



Interarea Price Levels

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Outline

- General Methodology and Data
- Estimation
 - Step One: Cluster Price Levels
 - Step Two: Aggregate Price Levels
- Sensitivity to Model Specification - Rents
- Application
 - Price levels of Goods vs. Services



Estimation

(Step One - Cluster Price Levels)

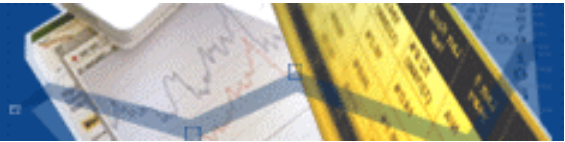
$$\ln P_{ij} = \sum_{i=1}^M \alpha_i A_{ij} + \sum_{n=1}^N \sum_{j=1}^{J(n)} \beta_j^n Z_{ij}^n + \varepsilon_{ij}$$

(A_{ij}, Z_{ij}) are two sets of dummy variables with

$i = 1, \dots, M$ (geographic areas); $j = 1, \dots, J(n)$ (specifications), $n = 1, \dots, N$ (characteristics).

Since the equation is overidentified, $\beta_1^n = 0$ (for each $n = 1, \dots, N$).

- P_{ij} = Effective price (\$)
- Normalized Quote Weights (minimize weighted residual SS)
- Antilogs of " are the price relatives in each area i (corrected for mean bias)
- Antilogs of \$ are the factor by which the characteristic or outlet changes the base price



EXAMPLE 2003 AVERAGE PRICES FA011 01A : FLOUR

The GLM Procedure

Dependent Variable: `l_price`

Weight: `nqt_wt`

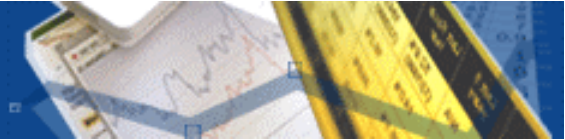
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	56	127.773	2.282	1060.26	<.0001
Error	142	0.306	0.00215		
Uncorrected Total	198	128.079			

R-Square	Coeff Var	Root MSE	<code>l_price</code> Mean
0.8169	-1.212	0.046390	-3.827

Source	DF	Type I SS	Mean Square	F Value	Pr > F
AREA	38	127.1435	3.3459	1554.79	<.0001
TP_BSNS	5	0.1914	0.0383	17.79	<.0001
A	7	0.2889	0.0413	19.18	<.0001
D	4	0.0912	0.0228	10.59	<.0001
F	2	0.0581	0.0291	13.51	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
AREA	37	0.3228	0.0087	4.05	<.0001
TP_BSNS (Outlet)	5	0.0889	0.0178	8.27	<.0001
A (Type)	7	0.1703	0.0243	11.31	<.0001
D (Size of Package)	4	0.0865	0.0216	10.05	<.0001
F (Brand)	2	0.0581	0.0291	13.51	<.0001

N=4 Characteristics (Outlet, Type, Size, Brand)



EXAMPLE FLOUR continued

Parameter		Estimate	Standard Error	t Value	Pr > t
AREA	A102 (Philadelphia)	-4.5981 B	0.3083	-14.91	<.0001
AREA	A312 (DC)	-4.5131 B	0.2740	-16.47	<.0001
AREA	A426 (Honolulu)	-3.9056 B	0.2526	-15.46	<.0001
TP_BSNS	572 (Large Grocery)	0.7645 B	0.1674	4.57	<.0001
TP_BSNS	573 (Small Grocery)	0.8129 B	0.1788	4.55	<.0001
TP_BSNS	637 (Warehouse Club)	0.0000 B	.	.	.
A	A1 (White)	-0.0963 B	0.0774	-1.24	0.2153
A	A2 (Whole wheat)	0.2569 B	0.0760	3.38	0.0009
A	A6 (Cake)	0.7826 B	0.2249	3.48	0.0007
A	A99 (Other)	0.0000 B	.	.	.

Characteristic A (type of Flour): J(n) = 8 Specifications A1-A7, A99



Example

	FLOUR		RENT: Owner Equivalent	
Area	Price Relative (antilog of coefficient*)	Cluster Price Level	Price Relative (antilog of coefficient*)	Cluster Price Level
DC A312	\$0.0126	0.82	\$650.8	0.93
Honolulu A426	\$0.0228	1.50	\$889.5	1.27
Average	\$0.0152/oz (Base specs)	1.00 (U.S.)	\$700.4 (Base specs)	1.00 (U.S.)

* With Goldberger correction



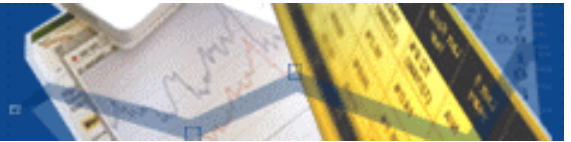
Data CPI 2003 (Table 1)

<u>Exp Group</u>	<u>CES Wt</u>	<u>Original Obs</u>	<u>Unique Obs</u>	<u>Number of Regs (Clusters)</u>	<u>N in Regs</u>	<u>% Miss</u>
1. Housing	42%	236,118	82,653	102	79,754	4%
2. Food & Beverages	15%	380,557	50,662	130	47,978	5%
...
TOTAL	100%	1,077,829	230,286	373	221,824	4%

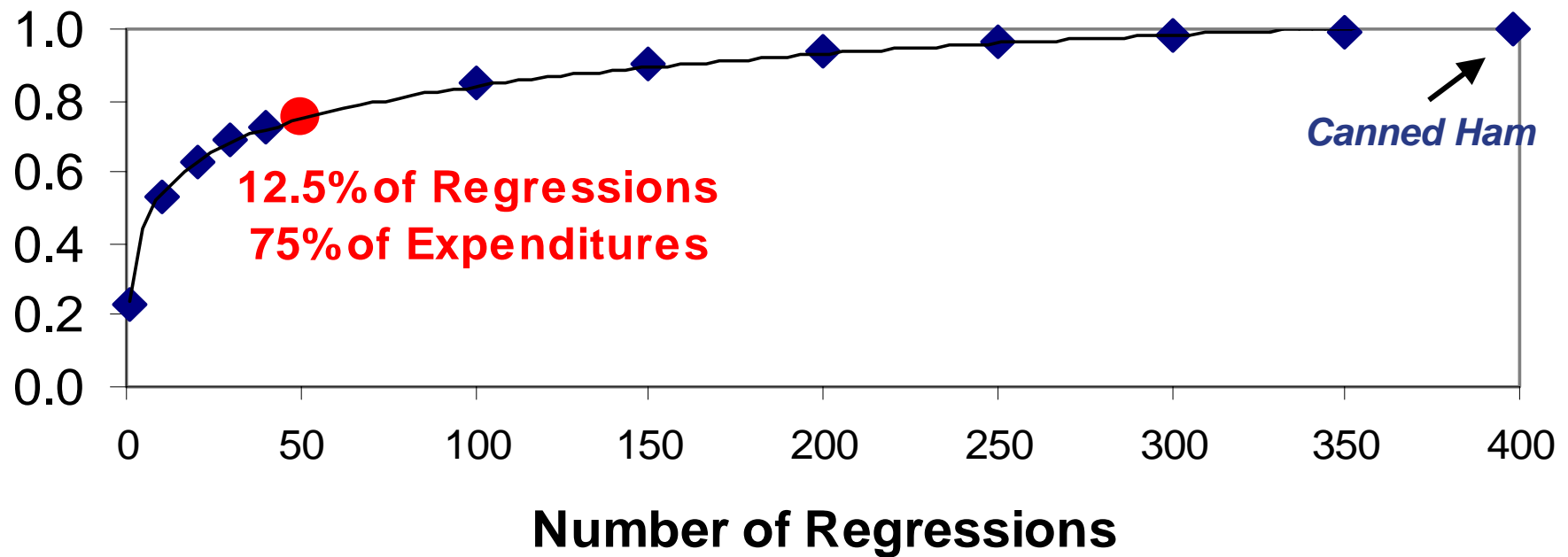


Results (Table A)

- Each regression in Table A is a Cluster
 - 38 " 's for each of 373 regressions
 - 25 'not elsewhere classified' or '09' items found by taking the weighted geometric mean of remaining items in that strata
 - tableau of $38 \times 398 = 15,124$ Cluster Price Levels
 - 4 missing medical CPLs would add 152 = 15,276 CPLs
- **Consumer Expenditure Survey weights for Items**
 - Allocate regional detailed cluster-level weights to areas



Cumulative Expenditure Weights of Regressions





Estimation

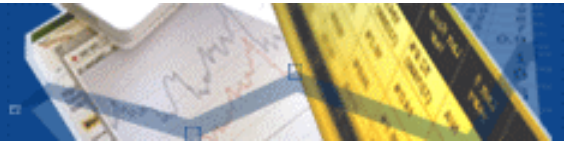
(Step Two: Aggregate Price Levels)

$$\underbrace{\ln P_{ij}}_{\alpha_i \text{ (eq.1)}} = \sum_{i=1}^M \gamma_i A_{ij} + \sum_{j=1}^N \delta_j X_{ij} + \varepsilon_{ij}$$

(A_{ij}, X_{ij}) are two sets of dummy variables with
 $i = 1, \dots, M$ (geographic areas); $j = 1, \dots, N$ (eli-clusters).

Since the equation is overidentified, $\delta_j = 0$ (for any one j).

- Normalized Weights (consumer expenditure weights)
- P_{ij} = Cluster Price Relatives (or CPLs) corresponding to the antilogs of the α 's from Equation 1 (relative to the U.S. average)
- Antilogs of γ_i are the aggregate price relatives



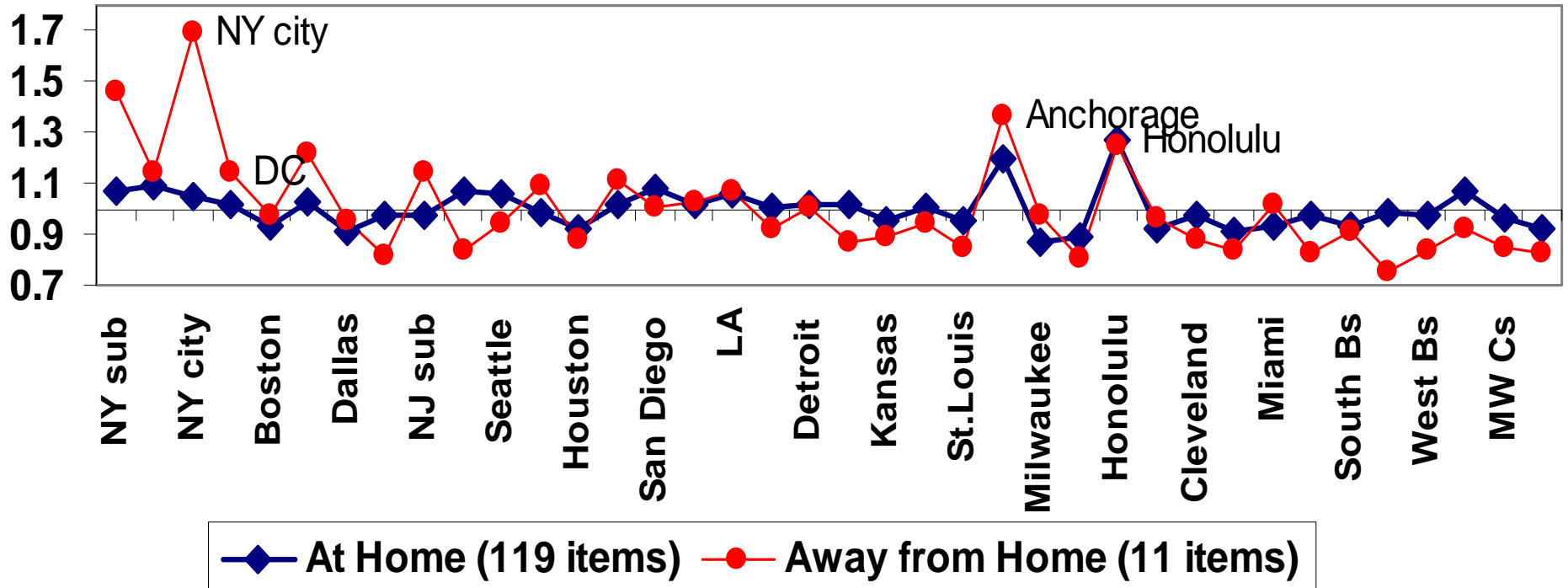
Results Step Two: Overall Price Levels (Table 3 and 3i)

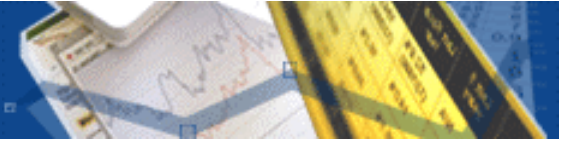
Rank	Area	Food	Housing*	Overall
1	NY suburbs	1.23	1.36	1.27
2	San Francisco	1.02	1.49	1.27
4	Honolulu	1.26	1.24	1.20
14	Philadelphia	1.03	1.06	1.03
17	DC	1.08	0.96	1.01
38	South C	0.88	0.70	0.81
	Mean	1.00	1.00	1.00
	Range	0.44	0.79	0.46

* Includes Rents, Owners' Equivalent Rents and 104 Items in Household Furnishings

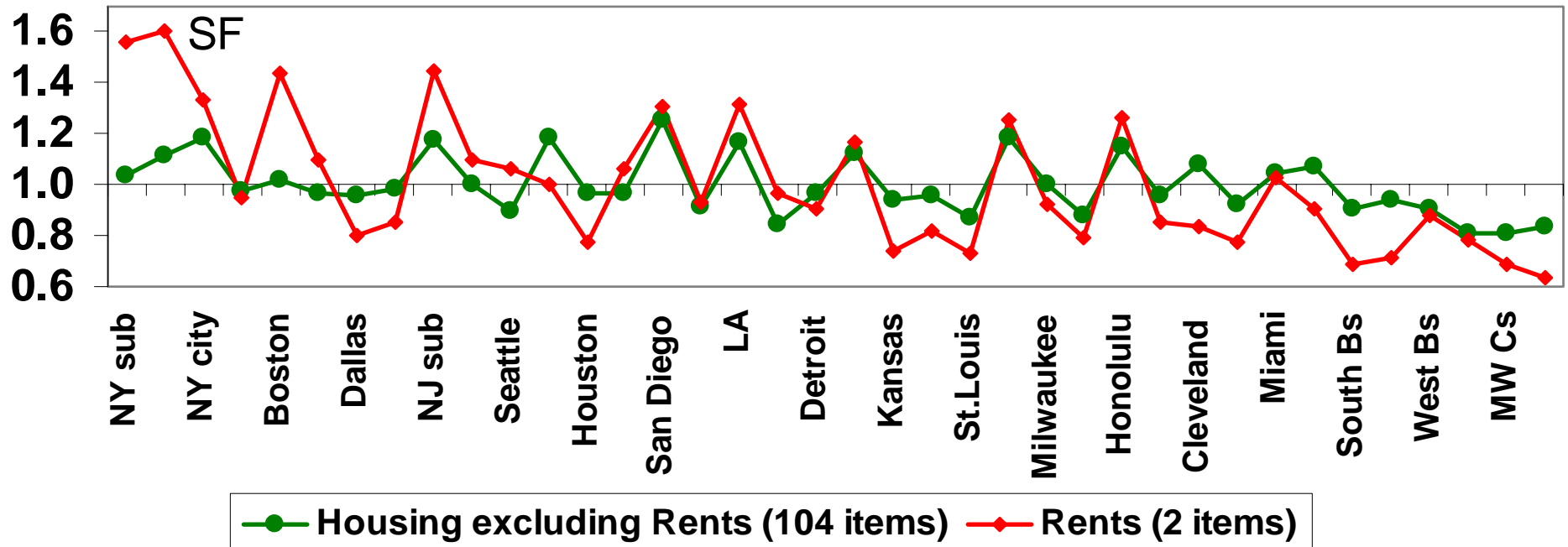


Food Price Levels (U.S. = 1.00)





Housing Price Levels (U.S. = 1.00)





Sensitivity of Price Levels to Model Specifications

1. Combine Regressions

- Household Linens: HH03 (0.236%)

2. Remove an Irrelevant variable

- Physician Services: MC01 (1.52%)

3. Remove Census variables

- Rents: HA011 (6%)
- Owner Equivalent Rents: HC011 (23%)



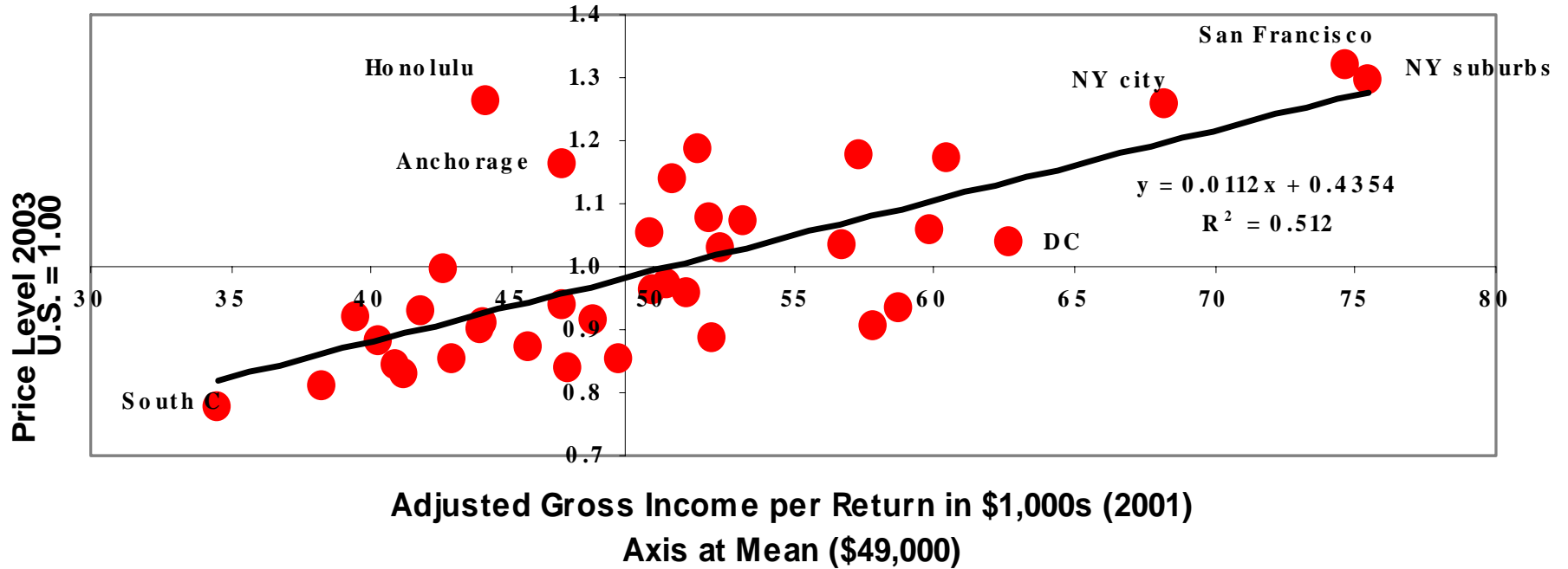
Sensitivity of Overall Price Levels to all three Changes (Table 11)

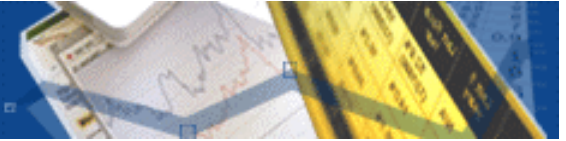
	Original	New	Difference (as % of original)
Mean	1.00	1.00	-0.24%
Max	1.270 NY suburbs	1.321 San Francisco	5.0% Honolulu
Min	0.815 South C	0.775 South C	-4.9% South C
Range	0.455	0.546	9.9%



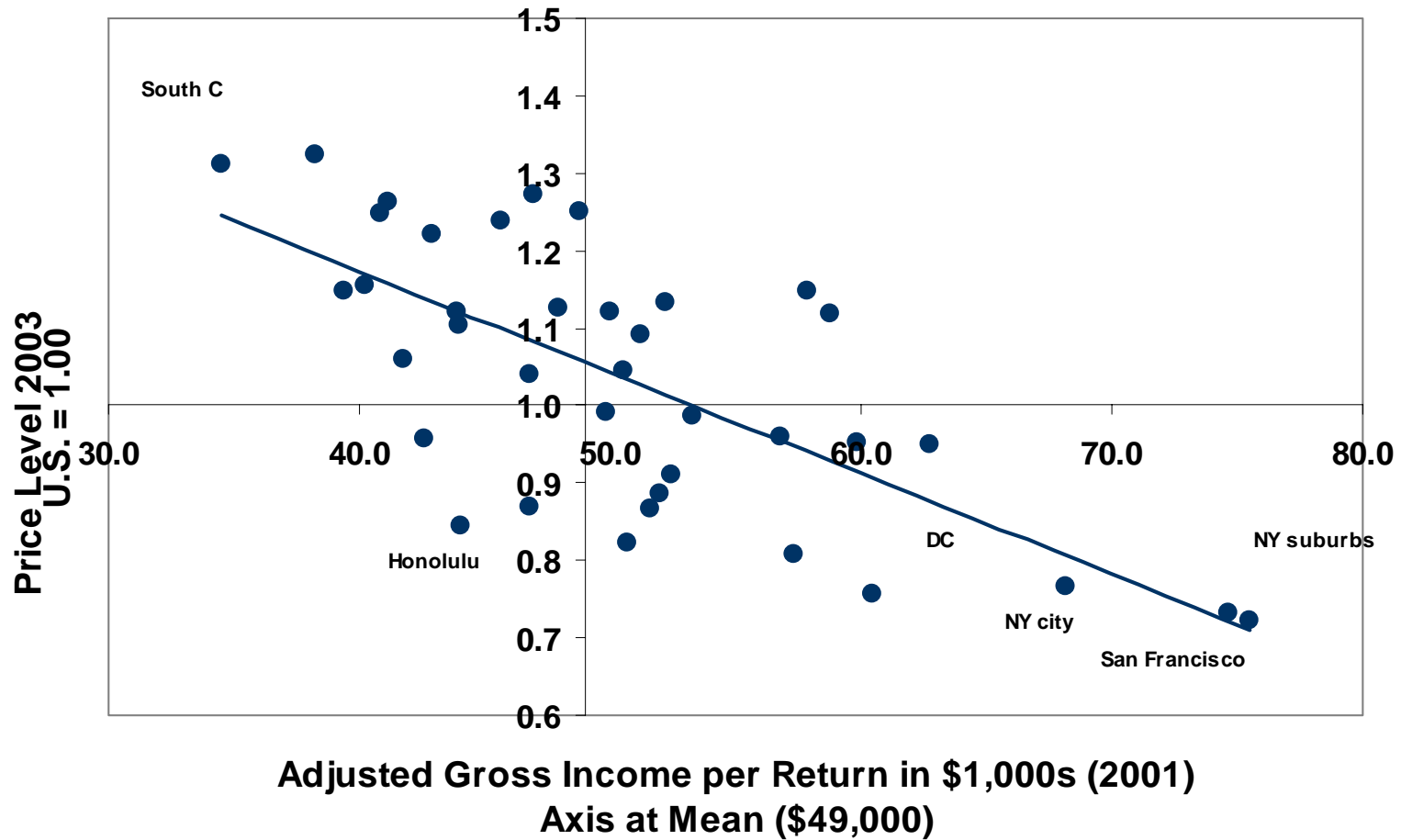
Application

Price Levels vs Income



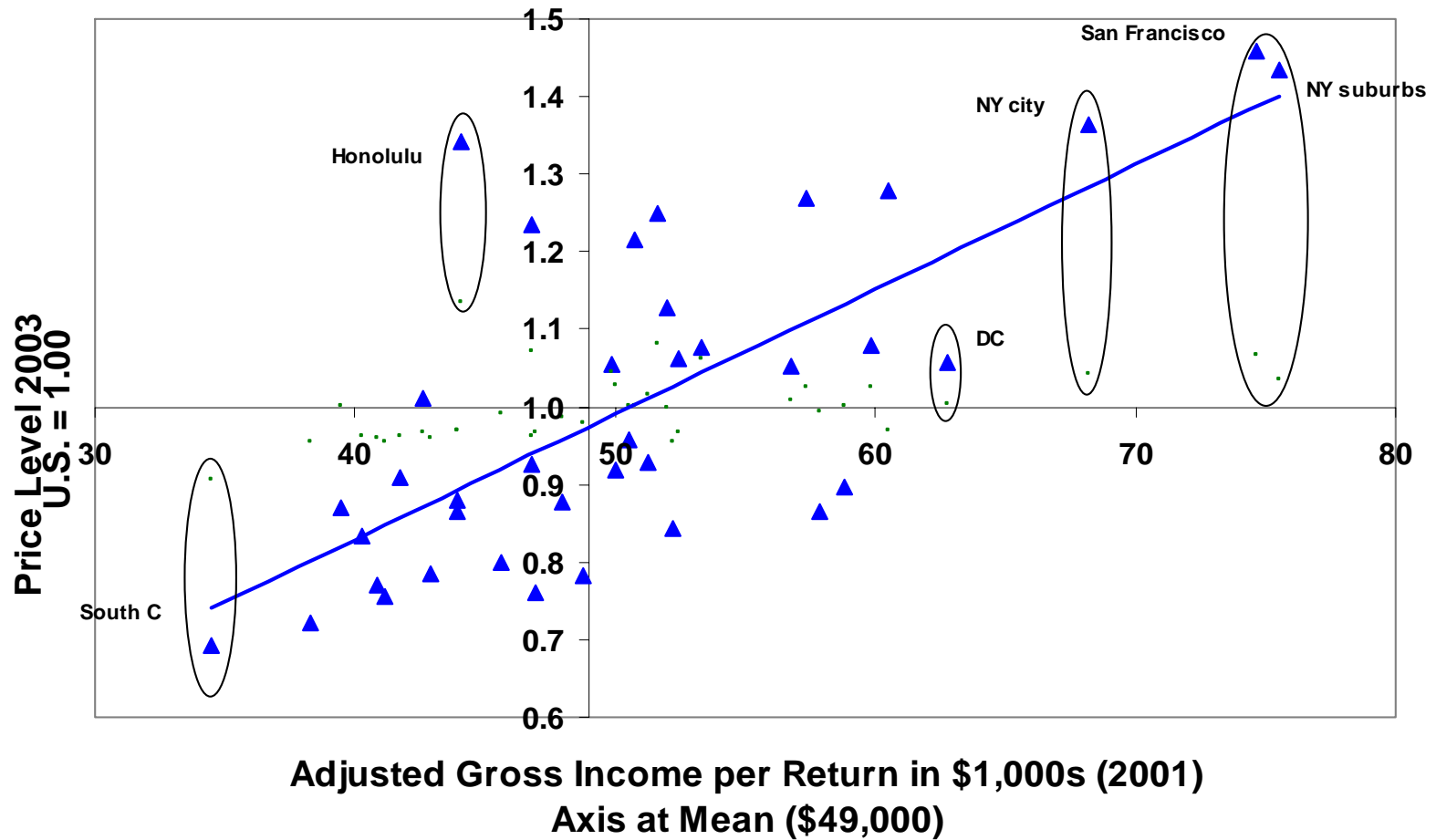


Ratio of Goods to Services Price Levels



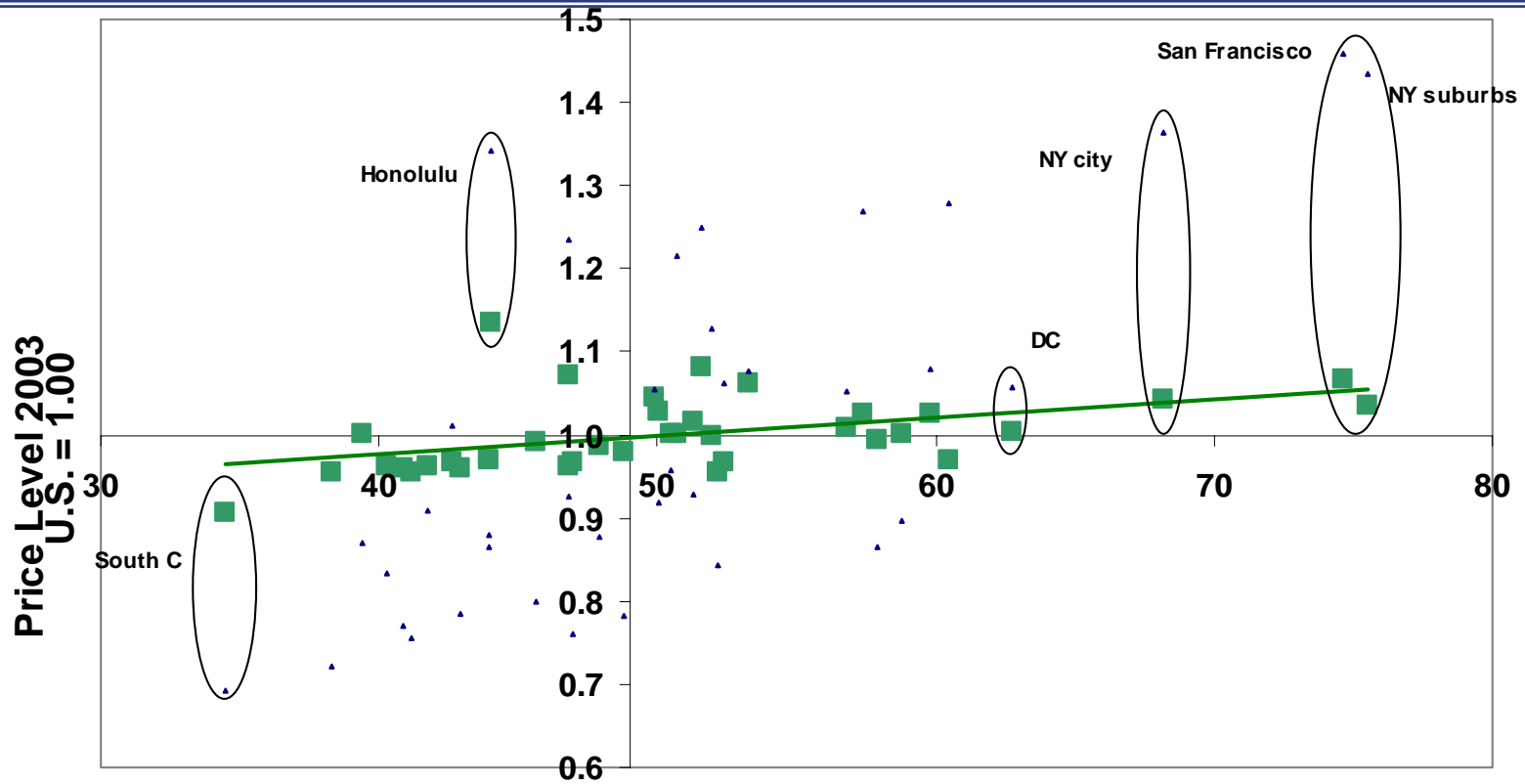


SERVICES





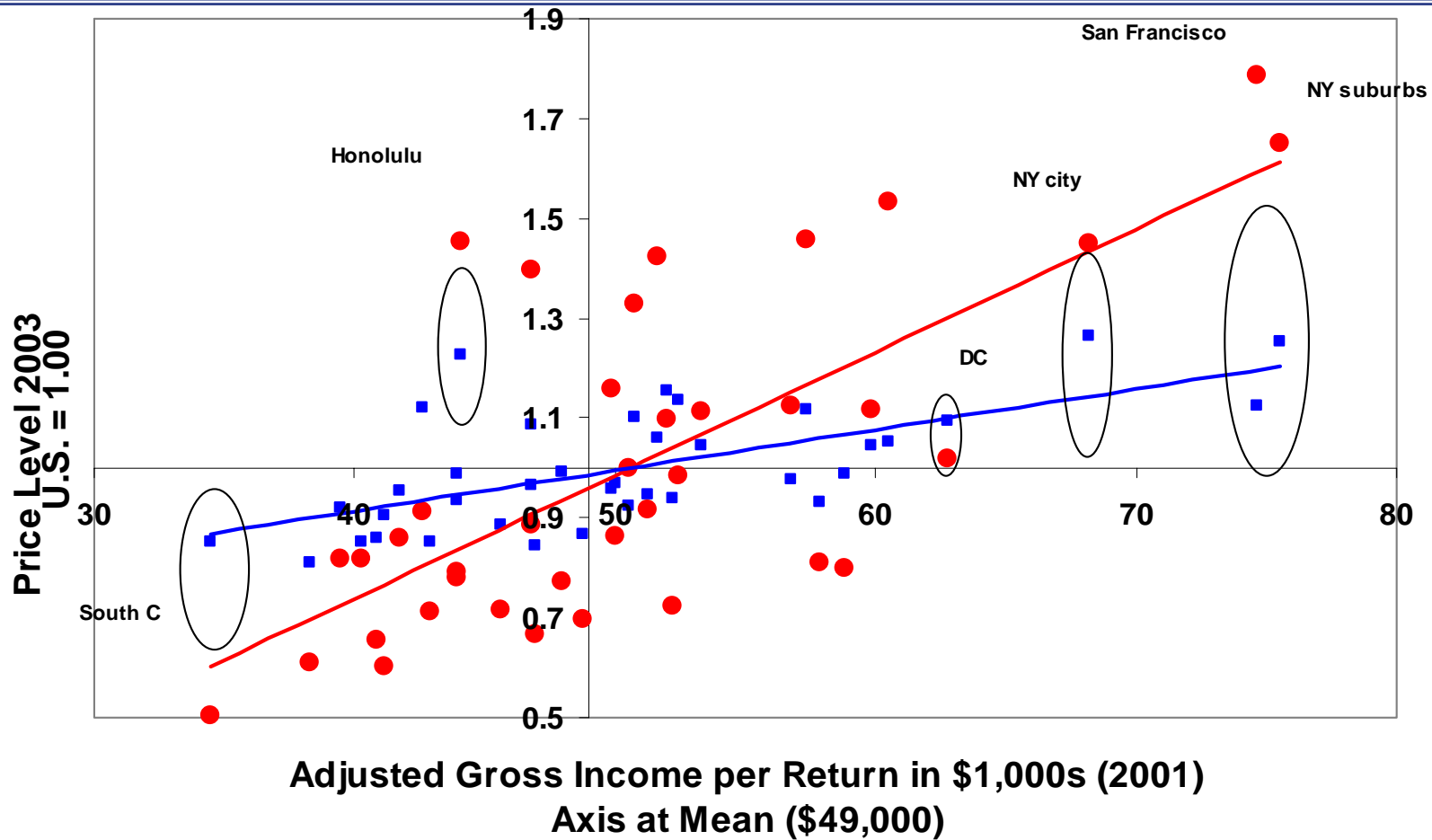
GOODS



Adjusted Gross Income per Return in \$1,000s (2001)
Axis at Mean (\$49,000)



RENTS vs OTHER SERVICES





Conclusions

- Advantages
 - Use of CPI
 - Hedonic approach
 - Simple Multilateral aggregation
 - Consistent with ICP - price levels across countries
- Future Research
 - Spatial vs. temporal variances for same item
 - Short-cut approaches
 - Stability in 'benchmark' years
 - State price levels