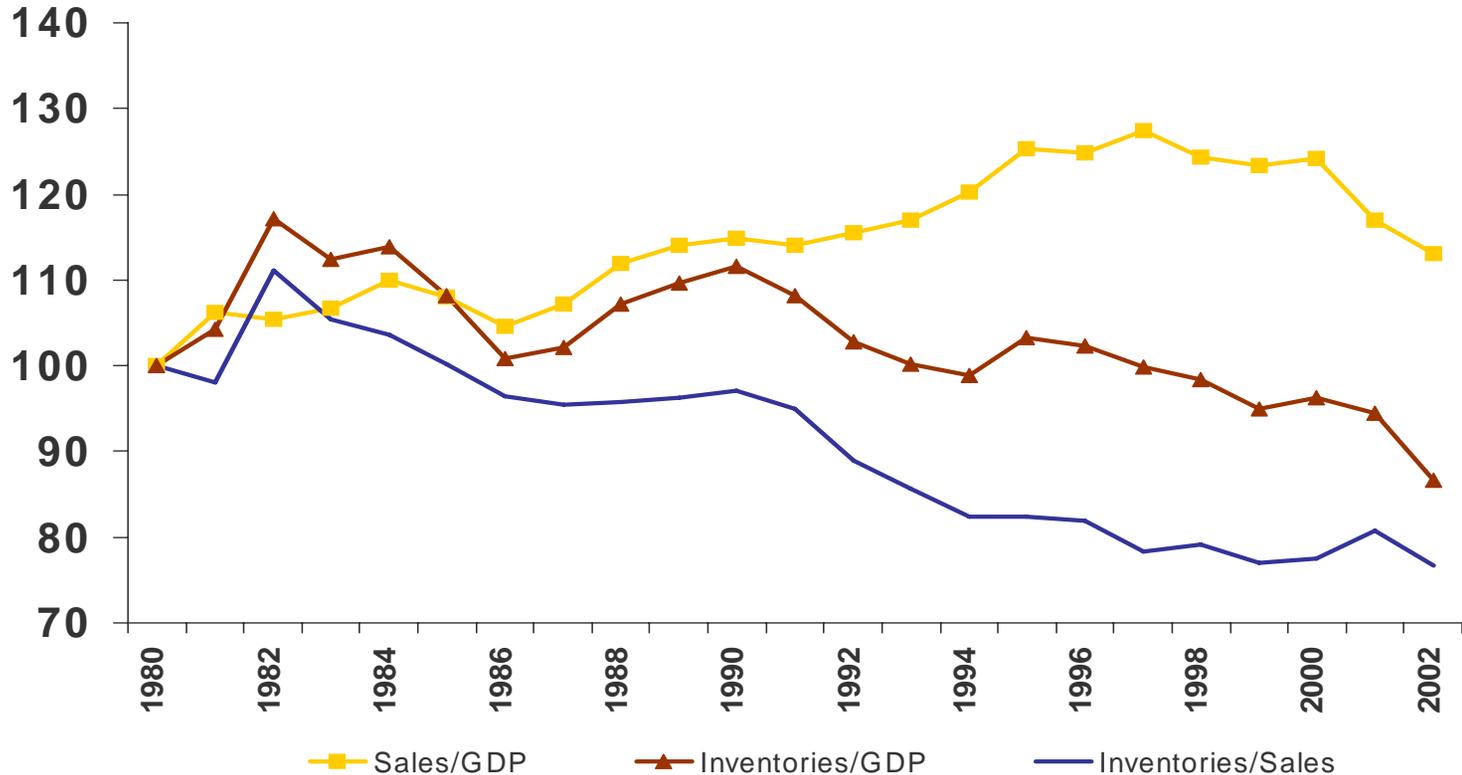
Industry of Occupant (SIC)	Building Use (millions of sq. ft)				
	Manufacturing	Distribution	R & D	Other	Total
Manufacturing	2422.8	807.1	140.4	2.7	3,373.00
Transportation / Communication / Utilities (TCU)	50.8	474.3	12.4	0.7	538.3
Wholesale Trade	260.1	1047.0	43.8	2.5	1,353.40
Retail Trade	19.4	175.1	5.8	0.2	200.5
Services	90.6	202.2	129.8	1.8	424.4
Other	<u>73.0</u>	<u>190.4</u>	<u>21.6</u>	<u>31.1</u>	<u>316.1</u>
Total	2916.7	2896.1	353.8	39.0	6,205.60

*adapted from DiPasquale and Wheaton (1996)*



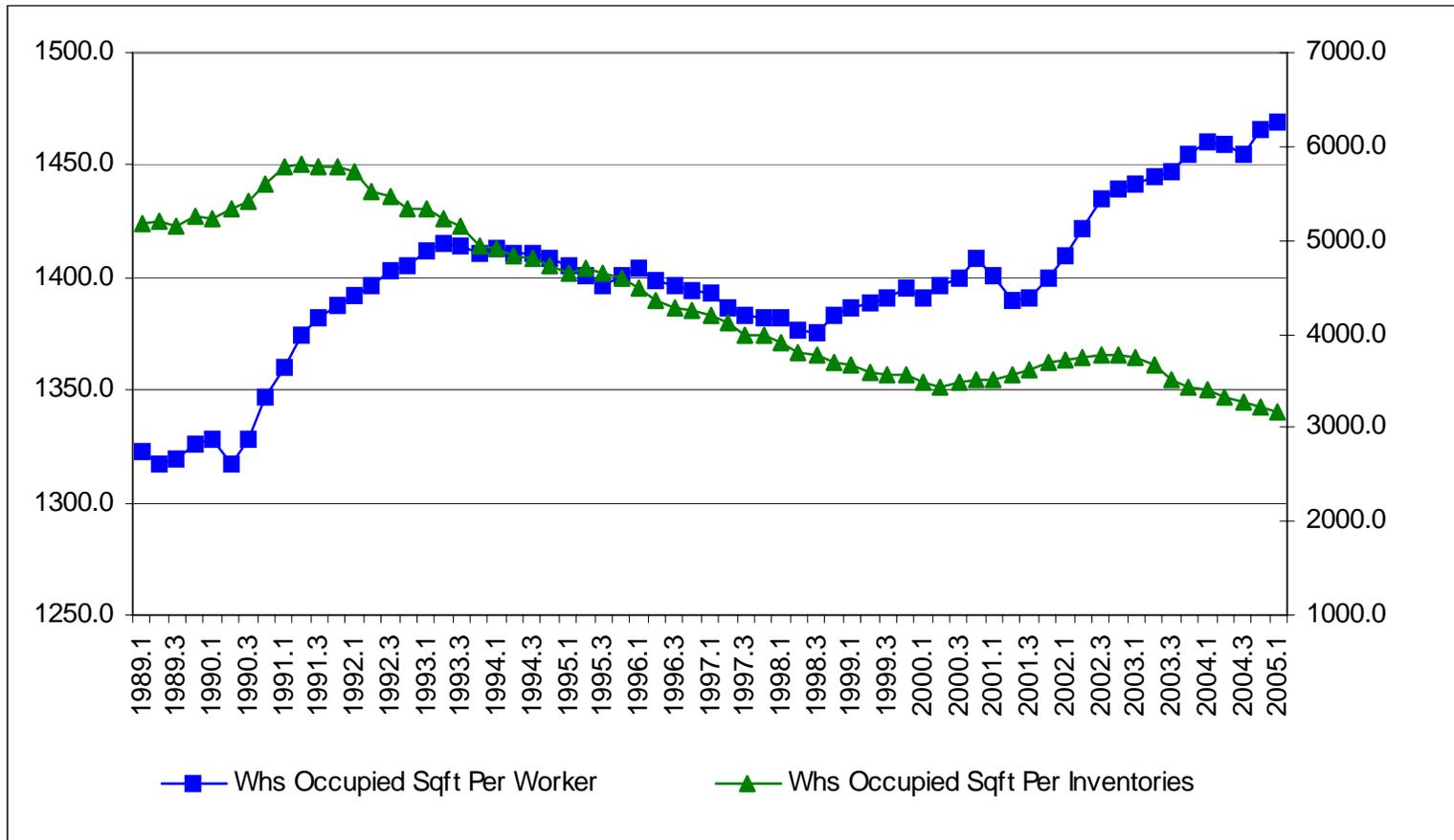
# Velocity (J.I.T. technology) = Shipments (sales) / Inventories

Index 1980 = 100  
(Billions \$, seasonally adjusted)



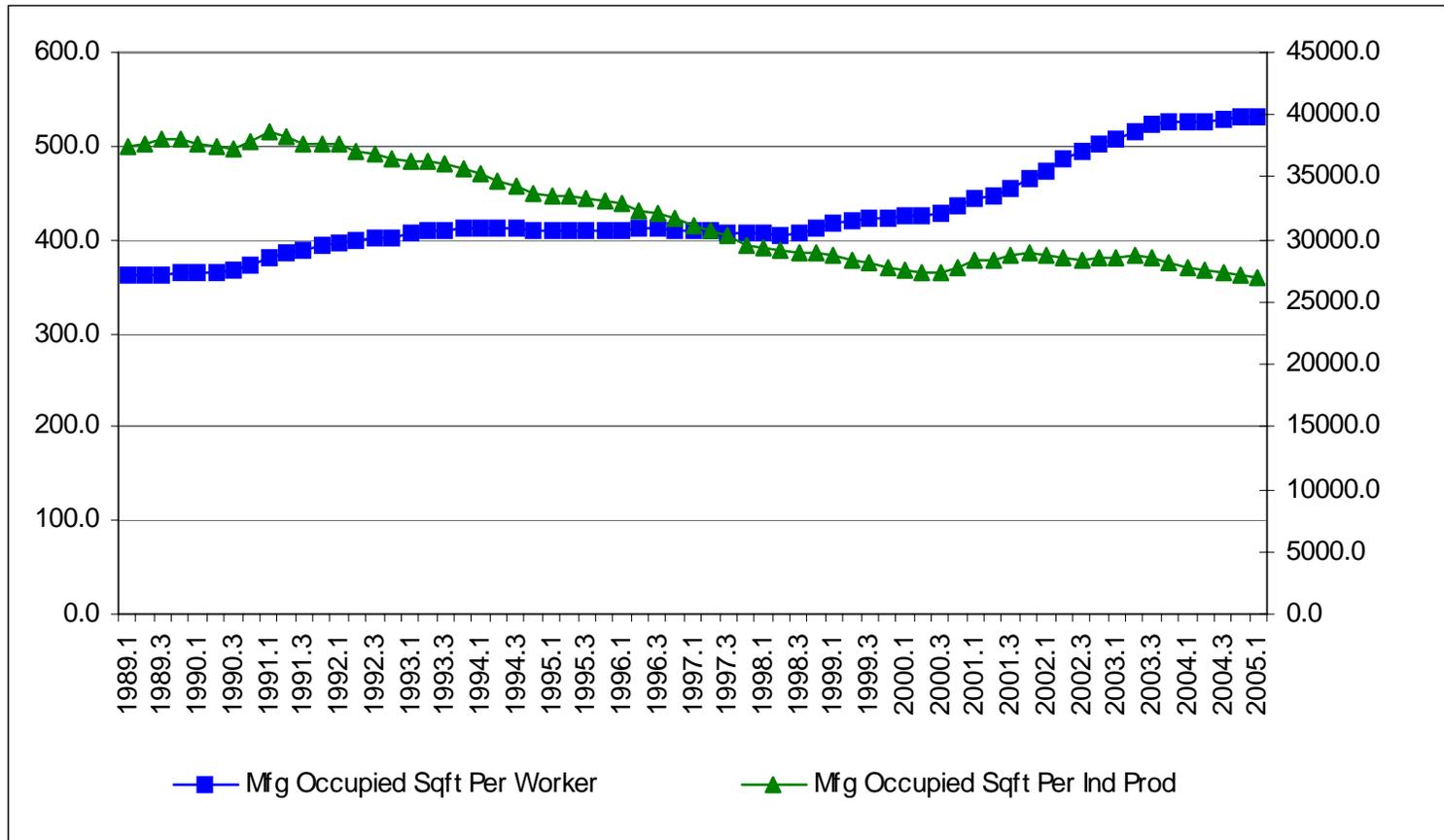


# Warehouse Demand: $\Delta$ Space/worker (+10%) = $\Delta$ space/\$inventory (-60%) + $\Delta$ \$ inventory/worker (+70%)





**Industrial demand:  $\Delta$ space/worker (+40%) =  $\Delta$ production/worker (+70%) +  $\Delta$ space/production (-30%)**





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# Logistics (S.C.M.): what enters the country at one place does not stay there!

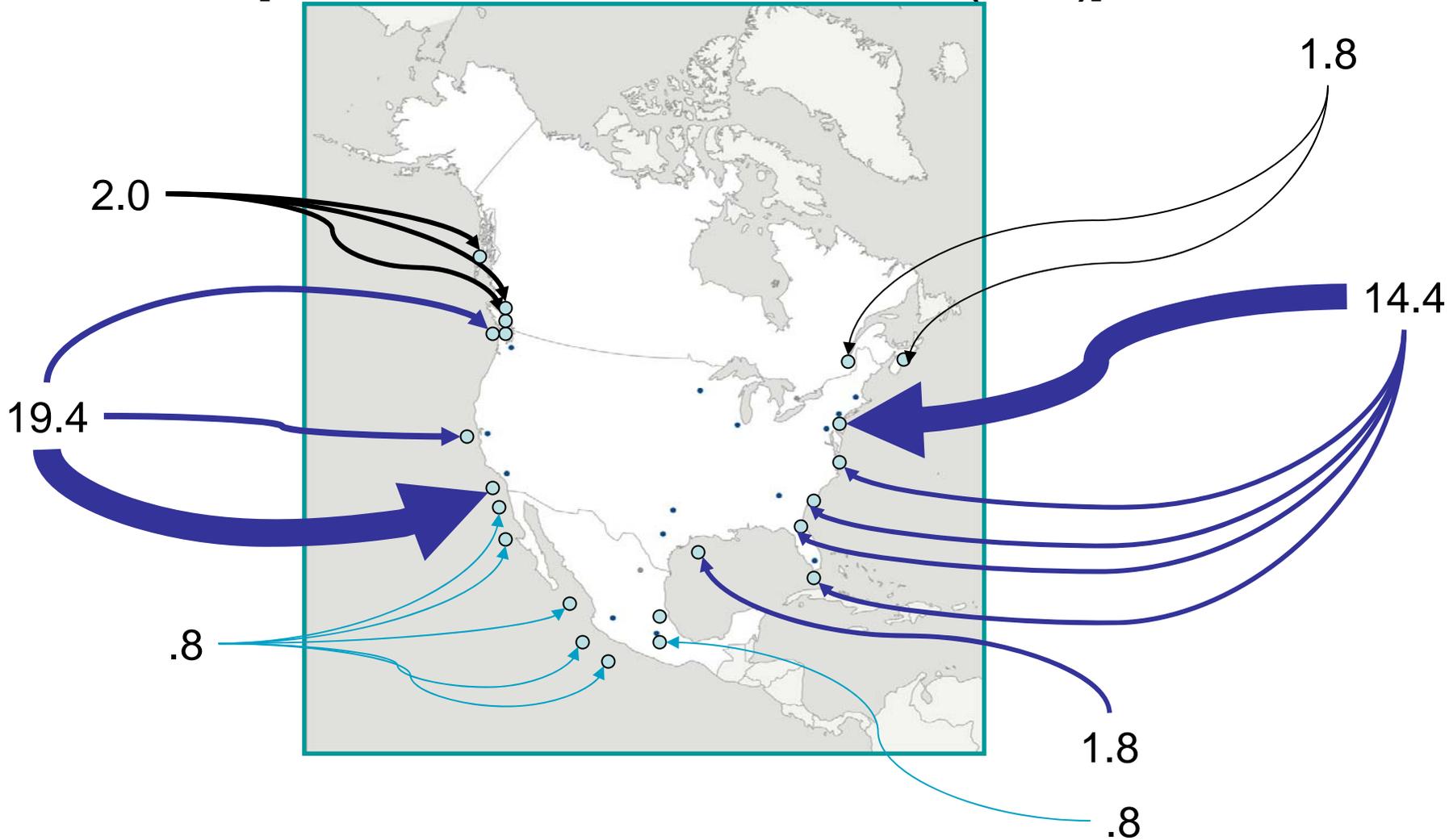




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# Logistics (S.C.M.): what determines which port is used by whom, for what, from where?

[U.S./Canada/Mexico Container Traffic (TEUs)]

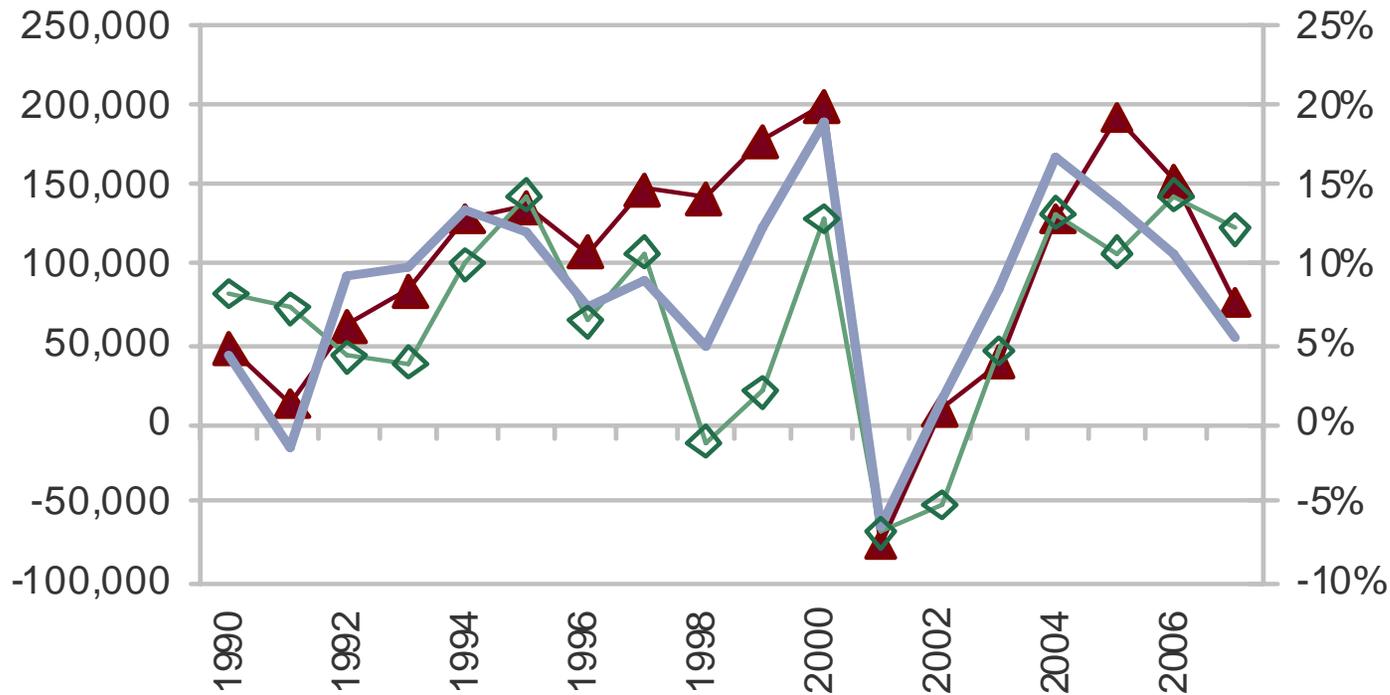




# Trade Flows and Warehouse Demand. Why do: Imports need more space than exports? Ports often need none?

Whs. Net Absorption (sf x 1000)

YoY % Growth in X,M (BoP basis,

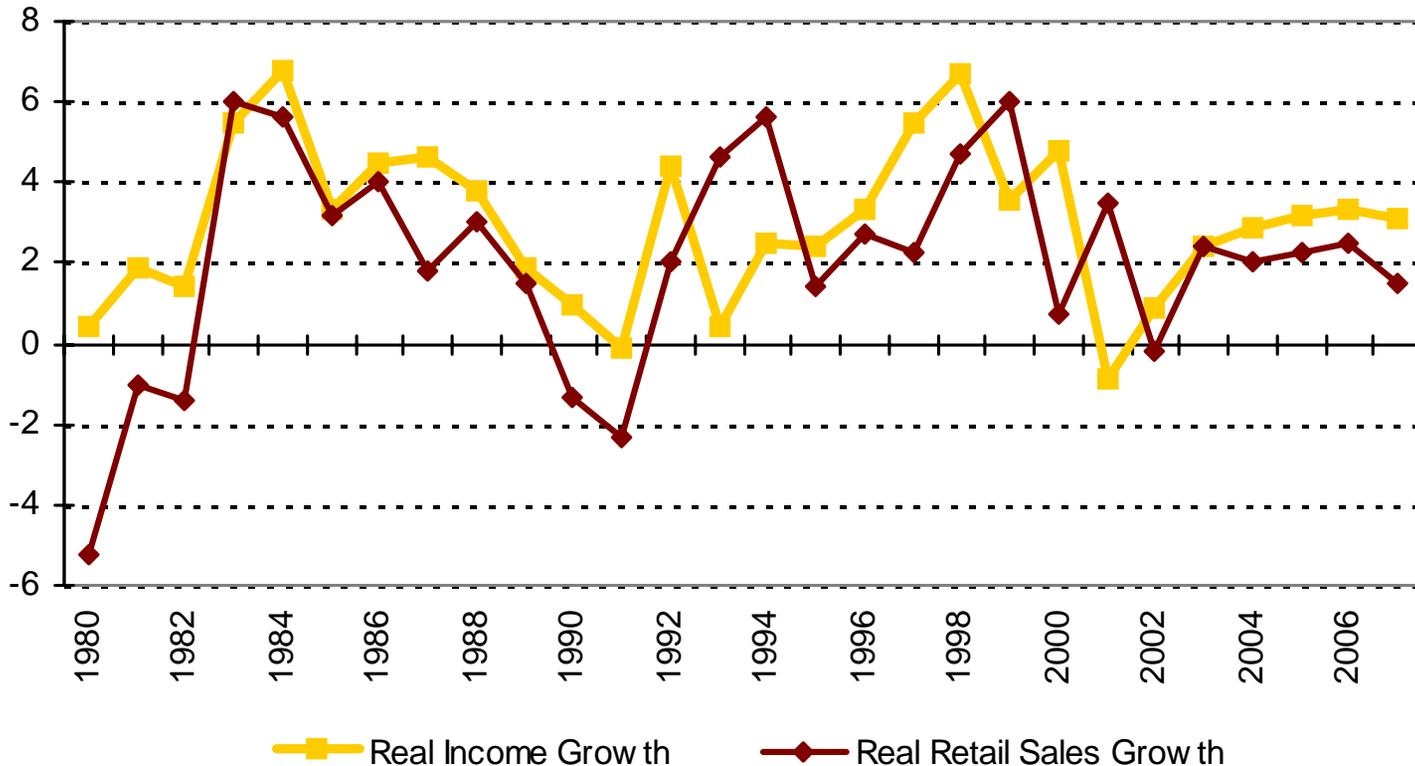


▲ Whs Net Absorption (sf x 1000) (L)  
◆ Export Growth (R)  
— Import Growth (R)



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**Retail sales closely follow personal income, but grow at only 80% of the rate!** (times series studies have difficulty identifying additional demographic effects)





**Retail Sales across 52 cities: more than just personal income: labor force participation and climate matter as well.**

Clothing (logs):

$$\begin{aligned} \text{sales/pop} = & .41 \text{ inc/pop} + .37 \text{ emp/pop} \\ & + .45 \text{ Jan Temp} - .03 \text{ pop} \quad [R^2 : .53] \end{aligned}$$

Food/Beverage eaten in (logs):

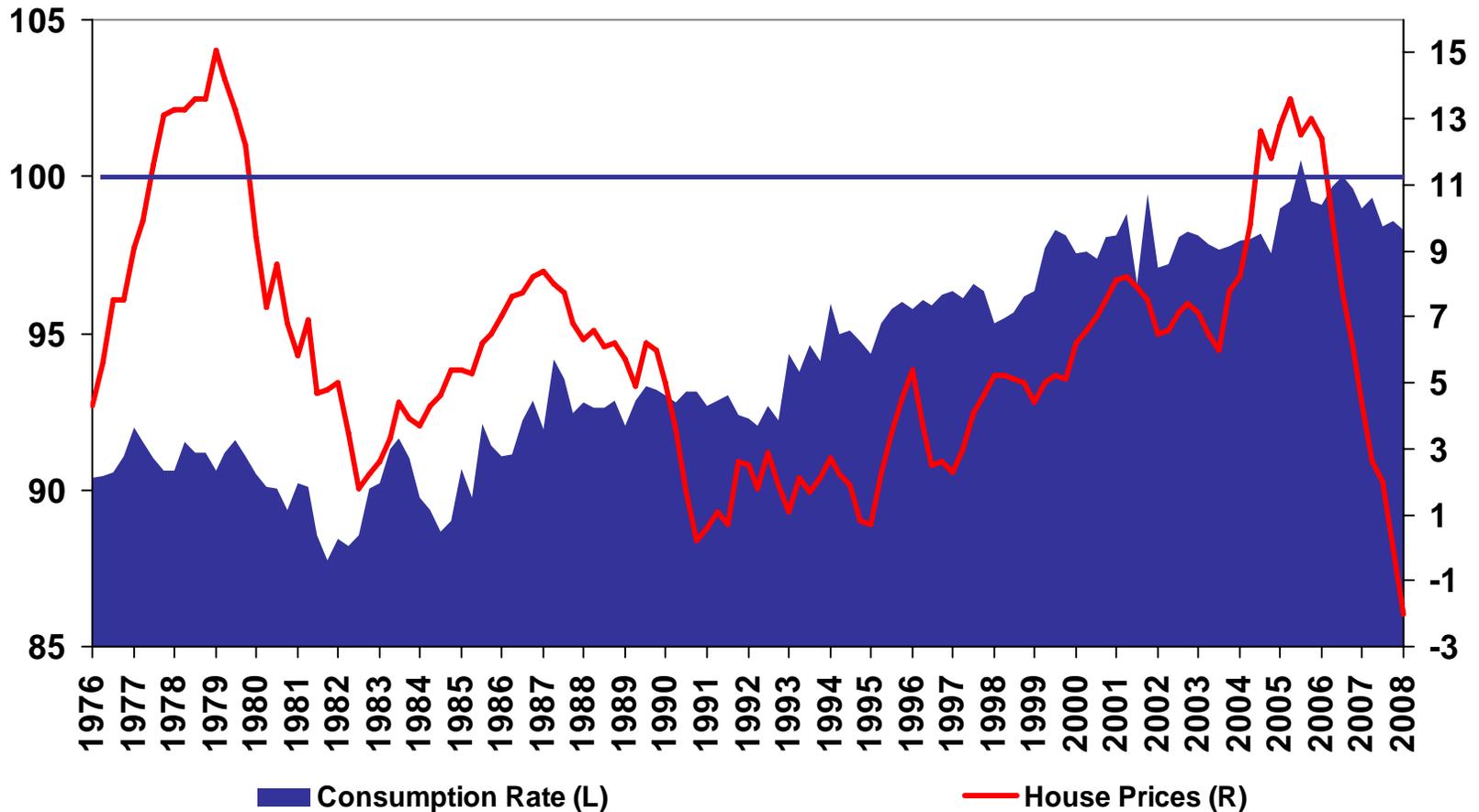
$$\begin{aligned} \text{sales/pop} = & .89 \text{ inc/pop} - .26 \text{ emp/pop} \\ & + .09 \text{ Jan Temp} - .06 \text{ pop} \quad [R^2 : .58] \end{aligned}$$



**Some contend that housing wealth impacts retail demand, but Housing Wealth has had only Small Impact on Consumption! Much of recent housing Wealth Gains Went Back into Housing!**

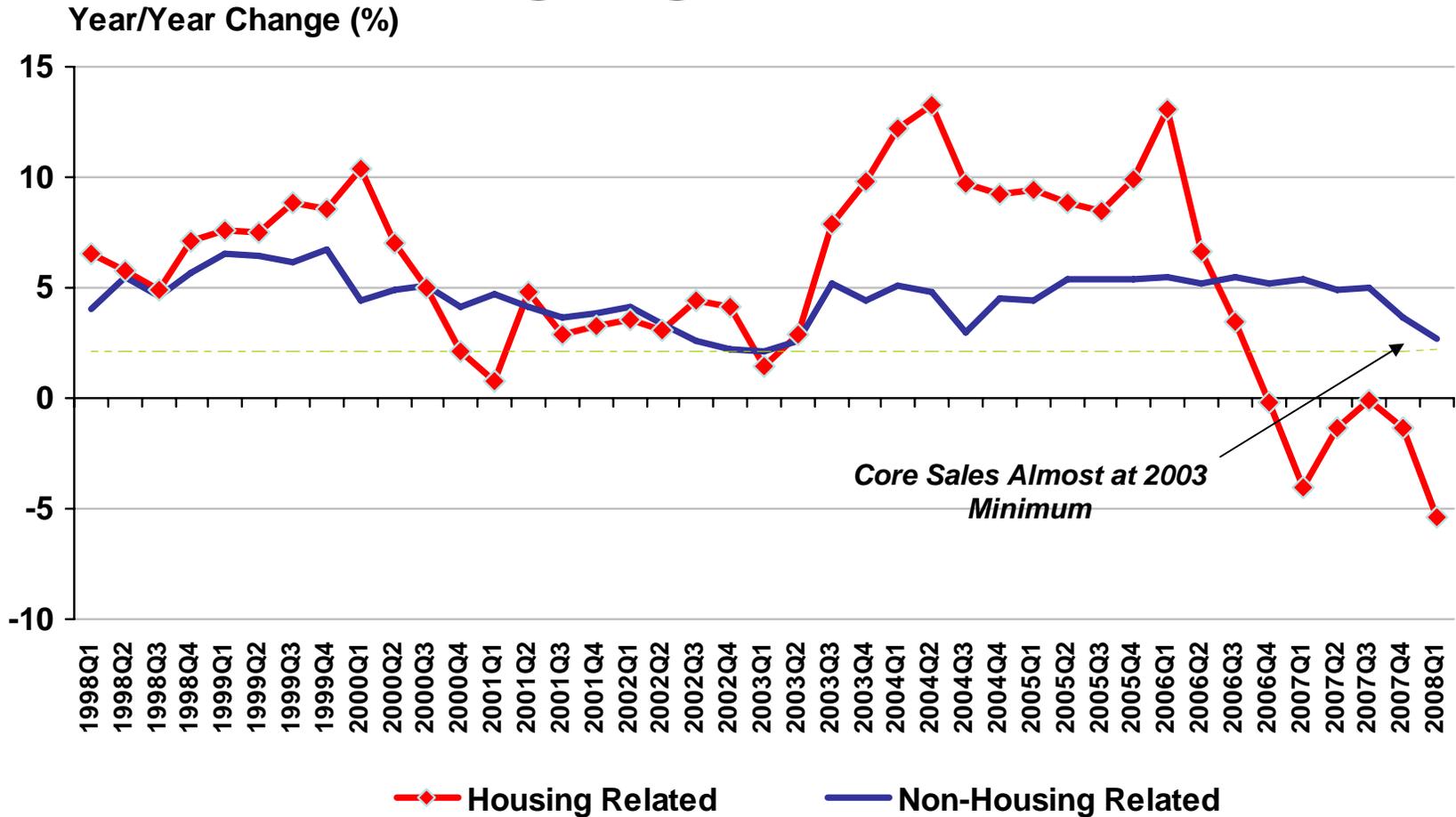
Consumption rate, % share of disposable income

Existing single family house price, % change year ago





# Hence going forward Housing Related Sales are going to Suffer the most



Source: BOC.

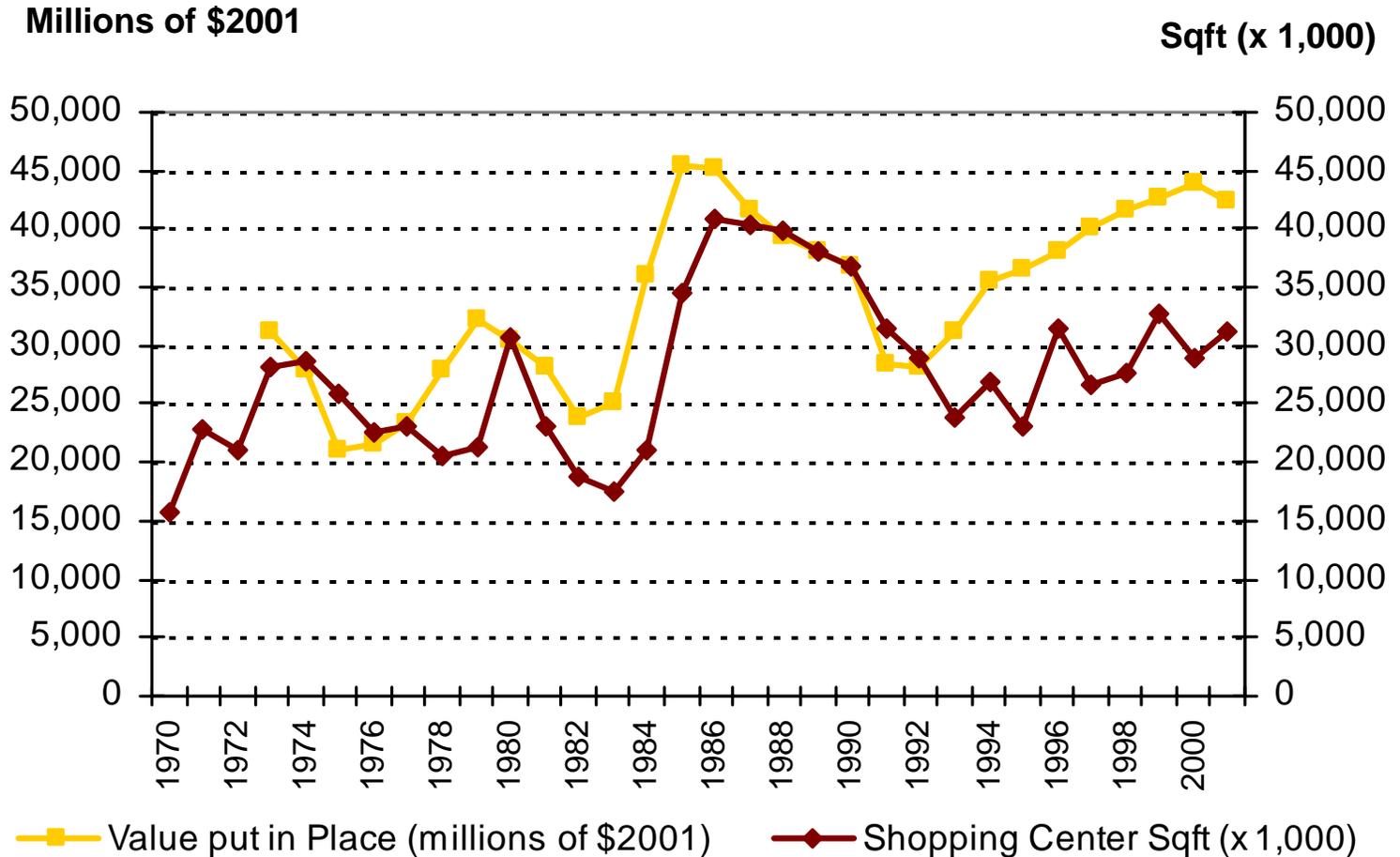


**1967-1993 growth of: Retail store Sales (from establishments) , and alternative measures of retail square feet. Is the US over supplied with retail space or is demolition widespread?**

- Restaurant and Entertainment: 102%
- Furniture: 79%
- Building Materials: 78%
- Other Hard goods (Appliance...): 68%
- GM: 46%
- Clothing: 31%
- Food at home 26%
- Personal Income: 83%<sup>0</sup>%
- Neighborhood Centers (NRB): 143% (net)
- Regional Malls(NRB): 238% (net)
- All retail space (FW Dodge) 117% (gross)

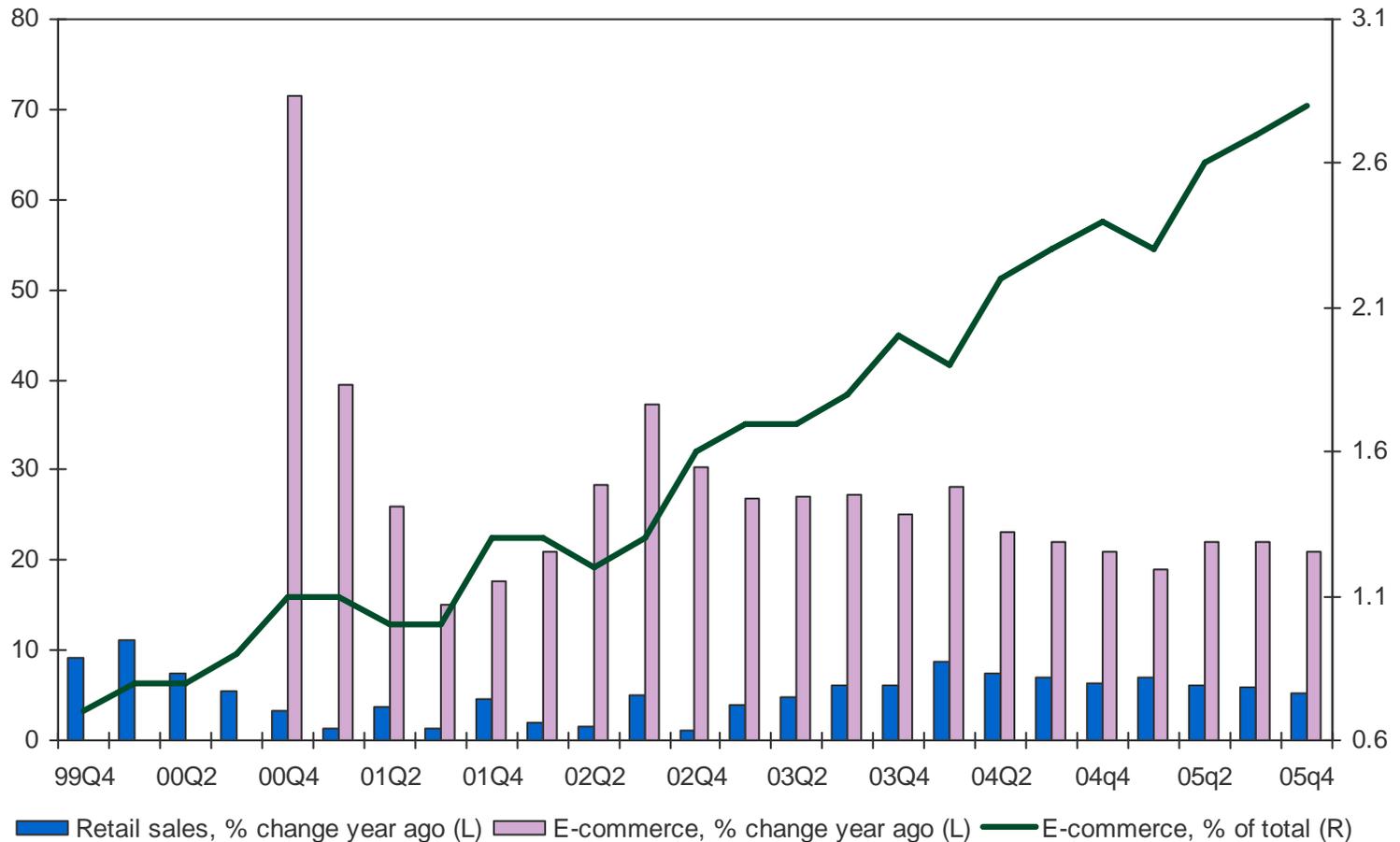


# But is Construction Moving Beyond the Shopping Center Format ? Walmart?





# The small E-Commerce Share doubles every 3-4 years: Will clicks cannibalize Bricks next decade?





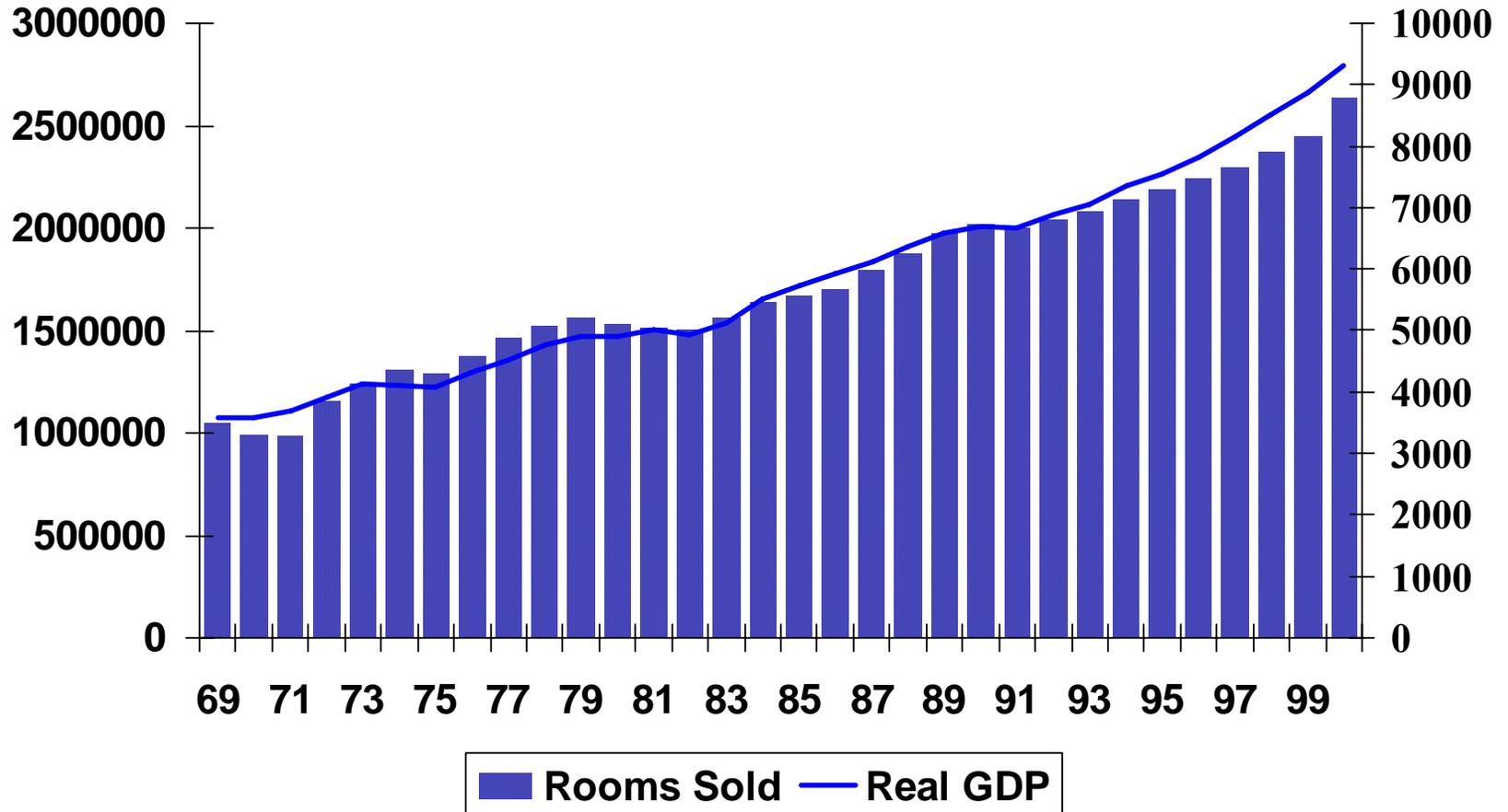
## The Lodging Industry (Smith Travel Research) [200 national hotel chains]

- Rooms available (potential nights) = “supply”
- Change in Rooms available = “net additions”
- Rooms sold = “demand”
- Change in Rooms Sold = “absorption”
- Rooms Sold/Available = “occupancy”
- $ADR = \text{Total room revenue} / \text{rooms sold}$
- $REVPAR = ADR \times \text{occupancy}$



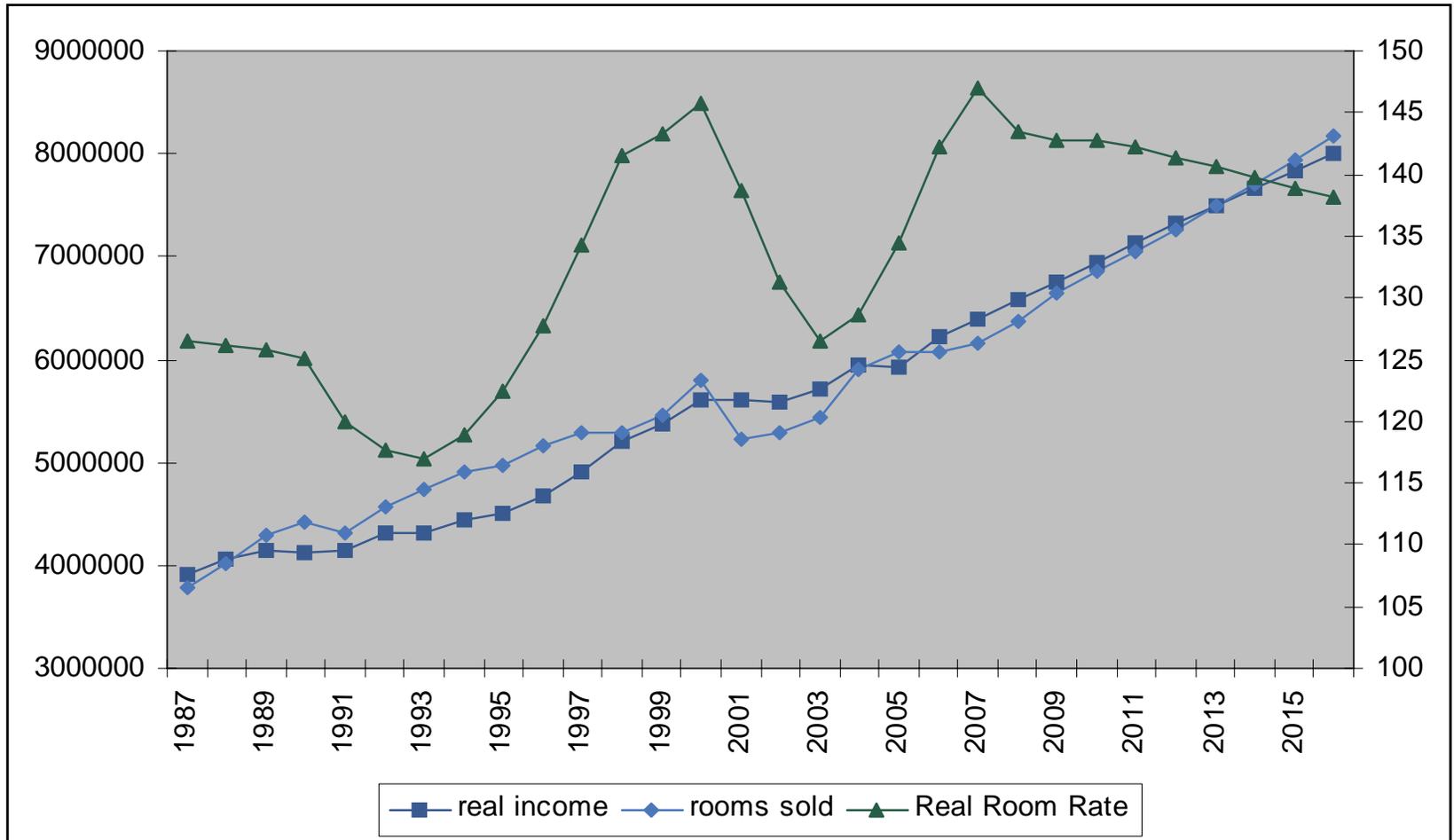
# National Hotel Market

Rooms Sold vs. Real GDP: GDP and room rates are all that matter!





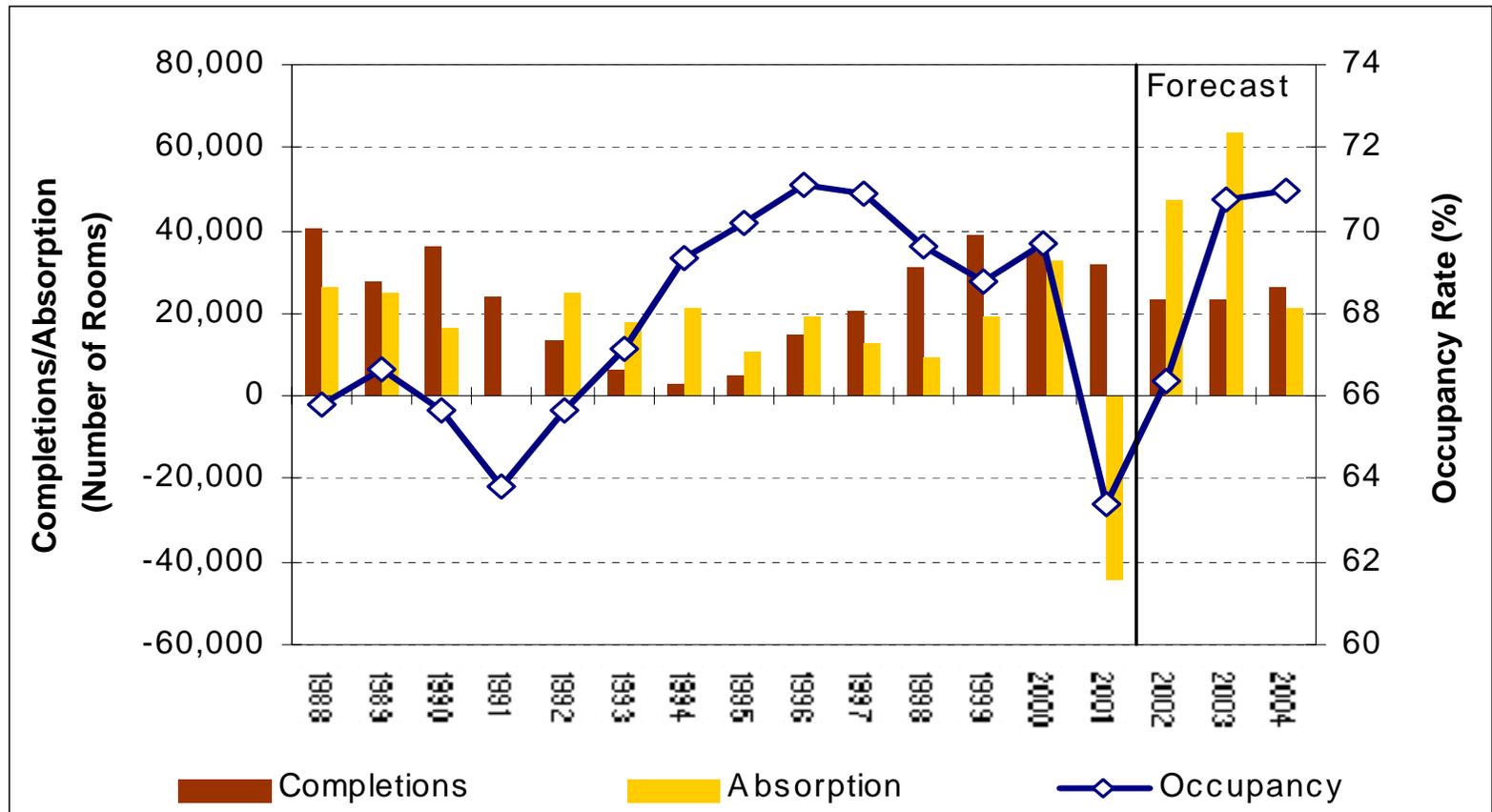
# Can you detect the “rental elasticity of hotel demand?





# Full Service Hotels at 9/11: Learning from the first Iraq war!

National Model Forecasts from 2002 (1<sup>st</sup> Quarter)





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# *Just as Forecast: A Remarkable Post 9/11 Turnaround: Occupancy first then ADR = Mean Reversion*

