What Determines Purchasing Power Parity between Japanese Cities?

メタデータ	言語: eng
	出版者:
	公開日: 2004-09-30
	キーワード (Ja):
	キーワード (En):
	作成者: 江阪, 太郎, Esaka, Taro
	メールアドレス:
	所属:
URL	https://kobe-cufs.repo.nii.ac.jp/records/745

What Determines Purchasing Power Parity between Japanese Cities?

Taro Esaka

1. Introduction

Over the past decade, a considerable number of empirical studies have analyzed purchasing power parity (PPP) or the law of one price (LOOP) (see Froot and Rogoff (1995) and Rogoff (1996) for a comprehensive survey). Many studies have tested the hypothesis that the real exchange rate is stationary by using unit root tests in order to examine whether long-run PPP holds across industrialized countries for the post Bretton-Woods period. However, these studies fail to reject the null hypothesis of unit roots by using industrialized country data. More recently, some studies have tested the null hypothesis of unit roots by using longer time series (*e.g.*, Lothian and Taylor (1996)) or panel data (*e.g.*, Frankel and Rose (1996)). While these studies have been more successful in rejecting the null hypothesis, the speed of convergence to PPP has been shown to be slow. Rogoff (1996) shows that the half-lives of PPP (LOOP) deviations are three to five years in cross-country data.

In this paper, we examine whether long-run PPP holds between cities within Japan by using 15 annual disaggregated consumer price indices during 1960-98. As shown by Froot and Rogoff (1995) and Rogoff (1996), aggregate price indices, trade barriers and exchange rate volatility (border effects) can affect the extent to which PPP or LOOP holds. By using disaggregated price indices[1] between cities in

1 For analyses of PPP by using disaggregated price data, see Engel and Rogers (1996), Parsley and Wei (1996), Jenkins (1997), Takagi and Yoshida (1999) and Esaka (2003). ↗

the same country, it should be possible to exclude some of these effects, so that the relationship between deviations from PPP and types of goods (*e.g.*, tradable goods or non-tradable goods) or transport cost can be directly analyzed.

The questions we ask in this paper are as follows. First, does PPP hold more for tradable goods than for non-tradable goods? Second, does distance between cities increase the incidence of violation of PPP? In order to answer these questions, we follow the following testing strategy.[2] First, we test the hypothesis that the relative price of goods between cities is stationary by using the unit root test and estimate the rate of convergence to PPP. Second, we examine whether the speed of convergence toward PPP is faster for tradable goods than for non-tradable goods and ask whether distance inhibits the elimination of price differences by using the estimated speed of convergence. Third and finally, we statistically identify the determinants of PPP between Japanese cities by using a logit model.

The paper is organized as follows. Section 2 will present the consumer price data and the result of the unit root test. Section 3 will examine the relationship between the speed of convergence to PPP and the type of goods or distance. Section 4 will present the result of estimating the logit model. Finally, Section 5 will present a summary and concluding remarks.

2. Purchasing Power Parity and the Rate of Convergence

2. 1. The Augmented Dickey-Fuller Test

Following the testing strategy described above, we first examine the extent to which long-run PPP holds between Japanese cities by

---

↘Takagi and Yoshida (1999) use the univariate ADF test to test long-run PPP between Japanese cities for three disaggregated consumer price indices for 1951-1991. Esaka (2003) applies new panel unit root tests of Im, Pesaran and Shin (1997) and Maddala and Wu (1999) to examine whether long-run PPP holds between major Japanese cities for 13 disaggregated consumer price indices for 1960-1998.

2 Jenkins (1997) first tests whether the relative price of goods between cities across the United States (US) and Canada is stationary by using the ADF test and then identifies the determinants of PPP by using the probit model.

using disaggregated price data. It is naturally supposed that a necessary condition for PPP is that the relative price of goods between cities is stationary; otherwise, deviations from PPP would be permanent. Accordingly, we test whether the relative price of goods between cities is stationary by using the Augmented Dickey-Fuller (ADF) test. The test equation is as follows,

$$\Delta q_t = \alpha_1 + \alpha_2 t + \beta q_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta q_{t-j} + \varepsilon_t, \quad (1)$$

where q_t is the relative price of good between city i and benchmark city at time t; Δ is a first difference operator; α_1, α_2, β and γ are the coefficients to be estimated; and ε_t is an error term.[3] All variable are expressed in natural logarithm.

The null hypothesis of the ADF test is that q_t is a random walk (nonstationary). In this study, the parameter β indicates the persistence of deviation from PPP. If β is zero, any deviation from PPP is permanent. On the other hand, if β is large (in absolute value), the persistence of deviation from PPP is small. The half-life of PPP deviations is computed from the speed of convergence (β) by $\ln(0.5)/\ln(1+\beta)$.

Following Campbell and Perron (1991), we choose the lag length in the ADF test in the following manner. Start with a maximum lag length, $k_{\max}$, on k. If the last included lag is significant, choose $k = k_{\max}$. If not, reduce k by one until the last lag becomes significant. If no lags are significant, set $k=0$. We set the maximum lag length is at six ($k_{\max}=6$) in order to preserve a reasonable number of degrees of freedom and then eliminate those lags with insignificant effects (at the 10 percent level).

---

3 Since the individual unit root tests are known to have low power with short time spans, panel unit root test might be considered as a way of increasing statistical power. Unfortunately, however, the relationship between deviations from PPP and the type of goods or distance between cities cannot be statistically examined with a panel unit root test.

Table 1. Disaggregated Consumer Price Indices, 1960-1998[a,b]

	Goods category	tradable or non-tradable[c]
1	General	
2	Food	tradable
3	Cereals	tradable
4	Meat	tradable
5	Dairy products and eggs	tradable
6	Fruits	tradable
7	Cakes and candies	tradable
8	Beverages	tradable
9	Alcoholic beverages	tradable
10	Clothes	tradable
11	Fuel, light and water charges	non-tradable
12	Medical care	non-tradable
13	Transportation and communication	non-tradable
14	Education	non-tradable
15	Housing	non-tradable

(Notes)

[a] The annual data of disaggregated consumer price indices are obtained from the *Annual Report on the Consumer Price Index* (published by the Statistics Bureau of the Management and Coordination Agency, the Government of Japan).

[b] The sample period is from 1960 to 1998. The seven cities are Tokyo (Tok), Yokohama (Yok), Nagoya (Nag), Kyoto (Kyo), Osaka (Osa), Hiroshima (Hir) and Fukuoka (Fuk).

[c] Goods are classified as either tradable or non-tradable goods.

2. 2. Consumer Price Data

We use Japanese consumer price data from seven cities for 15 annual disaggregated consumer price indices. The data cover the period from 1960 to 1998. Table 1 presents the types and characters of goods. The disaggregated consumer prices are obtained from the *Annual Report on the Consumer Price Index,* published by the Statistics Bureau of the Management and Coordination Agency, the Government of Japan. As sample cities, we use seven major cities: Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Hiroshima and Fukuoka, which are all prefectural capitals and the centers of larger economic regions.[4] Tokyo, the national capital and the center of the first largest economic region, is used as the benchmark city.

2. 3. The Augmented Dickey-Fuller Test and the Rate of Convergence

Table 2 shows the result of the ADF test and the estimated rates of convergence to PPP.[5] In the first row, the rates of convergence (β) toward PPP are presented and the ADF test statistics are presented in the second row. From this table, we observe that the null hypothesis can be rejected in 14 of the 90 cases at the 5 percent level and in 30 cases at the 10 percent level. For tradable goods, the null hypothesis can be rejected in 10 of the 54 cases at the 5 percent level and in 24 cases at the 10 percent level. These results suggest that PPP is more likely to hold for tradable goods than for non-tradable goods. Moreover, we find that PPP is more likely to hold for closer city pairs. For example, the null hypothesis can be rejected at the 10 percent level in 11 of the 15 cases for Yokohama and Tokyo.

Similarly, we observe that the speed of convergence may be faster for tradable goods than for non-tradable goods. For example, in the case of dairy products and eggs for Yokohama and Tokyo, the parameter β is -0.81, implying that the half-life of PPP deviations is 0.4 years. On the other hand, in the case of medical care, β is -0.11, implying that the half-life is 5.94 years. In addition, we find that the speed of convergence may be faster for closer city pairs. For example, in the case of beverages, the half-life of PPP deviations is 0.94 years for Yokohama and Tokyo, 1.40 years for Nagoya and Tokyo and 4.27 years for Hiroshima and Tokyo.

As shown by Rogoff (1996), the half-lives of PPP (LOOP) deviations in previous studies of cross-country data are three to five

---

4 For this study, it is necessary to select similar cities to directly examine the relationship between the deviations from PPP and type of goods, because it may be thought that variations in the population sizes and different consumption preferences across cities influence on the performance of PPP.

5 Our results were not changed substantively, if the estimated model (the ADF test) without a time trend was used.

Table 2. Rates of Convergence toward the Purchasing Power Parity (β) and the ADF Test Statistics[a,b,c]

		Yok/Tok	Nag/Tok	Kyo/Tok	Osa/Tok	Hir/Tok	Fuk/Tok
1	General	−0.68** (−3.74)	−0.43 (−3.08)	−0.29 (−2.55)	−0.23 (−1.93)	−0.40 (−2.94)	−0.28 (−2.31)
2	Food	−0.29 (−1.81)	−0.52* (−3.25)	−0.31 (−2.75)	−0.51* (−3.40)	−0.46 (−3.06)	−0.64 (−3.01)
3	Cereals	0.73** (−3.62)	−0.21 (−2.26)	−0.46* (−3.23)	−0.45 (−3.05)	−0.38 (−2.29)	−0.34 (−3.02)
4	Meat	−0.37* (−3.20)	−0.37*** (−4.27)	−0.35* (−3.48)	−0.32 (−2.77)	−0.32 (−2.77)	−0.31*** (−4.33)
5	Dairy products & eggs	−0.81** (−3.73)	−0.31 (−2.34)	−0.49* (−3.42)	−0.45* (−3.28)	−0.22 (−1.97)	−0.51 (−2.39)
6	Fruits	−0.65** (−4.17)	−0.42* (−3.08)	−0.78*** (−5.72)	−0.75*** (−4.60)	−0.44 (−3.02)	−0.54 (−2.99)
7	Cakes & candies	−0.17 (−1.60)	−0.37** (−4.07)	−0.38* (−3.23)	−0.21 (−2.12)	−0.19 (−2.04)	−0.24 (−2.17)
8	Beverages	−0.52*** (−4.78)	−0.39* (−3.32)	−0.26 (−2.25)	−0.26 (−2.59)	−0.15* (−3.20)	−0.19 (−2.22)
9	Alcoholic beverages	−0.39* (−3.37)	−0.34* (−3.38)	−0.20 (−2.26)	−0.10 (−1.44)	−0.06 (−1.19)	−0.21 (−2.15)
10	Clothes	−0.66** (−3.78)	−0.12 (−1.04)	−0.37* (−3.23)	−0.19 (−1.96)	−0.31 (−2.54)	−0.24 (−2.37)
11	Fuel, light & water charges	−0.25 (−2.19)	−0.27 (−2.30)	−0.36 (−2.83)	−0.32 (−2.27)	−0.31 (−1.46)	−0.26 (−1.81)
12	Medical care	−0.11 (−1.22)	−0.25 (−2.71)	−0.39 (−2.72)	−0.35 (−2.45)	−0.34 (−2.65)	−0.22 (−1.50)
13	Transportation & communication	−0.56** (−3.74)	−0.22 (−1.93)	−0.22 (−2.06)	−0.25 (−2.30)	−0.15 (−1.45)	−0.13 (−1.59)
14	Education	−0.54** (−3.87)	−0.27 (−2.63)	−0.33 (−1.79)	−0.20 (−2.92)	−0.11 (−1.57)	−0.13 (−1.94)
15	Housing	−0.31* (−3.29)	−0.20 (−2.66)	−0.42* (−3.25)	−0.27 (−2.50)	−0.25** (−3.56)	−0.27 (−2.72)
Memorandum: distance (km)		29	366	514	556	873	1176

(Notes)

[a] Lag length is chosen by the Campbell and Perron (1991) procedure. The numbers in parentheses are the ADF test statistics.

[b] The half−lives of PPP deviations are calculated as $\ln(0.5)/\ln(1+\beta)$.

[c] Tokyo is used as the benchmark city.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

years. The average half-life of PPP deviations for tradable goods between cities within Japan is 1.47 years. Hence, the rate of convergence is much faster for tradable goods within Japan than for the case with cross-country data.[6]

3. The Speed of Convergence toward Purchasing Power Parity

In this section, we formally test whether the speed of convergence toward PPP is faster for tradable goods than for non-tradable good as well as whether distance inhibits the elimination of price differences.[7] To do so, we estimate the following regression equations,

$$|ADFCoefficient_{ij}| = a + b_1 TredableDummy_{ij} + b_2 Dis\tan ce_{ij} + u_{ij}, \quad (2)$$

$$|ADFCoefficient_{ij}| = a + b_1 TredableDummy_{ij} + b_2 Dis\tan ce_{ij} + b_3 Dis\tan ceSquared_{ij} + u_{ij}, \quad (3)$$

where $|ADFCoefficient_{ij}|$ is the absolute value of the coefficient (β) obtained from the ADF test for good i and city pair j;[8] $TradableDummy_{ij}$ is the dummy variable for tradable goods, which assumes the value of one for tradable goods and zero otherwise; $Dis\tan ce_{ij}$ is the distance between the two cities in kilometers; $Dis\tan ceSquared_{ij}$ is the squared distance between the two cities; a, b_1, b_2 and b_3 are coefficients to be estimated; and u_{ij} is an error term.

In equations (2) and (3), the speed of convergence to PPP is expected to be faster for tradable goods, such that $b_1 > 0$ and distance is expected to reduce the speed of convergence to PPP, such that $b_2 < 0$. In equation (3), the concavity of the relationship between deviations from PPP and distance are examined by adding a

6 Parsley and Wei (1996) estimate the rate of convergence to PPP or LOOP between US cities by using a panel unit root test and show that the half-life of PPP or LOOP deviations for tradable goods within US is roughly four to five quarters. Hence, the rate of convergence for Japan is nearly the same.

7 Transport cost is assumed to be a function of distance between cities, as in Engel and Rogers (1996).

8 Because all coefficients were negative, a negative sign was dropped.

squared distance term. Hence, it is expected that $b_2 < 0$ and $b_3 > 0$.

Because the estimated speed of convergence is used as the dependent variable in equations (2) and (3), the variance of error terms can differ across observations (i.e., error terms are likely to be heteroscedastic). Accordingly, following Saxonhouse (1976), we estimate the regression equations by using the weighted least squared (WLS) method with the weight being the inverses of the standard errors of the parameter (β). In order to eliminate overlapping observations, the general price index and the food price index are excluded from this part of the analysis, because they include goods that are included in other price indices. The goods categories are classified as either tradable or non-tradable goods based on our best judgement.

Table 3. Regression of the Estimated Speed of Convergence on Distance and the Tradable Goods Dummy[a,b]

Specification	1	2
Constant	0.330*** (0.035)	0.377*** (0.063)
Tradable goods dummy	0.046# (0.031)	0.050* (0.029)
Distance (km)	−0.14E-03*** (0.44E-04)	−0.37E-03** (0.18E-03)
Distance squared		0.17E-06 (0.12E-06)
Adjusted R-squared	0.135	0.151
F-statistic	7.000*** [0.002]	5.573*** [0.002]

(Notes)

a The regression equations are estimated by the weighted least squared (WLS) method. Following Saxonhouse (1976), we use the inverse of the standard errors of the parameter (β) from the ADF regression as the weight.

b The numbers in parentheses are standard errors, which are computed from a heteroscedasticity−consistent matrix (White (1980)). The numbers in brackets are p −values.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 3 shows the result of regressing the speed of convergence on distance and the dummy variable.[9] As expected, b_1 is positive and significant at the 10 percent level in equation (3), indicating that the speed of convergence toward PPP is faster with tradable goods.[10] b_2 is negative and significant at the 5 percent level in equations (2) and (3), indicating that distance reduces the speed of convergence. It is statistically confirmed that the speed of convergence toward PPP is faster for tradable goods than for non-tradable goods and that distance inhibits the elimination of price differences.

4. Econometric Evidence of Purchasing Power Parity

4.1. The Logit Model of Purchasing Power Parity

In order to statistically identify the determinants of PPP between Japanese cities, we make use of a logit model.[11] Here, we assume that PPP holds between cities if the null hypothesis that q_t is nonstationary can be rejected by the ADF test at the 10 percent level, and PPP does not hold otherwise. The dependent variable, the PPP dummy variable (Y_i) can be written as,

$$Y_i = 0, \quad \text{if PPP does not hold,}$$

and $$Y_i = 1, \quad \text{if PPP holds.} \tag{4}$$

The probability that PPP holds between cities is defined as a logistic distribution and the probability is hypothesized to be a function of a vector of n explanatory variables X. The probability that PPP is supported is then represented as,

$$P(Y_i = 0 \mid X) = 1 - F(\beta' X) = \frac{1}{1 + \exp(\beta' X)}, \tag{5}$$

9 The standard errors are computed from a heteroscedasticity-consistent matrix (White (1980)).

10 In equation (2), b_1 is significantly positive at the 15 percent level.

11 For details of the logit model, see Greene (1993).

and $$P(Y_i = 1 | X) = F(\beta' X) = \frac{\exp(\beta' X)}{1 + \exp(\beta' X)}, \tag{6}$$

where β is a vector of n known coefficients, $F(\beta' X)$ is the cumulative probability distribution evaluated at $\beta' X$ and $P(\cdots | X)$ denotes the conditional probability that PPP can be supported, given the explanatory variables X. Taking the logarithms of equations (5) and (6) and combining, we obtain,

$$\ln \frac{P(Y_i = 1 | X)}{P(Y_i = 0 | X)} = \beta' X. \tag{7}$$

Moreover, the log likelihood function of the logit model can be written as,

$$\ln \ L = \Sigma_{i=1} \{ Y_i \ln F(\beta' X) + (1 - Y_i) \ln [1 - F(\beta' X)] \}. \tag{8}$$

The log likelihood function of the logit model is estimated by using the maximum likelihood (ML) method.

In order to answer the questions we set out to answer, we estimate equation (7) by specifying it in the following ways.

$$\ln \frac{P(Y_i = 1)}{P(Y_i = 0)} = \alpha + \beta_1 \ TradableDummyi + \beta_2 Dis \tan ce_i, \tag{9}$$

$$\ln \frac{P(Y_i = 1)}{P(Y_i = 0)} = \alpha + \beta_1 \ TradableDummyi + \beta_2 Dis \tan ce_i + \beta_3 Dis \tan ceSquared_i. \tag{10}$$

In equations (9) and (10), the probability that PPP can be supported is shown to be higher for tradable goods if $\beta_1 > 0$; distance is shown to reduce the probability if $\beta_2 < 0$. In equation (10), the relationship between PPP deviations and distance is shown to be concave if $\beta_2 < 0$ and $\beta_3 > 0$.

4. 2.. Estimating the Logit model of Purchasing Power Parity

Table 4 shows the result of estimating the logit model. From this table, we note that β_1 is positive and significant at the 5 percent

Table 4. The Logit Model of Purchasing Power Parity[a]

Specification	1	2
Constant	0.049 (0.604)	0.558 (0.771)
Tradable goods dummy	1.481** (0.605)	1.564** (0.639)
Distance (km)	−0.30E-02*** (0.89E-03)	−0.59E-02** (0.27E-02)
Distance squared		0.25E-05 (0.21E-05)
Fraction of correct predictions	0.744	0.756
Log likelihood	−40.69	−39.98
LR test statistic[b]	20.47*** [0.000]	21.87*** [0.000]
Logit slope derivatives (in percent)[c]		
$dP(I=1)/dTradeDummy$	25.85	26.61
$dP(I=1)/dDis\tan ce$	−0.052	−0.100
$dP(I=1)/dDis\tan ceSquared$		4.2E-05

(Notes)

[a] The numbers in parentheses are standard errors, which are computed from analytic second derivatives (Newton's method). The numbers in brackets are p-values.

[b] The log likelihood ratio (LR) test for the null hypothesis is that the coefficients of the independent variable are jointly equal to zero.

[c] We report the effects of a one-unit change in the regressors on the probability that PPP can be supported (also expressed in percentage points), evaluated at the mean of the data.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

level in equations (9) and (10), indicating that the probability that PPP can be supported is higher for tradable goods. β_2 is negative and significant at the 5 percent level in equations (9) and (10), indicating that distance reduces the probability.[12] In equation (10), β_3 is positive, though β_3 is not significant at the 10 percent level, indicating that the distance relationship is concave.

---

12 To capture the city pair-specific effects, we also included city pair dummy variables in equation (9). It turned out, that however, the coefficients of city pair dummy variables and β_2 were not significant, possibly owing to the presence of multicollinearity between distance and the city pair dummies.

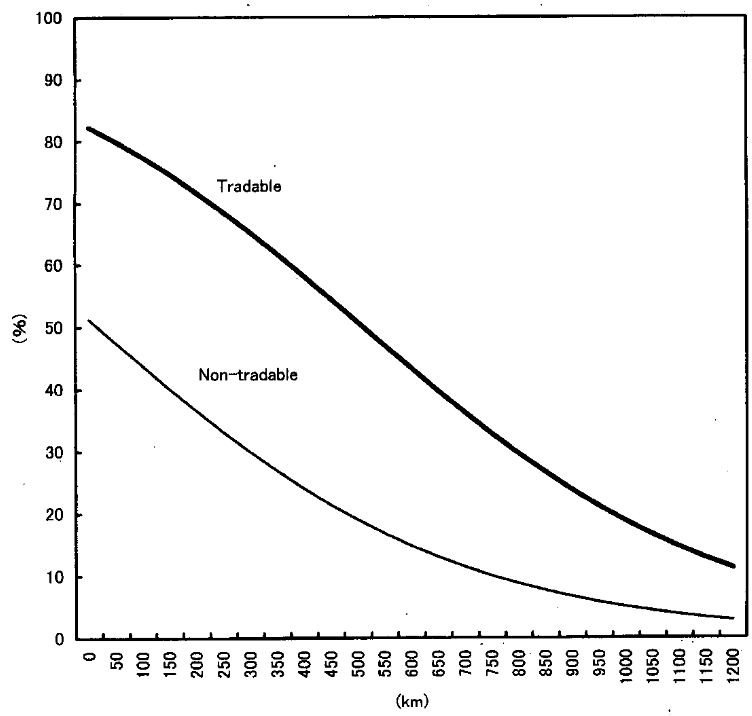

Figure 1. The Probabilities of Support of Purchasing Power Parity from the Logit Model

Figure 1 shows the estimated probabilities from the logit model (9). From this figure, we observe that the probabilities that PPP can be supported for tradable and non-tradable goods decline, as distance between cities increases. In the case of tradable goods, the probability is 75 percent for 100 kilometers, 50 percent for 500 kilometers, and 18 percent for 1000 kilometers. The probability is larger for tradable goods than for non-tradable goods. It can also be observed that the relationship between the probability and distance is concave.

From these results, the model appears consistent with the data, because β_1 is significantly positive, β_2 is significantly negative, and the log likelihood ratio test for the null hypothesis that the coefficients of the independent variable are jointly equal to zero is rejected at the 1 percent level in equations (9) and (10). It is thus statistically confirmed that (1) PPP is more likely to hold for tradable goods than for non-tradable goods and (2) the incidence of violation of PPP increases with distance between cities.

5. Summary and Concluding Remarks

In this paper, we have examined whether long-run PPP holds between seven Japanese cities by using 15 annual disaggregated consumer price indices during 1960-98. Aggregate price indices, trade barriers and exchange rate volatility (border effects) can influence the extent to which PPP or LOOP holds. By using disaggregated price indices between cities in the same country, we can potentially remove these effects, allowing us to observe directly the relationship between deviations from PPP and the type of goods or transport cost.

First, we have tested the hypothesis that the relative price of goods between cities is stationary by using the unit root test and estimated the rates of convergence to PPP. Then, we have formally tested whether the speed of convergence toward PPP is faster for tradable goods than for non-tradable goods as well as whether distance inhibits the elimination of price differences by using the results of the unit root tests. Both of these predictions were statistically confirmed. It turned out that the average half-life of PPP deviations for tradable goods was 1.47 years. Convergence for tradable goods within Japan was faster than that typically found in cross-country data.

Finally, we have statistically identified the determinants of PPP between Japanese cities by using the logit model. It was statistically confirmed that distance between cities makes it more likely that PPP is violated and that PPP does hold more for tradable goods than for non-tradable goods. It seems reasonable to conclude that distance (transport cost) inhibits the elimination of price differentials that may exist between cities.

References

Campbell, John Y. and Pierre Perron. "Pitfalls and Opportunities: What Macroeconomists should Know about Unit Roots", in Oliver J. Blanchard and Stanley Fischer (eds)., NBER Macroeconomic Annual, Cambridge, London: MIT Press, 1991, 141-201.

Engel, Charles and John H. Rogers. "How wide is the Border?" *American Economic Review* 86, December 1996, 1112-1125.

Esaka, Taro. "Panel Unit Root Tests of Purchasing Power Parity between Japanese Cities, 1960-1998: Disaggregated Price Data", *Japan and the World Economy* 15, April 2003, 233-244.

Frankel, Jeffrey A. and Andrew K. Ross. "A Panel Project on Purchasing Power Parity: Mean Reversion within and between Countries", *Journal of International Economics* 40, February 1996, 209-224.

Froot, Kenneth and Kenneth Rogoff. "Perspectives on PPP and Long-Run Real Exchange Rates", in Gene M. Grossman and Kenneth Rogoff (eds)., *Handbook of International Economics* 3, Amsterdam, The Netherlands: North-Holland, 1995, 1647-88.

Greene, William H. *Econometric Analysis,* Second Edition, Englewood Cliffs, NJ: Prentice-Hall, 1993.

Im, Kyung So, M. Hashem Pesaran and Yongcheol Shin. "Testing for Unit Roots in Heterogeneous Panels", Working Paper, Department of Applied Economics, University of Cambridge, 1997.

Jenkins, Michael A. "Cities, Borders, Non-traded and Purchasing Power Parity", *Oxford Bulletin of Economics and Statistics* 59, May 1997, 203-213.

Lothian, James and Mark Taylor. "Real Exchange Rate Behavior: The Recent Float from the Perspective of the Past Two Centuries", *Journal of Political Economy* 104, June 1996, 488-541.

Maddala, G. S and Shaowen Wu, "A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test", *Oxford Bulletin of Economics and Statistics* 61, November 1999, 631-652.

Parsley, David C. and Shang-Jin Wei. "Convergence to the Law of One Price without Trade Barriers or Currency Fluctuations", *Quarterly Journal of Economics* 108, November 1996, 1211-1236.

Rogoff, Kenneth. "The Purchasing Power Parity Puzzle", *Journal of Economic Literature* 34, June 1996, 647-668.

Saxonhouse, Gary R. "Estimated Parameters as Dependent Variables", *American Economic Review* 66, March 1976, 178-83.

Takagi, Shinji and Yushi Yoshida. "A Cointegration Test of Long-run Purchasing Power Parity between Major Japanese Cities, 1951-1991", *Osaka Economic Papers* 48, March 1999, 5-19.

White, Halbert. "A Heteroskedasticity-Consistence Covariance Matrix Estimator and a Direct Test for Heteroskedasticity", *Econometrica* 48, May 1980, 817-38.