NBER WORKING PAPER SERIES

CONVERGENCE TO THE LAW OF ONE PRICE WITHOUT TRADE BARRIERS OR CURRENCY FLUCTUATIONS

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Working Paper 5654

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 1996

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ABSTRACT

Using a panel of 51 prices from 48 cities in the United States we provide an upper bound estimate of the rate of convergence to Purchasing Power Parity. We find convergence rates substantially higher than typically found in cross-country data. We investigate some potentially serious biases induced by i.i.d. measurement errors in the data, and find our estimates to be robust to these potential biases. We also present evidence that convergence occurs faster for larger price differences. Finally, we find that rates of convergence are slower for cities farther apart. However, our estimates suggest that distance alone can only account for a small portion of the much slower convergence rates across national borders.

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I. Introduction

The aim of this paper is to provide an upper bound estimate of the rate of convergence to purchasing power parity (PPP). The speed at which relative prices move toward parity is important for theories of exchange rate determination and for open-economy macro models, almost all of which employ versions of PPP. Professional wisdom regarding the rate of convergence toward PPP has run the full gamut - from fairly high, to nearly zero, and now, back to positive but slow. In markets for goods and services there is little expectation that price disparities will instantly disappear as they do, for example, in financial markets, due to both explicit and implicit barriers to the flows of goods and services. We examine convergence in a context where many of these barriers are absent in order to quantitatively assess their importance in markets less integrated.

Not long after Jacob Frenkel's seminal work (1978) which provided evidence supportive of convergence to PPP during a hyperinflation, many subsequent studies concluded a "collapse of purchasing power parities."[1] In particular, these studies failed to reject the hypothesis that real exchange rates follow a random walk, which implies that any deviation from PPP is permanent. This finding undermined confidence in a wide range of open-economy macro models that assumed some version of PPP, including monetary theories of the exchange rate, and Dornbush's overshooting model.

Recent research has focused on increasing statistical power by using longer time series (Frankel 1986, Edison 1987), and on combining cross-sectional and time series features of the data (Abuaf and Jorion 1990, Frankel and Rose 1995, Papell 1996, Wei and Parsley 1995). These studies have been considerably more successful at rejecting the unit root null hypothesis.

While these studies have found mean reversion in real exchange rates, the implied half lives of between three and seven years have been difficult to interpret.

In this study we focus exclusively on prices within the United States in order to establish a natural benchmark for comparison to international evidence.[2] The use of this data set abstracts from two potentially important influences on the rate of convergence: trade barriers and exchange rate volatility. Additionally, the higher degree of factor market integration further limits departures from price parity and thus facilitates convergence. A second important feature of this study is the use of commodity level price data. Thus we implicitly control for terms of trade and other aggregation effects that can impact convergence estimates. A further benefit is that we are able to make direct comparisons of how rates of convergence depend on the degree of tradability. Finally, we explicitly examine the effects of taxes and transportation costs on estimated rates of convergence. To our knowledge, this is the first study that looks at the effect of tax rates on convergence.

Section II describes the data and its collection in more detail. Section III begins by providing some summary statistics on the price data and subsequently provides estimates of rates of convergence. After comparing rates of convergence across (and within) tradable and non-tradable groupings, we investigate other influences on our findings. A final section summarizes our main conclusions.

II. Data

The 51 final goods and services prices in our panel are sampled (quarterly) from 48 cities in the United States over the period 1975.1 through 1992.4. The data set includes prices of both tradable and non-tradable goods and services. The price data was assembled from publications of the American Chamber of Commerce Researchers Association, and included in the publication, **Cost of Living Index** (hereafter, **Index**). Each quarterly issue of the **Index** contains comparative average price data for a sample of urban areas, and a cost of living index computed from these data by the association. In this study we use only the raw price data.

The actual data collection is done by the local Chamber of Commerce staff or volunteers for the Chamber, and is voluntary. Explicit instructions and data forms are provided for each data collector by the association.[3] Some prices are obtained by phone and usually the respondents do not know it is for a survey. Once collected, the data is sent to one of nine different regional coordinators for checking. Finally, the data is sent to Houston where it is transferred to computer and subjected to both computer and visual checks for outliers. Publication occurs approximately five and one half months after the original data are collected.

Consequently the sample of cities included in each issue of the **Index** varies. At the beginning of our sample period there were one hundred sixty six cities and forty four items priced. The number of cities steadily increased to two hundred ninety seven in 1992.4; however each report contains a distinct sample of cities. In an attempt to construct a balanced panel, we choose a sample of forty eight cities which appeared in roughly ninety percent of the quarterly surveys.

The goods and services sampled however are much less variable, though there have been additions to and subtraction's from the list. For this study we selected fifty one goods and services (hereafter, commodities) with three criteria in mind. First, for each commodity we wanted wide coverage in terms of availability across cities and over time. Second, we wanted variation in the degree of tradability of the commodities included in the data set. Finally, we wanted homogeneity in the definitions of the commodities over time. Some commodities did however, change during the sample period; typically as a result of a change in manufacturer packaging. This change was accounted for by assigning a missing value to the last quarter prior to the change.

For this study, we classify the goods into tradables (41) and non-tradables (mostly services) (10), for a total of 51 goods and services. Within the tradable category, we make a further distinction between perishable goods (mostly vegetables and dairy products) and non-perishable goods. These categories were designed to facilitate the presentation of our results. While it is true that the groupings necessarily involve some subjective judgment, redesignating certain commodities into a different category would not change the basic conclusions. Appendix tables A1 and A2 provide a complete list and description of all commodities and cities included in this study.[4]

Briefly, our sample of (15) perishable goods includes prices for: bacon, bananas, bread, cheese, eggs, fried chicken, ground beef, lettuce, margarine, McDonalds hamburger, milk, potatoes, pizza, steak, and, whole chicken. The prices are for some standard unit, e.g., per pound. The (26) non-perishable goods are: aspirin, baby food, beer, cigarettes, coffee, corn flakes, frozen corn, game, jeans, liquor, man's shirt, canned orange juice, canned peaches, shampoo, shortening, soft drink, sugar, canned peas, tennis balls, tissue, canned tomatoes, toothpaste, tuna, underwear, washing powder, Wine. The (10) non-tradable goods in the sample are: appliance repair, auto maintenance, beauty salon, bowling, dentist, doctor, dry cleaning, hospital room, man's haircut, and the price to attend a first run movie.

The tax data are combined (state, county, and local) sales tax rates collected from each local jurisdiction's taxing authority, e.g., the Departments of Revenue. The data were typically obtained by phone, though some jurisdictions provided written histories of tax rates and exemptions. For this study it was also necessary to determine whether the good was subject to a differential (including possibly exempt) tax rate since our sample includes many food and service items and the treatment of these is not uniform across jurisdictions. For our study the primary difference across jurisdictions is in the treatment of grocery items. Thus we created two tax tables with tax rates for grocery, and one for non-grocery items, for each city. The group we designate as perishables is composed exclusively of grocery items. Our non-perishables group also contains some non-grocery items. Finally, the non-tradables group contains services for which there is generally no sales tax payable explicitly by the customer. For this reason, we exclude non-traded goods from the analysis explicitly incorporating taxes. Appendix table A3 provides some summary statistics on the tax data. For each city, the table records (a) the sales tax rates in effect in the last quarter of our sample, and the change in tax rates between (b) 1975-1984, and (c) 1984-1992, for both grocery and non-grocery items. The summary statistics at the bottom of the table indicate that there is wide variation across cities though less variation over time.

III. Convergence

A. Basic Statistics

Before discussing our regression results, it is useful to look at some summary statistics on the variability of price differentials and on mean absolute price differentials that are presented in Table I. In the table we compare the three groups on the basis of these two measures of the intercity price differentials over time. Our benchmark city is New Orleans. As a robustness check, we have also considered using New York as the benchmark city; this change has little effect on the conclusions we draw.

Define the (pre-tax) price difference, $Q_{ij,k,t}$, as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln\left(P_{i,k,t}/P_{j,k,t}\right)$. The natural benchmark for $Q_{ij,k,t}$ is zero. However, given impediments to arbitrage of goods and services, the price difference at any point in time may differ from zero. In models presented in Engel and Rogers (1994), and Wei and Parsley (1995), prices in two locations may differ at any point in time, but these differences are bounded due to the cost of arbitrage between the two cities. The width of this band increases with transportation costs, which can be approximated by distance. This implies that both the variability of $Q_{ij,k,t}$, and the mean absolute deviation, i.e., the mean over time of $\left|\ln\left(P_{i,k,t}/P_{j,k,t}\right)\right|$, are positively related to transportation costs between cities.

From Table I we see that, of the three groups, perishables has on average, the highest variability of the inter-city price differential while services has the highest mean average price differential. The higher variability of perishables price differences could be due to seasonal variation in either the arrival of, or demand for, some of the goods in this group.

It is useful to link these indicators of the magnitude and variability of price differentials with the costs of arbitrage activities, which is what we turn to in Table II. The table presents results by group (i.e., perishables, non-perishables, and services) on the impact of distance on inter-city price differentials. Following Engel and Rogers (1994), and Wei and Parsley (1995), we approximate transportation costs by distance as measured by the "greater circle distance" between the cities.[5] The results in Table II overwhelmingly support the implication of these models that transportation costs permit price differences between cities, and the size of such differences increases with arbitrage costs.

From the table, the distance between two cities is positively related to the variability of price differences for all three categories, with the effect being the strongest among tradables. The results for mean absolute price differentials is presented in Panel B. Again, the implication of the models is strongly supported. We explore a possible non-linearity in this relationship by adding a squared distance term to these specifications: the distance effect shows different convexities for different product groups but the convexity features depend on whether we examine the variability of, or mean absolute price differentials.

B. Testing for Stationarity and Estimating Rates of Convergence

In this section we proceed in two stages. First, we test whether it is possible to reject the unit root hypothesis, and we ask whether the answer varies systematically across products. After rejecting the unit root we turn to the issue of convergence speed. At this stage the possibility of measurement error must be considered, which leads us to additional estimations prior to reporting rates of convergence. For expositional convenience, we discuss each of the three groups separately.

In our test, the null hypothesis is a (driftless) random walk. The alternative hypothesis is a zero-mean AR(1) process common to all city-pairs. All regressions reported use New Orleans as the benchmark city, i.e., we examine differences in prices in other cities relative to New Orleans. More precisely, for each commodity (k) the basic regression specification is:

$$(1) \qquad \Delta Q_{i,k,t} = \beta Q_{i,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{i,k,t-m} + \varepsilon_{i,k,t} ,$$

where $Q_{i,k,t}$ is the log-difference in the price of product k in city i relative to New Orleans at time t, and, Δ is the first difference operator. The lag structure, s(k), used to account for possible serial correlation in the error term, is determined on a product-by-product basis as in a univariate augmented Dickey-Fuller test.

Results of panel unit root tests for the first category (i.e., non-perishables) are summarized in Panel A of Table III. The table presents the tests on a commodity by commodity basis. Levin and Lin (1992) have shown that panel data can dramatically increase the power of the unit root test, and that in contrast to univariate case, the test statistic in a panel context is asymptotically normal. In all cases, the point estimate of β is negative. According to Levin and Lin, the critical values for t=50 and N=50 (approximately our panel size) at the 1%, 5% and 10%

levels are -2.38, -1.71, and -1.35. Using these critical values, we reject the unit root for twenty two of the twenty six products (or 85%) at the 10% level, of which twenty are rejected at the 5% level.

In Panel B of Table III, we examine the (15) perishables, and (10) services. For perishables, we can reject the random walk null at the ten percent level for an overwhelming majority (80%, or twelve) of the commodities. In fact, we can reject it at the 1% level for ten of the fifteen goods. Even for our final group of mostly services, we can reject the null at the 10% level in half of the cases; it can be rejected at the 1% level in four of the five cases. This implies that price differences for many of the items that would be called "non-tradable" in an international context are disciplined to not wander away from zero indefinitely.

Thus, the bulk of the evidence rejects the random walk null hypothesis in favor of a zero-mean stationary process for all three categories. Does this imply that the distinction between tradables and non-tradables is unimportant within a given country? Not necessarily, since so far we have not addressed the issue of the speed of convergence. Under the assumption that the $Q_{i,k,t}$ process is a zero-mean AR(1) process, the rate of convergence is positively related to the absolute size of the estimated coefficient β.[6] In Figure 1, we plot the empirical density functions of the estimated AR(1) coefficients for the three categories based on the estimates in Table III. As can be seen, the estimated coefficients for the service items tend to be smaller in absolute magnitude than both the perishables and the non-perishables groups. That is, on average, the deviation from price parity tends to last longer for services.

[Figure 1 approximately here]

A further way to examine differences among the three groups is to focus on the median convergence rate for each group. That is, for each group, we calculate the implied half-life for the product whose AR(1) coefficient is the median value in the group.[7] The medians are com flakes (-0.123), fried chicken (-0.157), and beauty salon visit (-0.044), for non-perishables, perishables, and services, respectively. These coefficient estimates imply half-lives for deviations from parity of approximately five quarters for non-perishables, four quarters for perishables, and fifteen quarters for services.[8] Thus in fact, the median convergence rate is substantially lower for the services category than for either of the tradable counterparts. In a broader context, both tradable categories converge substantially faster than rates estimated in an international context (typically with a half-life of three to five years, see Frankel and Rose, 1995, for CPI-based real exchange rates, and Wei and Parsley, 1995, for tradable sector price indices).

C. City specific effects

So far, the only alternative to a random walk null that we have entertained is a mean-zero AR(1) process. We may also want to consider non-zero city-specific means. This is to allow the sale prices of the products to reflect the cost of local non-traded components (e.g., extra store security guards in a more crime-prone city). Additionally, we may want to control for possible seasonal effects. Specifically, we augment the basic specification in Table III by allowing city and quarter dummies, i.e.,

$$\Delta Q_{i,k,t} = \beta Q_{i,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{i,k,t-1} + \Sigma\, \textit{city and quarter dummies} + \varepsilon_{i,k,t}\,.$$

The results are reported in Table IV. We also perform an F-test to see if the city dummies are jointly significant. It turns out that for about sixty percent of the time, the city dummies are jointly significant if we use a 10% critical value. As demonstrated by Levin and Lin (1992), the critical values to reject the unit root null increase dramatically in a fixed effects regression relative to a uniform intercept case, and a comparison of their figures 4 and 9 indicates that the power to reject the null also declines. According to their Table V, the critical values at the 1%, 5% and 10% levels for T=50 and N=25 (approximately our panel size after allowing for lagged dependent variables) are -8.25, -7.71 and -7.39, respectively. Based on these critical values, we can reject the unit root null far less frequently than for the case of a zero-mean AR(1) process as the alternative: 53% for perishables, 31% for non-perishables, and only 10% for services. This result echoes that in Frankel and Rose (1995) who, using a panel of real exchange rates from IMF member countries, also find it hard to reject the unit root null when fixed effects are allowed.

In an effort to increase the power of the statistical tests we pooled the data and repeated the estimation. Appendix Table A4 summarizes our results. In the table we report two specifications, which differ only in what dummies are included in the regression. In the first regression we include only city-pair dummies, and in the second regression we include both city-pair and product dummies. For these regressions the critical values in Levin and Lin (1992) for T=50 and N=300 (the largest cross-section dimensions they report) are -23.03, and -22.72, for the 5%, and 10% levels respectively. Using these critical values, we can reject the unit root in regressions with individual specific intercepts only for perishables. Thus the inclusion of individual specific fixed effects greatly diminishes our ability to reject the unit root hypothesis. Note that for non-perishables and services, the point estimates obtained from the pooled estimation are broadly similar to those reported in Table III, though for perishables the estimate of convergence is somewhat faster.[9]

In an international context various authors have found results sensitive to the choice of benchmark currency (e.g., Frenkel 1981, and Fisher and Park 1991). We repeated the panel augmented Dickey-Fuller tests using New York as an alternate benchmark city. Appendix Table

A5 summarizes these results. Our ability to reject the null is virtually unaffected by the choice of benchmark city. Thus in what follows we use the New Orleans benchmark exclusively.

D. Tax adjustment

As noted in Caves, Frankel and Jones (1995), tariffs and transportation costs create a band within which the real exchange rate can fluctuate. Moreover, time variation in taxes or transportation costs suggests the band itself would shift. There is little guidance in the literature however, concerning whether PPP should hold on a pre-tax, or tax adjusted basis. One might conjecture that consumers care about post-tax prices while producers respond to pre-tax prices. That is, a sufficiently large post-sales tax price differential between two cities would induce consumers to arbitrage the difference. Alternatively if pre-sales tax prices between two cities diverge too far, producers would respond and arbitrage this difference.

Define $R_{i,k,t}$ be the tax adjusted price difference for product k at time t between city i and New Orleans, i.e., $R_{i,k,t} = \log \frac{P_{i,k,t}(1+t_{i,k,t})}{P_{j,k,t}(1+t_{j,k,t})}$, where t is the tax rate and j = New Orleans. Also, define $Z_{i,k,t}$ to be either $Q_{i,k,t}$, or $R_{i,k,t}$, depending on which one is smaller in absolute value. Thus $Z_{i,k,t}$ is the minimum price difference at each point in time.

In Tables V and VI, we repeat the tests for these (minimum) price differences. Since sales taxes generally do not apply to the services in our study, we restrict the discussion to the two tradable groups. From the tables we see that both the estimates, and our ability to reject the null hypothesis, are virtually unaffected. What these tables suggest is that explicit sales taxes have a minimal influence on the time series properties of deviations from price parity. Thus, in the remaining analysis we focus on the non-tax adjusted price differentials.

E. Measurement Errors

The convergence rates reported earlier assume no measurement error in the data. If, however, the price data are collected with measurement error, the estimates could be affected. To see this, suppose the true process is given by:

(2) $Q_t^* = \beta Q_{t-t}^* + \varepsilon_t$,

where Q_t^*, the true price, is unobservable. We actually observe $Q_t = Q_t^* + u_t$, where u_t is a zero-mean, serially uncorrelated measurement error. This implies that $Q_t = \beta Q_{t-1} + \varepsilon_t + u_t - \beta u_{t-1}$, which is almost an ARMA(1,1) process.

We attempt to gauge the impact of the possible measurement errors using two approaches: (1) a restricted ARMA(1,1) specification, and (2), an instrumental variable approach. In both approaches, we reduce the dimensionality of the problem by choosing the three products which bracket the median from each of the three categories[10]. We also restrict our sample to the ten cities (in addition to New Orleans) with the fewest missing observations[11].

The first column of Table VII reports a simple AR(1) estimation. In the second column, we estimate an ARMA(1,1), in which the moving average coefficient is restricted to be the minus the autoregressive coefficient $(\theta = -\beta)$. This restriction approximates that implied by the assumption of an i.i.d. measurement error. As one can see, the autoregressive coefficients in the restricted ARMA(1,1) are almost always larger than those in the straight AR(1) regressions. Hence a straightforward AR(1) regression, ignoring possible measurement error, exaggerates rates of convergence. Column 3 of Table VII presents the results of unrestricted ARMA(1,1) regressions. Comparing unrestricted and restricted ARMA(1,1) regressions, the coefficient restrictions are rejected in all cases.[12]

Our second method of accounting for possible measurement errors is to employ an instrumental variable approach. Specifically, we use Q_{t-3} as an instrument for Q_{t-1}. According to our assumptions, Q_{t-3} is clearly correlated with Q_{t-1}, yet uncorrelated with the error terms in the basic AR(1) regressions. The IV-estimation results are reported as the last column of Table VII. There are two noteworthy features from this column. First, the coefficient estimates on Q_{t-1} are higher than the corresponding AR(1) estimates, implying that the rates of convergence for all products are somewhat slower after accounting for possible measurement errors. And second, consistent with our earlier results, tradable goods generally converge to the law of one price faster than services. Using the IV estimates in Column 4, the half lives for the median products become 4.5 for non-perishables (corn flakes), 3.5 quarters for perishables (fried chicken), and 10.5 for services (Beauty salon visit). These half lives correspond very closely to those reported earlier (5, 4, and 15, respectively), suggesting our estimates derived from augmented Dickey-Fuller specifications also approximately address the measurement errors issue.

F. Non-linearities in the rate of convergence

We wish to know whether convergence is non-linear in the initial price difference, as found by e.g., Wei and Parsley (1995). In particular, convergence may occur faster if the initial price difference is wider. For ease of exposition, we pool the data, and report results for each of our three groups. To examine formally whether there is a non-linear pattern in the rate of convergence, we add a term of the initial deviation squared to the regression, and add product dummies. To be precise, the specification for each group is,

(3) $$\Delta Q_{ij,k,t} = \beta_0 Q_{ij,k,t-1} + \gamma\, Q^2_{ij,k,t-1} + \sum_{m=1}^{16} \beta_m \Delta Q_{ij,k,t-m} + dummies + \varepsilon_{ij,k,t} \; .$$

The quarterly decay rate now becomes: $\beta_0 + 2\gamma\, Q_{ij,k,t-1}$. The estimation results are reported in Table VIII. In the table we report four specifications depending on the structure of lagged dependent variables and additional fixed effects. As is clear from the table, the conclusion does not depend crucially on the specification. In particular, the squared price difference is statistically significant for all three product/service categories, and for virtually all specifications. Thus, there is strong evidence that the rate of convergence depends on the initial price differential, i.e., convergence occurs faster for larger price differences.

Results in Table II imply that distance is a factor in explaining inter-city price differential variability, i.e., price differentials are more variable for cities farther apart. We now ask whether an effect exists on rates of convergence. In Table IX we augment the basic specification (equation 1) with two more terms. The first is log distance and the second is an interaction term between log distance and the initial price differential,

$$(4) \quad \Delta Q_{ij,k,t} = \theta \ln(distance) + \beta_0 Q_{ij,k,t-1} + \gamma\, Q_{ij,k,t-1} \ln(distance) + \sum_{m=1}^{16} \beta_m \Delta Q_{ij,k,t-m} + dummies + \varepsilon_{ij,k,t}.$$

Results in the table provide evidence that convergence rates are slower for cities farther apart. The implied half life now depends on the distance between the cities in question and on the initial price difference. An approximation can be obtained however by using the average distance between cities within the United States (856 miles using New Orleans as the benchmark city) and the estimates obtained from Tables III. Using the results in Column 4, the (approximate) half lives for non-perishables, perishables, and services are 6, 3, and 14 quarters.[13]

We are now in a position to ask how the convergence rates estimated in this paper compare to existing estimates obtained from cross-country data. That is, our lower estimated convergence rates may simply reflect the fact that cities within the United States are closer to one another than "typical" international city pairs. Indeed, the average distance between the

OECD sample in Wei and Parsley (1995) is 3285 miles (using the United States as a benchmark) as compared to 856 miles for this sample. According to the estimates in Column 4 of Table IX, if distance were the only factor differentiating cities within the United States and OECD cities, the average half lives among OECD countries would be (approximately) four to seven quarters for tradables. However, estimates in Wei and Parsley (1995) for tradable sector price indices are closer to four years![14] Similarly, if distance were the only factor, then price differences for services that would be classified "non-tradable" internationally, would have a half life of about 18 quarters. Thus we conclude that distance explains only a small part of the difference between domestic and international estimates of convergence.

IV. Conclusion

To summarize, there are a few noteworthy observations. First, tradable goods (perishable and non-perishable categories) converge very fast to price parity. The half life of the price gap for tradable goods is roughly four to five quarters (fried chicken and corn flakes), and fifteen quarters for services (beauty salon visit). Convergence rates for both tradable categories (perishables and non-perishables) are much faster than those found in cross-country data; indeed, the convergence rate for our least tradable category is on par with convergence rates found in studies examining international tradable goods. These conclusions are not affected by the presence of tax differentials or by possible measurement errors in the data. Additionally, we present evidence of non-linearities in the rate of convergence. In particular, convergence occurs faster for larger initial price differences, and far away locations exhibit slower convergence. However using these estimates we find that transport costs account for only a small portion of the much slower convergence rates found in cross-country data.

ENDNOTES

1. See the excellent survey in Froot and Rogoff 1996.

2. Earlier studies examining disaggregated prices include Richardson (1978), who finds that Canadian and United States prices are only weakly related, and Rogers and Jenkins (1994), who are able to reject the unit root null in fewer than one-sixth of the 54 disaggregated products they study. While these findings are discouraging, there is reason to suspect the failures are due to the notoriously low power of common unit root tests. Recent work by Levin and Lin (1992) demonstrates that statistical power increases rapidly in a panel setting.

3. According to phone conversations with the person now in charge of final data checking for ACCRA, the reported prices were obtained as an average over a small number of sellers in the city (generally > 3, and, since 1982, >5 & < 10 sellers), on the Thursday, Friday, or Saturday of the first week of each quarter.

4. Our data set will be available for one year following publication. Requests should include a 3.5 inch IBM formatted (1.44MB) diskette and a self-addressed mailer.

5. See **The American Practical Navigator**, 1977.

6. The interpretation that follows is complicated by the possible presence of measurement errors. We return to this issue in more detail below. For now, we assume there is no measurement error in order to obtain a suggestive characterization of convergence rates across groups.

7. In the case of two medians, we pick the one with a smaller coefficient in absolute value.

8. The implied half-life = $\ln(0.5)/\ln(\beta)$.

9. On the other hand, the assumption the AR(1) coefficient is the same across products within a group, which we impose here, can also be rejected.

10. That is, in the case of a single median, we choose the median, and one product above and below the median, in terms of their rate of convergence as in Table 3. When there are two medians, we choose the product with the next smallest coefficient estimate in absolute value as the third product.

11. Missing values were interpolated these the average of the values just prior and following the missing observations. Some experiments with other interpolation methods, e.g., by choosing the value just prior to the missing observation, did not affect our conclusions. See Table VII for a list of the ten cities included in the estimations.

12. Let L_u and L_r be the log likelihood values for the unrestricted and restricted ARMA regressions, respectively. Then, $2(L_u-L_r)$ has a χ^2 distribution with a degree of freedom of N-1, where N is the number of observations. The five percent critical value is approximately 101.9 for all products.

13. The half life was calculated as $\ln(0.5)/\left(\ln(1-\beta)+\gamma\ln(\text{distance})\right)$. This approximation also ignores a possible drift term in the time series representation of the price differential. The approximation yields an estimate of the rate of convergence that is slightly slower than the true one when the drift term is small.

14. The estimates in Wei and Parsley (95) are in line with other cross-country evidence. See, e.g., Frankel (86), Edison (87), who obtain estimates using extremely long time-series, or more recently, Frankel and Rose (95). The estimates in Papell (95) imply even slower convergence.

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TABLE I: SUMMARY STATISTICS

	Mean	Standard Deviation	Observations
Variability of Price Differential			
Perishables	.149	.058	705
Non-Perishables	.129	.046	1222
Services	.132	.049	470
Mean Absolute Price Differential			
Perishables	.144	.066	705
Non-Perishables	.125	.052	1222
Services	.156	.082	470

Notes: Price differential variability is defined as the standard deviation over time of the percentage price difference ($Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$). Mean absolute price differential is defined as the mean absolute deviation of log prices between cities, i.e., the mean over time of: $\left|\ln\left(P_{i,k,t} / P_{j,k,t}\right)\right|$. Where $P_{i,k,t}$ is the price of good k in city i at time t. For these calculations city i is New Orleans.

The three commodity groupings are:

Perishables
Bacon, Bananas, Bread, Cheese, Eggs, Ground Beef, Lettuce, Margarine, Milk, Potatoes, Steak, Whole Chicken, Fried Chicken, McDonalds, Pizza.

Non-Perishables
Aspirin, Baby food, Beer, Cigarettes, Coffee, Corn Flakes, Frozen Corn, Game, Jeans, Liquor, Man's Shirt, Canned Orange juice, Canned Peaches, Shampoo, Shortening, Soft Drink, Sugar, Canned Peas, Tennis balls, Tissue, Canned Tomatoes, Toothpaste, Canned Tuna, Underwear, Washing Powder, Wine.

Services
Appliance Repair, Auto Maintenance, Beauty Salon, Bowling, Dentist, Doctor, Dry Cleaning, Hospital Room, Man's Haircut, Movie.

TABLE II: SHIPPING COSTS AND INTER-CITY PRICE DIFFERENTIALS:

Panel A: Variability of Price Differential

	Perishables		Non-Perishables		Services	
Regression Number:	1	2	3	4	5	6
Ln Distance	0.011	-0.087	0.018	0.038	0.004	-0.062
	(0.002)	(0.022)	(0.001)	(0.002)	(0.003)	(0.039)
Ln Distance Squared		0.008		-0.003		0.005
		(0.002)		(0.0003)		(0.003)
Product dummies	yes	yes	yes	yes	yes	yes
$\overline{R}^2$	.72	.73	.45	.49	.20	.21
Std. Error of Regression	.0308	.0304	.0341	.0330	.0436	.0435
Number of Observations	705	705	1222	1222	470	470

Panel B: Mean Absolute Price Differential

	Perishables		Non-Perishables		Services	
Regression Number:	1	2	3	4	5	6
Ln Distance	0.019	0.030	0.022	0.019	0.021	-0.336
	(0.0002)	(0.003)	(0.0004)	(0.005)	(0.006)	(0.068)
Ln Distance Squared		-0.002		0.0004		0.029
		(0.0004)		(0.0007)		(0.006)
Product dummies	yes	yes	yes	yes	yes	yes
$\overline{R}^2$	-.01	.01	.03	.03	.10	.15
Std. Error of Regression	.0526	.0523	.0649	.0649	.0771	.0750
Number of Observations	705	705	1222	1222	470	470

Notes: "Ln" refers to the natural log. In Panel A, columns 1, 3, and 5, the regression run was: $s.d.\left(Q_{ij,k,t}\right) = \beta \ln(\text{distance}) + \text{dummies}$, and in columns 2, 4, and 6, the regression run was: $s.d.\left(Q_{ij,k,t}\right) = \beta_1 \ln(\text{distance}) + \beta_2 \ln\left(\text{distance}^2\right) + \text{dummies}$, where $s.d.\left(Q_{ij,k,t}\right)$= the standard deviation over time of $\ln\left(P_{i,k,t} / P_{j,k,t}\right)$. In Panel B, the dependent variable is the mean over time of: $\left|\ln\left(P_{i,k,t} / P_{j,k,t}\right)\right|$, i.e., the mean absolute deviation of log prices between cities. Standard errors in parentheses. New Orleans is defined as the benchmark city.

TABLE III: PANEL UNIT ROOT TESTS

Panel A: Non-Perishables

Good	*Beta*	*# lags*	*# obs*	*Good*	*Beta*	*# lags*	*#obs*
Asprin	-0.259* (0.056)	15	503	Shampoo	-0.367* (0.085)	16	465
Baby food	-0.057*** (0.035)	16	474	Shortening	-0.141* (0.046)	16	474
Beer	-0.077* (0.028)	13	585	Soft Drink	-0.116* (0.038)	12	639
Cigarettes	-0.045** (0.023)	16	474	Sugar	-0.147* (0.036)	13	583
Coffee	-0.036 (0.071)	14	258	Canned Peas	-0.192** (0.109)	15	206
Corn Flakes	-0.123** (0.066)	16	463	Tennis Balls	-0.207* (0.067)	16	465
Frozen Corn	-0.379* (0.096)	16	321	Tissue	-0.063 (0.047)	16	474
Game	-0.067** (0.036)	15	503	Canned Tomatoes	-0.141** (0.082)	13	242
Jeans	-0.166* (0.063)	13	585	Toothpaste	-0.037 (0.074)	15	503
Liquor	-0.001 (0.026)	16	163	Canned Tuna	-0.192* (0.051)	15	502
Man's Shirt	-0.228* (0.055)	15	503	Underwear	-0.058*** (0.039)	16	465
Orange Juice	-0.319* (0.058)	14	212	Washing Powder	-0.104** (0.060)	16	182
Canned Peaches	-0.136* (0.034)	14	233	Wine	-0.100* (0.025)	16	465

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was:

$\Delta Q_{ij,k,t} = \beta Q_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{ij,k,t-m} + \varepsilon_{ij,k,t}$, where, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. New Orleans is defined as the benchmark city.

TABLE III: PANEL UNIT ROOT TESTS

Panel B: Perishables and Services

Good	Beta	# lags	# obs	Good	Beta	# lags	#obs
Perishables:							
Bacon	-0.207*	16	511	McDonalds	-0.106**	16	465
	(0.040)				(0.047)		
Bananas	-0.427*	16	510	Pizza	-0.166*	15	503
	(0.085)				(0.030)		
Bread	-0.194*	10	1358				
	(0.027)			***Services:***			
Cheese	-0.064***	14	541	Appliance repair	-0.045*	10	743
	(0.039)				(0.023)		
Eggs	0.117*	16	474	Auto Maintenance	-0.015	16	465
	(0.047)				(0.056)		
Ground Beef	-0.232*	12	688	Beauty Salon	-0.044***	14	543
	(0.054)				(0.035)		
Lettuce	-0.251*	15	512	Bowling	-0.082*	15	512
	(0.076)				(0.028)		
Margarine	0.010	16	467	Dentist	-0.015	16	430
	(0.045)				(0.023)		
Milk	-0.109*	13	594	Doctor	-0.093*	16	468
	(0.023)				(0.056)		
Potatoes	-0.050*	15	579	Dry Cleaning	0.006	16	474
	(0.061)				(0.035)		
Steak	-0.018*	16	474	Hospital Room	-0.003	13	594
	(0.041)				(0.056)		
Whole Chicken	-0.175*	10	1732	Man's Haircut	-0.017	16	468
	(0.022)				(0.035)		
Fried Chicken	-0.157*	16	465	Movie	-0.117*	13	321
	(0.047)				(0.028)		

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was: $\Delta Q_{ij,k,t} = \beta Q_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{ij,k,t-m} + \varepsilon_{ij,k,t}$, where, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. New Orleans is defined as the benchmark city.

TABLE IV: PANEL UNIT ROOT TESTS:
with seasonal and individual specific fixed effects

Panel A: Non-Perishables

Good	*Beta*	*F-test*	*signif.*	*Good*	*Beta*	*F-test*	*signif.*
Asprin	-0.661 (0.101)	0.93	0.599	Shampoo	-1.595*** (0.214)	1.30	0.101
Baby food	-1.142* (0.119)	2.86	0.001	Shortening	-0.677 (0.120)	1.62	0.009
Beer	-0.713*** (0.095)	1.57	0.012	Soft Drink	-0.458 (0.102)	1.51	0.019
Cigarettes	-0.831** (0.104)	1.89	0.001	Sugar	-0.488*** (0.064)	1.52	0.017
Coffee	-0.301 (0.224)	0.46	0.999	Canned Peas	-0.939 (0.424)	1.33	0.102
Corn Flakes	-0.457 (0.151)	0.96	0.544	Tennis Balls	-1.107* (0.133)	1.77	0.002
Frozen Corn	-1.684 (0.264)	1.26	0.131	Tissue	-1.030** (0.127)	1.99	0.001
Game	-0.568 (0.145)	1.03	0.417	Canned Tomatoes	-2.047 (0.370)	1.31	0.105
Jeans	-0.641 (0.131)	1.17	0.215	Toothpaste	-0.270 (0.131)	0.93	0.604
Liquor	-1.577 (0.470)	0.93	0.599	Canned Tuna	-1.103** (0.137)	1.65	0.006
Man's Shirt	-0.827 (0.112)	1.19	0.191	Underwear	-0.780 (0.119)	1.72	0.003
Orange Juice	-1.084 (0.207)	1.66	0.011	Washing Powder	-2.907 (0.490)	1.80	0.005
Canned Peaches	-1.024 (0.183)	1.03	0.433	Wine	-0.746 (0.127)	1.56	0.014

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was: $\Delta Q_{ij,k,t} = \beta Q_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{ij,k,t-m} + \text{dummies} + \varepsilon_{ij,k,t}$, where, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New Orleans is defined as the benchmark city.

TABLE IV: PANEL UNIT ROOT TESTS:
with seasonal and individual specific fixed effects

Panel B: Perishables and Services

Good	*Beta*	*F-test*	*signif.*	*Good*	*Beta*	*F-test*	*signif.*
Perishables:							
Bacon	-0.933 (0.040)	0.79	0.836	McDonalds	-1.184** (0.148)	1.96	0.001
Bananas	-1.601** (0.085)	1.47	0.028	Pizza	-0.569 (0.097)	1.22	0.159
Bread	-0.594** (0.027)	1.58	0.009	***Services:***			
Cheese	-0.608 (0.039)	1.46	0.029	Appliance repair	-0.237** (0.029)	2.08	0.001
Eggs	-0.546 (0.047)	1.23	0.153	Auto Maintenance	-0.491 (0.118)	1.45	0.033
Ground Beef	-1.508* (0.054)	2.39	0.001	Beauty Salon	-0.235 (0.057)	1.03	0.420
Lettuce	-1.799* (0.076)	1.71	0.004	Bowling	-0.418 (0.072)	2.72	0.001
Margarine	-1.173 (0.045)	2.06	0.001	Dentist	-0.360 (0.060)	1.13	0.266
Milk	-0.360* (0.023)	1.27	0.116	Doctor	-0.535 (0.087)	2.08	0.001
Potatoes	-1.569*** (0.061)	2.68	0.001	Dry Cleaning	-0.403 (0.073)	2.06	0.001
Steak	-0.740** (0.041)	0.19	1.000	Hospital Room	-0.060 (0.053)	1.69	0.004
Whole Chicken	-0.705 (0.022)	7.87	0.001	Man's Haircut	-0.449 (0.065)	1.84	0.001
Fried Chicken	-1.677** (0.047)	1.36	0.067	Movie	-0.466 (0.160)	0.84	0.750

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was:

$$\Delta Q_{ij,k,t} = \beta Q_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \, \Delta Q_{ij,k,t-m} + \text{dummies} + \varepsilon_{ij,k,t},$$

where, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New Orleans is defined as the benchmark city.

TABLE V: PANEL UNIT ROOT TESTS INCORPORATING TAXES

Panel A: Non-Perishables

Good	*Beta*	*# lags*	*# obs*	*Good*	*Beta*	*# lags*	*#obs*
Asprin	-0.250* (0.054)	15	503	Shampoo	-0.347* (0.080)	16	465
Baby food	-0.064*** (0.039)	16	474	Shortening	-0.111* (0.045)	16	474
Beer	-0.085* (0.029)	13	585	Soft Drink	-0.111* (0.039)	12	639
Cigarettes	-0.044** (0.025)	16	474	Sugar	-0.145* (0.037)	13	583
Coffee	-0.043 (0.080)	14	258	Canned Peas	-0.181*** (0.123)	15	206
Corn Flakes	-0.081 (0.064)	16	463	Tennis Balls	-0.222* (0.071)	16	465
Frozen Corn	-0.475* (0.095)	16	321	Tissue	-0.043 (0.043)	16	474
Game	-0.071** (0.039)	15	503	Canned Tomatoes	-0.157** (0.082)	13	242
Jeans	-0.147* (0.059)	13	585	Toothpaste	-0.092 (0.071)	15	503
Liquor	-0.027 (0.031)	16	163	Canned Tuna	-0.210* (0.054)	15	502
Man's Shirt	-0.193* (0.051)	15	503	Underwear	-0.068*** (0.043)	16	465
Orange Juice	-0.290* (0.055)	14	212	Washing Powder	-0.129** (0.064)	16	182
Canned Peaches	-0.138* (0.033)	14	233	Wine	-0.105* (0.027)	16	465

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was: $\Delta Z_{ij,k,t} = \beta Z_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Z_{ij,k,t-m} + \varepsilon_{ij,k,t}$, where, $Z_{ij,k,t}$, is defined as the 'tax-adjusted' percentage difference in price of commodity k at time t between cities i and j. See text for details. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New Orleans is defined as the benchmark city.

TABLE V: PANEL UNIT ROOT TESTS INCORPORATING TAXES

Panel B: Perishables

Good	*Beta*	*# lags*	*# obs*	*Good*	*Beta*	*# lags*	*#obs*
Perishables:							
Bacon	-0.502*	16	511	McDonalds	-0.122**	16	465
	(0.072)				(0.052)		
Bananas	-0.408*	16	510	Pizza	-0.157*	15	503
	(0.082)				(0.029)		
Bread	-0.203*	10	1358				
	(0.030)						
Cheese	-0.060***	14	541				
	(0.036)						
Eggs	0.137*	16	474				
	(0.049)						
Ground Beef	-0.270*	12	688				
	(0.055)						
Lettuce	-0.210*	15	512				
	(0.071)						
Margarine	-0.000	16	467				
	(0.050)						
Milk	-0.135*	13	594				
	(0.025)						
Potatoes	-0.036*	15	579				
	(0.056)						
Steak	-0.004*	16	474				
	(0.041)						
Whole Chicken	-0.220*	10	1732				
	(0.024)						
Fried Chicken	-0.170*	16	465				
	(0.047)						

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was: $\Delta Z_{ij,k,t} = \beta Z_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Z_{ij,k,t-m} + \varepsilon_{ij,k,t}$, where, $Z_{ij,k,t}$, is defined as the 'tax-adjusted' percentage difference in price of commodity k at time t between cities i and j. See text for details. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. New Orleans is defined as the benchmark city.

TABLE VI: PANEL UNIT ROOT TESTS INCORPORATING TAXES:

with seasonal and individual specific fixed effects

Panel A: Non-Perishables

Good	*Beta*	*F-test*	*signif.*	*Good*	*Beta*	*F-test*	*signif.*
Asprin	-0.656 (0.101)	0.95	0.577	Shampoo	-1.601 (0.218)	1.30	0.101
Baby food	-1.100* (0.124)	2.63	0.001	Shortening	-0.633 (0.119)	1.48	0.026
Beer	-0.685*** (0.095)	1.51	0.019	Soft Drink	-0.450 (0.099)	1.49	0.023
Cigarettes	-0.828** (0.106)	1.86	0.001	Sugar	-0.490** (0.062)	1.48	0.025
Coffee	-0.349 (0.242)	0.47	0.998	Canned Peas	-0.916 (0.418)	1.39	0.071
Corn Flakes	-0.372 (0.153)	0.85	0.751	Tennis Balls	-1.088** (0.133)	1.74	0.003
Frozen Corn	-1.855 (0.286)	1.31	0.101	Tissue	-1.030** (0.127)	1.89	0.001
Game	-0.591 (0.152)	1.06	0.367	Canned Tomatoes	-2.020 (0.358)	1.40	0.061
Jeans	-0.634 (0.133)	1.13	0.260	Toothpaste	-0.341 (0.137)	0.86	0.734
Liquor	-1.654 (0.462)	1.10	0.332	Canned Tuna	-1.095** (0.134)	1.68	0.005
Man's Shirt	-0.816 (0.111)	1.21	0.176	Underwear	-0.773 (0.118)	1.73	0.003
Orange Juice	-1.083 (0.207)	1.71	0.008	Washing Powder	-2.872 (0.491)	1.73	0.008
Canned Peaches	-1.040 (0.174)	1.09	0.342	Wine	-0.758 (0.124)	1.61	0.009

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was:

$$\Delta Z_{ij,k,t} = \beta Z_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Z_{ij,k,t-m} + \text{dummies} + \varepsilon_{ij,k,t},$$

where, $Z_{ij,k,t}$, is defined as the 'tax-adjusted' percentage difference in price of commodity k at time t between cities i and j. See text for details. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New Orleans is defined as the benchmark city.

TABLE VI: PANEL UNIT ROOT TESTS INCORPORATING TAXES:
with seasonal and individual specific fixed effects

Panel B: Perishables

Good	*Beta*	*F-test*	*signif.*	*Good*	*Beta*	*F-test*	*signif.*
Perishables:							
Bacon	-0.911 (0.040)	0.71	0.925	McDonalds	-1.197 (0.148)	1.71	0.004
Bananas	-1.545** (0.085)	1.47	0.029	Pizza	-0.622 (0.097)	1.29	0.107
Bread	-0.588** (0.027)	1.58	0.009				
Cheese	-0.638 (0.039)	1.41	0.045				
Eggs	-0.474 (0.047)	1.20	0.177				
Ground Beef	-1.133* (0.054)	2.41	0.001				
Lettuce	-1.806* (0.076)	1.84	0.001				
Margarine	-1.209 (0.045)	2.13	0.001				
Milk	-0.322 (0.023)	1.08	0.337				
Potatoes	-1.460 (0.061)	2.68	0.001				
Steak	-0.736* (0.041)	0.39	1.000				
Whole Chicken	-0.726 (0.022)	8.09	0.001				
Fried Chicken	-1.593*** (0.047)	1.25	0.134				

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was:

$\Delta Z_{ij,k,t} = \beta Z_{ij,k,t-1} + \sum_{m=1}^{s(k)} \beta_m \Delta Z_{ij,k,t-m} + \text{dummies} + \varepsilon_{ij,k,t}$, where, $Z_{ij,k,t}$, is defined as the 'tax-adjusted' percentage difference in price of commodity k at time t between cities i and j. See text for details. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New Orleans is defined as the benchmark city.

TABLE VII: THE IMPACT OF MEASUREMENT ERRORS ON ESTIMATED RATES OF CONVERGENCE

	AR(1)		ARMA(1,1)*		ARMA(1,1)		IV
Corn Flakes	0.643	$\sigma^2 = .0067$	0.903	$\sigma^2 = .0107$	0.836	$\sigma^2 = .0063$	0.856
	(0.035)	$\ell = 1083$	(0.036)	$\ell = 954$	(0.034)	$\ell = 1097$	(0.023)
					$\theta =$ -0.347		
					(0.058)		
Canned Peaches	0.694	$\sigma^2 = .0103$	0.579	$\sigma^2 = .0201$	0.853	$\sigma^2 = .0099$	0.924
	(0.026)	$\ell = 1268$	(0.090)	$\ell = 1031$	(0.028)	$\ell = 1284$	(0.014)
					$\theta =$ -0.340		
					(0.054)		
Shortening	0.698	$\sigma^2 = .0087$	0.973	$\sigma^2 = .0149$	0.952	$\sigma^2 = .0073$	0.899
	(0.027)	$\ell = 1328$	(0.003)	$\ell = 1137$	(0.014)	$\ell = 1393$	(0.017)
					$\theta =$ -0.592		
					(0.037)		
Milk	0.890	$\sigma^2 = .0051$	0.707	$\sigma^2 = .0244$	0.967	$\sigma^2 = .0045$	0.973
	(0.017)	$\ell = 1501$	(0.094)	$\ell = 950$	(0.012)	$\ell = 1538$	(0.009)
					$\theta =$ -0.430		
					(0.048)		
Fried Chicken	0.564	$\sigma^2 = .0423$	0.755	$\sigma^2 = .0468$	0.909	$\sigma^2 = .0341$	0.821
	(0.039)	$\ell = 443$	(0.042)	$\ell = 380$	(0.024)	$\ell = 488$	(0.028)
					$\theta =$ -0.586		
					(0.054)		
Pizza	0.762	$\sigma^2 = .0036$	0.639	$\sigma^2 = .0084$	0.750	$\sigma^2 = .0036$	0.902
	(0.030)	$\ell = 949$	(0.049)	$\ell = 776$	(0.038)	$\ell = 949$	(0.022)
					$\theta =$ 0.034		
					(0.065)		
Appliance Repair	0.879	$\sigma^2 = .0080$	0.950	$\sigma^2 = .0303$	0.928	$\sigma^2 = .0078$	0.921
	(0.017)	$\ell = 1357$	(0.006)	$\ell = 886$	(0.016)	$\ell = 1369$	(0.015)
					$\theta =$ -0.238		
					(0.046)		
Beauty Salon	0.886	$\sigma^2 = .0072$	0.909	$\sigma^2 = .0261$	0.976	$\sigma^2 = .0064$	0.936
	(0.024)	$\ell = 806$	(0.013)	$\ell = 543$	(0.015)	$\ell = 832$	(0.020)
					$\theta =$ -0.439		
					(0.047)		
Man's Haircut	0.804	$\sigma^2 = .0075$	0.825	$\sigma^2 = .0187$	0.859	$\sigma^2 = .0074$	0.927
	(0.022)	$\ell = 1383$	(0.039)	$\ell = 1021$	(0.024)	$\ell = 1388$	(0.014)
					$\theta =$ -0.161		
					(0.050)		

Notes: Standard errors in parentheses, $\ell =$ the value of the log likelihood function, and $\sigma^2 =$ the estimate of the sample variance. Columns 1 - 3 report maximum likelihood estimates pooling data from 10 cities. *Column 2 imposes the restriction that the MA(1) coefficient (θ) = -1* the AR(1) coefficient. The estimates in Column 4 were obtained instrumenting $Q_{ij,k,t-1}$ with $Q_{ij,k,t-3}$. The 10 cities used are: Mobile, Al; Blythe, Ca; Denver, Co; Indianapolis, In; Lexington, Ky; Louisville, Ky; St. Louis, Mo; Hastings, Ne; Rapid City, SD; and Houston, Tx.

TABLE VIII: NON-LINEARITY IN RATES OF CONVERGENCE TOWARDS THE LAW OF ONE PRICE

	Regression 1	Regression 2	Regression 3	Regression 4
Perishables				
$Q_{ij,k,t-1}$	-0.474	-0.551	-0.195	-0.260
	(0.004)	(0.004)	(0.008)	(0.009)
$Q^2_{ij,k,t-1}$	-0.097	-0.125	0.021	-0.071
	(0.009)	(0.011)	(0.017)	(0.019)
Non-Perishables				
$Q_{ij,k,t-1}$	-0.376	-0.412	-0.105	-0.125
	(0.004)	(0.004)	(0.009)	(0.010)
$Q^2_{ij,k,t-1}$	-0.243	-0.167	-0.087	-0.073
	(0.012)	(0.013)	(0.026)	(0.029)
Services				
$Q_{ij,k,t-1}$	-0.134	-0.141	-0.029	-0.053
	(0.004)	(0.004)	(0.009)	(0.009)
$Q^2_{ij,k,t-1}$	-0.083	-0.063	-0.076	-0.037
	(0.011)	(0.012)	(0.024)	(0.027)
Std. error of Regression	.1343	.1321	.1224	.1212
Number of Observations	106910	106910	26989	26989
Product dummies	no	yes	no	yes
City dummies	no	no	no	yes
lagged dependent variable	no	no	yes	yes

Notes: Standard errors in parentheses. For columns 1 and 2, the regression run was:

$$\Delta Q_{ij,k,t} = \sum_{n=1}^{3} \beta_n Q_{ij,k,t-1} + \sum_{n=1}^{3} \gamma_n Q^2_{ij,k,t-1} + \text{dummies} + \varepsilon_{ij,k,t}$$

For columns 3 and 4, the regression run was:

$$\Delta Q_{ij,k,t} = \sum_{n=1}^{3} \beta_n Q_{ij,k,t-1} + \sum_{n=1}^{3} \gamma_n Q^2_{ij,k,t-1} + \sum_{m=1}^{16} \delta_m \Delta Q_{ij,k,t-m} + \text{dummies} + \varepsilon_{ij,k,t}$$

, where n=1 if k is perishable, n=2 if k is non-perishable, and n=3 if k is a service, and, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. New Orleans is defined as the benchmark city.

TABLE IX: THE IMPACT OF DISTANCE ON CONVERGENCE

	Regression 1	Regression 2	Regression 3	Regression 4
Perishables				
$Q_{ij,k,t-1}$	-1.174	-1.150	-0.691	-0.622
	(0.042)	(0.042)	(0.074)	(0.075)
$Q_{ij,k,t-1}$*ldist	0.104	0.090	0.073	0.054
	(0.006)	(0.006)	(0.011)	(0.011)
Non-Perishables				
$Q_{ij,k,t-1}$	-0.570	-0.609	-0.265	-0.283
	(0.040)	(0.039)	(0.075)	(0.076)
$Q_{ij,k,t-1}$*ldist	0.031	0.031	0.025	0.024
	(0.006)	(0.006)	(0.011)	(0.011)
Services				
$Q_{ij,k,t-1}$	-0.274	-0.303	-0.070	-0.103
	(0.045)	(0.046)	(0.078)	(0.080)
$Q_{ij,k,t-1}$*ldist	0.021	0.025	0.007	0.008
	(0.007)	(0.007)	(0.012)	(0.012)
Ln distance	-.0012	-.0004	-.0005	.0004
	(.0001)	(.0003)	(.0001)	(.0007)
Std. error of Regression	.1343	.1321	.1224	.1212
Number of Observations	106910	106910	26989	26989
Product dummies	no	yes	no	yes
City dummies	no	no	no	yes
lagged dependent variable	no	no	yes	yes

Notes: "Ln" refers to the natural log, standard errors in parentheses. For columns 1 and 2, the regression run was:

$$\Delta Q_{ij,k,t} = \theta \ln \text{ distance} + \sum_{n=1}^{3} \beta_n Q_{ij,k,t-1} + \sum_{n=1}^{3} \gamma_n Q_{ij,k,t-1} \ln \text{distance} + \text{ dummies} + \varepsilon_{ij,k,t}.$$

For columns 3 and 4, the regression run was:

$$\Delta Q_{ij,k,t} = \theta \ln \text{ distance} + \sum_{n=1}^{3} \beta_n Q_{ij,k,t-1} + \sum_{n=1}^{3} \gamma_n Q_{ij,k,t-1} \ln \text{distance} + \sum_{m=1}^{16} \delta_m \Delta Q_{ij,k,t-m} + \text{ dummies} + \varepsilon_{ij,k,t},$$

where n=1 if k is perishable, n=2 if k is non-perishable, and n=3 if k is a service, and, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. New Orleans is defined as the benchmark city.

TABLE A1: CITIES AND COMMODITIES INCLUDED

	Cities		Goods
C1	Birmingham AL	G1	Appliance Repair
C2	Mobile AL	G2	Aspirin
C3	Blythe CA	G3	Auto Maintenance
C4	Indio CA	G4	Baby food
C5	Palm Springs CA	G5	Bacon
C6	Denver CO	G6	Bananas
C7	Lakeland FL	G7	Beauty Salon
C8	Boise ID	G8	Beer
C9	Champaign,Urbana IL	G9	Bowling
C10	Peoria IL	G10	Bread
C11	Ft. Wayne IN	G11	Cheese
C12	Indianapolis IN	G12	Cigarettes
C13	Cedar Rapids IA	G13	Coffee
C14	Lexington KY	G14	Corn Flakes
C15	Louisville KY	G15	Dentist
C16	Baton Rouge LA	G16	Doctor
C17	Lafayette LA	G17	Dry Cleaning
C18	New Orleans LA	G18	Eggs
C19	Benton Harbor MI	G19	Fried Chicken
C20	Traverse City MI	G20	Frozen Corn
C21	Columbus MS	G21	Game
C22	St. Joseph MO	G22	Ground Beef
C23	St. Louis MO	G23	Hospital Room
C24	Falls City NE	G24	Jeans
C25	Hastings NE	G25	Lettuce
C26	Omaha NE	G26	Liquor
C27	Reno,Sparks NV	G27	Man's Haircut
C28	Newark NJ	G28	Man's Shirt
C29	New York NY	G29	Margarine
C30	Hickory NC	G30	McDonalds
C31	Columbus OH	G31	Milk
C32	Altoona PA	G32	Movie
C33	Rapid City SD	G33	Canned Orange juice
C34	Vermillion SD	G34	Canned Peaches
C35	Chattanooga TN	G35	Pizza
C36	Knoxville TN	G36	Potatoes
C37	Abilene TX	G37	Shampoo
C38	El Paso TX	G38	Shortening
C39	Ft. Worth TX	G39	Soft Drink
C40	Houston TX	G40	Steak
C41	Lubbock TX	G41	Sugar
C42	Salt Lake City UT	G42	Canned Peas
C43	Charleston WV	G43	Tennis balls
C44	Appleton WI	G44	Tissue
C45	Eau Claire WI	G45	Canned Tomatoes
C46	Madison WI	G46	Toothpaste
C47	Oshkosh WI	G47	Tuna
C48	Casper WY	G48	Underwear
		G49	Washing Powder
		G50	Whole Chicken
		G51	Wine

TABLE A2: DESCRIPTIONS OF COMMODITIES INCLUDED

Item	Date added	Description
Appliance Repair	75.1	Service call excluding parts color TV (75.1-79.1); Washing Machine (79.2-92.4).
Aspirin	82.2	Bayer brand, 100-tablets, bottle 325 mg tablets (82.2-92.4).
Auto Maintenance	79.2	Average price to balance two front wheels (79.2-84.1); average price to balance one front wheel (84.2-88.3); average price to computer or spin balance one front wheel (88.4-92.4).
Baby food	75.1	Jar 4 1/2 oz strained vegetables.
Bacon	75.1	lb, or national brands.
Bananas	75.1	lb.
Beauty Salon	82.2	Woman's visit, shampoo, trim and blow-dry.
Beer	82.2	6 pack, 12 oz. containers, excluding deposit, Miller Lite or Budweiser.
Bowling	75.1	Price per line evening price.
Bread	75.1	24 oz (75.1-80.2); 20 oz (80.3-92.4).
Cheese	82.2	Parmesan, grated 8 oz. canister, Kraft.
Cigarettes	75.1	Carton Winston king-size.
Coffee	75.1	2 lbs (75.1-80.2); 1 lb (80.3-88.3); 13 oz (88.4-92.4); Maxwell House Hills Brothers Folgers.
Corn Flakes	79.2	12 oz. Kellogg's or Post Toasties (79.2-80.3); 18 oz. (80.4-92.4).
Dentist	75.1	Office Visit, teeth cleaning and inspection, no x-ray or fluoride treatment.
Doctor	75.1	Office Visit, general practitioner routine exam of existing patient.
Dry Cleaning	75.1	Man's two piece suit.
Eggs	75.1	Doz. large Grade A.

TABLE A2: DESCRIPTIONS OF COMMODITIES INCLUDED

Fried Chicken	82.2	Breast and drumstick (82.2-83.4), thigh and drumstick (84.1-92.4), Church's, or Kentucky Fried Chicken if available.
Frozen Corn	84.1	Frozen, whole kernel, 10 oz. package.
Game	82.2	Monopoly, standard (No. 9) edition.
Ground Beef	75.1	lb, or Hamburger.
Hospital Room	75.1	Semi-private cost per day.
Jeans	82.2	Levi's straight leg, sizes 28/30 to 34/36 (82.2-87.4), Levi's 501 (88.1-91.3); Levi's 505s or 501s (91.4-92.4).
Lettuce	75.1	Each.
Liquor	75.1	750 ml bottle Seagram's 7 Crown (75.1-88.3); J&B Scotch (88.4-92.4).
Man's Haircut	75.1	No styling.
Man's Shirt	82.2	Arrow or Van Heusen, white, long sleeve, cotton/polyester blend (82.2-83.4); sizes 15/32 to 16/34 (89.1-89.3); Arrow, Enro, Van Heusen, J.C. Penny, cotton/polyester (at least 55% cotton) long sleeves (89.4-92.4).
Margarine	75.1	lb.
McDonalds	82.2	1/2 lb patty (82.2-83.2); 1/4 lb. patty with cheese, pickle, onion, mustard, catsup (83.3-92.4).
Milk	75.1	1/2 gal. carton.
Movie	75.1	First run indoor evening price.
Canned Orange juice	75.1	6 oz can (75.1-85.4); 12 oz can (86.1-92.4).
Canned Peaches	75.1	#2 1/2 can approx 29 oz (75.1-85.4); 29 oz (86.1-92.4); Del Monte or Libby's halves or slices.
Pizza	82.2	12" - 13" thin crust, regular cheese, Pizza Hut or Pizza Inn, where available.
Potatoes	75.1	10 lbs white or red.
Shampoo	82.2	11 oz. container Johnson's (82.2-88.3); 15 oz. bottle (88.4-89.3); 11 oz. (89.4-90.4); 15 oz bottle (91.1); 11 oz. bottle (91.2); 15 oz. bottle Alberto VO-5 (91.3-92.4).
Shortening	75.1	3 lb can all vegetable, Crisco brand.

TABLE A2: DESCRIPTIONS OF COMMODITIES INCLUDED (Continued)

Soft Drink	75.1	1 qt Coca-Cola (75.1-79.2); 2 liter (79.3-92.4).
Steak	75.1	lb, round steak (75.1-80.3); T-bone steak (80.4-92.4) USDA Choice.
Sugar	79.2	5 lbs. cane or beet (79.2-92.3); 4 lbs cane or beet. 92.4.
Canned Peas	75.1	#303 can 15-17 oz (75.1-85.4); 17 oz (86.1-92.4); Del Monte or Green Giant.
Tennis balls	82.2	Wilson or Penn brands, yellow, can of 3 heavy duty.
Tissue	75.1	1 roll (75.1-79.1); 4 rolls (79.2-80.2); Kleenex brand 175 count box (80.3-92.4).
Canned Tomatoes	75.1	#303 can 15-17 oz (75.1-85.4); 14.5 oz (86.1-92.4); Del Monte or Green Giant.
Toothpaste	82.2	6 to 7 oz. tube Crest, or Colgate.
Tuna	82.2	6.5 oz., Starkist or Chicken of the Sea, packed in oil (82:2-91.3); 6.125-6.5 oz (92.4).
Underwear	82.2	Package of 3 briefs, sizes 28/30-34/36 (82.2-90.3); sizes 10-14 (90.4-92.4).
Washing Powder	75.1	49 oz (75.1-88.4); 42 oz (89.1-92.4); Giant Tide, Bold, or Cheer.
Whole Chicken	75.1	lb, Grade A Frying.
Wine	82.2	Paul Masson Chablis 750 milliliter bottle (82.2-83.4), Paul Masson Chablis 1.5 liter (84.1-90.3) Gallo Sauvignon blanc 1.5 liter (90.4-91.3); Gallo Chablis Blanc 1.5 liter (91.3-92.4).

TABLE A3: SALES TAX RATES AND CHANGES, BY CITY

	Cities	Grocery Items			Non-Grocery Items		
		92.4	75-84	84-92	92.4	75-84	84-92
C1	Birmingham AL	8.00	0.00	3.00	8.00	0.00	3.00
C2	Mobile AL	9.00	1.00	1.00	9.00	1.00	1.00
C3	Blythe CA	7.80	0.00	7.80	7.80	0.00	1.80
C4	Indio CA	7.80	0.00	7.80	7.80	0.00	1.80
C5	Palm Springs CA	7.80	0.00	7.80	7.80	0.00	1.80
C6	Denver CO	6.00	1.00	0.00	6.00	1.00	0.00
C7	Lakeland FL	0.00	0.00	0.00	6.00	1.00	1.00
C8	Boise ID	5.00	1.50	0.50	5.00	1.50	0.50
C9	Champaign,Urbana IL	1.00	-4.00	1.00	7.20	1.00	2.20
C10	Peoria IL	7.40	1.00	2.40	7.20	1.00	2.20
C11	Ft. Wayne IN	0.00	0.00	0.00	5.00	1.00	0.00
C12	Indianapolis IN	0.00	0.00	0.00	5.00	1.00	0.00
C13	Cedar Rapids IA	0.00	0.00	0.00	5.00	1.00	1.00
C14	Lexington KY	0.00	0.00	0.00	6.00	0.00	1.00
C15	Louisville KY	0.00	0.00	0.00	6.00	0.00	1.00
C16	Baton Rouge LA	8.00	0.00	2.00	8.00	0.00	2.00
C17	Lafayette LA	7.50	0.00	2.50	7.50	0.00	2.50
C18	New Orleans LA	7.50	1.50	3.00	9.00	2.00	1.00
C19	Benton Harbor MI	0.00	0.00	0.00	4.00	0.00	0.00
C20	Traverse City MI	0.00	0.00	0.00	4.00	0.00	0.00
C21	Columbus MS	6.00	1.00	0.00	7.00	1.00	1.00
C22	St. Joseph MO	6.20	3.00	0.20	6.20	3.00	0.20
C23	St. Louis MO	5.70	2.60	0.10	5.70	2.60	0.10
C24	Falls City NE	0.00	-2.50	0.00	5.00	1.50	1.00
C25	Hastings NE	0.00	-2.50	0.00	6.00	1.50	2.00
C26	Omaha NE	0.00	-3.50	0.00	6.50	2.00	1.00
C27	Reno,Sparks NV	0.00	-3.50	0.00	7.00	2.50	1.00
C28	Newark NJ	0.00	0.00	0.00	7.00	1.00	1.00
C29	New York NY	0.00	0.00	0.00	8.30	0.30	0.00
C30	Hickory NC	6.00	0.50	1.50	6.00	0.50	1.50
C31	Columbus OH	0.00	0.00	0.00	5.00	1.00	0.00
C32	Altoona PA	0.00	0.00	0.00	6.00	0.00	0.00
C33	Rapid City SD	6.00	0.00	0.50	6.00	0.00	0.50
C34	Vermillion SD	6.00	1.00	1.00	6.00	1.00	1.00
C35	Chattanooga TN	7.20	1.00	0.90	7.20	0.00	0.90
C36	Knoxville TN	7.80	1.00	1.80	7.80	0.00	1.80
C37	Abilene TX	0.00	0.00	0.00	7.80	0.00	0.80
C38	El Paso TX	0.00	0.00	0.00	8.30	0.00	2.80
C39	Ft. Worth TX	0.00	0.00	0.00	7.80	0.00	2.80
C40	Houston TX	0.00	0.00	0.00	8.30	2.00	1.30
C41	Lubbock TX	0.00	0.00	0.00	7.80	0.10	2.70
C42	Salt Lake City UT	0.00	0.00	0.00	6.30	0.10	1.70
C43	Charleston WV	6.00	-3.00	6.00	6.00	2.00	1.00
C44	Appleton WI	0.00	0.00	0.00	5.00	1.00	0.00
C45	Eau Claire WI	0.00	0.00	0.00	5.00	1.00	0.00
C46	Madison WI	0.00	0.00	0.00	5.50	1.00	0.50
C47	Oshkosh WI	0.00	0.00	0.00	5.00	1.00	0.00
C48	Casper WY	4.00	0.00	0.00	4.00	0.00	0.00
Mean		2.99	-0.06	1.06	6.48	0.78	1.05
Standard Deviation		3.48	1.38	2.11	1.34	0.82	0.90
Minimum		0.00	-4.00	0.00	4.00	0.00	0.00
Maximum		9.00	3.00	7.80	9.00	3.00	3.00

TABLE A4: POOLED PANEL UNIT ROOT TESTS

	Regression 1	Regression 2
Perishables		
$Q_{ij,k,t-1}$	-0.207	-0.273
	(0.009)	(0.011)
Non-Perishables		
$Q_{ij,k,t-1}$	-0.117	-0.160
	(0.009)	(0.012)
Services		
$Q_{ij,k,t-1}$	-0.012	-0.051
	(0.010)	(0.012)
Std. error of Regression	.1239	.1229
Number of Observations	21319	21319
Product dummies	no	yes
City dummies	yes	yes

Notes: Standard errors in parentheses. The regression run was:

$$\Delta Q_{ij,k,t} = \sum_{n=1}^{3} \beta_n Q_{ij,k,t-1} + \sum_{m=1}^{16} \delta_m \Delta Q_{ij,k,t-m} + \text{dummies} + \varepsilon_{ij,k,t},$$

where n=1 if k is perishable, n=2 if k is non-perishable, and n=3 if k is a service, and, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. New Orleans is defined as the benchmark city.

TABLE A5: PANEL UNIT ROOT TESTS (NEW YORK BENCHMARK)

Panel A: Non-Perishables

Good	*Beta*	*# lags*	*# obs*	*Good*	*Beta*	*# lags*	*#obs*
Asprin	-0.317* (0.094)	15	143	Shampoo	-0.021 (0.101)	16	115
Baby food	0.074* (0.022)	6	1170	Shortening	0.005 (0.029)	8	918
Beer	-0.090** (0.038)	13	200	Soft Drink	0.010 (0.019)	5	1022
Cigarettes	-0.062** (0.028)	15	143	Sugar	0.009 (0.029)	10	399
Coffee	-0.171* (0.023)	4	1264	Canned Peas	0.018 (0.088)	8	85
Corn Flakes	-0.109* (0.023)	4	924	Tennis Balls	-0.044 (0.038)	4	571
Frozen Corn	-1.053 (0.823)	16	19	Tissue	-0.455* (0.035)	4	993
Game	-0.060* (0.013)	4	571	Canned Tomatoes	-0.257* (0.032)	4	1280
Jeans	-0.073* (0.025)	5	488	Toothpaste	-0.202* (0.070)	13	200
Liquor	-0.085*** (0.062)	14	237	Canned Tuna	0.090* (0.024)	4	570
Man's Shirt	-0.082*** (0.052)	12	232	Underwear	-0.184* (0.074)	9	330
Orange Juice	-0.218* (0.063)	9	522	Washing Powder	-0.076* (0.024)	7	1047
Canned Peaches	-0.269* (0.053)	9	493	Wine	-0.073** (0.036)	7	403

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was:

$\Delta Q_{ij,k,t} = \beta Q_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{ij,k,t-m} + \varepsilon_{ij,k,t}$, where, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New York is defined as the benchmark city.

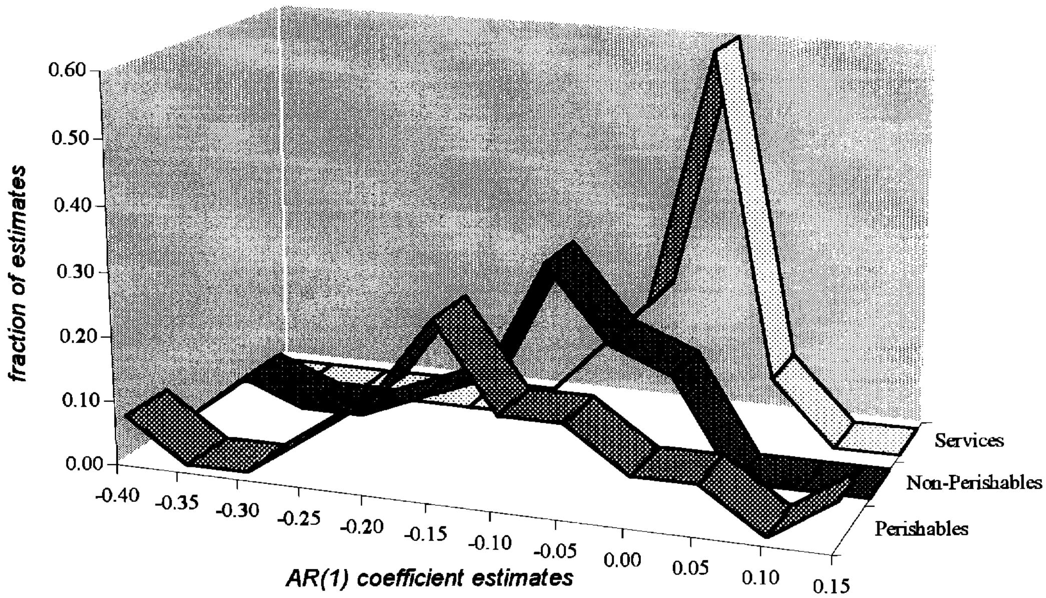
TABLE A5: PANEL UNIT ROOT TESTS (NEW YORK BENCHMARK)

Panel B: Perishables and Services

Good	*Beta*	*# lags*	*# obs*	*Good*	*Beta*	*# lags*	*#obs*
Perishables:							
Bacon	-0.149*	4	1471	McDonalds	-0.146*	4	571
	(0.023)				(0.021)		
Bananas	-0.296*	14	237	Pizza	-0.023***	12	232
	(0.089)				(0.016)		
Bread	-0.191*	4	1261				
	(0.022)			***Services:***			
Cheese	-0.009	14	171	Appliance repair	-0.099*	7	676
	(0.035)				(0.019)		
Eggs	0.041	14	237	Auto Maintenance	-0.081*	10	396
	(0.046)				(0.020)		
Ground Beef	0.060	15	143	Beauty Salon	-0.089**	11	264
	(0.141)				(0.041)		
Lettuce	-0.261*	10	673	Bowling	-0.216*	15	143
	(0.045)				(0.060)		
Margarine	0.056	16	110	Dentist	0.100*	16	103
	(0.106)				(0.039)		
Milk	-0.100***	16	115	Doctor	-0.130*	16	111
	(0.063)				(0.047)		
Potatoes	-0.161*	11	548	Dry Cleaning	-0.152*	4	1507
	(0.072)				(0.011)		
Steak	0.001	10	338	Hospital Room	-0.008	14	237
	(0.045)				(0.009)		
Whole Chicken	-0.221*	4	1507	Man's Haircut	-0.050***	13	327
	(0.028)				(0.037)		
Fried Chicken	-0.253*	13	200	Movie	-0.039	14	230
	(0.062)				(0.032)		

Notes: Standard errors are in parentheses, and '*', '**', '***', denote significant at the 1%, 5%, and 10% levels. For each good, the regression run was:

$\Delta Q_{ij,k,t} = \beta Q_{ij,k,t-1} + \sum_{m=1}^{s(k)} \gamma_m \Delta Q_{ij,k,t-m} + \varepsilon_{ij,k,t}$, where, $Q_{ij,k,t}$, is defined as the percentage difference in price of commodity k at time t between cities i and j, i.e., $Q_{ij,k,t} = \ln(P_{i,k,t} / P_{j,k,t})$. $s(k)$ is chosen as the highest significant lag from a preliminary regression including 16 lags. The F-Test is a test of the joint significance of city-pair dummies. New York is defined as the benchmark city.



	<-.40	(-.40,-.35)	(-.35,-.30)	(-.30,-.25)	(-.25,-.20)	(-.20,-.15)	(-.15,-.10)	(-.10,-.05)	(-.05,0.0)	> 0.0
Perishables	0.07	0.00	0.00	0.07	0.13	0.27	0.13	0.13	0.07	0.14
Non-Perishables	0.00	0.08	0.04	0.04	0.08	0.12	0.31	0.19	0.15	0.00
Services	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.60	0.10

Figure I
Empirical Density Functions of Coefficient Estimates
Based on panel unit root test regressions without city dummies