(Why) Do Prices Differ Across US Cities?
Balassa-Samuelson Versus 42nd Street

Holger Wolf
Center for German and European Studies
Department of Economics
Georgetown University
wolfh@gunet.georgetown.edu

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Introduction

The law of one price, or purchasing power parity in its aggregate form, provides a cornerstone for much of international economics. Not too surprisingly, its empirical validity has attracted strong interest. The consensus view has shifted over time; while early studies tended to reject PPP, the availability of longer time series and advances in econometric methodology have recently tilted the balance of evidence in favour of weak versions of PPP, notably long term mean reversion.

For macro-policy, the behaviour of aggregate real exchange rates is indeed the appropriate focus. Yet ultimately the behaviour of aggregate price indices is the aggregate of the behaviour of individual prices. As the comparison of aggregate indices across counties by necessity involves compromises in terms of product similarity and weightings --- features which, in combination with different productivity growth rates may in the extreme spuriously influence aggregate PPP examinations --- a look at individual prices promises additional insights.

Building on this motivation, a number of authors have hence augmented the literature on aggregate PPP with studies of more dis-aggregated prices. Starting with Isard=s (1977) classic study, this literature has all but unanimously rejected the validity of the LOOP, and has done so not only for non-tradables but also for tradable goods. At this juncture, the failure of the LOOP to hold --- at least over extended periods --- is thus quite well established. The attention has hence turned from documenting the failure of the LOOP to establishing the role played in its failure by a range of partly complementary, partly competing hypothesis; ranging from arbitrage costs to the effects of combining sticky goods prices with volatile nominal exchange rates to local non-traded inputs and to pricing to market.

The (intuitively appealing) presence of arbitrage costs implies that arbitrage will only take place once relative prices breach thresholds. A growing literature documenting non-linear mean reversion supports this view. As the data set used in this paper is purely cross-section, we have relatively little to say about this explanation, though the documented divergences in relative prices controlling for other factors of course have a bearing on the potential size of the non-arbitrage bands. As the data set covers different locations within a country, the role of volatile nominal exchange rates likewise remains outside the purview of the paper, which focusses primarily on the latter two possibilities.

Local non-traded inputs imply that the failure of the LOOP for actual retail prices is insufficient to infer the existence of unexploited arbitrage opportunities as potential arbitrageurs would also have to incur the local costs. In exploring this possibility beyond documenting divergences of non-traded input costs, it is of interest to examine whether such divergences are systematically linked to identifiable factors. The classic Harrod-Balassa-Samuelson explanation for overall price levels provides an obvious starting point. To the extent that labor is non-mobile across locations but mobile across sectors (admittedly a harder assumption to make for alternative locations within a country than for cross-country data), greater differences in labor productivity in tradables compared to non-tradables across locations, reflected in wage differentials, could explain systematic differences in the retail prices of tradables across locations. Local taxes, and differences in rents, provide a second promising avenue of study.

Finally, price difference may indeed reflect site-specific pricing in the absence of effective arbitrage, and thus separated markets. The role of pricing to market has been studied for a number of inter-national micro datasets on actual transactions prices[1] ranging from industrial products [Knetter (1989,1993)] to BigMacs [Cumby (1993)], commodities [Froot, Kim and Rogoff (1995)], magazines [Ghosh and Wolf (1994)] and furniture [Haskel and Wolf (1998)]. This literature strongly suggests that national markets are indeed effectively segmented, though some studies [Cumby (1993), Ghosh and Wolf (1994), Haskel and Wolf (1998)] also document a tendency towards (slow) longer term mean reversion to the absolute law of one price.

Market segmentation has also been the focus of a separate literature either explicitly contrasting relative price patterns within and across countries or studying intra-national relative price patterns [Engel (1993), Rogers and Jenkins (1995), Engel and Rogers (1995), Parsley and Wei (1995) inter alia].[2] This literature again quite unambiguously rejects the law of one price and tends to find price dispersion to increase in distance and decrease in homogeneity. Controlling for other factors, a very significant border effect typically emerges, providing support both for the view that markets (marketing, distribution networks etc.) are structured along national lines, and for the sticky-price/volatile nominal exchange rate view.

This paper follows in the footsteps of these prior contributions. We focus on a cross section of thirty-four retail transaction prices of precisely identified goods across two-hundred and eleven US cities. As has been noted before, the use of intra-national data is quite attractive for the issue at hand, for three reasons. First, the entire set of institutional market arrangements are likely to be more similar across a set of cities within a country than across countries. Second, trade barriers are much lower within than across countries, indeed, for the current data set, the freedom of inter-state commerce is constitutionally protected. Third, the exchange rate is credibly fixed at one. In combination, the three features arguably lower the hurdle for a finding favourable to the LOOP: if the law of one price holds anywhere, it should hold for identical products sold in well-connected cities within a common natural border without exchange rate fluctuations. A failure to find evidence favourable to the LOOP even for this data set would thus cast serious doubt on its overall validity.

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[1] Froot and Rogoff (1995) and Goldberg and Knetter (1997) provide critical surveys of these literatures.

[2] The price literature is complemented by an equally active literature on the effect of borders on real magnitudes [Helliwell (1998)]. To the extent that prices are significantly determined by actual or potential arbitrage, the two border effects are of course linked.

In terms of data the paper is closest to Parsley and Wei (1995) and Rogers and Jenkins (1995) who use a panel structure to primarily examine the time series behaviour of relative prices[3], whereas the present paper focus solely on a cross section, allowing the exploration of a somewhat richer set of locations and site-specific controls. In terms of methodology, the paper is closest to Crucini, Telmer and Zachariadis (1998) who examine a broad set of actual prices across European cities, finding deviations from the LOOP to vary substantially across products and to be larger for non-traded goods, for items with lower prices and, within traded goods, for branded products as well as to be larger for more distant cities, while non-traded inputs are found to play a smaller role. Part of the motivation for the present paper is to examine whether similar results hold across cities in the US, as some of the prior work cited above suggests. The main motivation is however to make use of the availability of a large set of city characteristics to explore the alternative explanations for the observed divergences in a nested framework, further explained below.

Framework

The alternative explanations for the failure of the LOOP can be summarized by decomposing the final retail price of a product i sold in location j into its various components [Harrod (1939), Jones and Purvis (1981), Engel and Rogers (1996)]:

(1) $P^{ij} = u^{ij}(1+t^{j})[w^{ij}]^{\alpha}[q^{ij}]^{1-\alpha}$

where P^{ij} is the actual retail transaction price, u^{ij} is the markup, tj is the tax rate, w^{ij} is the cost of local nontraded input (including transportation costs) and q^{ij} is the price of good ex factory gate. In consequence, the relative price of good i in two locations j1 and j2 is given by:

(2) $\ln(P^{ij1} / P^{ij2}) = \ln(u^{ij1}/u^{ij2}) + \ln((1+t^{j1})/(1+t^{j2})) + \alpha \ln(w^{ij1}/w^{ij2}) + (1-\alpha) \ln(q^{ij1}/q^{ij2})$

A first simple explanation attributes price differences to costs of arbitrage, most importantly transportation costs which require price divergences to exceed thresholds before arbitrage takes place: AA traveller leaving a centre of output will ascend a slope of rising prices until he reaches the watershed which bounds the area supplied by a neighbouring centre. The price at each centre is not necessarily the same. The price at each centre plus the cost of transport to the watershed dividing them, mist be the same@ [Harrod ((1939: 65)]. In the presence of such transportation costs, price divergences would thus be bounded, but could well be non-zero. Empirically, the distance between two locales provides an appealing proxy for such transportation costs.

A second explanation focusses on local non-traded costs: the cost of retail product is a combination

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[3] Cecchetti, Mark and Sonara (1998) explore the same question for more aggregated city price levels covering more than eighty years, finding that deviations from city PPP are more persistent than deviations from international PPP.

of the ex-factory gate cost --- measured by q^{ij1} --- , and local wage and rent costs --- measured by w^{ij1} ---. In consequence, price divergence between two locations may simply reflect local cost differences, while the traded component is equal across locations. If local costs have also to be born by a potential arbitrageur, there consequently does not exist a scope for profitable arbitrage. The explanation is thus a close analogue to the Harrod-Balassa-Samuelson model of the aggregate real exchange: the higher local productivity in tradables, the higher are local wages and --- if the productivity of sales-personnel does not differ across location --- the higher are local distribution costs. Empirically, the explanation is captured by adding local wage and other local non-traded costs to the analysis. A related possibility is that local prices differ because of differences in local sales taxes, a possibility readily allowed for by also adding tax rates to the analysis.

The third major explanation focuses instead on differences in the markup of price over cost --- measured by u^{ij1}. While the first two explanations were consistent with effective arbitrage taking place (leading to upper and lower bounds on relative prices, if not to actual price equality),differences in markups are prima facie evidence of the absence of effective arbitrage, and thus of market segmentation. Empirically, for a given product, the presence of market segmentation can be inferred from the presence of price difference after controls for local cost differences and taxes are included. Across products, the role of market segmentation can be assessed by exploring differences in relative price patterns across classes of products. Below, we follow Crucini, Telmer and Zachariadis (1998) in assuming that branded products are likely to exhibit pricing to market.

In the empirical evidence reported below, we examine the various hypothesis in the context of the following regression equation:

(3) $$\ln(P^{ij1} / P^{ij2}) = b_0 + b_1 \ln(D^{j1j2}) + b_2 \ln((1+t^{j1})/(1+t^{j2})) + b_3 \ln(w^{ij1}/w^{ij2}) + bX + \varepsilon$$

where prices have been arranged such that $P^{ij1} >= P^{ij2}$ for all observations and X is a set of additional controls discussed below. If differences in local costs (including taxes) and transportation costs are negligible, the LOOP holds for traded goods, and markups are identical across locations, the final retail prices will obey the LOOP in the sense of

(4) $$H0: \; b_0 = b_1 = b_2 = b_3 = 0$$

In contrast, if arbitrage costs matter, one would expect to find $b_1 > 0$. If local distribution costs and taxes matter, one would expect to find $b_2 > 0$ (=1) and $b_3 > 0$ (=α) ; and if markups differ, one would expect to find $b_0 > 0$.

Data

The data set comprises the prices in 1991 for forty-two goods and services in two-hundred-eleven cities across the US States, taken from the 2nd edition of the American Cost of Living Survey [Fisher (1995)]. The data are drawn from a variety of sources, including federal and state statistics, association databases, the main source is the ACCRA Cost of Living Index. While there is some divergence in sample periods, the prices for individual products are in most cases from exactly the same time period, in most cases December 1994.

The products were selected to capture a wide variety of characteristics. For the empirical results reported below, the products were divided into five broad groups, listed in Table 1.[4] The first two groups contains nationally available non-perishable goods, either branded (Group A) or non-branded (Group B). goods. Ex ante, one might expect the prices of products in group B to be most likely to conform to the law of one price, while sellers of products in group A may be expected to enjoy more pricing powers and to be able to more effectively segment local markets if so desired. The third group contains perishable products, where perishable is taken to mean products likely to spoil within a period of about 10 days (thus baby food in jars and ice cream are not defined as perishable). Ex ante, one might expect arbitrage possibilities to be more limited for these products, providing more pricing power to producers. The forth and fifth group contain non-tradable goods and services. Ex ante, one might expect price divergences to be largest for products in these groups.

As a rough proxy both for the supply of a particular product in a given city, and of the (presumably related) competitive pressure for that particular product, we collected, for each product and each city, the number of stores likely to sell that product in the city. The latter was obtained from the Yellow Page CDs. For example, for Alberto V05™ shampoo we collected the number of local drugstores and supermarkets, for men= shirts, we collected the number of local clothing stores and department stores etcetera.) The appendix lists the set of stores associated with each product.

Beyond the information on individual products, the data set also contains a range of characteristics for each of the two-hundred-eleven cities, including (1) the per capita income; (2) the median household income; (3) the value added per employee in manufacturing; (4) the median house price; (5) total retail establishments; (6) retail sales per capita; (7) city government expenditure per capita; and (8) population. Finally, the data set includes the distance between each of the 22,115 city-pairs.

Basic Statistics

To achieve comparability across products, we express prices for each product in a given city relative to the median price of that product across all cities. Unless otherwise noted, all results reported below are for this scaled price measure.

Basic Statistics: Products

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[4] The proper classification is at times ambiguous. Thus college room and board is, to an extent, indirectly tradeable through the initial application and location choice of students, but becomes largely non-traded after enrollment. Likewise, doctor and barber visits are to an extent tradable, though most visits tend to occur close to the patient/customer=s residence or work place.

Table 2 reports the range and the coefficient of variation for each product, as well as the median coefficient of variation for each product. The three most variable prices are for the classic non-tradable, women=s haircut (0.43), and for two non-tradable goods, hamburgers (0.41) and newspaper subscriptions (0.21). On the opposite end of the scale are two non-branded tradables, pre-packed bulk ice-cream (0.04) and gasoline (0.05); and a perishable, sirloin steak.

Comparing the three large groups, the median coefficient of variation in the non-branded tradables (0.117) falls (just) below the median coefficient of variation in branded tradables (0.127); both are substantially lower than the median coefficient of variation for services (0.160). That said, the data hardly suggest a sharp break between the categories, a finding also reported by the preceding studies. Leaving out the two extreme values, the coefficient of variation for branded tradables ranges from 0.11 to 0.15; for non-branded tradables (leaving out the two extreme values) from 0.04 to 0.14 and for services from 0.11 to 0.19. The categories thus exhibit substantial overlap. The min-max range likewise exhibits substantial similarity across categories, though extreme values for branded traded goods appear to be rarer than for the other categories.

Basic Statistics: Cities

Table 3 reports the five cities with the smallest and the highest average price (across all available products), as well as the per capita money income and the median household money income. Ex ante, one might expect that large, densely populated cities exhibit the highest prices, reflecting both higher wages, and higher rents. That is partly born out: both Pittsburgh and New York are among the five cities with the highest relative prices, while only two of the five cities with the lowest prices has a population exceeding half a million. Yet the top spot is taken by Sherman, Texas, with a population of less than 100,000; many of the largest cities, including Houston, Chicago and Los Angeles do not exhibit particularly high prices, and neither per capita nor median household income exhibit any striking pattern across the groups. An alternative explanation, further pursued below, is that local competitive pressure has significant bearing on local prices, if so, the size of the population and household disposable income may have a second, opposing effect if competitive pressures increase with population size, population density and market spending power, what one might term the 42nd street effect.

Table 4 reports the largest unconditional correlations of the average city relative price and the set of city characteristics. Market size, as measured by population, the number of retail outlets, per capita and median household income is positively correlated with the mean relative price, as is per capita expenditure of the local authority. Many of these features are of course highly correlated themselves, limiting the information that can be gleaned from unconditional correlations. Below, some of these factors are re-visited in a regression framework.

Results by City-Pair

We next compute, for each city pair, the median relative price across all products. Table 5 reports the resulting frequency distribution (where each observation is for one city pair). If the relative price deviation for a given product for a given city-pair were purely random, the median should be close to one and in consequence the distribution should be centered closely around one. If, in contrast, deviations are large and have a systematic component, most relative prices for a given city-pair should either be above or below one, leading to a bi-peaked distribution. The distribution suggests the former scenario. Eighty-two percent of all median relative prices fall into the 0.9 to 1.1 range, a full ninety-seven percent fall into the 0.8 to 1.2 range.

A corroborative piece of evidence is provided by asking whether, for a given city pair, the majority of relative prices are either above unity, or below unity, and computing the average share of all relative prices for this city pair falling into this group. By construction, the statistic is bounded below by 0.5 (half of the relative prices for the given city pair are above one, and half are below one) and above by 1 (either all relative prices are above one, or all relative prices are below one). Averaging over all 22,183 city-pairs, the share comes to 0.684. Thus, for a Atypical@ city pair, 68.4 percent of relative prices (or roughly 23 of the 34 relative prices) are above unity and 31.6 (or 11 out of 34) relative prices are below unity, or vice versa.

Taken in conjunction with the results on relative prices in individual cities reported above, the findings suggest that the violation of the law of one price for individual goods may not exhibit a strong common factor across products, put differently, that upside and downside deviations from the LOOP cancel to a significant extent, generating overall city price levels exhibiting much less variability than observed for the prices of individual goods. The finding suggests that simple explanations of price divergences relaying on factors C such as local non-traded inputs or taxes C which reasonably may be expected to be constant across products, will not provide a complete picture, as these explanations would lead to the prediction that either all relative prices are above unity, or all relative prices are below unity.

Regression Results

To explore the determinants of relative prices in more detail, we next turn to regression analysis. We begin by examining an issue pursued in a number of earlier studies, the dependence of price divergences between two locations on distance. We then turn to a more detailed examination of relative prices of individual goods across cities.

Price Dispersion

Earlier studies of price behaviour --- both for individual products and for indices --- have almost unanimously found that (mostly time series) dispersion measures between two locations increase in distance. As an initial step, we examine whether a similar relation holds in cross section, using three alternative measures of the dispersion of prices between two cities --- the average absolute percentage deviation across all sample prices; the correlation across all prices; and the standard deviation of the relative price of tradables. The measures are regressed on the log of the distance between the two cities, yielding (with t-statistics in brackets and 22,803 observations):

(1) Average absolute percentage deviation = 6.85 + 2.14*ln(Distance)
(31.7) R2=0.04

(2) Correlation of prices = 7.13 - 0.39*ln(Distance)

(34.7) $R2= 0.05$

(3) Standard deviation of relative price of tradables = 7.06 + 0.31*ln(Distance)
(9.7) $R2=0.004$

The two dispersion measures increase significantly in distance, while the correlation decreases significantly in distance. The cross section results thus exactly match prior findings. The last regression comes closest to a direct test of the LOOP: in the absence of local non-traded costs and with zero transportation costs, the relative price of tradables should be one under the LOOP, with a zero standard deviation. In fact, the standard deviation is 0.17 and the distance elasticity is significantly positive. The finding is of course as consistent with costly arbitrage placing bounds on the deviation of the relative price of tradables, but not forcing them towards unity, as it is with local non-traded inputs, and, more restrictively, with pricing to market if distance is a good proxy for the ease of market segmentation. In light of the very low R2s, one hesitates to place great weight on these findings, save as serving notice that distance itself is obviously far from sufficient to explain price dispersion and may act as a proxy for other factors.

The Relative Price Of Individual Products

We next turn to the distribution of the prices of individual products across locations. Based on the decomposition given above, a relatively high price may be due to above average local non-traded costs. In the regression aiming to account for variations in the relative price for good i in city j (relative to the median price of good j in all sample cities), we proxy for local costs by (log) per-capita income, INCOME (as a proxy for wages) and the (log) median house price RENT (as a proxy for rent). A second possible explanation is provided by differences in local sales taxes, which is included as an additional explanatory variable, TAX. Finally, it might be that differences in local competitive pressures account for differences in prices, we allow for this effect by including the log of overall retail sales per capita, SALES, and the log of the number of stores selling the particular product per capita, STORES. Table 6 reports the resulting regressions.

The most striking feature of the results is the absence of striking features, save the very pronounced negative elasticity of sales tax rates. Neither differences in per capita income, nor differences in house prices (proxying for rents), nor total retail sales, nor the number of local stores exert a large influence on the price of goods across cities. Indeed, the signs of the coefficients on income per capita and local competition, though insignificant, clash with reasonable priors: higher per capita income seems primarily to be associated with lower prices, while a greater density of stores per capita is associated with higher prices. Similar to the findings reported above, there does not appear to be a sturdy difference between groups of products: traded and nontraded, branded and non-branded goods are explained to roughly the same degree (mainly by tax rates).

Conclusion

The paper examined the retail level prices of a set of traded and non-traded goods in US cities. A number of, mostly negative, results emerge. First, there does not appear to be a significant difference in the behaviour of traded and non-traded prices: the dispersion of traded goods prices is only marginally tighter than the distribution of non-traded prices. Second, price divergences between pairs of cities jump sign across goods, i.e. some goods are cheaper in the first, and some goods are cheaper in the second city. The finding implies that explanations of price divergences based on factors that are fairly constant across goods --- taxes, local non-traded inputs etc --- are unlikely to be complete. Regression analysis bears this out: neither income per capita --- a proxy for local labor cost --- not house prices --- a proxy for local rents --- are significant explanatory factors. This leaves differences in markups as an appealing alternative. Yet the evidence argues against this explanation as well: price divergences do not seem to be larger for goods for which one might expect greater pricing power, nor do proxies of local competition show up significantly in regressions.

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Appendix 1: Cities in Sample

Abilene, Akron, Albany, Albany-Schenectady-Troy, Albuquerque, Alexandria, Altoona, Amarillo, Anniston, Appleton-Neenh, Asheville, Athens, Atlanta, Augusta, Bakersfield, Baltimore, Baton Rouge, Beaumont-Port Arthur, Bellingham, Billings, Biloxi, Binghamton, Birmingham, Bismarck, Bloomington, Bloomington-Normal, Boise, Boston, Boulder, Brownsville-Harlingen, Bryan- College Station, Buffalo, Burlington, Canton, Caspe, Cedar Rapids, Champaign-Urbana, Charleston, Charleston, Charlotte, Charlottesville, Chattanooga, Cheyenne, Chicago, Cincinnati, Clarksville, Cleveland, Colorado Springs, Columbia, Columbia, Columbus, Corpus Christi, Dallas-Fort-Worth, Danville, Dayton, Daytona Beach, Decatur, Decatur-Hartselle, Denver, Des Moines, Detroit-Ann Arbor, Dothan, Dubuque, Eau Claire, El Paso, Elkhart-Goshen, Enid, Erie, Eugene, Evansville, Fargo-Moorhead, Fayetteville, Fayetteville, Florence, Florence, Fort Collins, Fort-Lauderdale-Hollywood-Pompano Bea, Fort Myers-Cape Coral, Fort Pierce, Fort Smith, Fort Wayne, Fort Worth, Fresno, Gadsden, Gainesville, Galveston-Texas City, Grand Forks, Great Falls, Green Bay, Greensboro, Greenville, Harrisburg, Hartford, Hickory, Houma-Thibodaux, Houston, Huntington, Huntsville, Indianapolis, Jackson, Jacksonville, Jacksonville, Janesville, Johnson City, Joplin, Kansas City, Knoxville, Lafayette, Lake Charles, Lakeland-Winter Haven, Lancaster, Lansing, Laredo, Las Cruces, Las Vegas, Lawrence, Lawton, Lexington-Fayette, Lincoln, Little Rock, Longview, Los Angeles, Louisville, Lubbock, Lynchburg, Macon, Mansfield, Mcallen-Edinburg-Mission, Medford, Melbourne-Titusville-Palm Bay, Memphis, Miami, Milwaukee, Minneapolis-St.Paul, Mobile, Monroe, Montgomery, Muncie, Nashville-Franklin, New Orleans, New York, Ocala, Odessa, Oklahoma City, Omaha, Orlando, Owensboro, Panama City, Pensacola, Peoria, Philadelphia, Phoenix, Pine Bluff, Pittsburgh, Portland, Provo-Orem, Pueblo, Raleigh-Durham, Rapid City, Reno, Richland- Kennewick- Pasco, Richmond, Riverside, Roanoke, Rochester, Rockford, Saint Cloud, Saint Louis, Salem, Salt Lake City, San Angelo, San Antonio, San Diego, San Francisco, Santa Fe, Santa Rosa - Petaluma, Sarasota, Savannah, Seattle, Sheboygan, Sherman-Denison, Shreveport, Sioux Falls, South Bend, Springfield, Syracuse, Tacoma, Tallahassee, Tampa, Terre Haute, Texarkana, Toledo, Tucson, Tulsa, Tuscaloosa, Tyler, Utica-Rome, Victoria, Visalia, Waco, Washington, Wausau, West Palm Beach-Boca Raton-Delray Bea, Wheeling, Wichita, Wichita Falls, Williamsport, Wilmington, Yakima, York, Youngstown, Yuma

Appendix 2: Competition Sources

2711	NEWSPAPER PUBLISHING OR PUBLISHING & PRINTING
5311	DEPARTMENT STORES
5411	GROCERY STORES
5541	GASOLINE SERVICE STATIONS
5611	MEN & BOYS CLOTHING & ACCESSORY STORES RETAIL
5651	FAMILY CLOTHING STORES RETAIL
5812D	RESTAURANTS - FAST FOOD
5812U	RESTAURANTS - PIZZA
5912	DRUG & PROPRIETARY STORES RETAIL
5921	LIQUOR STORES RETAIL
5941	SPORTING GOODS STORES & BICYCLE SHOPS RETAIL
7216	DRY-CLEANING EXCEPT RUG CLEANING
7241B	BARBER SHOPS
7261	FUNERAL SERVICE & CREMATORIES
7629C	CLOTHES WASHING MACHINE & DRYER REPAIR SERVICES
7933	BOWLING CANTERS
8021	DENTISTS - CLINICS AND OFFICES

Source: ProCD

Competition by Product

Alberto VO5™ Shampoo		5912
Crest™ or Colgate™ toothpaste		5912
Crisco™ vegetable shortening	5411	
Gallo™ Chablis 1.5 litre		5921
Kraft™ grated Parmesan cheese		5411
Miller LITE™ Beer		5921
Minute Maid™ Orange Juice (frozen)	5411	
Monopoly™ game		5311
Tide Ultra™, Bold™ or Cheer™ detergent		5912
Winston Kings™ Cigarettes (Pack)		5411+5912+5921
Baby Food (strained vegetables)		5411
Chunk Tuna (light, oil-packed)	5411	
Gasoline, unleaded regular (gallon)		5541
Ice Cream (pre-packed bulk)		5411
Men=s Denim jeans		5611+5651+5311
Men=s dressing shirt		5611+5651+5311
Sliced Bacon		5411
Tennis Balls		5941+5311
Apples (Red Delicious)	5411	
Sirloin steak, sirloin (USDA choice, boneless)	5411	
White bread		5411
White potatoes	5411	
Whole milk (half gallon)		5411
Hamburger with cheese	5812D	
Newspaper subscription (month)		2711
Pizza Hut™ or Pizza Inn™ pizza		5812U
Washing machine repair minimum charge		7629C
Bowling, evening rate	7933	
Dentist=s fee (adult tooth cleaning, oral exam)	8021	
Dry cleaning, men=s two piece suit		7216
Embalming		7261
Men=s Haircut, no styling		7241B
Women=s Haircut, shampoo, trim, blow-dry		7241B

Table 1: Goods and services in the sample

Group A: Branded, non-perishable, tradable products

Alberto VO5™ Shampoo	Crest™ or Colgate™ toothpaste
Crisco™ vegetable shortening	Gallo™ Chablis 1.5 litre
Kraft™ grated Parmesan cheese	Miller LITE™ Beer
Minute Maid™ Orange Juice (frozen)	Monopoly™ game
Tide Ultra™, Bold™ or Cheer™ detergent	Winston Kings™ Cigarettes (Pack)

Group B: Non-branded, non-perishable, tradable products

Baby Food (strained vegetables)	Chunk Tuna (light, oil-packed)
Gasoline, unleaded regular (gallon)	Ice Cream (pre-packed bulk)
Men=s Denim jeans	Men=s dressing shirt
Sliced Bacon	Tennis Balls

Group C: Perishable goods

Apples (Red Delicious)	Sirloin steak, sirloin (USDA choice, boneless)
White bread	White potatoes
Whole milk (half gallon)	

Group D: Non-tradable goods

Hamburger with cheese	Newspaper subscription (month)
Pizza Hut™ or Pizza Inn™ pizza	

Group E: Non-tradable services

Washing machine repair minimum charge	Bowling, evening rate
Dentist=s fee (adult tooth cleaning, exam)	Doctor=s fee (routine exam)
Dry cleaning, men=s two piece suit	Embalming
Men=s Haircut, no styling	Women=s Haircut, shampoo, trim, blow-dry

Table 2: Price Statistics By Product

	CoV	**Min**	**Max**
Alberto VO5™ Shampoo	0.154	0.750	1.598
Crest™ or Colgate™ toothpaste	0.147	0.659	1.474
Crisco™ vegetable shortening	0.156	0.301	1.815
Gallo™ Chablis 1.5 litre	0.131	0.622	1.468
Kraft™ grated Parmesan cheese	0.079	0.802	1.366
Miller LITE™ Beer	0.124	0.507	1.489
Minute Maid™ Orange Juice	0.122	0.233	1.516
Monopoly™ game	0.115	0.765	1.553
Tide™, Bold™ ,Cheer™ detergent	0.129	0.750	1.579
Winston Kings™ Cigarettes (Pack)	0.120	0.789	1.415
Branded Tradables (Median)	**0.127**		
Baby Food (strained) vegetables)	0.356	0.484	5.060
Chunk Tuna (light, oil-packed)	0.346	0.661	4.367
Gasoline, unleaded regular (gallon)	0.051	0.972	1.118
Ice Cream (pre-packed bulk)	0.049	0.995	1.181
Men=s Denim jeans	0.103	0.777	1.274
Men=s dressing shirt	0.146	0.539	1.650
Sliced Bacon	0.104	0.289	1.294
Tennis Balls	0.134	0.726	1.533
Tradables (Median)	**0.117**		
Apples (Red Delicious)	0.098	0.931	2.287
Sirloin steak, sirloin (USDA)	0.066	0.820	1.305
White bread	0.185	0.647	1.943
White potatoes	0.133	0.823	2.264
Whole milk (half gallon)	0.102	0.741	1.244
Perishables (Median)	**0.133**		
Hamburger with cheese	0.416	0.465	4.634
Newspaper Subscription	0.216	0.330	1.617
Pizza	0.110	0.563	1.251
Non-Traded Goods (Median)	**0.216**		
Washing machine repair min.	0.146	0.643	1.718
Bowling, evening rate	0.159	0.646	1.578
Dentist=s fee	0.194	0.704	1.820
Doctor=s fee (routine exam)	0.176	0.712	2.089
Dry cleaning, men=s suit	0.118	0.701	1.332
Embalming	0.099	0.839	1.273
Men=s Haircut, no styling	0.161	0.629	2.049
Women=s Haircut	0.438x	0.571	6.508
Services (Median)	**0.160**		

Table 3: Extreme Values of Average City Price

	Average price	Per capita money income	Median household money income
Clarksville, TN	0.901	11,252	25,341
Youngstown, OH	0.922	8,544	17,060
Little Rock, AZ	0.926	15,307	26,889
Waco, TX	0.928	10,195	17,852
Victoria, TX	0.932	12,322	25,576
Pittsburgh, PA	1.177	12,580	20,747
Galveston, TX	1.188	12,399	20,825
Greensboro, NC	1.196	15,644	29,184
New York, NY	1.457	16,281	29.823
Sherman, TX	1.568	12,929	24,763

Table 4: Unconditional Correlations

Population	0.398
Median value of owned housing	0.377
Total retail trade establishments	0.374
City government expenditure per capita	0.347
Per capita money income	0.257
Median household income	0.156

Table 5: Distribution of City-Pair Relative Prices (%)

Range	%	Range	%
0.6-0.7	0.126%	**1.3-1.4**	0.276%
0.7-0.8	0.403%	**1.4-1.5**	0.163%
0.8-0.9	4.904%	**1.5-1.6**	0.131%
0.9-1.0	35.660%	**1.6-1.7**	0.040%
1.0-1.1	46.243%	**1.7-1.8**	0.013%
1.1-1.2	10.193%	**1.8-1.9**	0.022%
1.2-1.3	1.815%	**1.9-2.0**	0.004%

Observations: 22,083

Table 6: Price Statistics By Product

	CONS.	INCOME	RENT	TAX	SALES	STORES	R2
Alberto VO5™	-1.72*	-0.091	0.436	-0.810***	-0.597	0.033	0.215
Crest™ or	-1.70*	-0.189	0.414	-0.773***	-0.529	0.032	0.224
Crisco™	0.532	-0.174	0.313	-1.119***	0.325	0.054	0.231
Gallo™ Chablis	-1.86	-0.152	0.141	-0.531**	0.639	-0.016	0.040
Kraft™	-0.05	0.645**	0.451	-1.286***	0.255	0.053	0.248
Miller LITE™	1.65	-0.171	0.082	-0.519**	0.444	-0.016	0.040
Minute Maid™	1.22	-0.294	0.213	-1.146***	0.262	0.049	0.242
Monopoly™	-2.58	-0.164	1.147**	-1.238***	-0.314	0.063	0.181
Tide™, Bold™	-1.72*	0.009	0.477	-0.863***	-0.555	0.031	0.212
Winston	-0.226	-0.310*	0.255	-0.792***	0.039	0.017	0.186
Branded							
Baby Food	0.48	-0.082	0.386	-1.195***	0.414	0.058	0.234
Chunk Tuna	0.677	0.003	0.335	-1.207***	0.342	0.056	0.226
Gasoline.	-1.09	-0.623	0.316	-0.740***	-1.504	0.060	0.147
Ice Cream	3.46**	-2.761***	-0.382	-0.570**	-0.240	0.045	0.310
Men=s Denim	2.52	-0.481**	0.900**	-0.937***	0.804	0.048	0.165
Men=s	-2.61	-0.031	0.841*	-0.965***	1.194	0.047	0.140
Sliced Bacon	2.55	-1.277***	-0.164	-0.879***	0.589	0.033	0.333
Tennis Balls	-2.51	0.166	1.066**	-1.158***	-1.292	0.051	0.190
Tradables							
Apples	0.25	-0.088	0.104	-0.889***	0.181	0.045	0.147
Sirloin steak.	1.45	-0.913**	-0.055	-0.835***	0.324	0.048	0.179
White bread	1.15	-0.172	0.019	-0.998***	0.140	0.058	0.221
White potatoes	0.177	0.083	0.157	-0.951***	0.143	0.041	0.155
Whole milk	0.63	0.344	0.366	-1.297***	0.255	0.060	0.236
Perishables							
Hamburger	-0.562	-0.048	-0.078	-0.685**	0.046	0.039	0.084
Newspaper	-6.52***	-0.001	0.712	-0.152	0.061	0.020	0.017
Pizza	-1.436	0.108	0.409	-0.935***	-2.535	0.068	0.172
Non-Traded							
Washing	0.65	-0.255	0.210	-1.264***	-3.796*	0.032	0.259
Bowling.	2.92	-1.052***	-0.553	-0.962**	-0.288	0.031	0.198
Dentist=s fee	3.65	-0.269	-0.254	-1.175**	-4.101	0.020	0.112
Doctor=s fee	2.55	-0.566*	0.121	-1.229**	-3.734	0.054	0.152
Dry cleaning.	-3.93**	-0.519**	0.687*	-0.540**	0.438	0.070**	0.139
Embalming	0.94	0.222	-0.337	-0.818***	-1.493	0.019	0.240
Men=s Haircut.	-1.02	-0.192	0.349	-0.827***	-3.048**	0.027	0.242
Women=s	-0.97	-0.038	0.373	-0.895***	-2.909**	0.033	0.234
Services							